

Advancing The Green Transition on Technical Vocational Education and Training in Davao Del Norte

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Abstract

This study explores the green transition within the Technical and Vocational Education and Training (TVET) system in Davao del Norte, Philippines, aiming to support a sustainable economy. We utilized the British Council's Greening TVET Systems Self-Assessment Tool to assess seven key areas of green TVET: policy coherence, labor market intelligence, employer engagement, curriculum assessment, learner support, institutional strengthening, and financing. Data were collected from TVET administrators and green TVET focal persons from accredited training institutions, and we analyzed the information using descriptive statistics and the Friedman test. The findings revealed that the TVET sector in Davao del Norte shows moderate to high readiness to pursue green initiatives. Notably, employer engagement scored the highest, indicating strong collaboration from industry partners in areas such as curriculum development, governance, and work-based learning opportunities. Other areas like curriculum assessment and learner support also demonstrated promising progress. However, financing emerged as a significant challenge, highlighting insufficient resources for institutional transformation and green skills development. Despite these issues, the study concludes that Davao del Norte has a solid foundation for implementing green TVET. To fully support the transition to a sustainable economy, it is crucial to improve collaboration among institutions, develop sustainable financing strategies, enhance curricula, and build workforce capabilities. These insights contribute to the growing conversation on sustainable technical education and can serve as a valuable resource for policymakers and researchers interested in advancing green TVET systems in the Philippines.

1. Introduction

Climate change is a challenge that affects all of us, influencing how we live, work, and interact with our environment. It's clear that discussion of these environmental issues is urgent. At the same time, this challenge presents a valuable opportunity for us to move toward a greener economy that benefits both the planet and future generations. A key milestone to address this concern was the adoption of the 2030 Agenda for Sustainable Development, which includes the 17 Sustainable Development Goals (SDGs). These goals set a framework for

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action and policies affecting humanity and the planet. In fact, Sotiropoulos et al. (2025) highlighted that the global community is coming together to prioritize the development of sustainable strategies to tackle climate change. Further research by Yuan et al. (2024) highlights that climate change is one of the biggest challenges we face as a society. They explain how it has deeply influenced our daily lives and the way we interact with the world around us. This ongoing threat doesn't just endanger our environment; it also takes a toll on our productivity, impacting both individuals and communities as we strive to adapt to these changes. With the rise of new ideas and strategies to combat climate change, the United Nations Environment's Green Economy Initiative reminds us that truly sustainable development depends on creating an inclusive green economy. This approach aims to foster an economy that minimizes carbon emissions, promotes efficient production, and encourages inclusive consumption and outcomes. It's built on values like sharing, circularity, collaboration, solidarity, resilience, and recognizing our interdependence. We're starting to see a noticeable shift towards sustainable practices across different sectors, including industry and education. This change reflects a growing commitment to caring for our environment as a society. Research by Lee et al. (2025) indicates that the success of our transition to a greener economy isn't just about having access to new technologies or funding—it's about having skilled workers ready to put these ideas into practice. This highlights the crucial role of education in achieving global sustainability as we work to implement the green economy concept.

Technical-vocational education provides skills training to support the transition to the green economy, prioritizing sustainability and environmental responsibility. Additionally, the role of TVET in equipping individuals with the skills necessary to engage in green practices and industries becomes paramount. Likewise, Muaddab, H. (2024) emphasized that TVET is considered key to developing competencies in green industries. (7) Similarly, Krainov, G. N. et al. (2021) studied that the growth of green competencies calls for a qualified workforce trained in addressing challenges posed by both climate change and depletion of resources by economies. That aligns perfectly with the principles guiding the world toward sustainable development through international frameworks, such as the SDGs, which highlight the role of education in building sustainable societies. Persson et al. (2023) further noted that TVET's role in the transition includes technological change and the rapid expansion of green jobs and skills, requiring the reskilling and upskilling of many industrial workers in response to climate change. In ASEAN member states, such as Malaysia, the promotion of green skills in all sectors of the industries is being widened. Keshminder, J. S., & Cheng, C. S. (2020), affirmed that the chemical manufacturing in Malaysia has provided green skills among employees which makes them easy to quickly respond to any green policies while providing superior strategies in mitigating the threat of climate change. In fact, Kerr, K. et al. (2025) emphasized that delays in climate and energy projects due to skills shortages could lead to additional global warming while also increasing the costs of project implementation, as demand for workers with technical and green skills outstrips supply.

According to Orbet et al. (2023), in the Philippines, TVET is spearheaded by the Technical Education and Skills Development Authority (TESDA), which initiated the Green Jobs Certification Program, aiming to harmonize vocational training with green economic demands. This shift in our institutions reflects a growing commitment across the country to sustainable development. We're using Technical and Vocational Education and Training (TVET) to boost environmental awareness, promote eco-friendly practices, and build economic resilience during these rapidly changing times. Yet, research by Arzadon, O. et. Al. (2025) reveals that the training programs offered by the Technical Education and Skills Development Authority (TESDA) aren't fully equipped for the future. Many of these programs don't align with emerging sectors like green jobs and digital agriculture, and they often lack input from local communities, which is essential for their relevance. The absence of adequate green skills training is a significant challenge, especially as industries increasingly demand sustainable skill sets. Moreover, Guzman Bautista and their team (2024) point out that while we've seen some progress, we still face hurdles like limited resources, outdated teaching materials, and a lack of engagement from key stakeholders. It's important to note that although TVET policies are in place across all regions, the idea of a green economy is often seen as optional rather than essential. Knowledge gaps in both public and private TVET institutions are a pressing concern that we need to address. This concern is echoed by Onele (2025), who found that while TVET educators recognize climate change as an important issue, many do not fully grasp its main causes, wide-ranging impacts, or effective ways to mitigate it. Contributing to this gap are inadequate environmental education, weak policy incentives, and a lack of governmental commitment to addressing these pressing climate issues.

Chee Sern et al. (2021) emphatically stated that there is a significant demand for green skills in the green industry. However, many TVET institutions have yet to incorporate green skills into their curricula due to uncertainty about the specific types of green skills the green industry requires. Given these considerations, it is essential to analyze the green transition to assess the current state and identify effective strategies to advance environmentally sustainable initiatives. This includes the comprehensive development of green skills within the country's technical-vocational education and training framework. Additionally, the study will gather evidence-based benchmarks for development in policy coherence and vision, labor market intelligence and skills anticipation, and employer engagement. Also, this will include the curriculum and assessment, learner engagement and support, institutional strengthening, TVET Workforce development, and lastly, the financing

aspect of green transition. Evidently, Park, S., & Park, H. (2025) found that when TVET develops and produces skilled human resources who contribute to the industrial sector, the industry itself progresses. As TVET's contribution to industrial development grows, public recognition of TVET improves and its importance increases, including in strategies to combat climate change.

This study aims to critically assess the green transition in Davao del Norte, the most populous province in the Davao Region of the Philippines. Situated in the northern part of the Davao Region, it presents a significant case for examining the intersection of environmental sustainability and regional development. The tools used in the assessment are the Greening TVET systems self-assessment tool, designed by the (17) British Council, which aims to examine the green transition of TVET in a certain locality. The tool aims to assist governments and broader TVET system stakeholders in recognizing their strengths, identifying areas that require further development, and understanding stakeholder priorities. Generally, this study aims to contribute to a broader discourse of sustainable technical education and its important role in fulfilling regional and national sustainability goals. Additionally, this study will support the Climate Connection global initiative, which brings together individuals worldwide to address the climate crisis.

2. Literature Review

Cao, Y., & Yue, S. (2023) stressed that all nations have aimed to foster sustainable economic growth, and attaining environmentally friendly economic development is essential for sustainable economic progress. Moreover, Su L. (2022) points out that the harmonious advancement of the ecological environment alongside technological innovation is crucial for fostering a green economy. The implementation of these green initiatives has provided an avenue for involving all sectors of society, particularly the education sector. In this way, Torracco, R. J. (2016) emphasized that the vocational education literature offers various ideas and complex topics, specifying its role in the green transition across industries. In fact, education plays vital role in the process to increase the acquisition of knowledge and skills in the preservation of the environment. In fact, Putra, R. C et al. (2025) revealed that there is a significant increase in publications related to teaching factory and Green skills from 2021 to 2025, peaking in 2025 with 35.5% of total publications.

In the case of TVET, it has been recognized in many parts as the driver towards sustainable development. By imparting practical skills and knowledge, the institution ensures a basis for growth of the economy and solving the environmental issues that the society is facing. (22) In fact, Holubnychy, L. et al. (2023) found that integrating TVET into sustainability helps build graduates' readiness for a green economy. This is added by the European Training Foundation (ETF), greening TVET refers to the realignment of education and training systems in support of sustainable development through green skills and competencies development. The relevance of TVET with SDGs can be traced back in the alignment process. The importance of SDG 4 on inclusive and equitable quality education must be taken into consideration. Likewise, decent work and economic growth under SDG 8 are vital.

Greening TVET also means that incorporating green skills will help institutions contribute to these ends by preparing such a workforce to support sustainable industries. This is further elaborated in the study by Krainov, G. N. et al. (2021), which argues that green TVETs are necessary to ensure a fair transition to a sustainable future, with workers having the proper skills to develop green jobs and industries. In addition, Chee Sern, L. et al. (2021) found out that the TVET curriculum should incorporate several of the following green skills: problem-solving abilities related to environmental pollution, interpretative skills for understanding environmental phenomena, research skills concerning environmental issues, data collection capabilities, analytical skills, proficiency in utilizing green technology, management skills for natural resources, design skills, skills for controlling environmental pollution, raw material management skills, energy-saving abilities, recycling skills, and skills for reuse. In the research conducted by Zolkifli, H. et al. (2016), it was observed that some individuals were unaware of the concept of generic green skills, often referring to them as green practices. To facilitate change, it is important to highlight the significance of technical and vocational education and training (TVET) in fostering generic green skills that can ultimately contribute to environmental sustainability. Consequently, TVET has the potential to serve as an effective platform for promoting generic green skills.

British Council (2023) stresses that the systems for technical and vocational education and training (TVET) must adapt to help individuals navigate shifting labor markets and acquire the skills needed to improve employability and achieve their developmental objectives. Furthermore, greening the TVET system requires integrating environmental sustainability across all aspects of vocational education and training. In fact, Piper, N. (2023) emphasized that Greening TVET and Skills Development enable the establishment of newly relevant occupational standards and training programs that relate to the demands of a green economy. These newly established standards allow every TVET training institution to initiate green transition on its operation, curriculum offering and the laboratory practices to support the green transition of TVET. This is further highlighted by Quimba, F. M. A., et al. (2023), who note an increased investment in green technologies and facilities to support the improvement of green TVET institutions. The greening of the TVET system must be evaluated appropriately to ensure its optimal implementation. Additionally, Jerald, H. et al. (2024) highlighted the necessity

of restructuring economies, and the skills individuals must acquire in this new landscape are critical given the global effects of climate change. Technical and Vocational Education and Training (TVET) systems are essential for reskilling and equipping the workforce with environmentally sustainable skills for green economies and employment opportunities.

Based on the greening concept established by the British Council (2023), there are eight dimensions that will aid in examining the TVET system to support the transition to a greener economy. The first dimension focuses on Policy Coherence and vision aims to assess the commitment of the government and TVET organizations in moving towards a green economy. Examining the alignment of current priorities and policies of the organization in the green transition process, integrated into the TVET system. Masemene, K. J., & Mahlomaholo, M. R. (2025) highlight that a green policy within institutions could enhance the creation of a green competency framework, the greening of the curriculum, and the development and support of capacity. Consequently, policies aimed at greening TVET are essential for promoting the greening process within the TVET system.

Another dimension of the greening concept is the labour market intelligence and skills anticipation. This emphasizes how well the organization's personnel understand the labour market shifts expected because of efforts to make the economy more sustainable. These shifts encompass the need to reskill and upskill current positions, as well as the creation of new roles arising from technological advancements. A review of labour-market knowledge will offer vital opportunities for the transition process in TVET. In fact, Thake, A. M. (2025) studied the effect of green policies and practices on employment in skills development, drawing the establishment of various opportunities for job creation, specifically in renewable energy, efficiency, and sustainable agriculture.

Employer engagement is the third dimension of the greening concept. This dimension seeks to assess each employer's engagement, as it is believed that the greening process has significant implications for the workforce. Green engagement among employers helps them develop behaviours aligned with the concept of sustainability. In fact, Andrianova, O. (2019) stated that the development of green behaviour among employers in an organization will promote minimization within and outside the organization. It will provide an avenue to accelerate the green transition within the system. Also, the curriculum and assessment in the greening concept focus on the implementation of TVET institutions. Reorganizing the TVET curriculum aligned with the greening concept provides greater opportunities to advance the transition. Perez, R. (2019) indicated that the increasing environmental challenges have created a significant demand for the transformation of educational curricula to enhance and support sustainable development. Furthermore, this aligns with the learner engagement and support concept to ensure the greening transition is feasible across all TVET organizations. Also, this will strengthen the institutional TVET workforce, which ensures appropriate financial capability. All these dimensions in the greening concept shall undergo a regular Quality Assurance, monitoring, and evaluation process to ensure that the greening transition aligns with the real concept of sustainable development.

Looking ahead, the green transition offers serious opportunities for TVET systems to function as key enablers of sustainable development. Technical and Vocational Education and Training (TVET) providers have a unique opportunity to meet labour-market needs while also supporting global sustainability goals. Orbeta et al. (2023) suggested that they can do this by updating their curricula with innovative approaches, integrating sustainable practices into their daily operations, and building strong partnerships with green industries. To make this vision a reality, Smith et al. (2023) emphasized that it's crucial to continuously invest in developing educators' skills, modernizing facilities, and creating policies that work in harmony. Moreover, Greenfield (2023) noted that research indicates that incorporating sustainability into the culture of TVET institutions can lead to significant change, fostering a deeper environmental consciousness within vocational education systems. This transformation not only prepares students for the workforce but also equips them to contribute positively to the planet.

3. Methodology

In this study, a quantitative approach is utilized to gain insight into how different variables interact. We carefully gathered and analysed numerical data, which helped us understand their relationships and how they work together. Questionnaires were distributed as surveys to collect data, which was then utilized to test hypotheses, clarify causation, and forecast future occurrences (Creswell, 2024). It focuses on assessing the greening initiatives implemented in the Province of Davao del Norte. The assessment was conducted systematically using a descriptive research design. Numerical data derived from the self-assessment survey.

All data gathered in the study were analysed using descriptive statistics, particularly frequency, mean, and standard deviation. Also, A Friedman test was conducted to determine whether readiness scores differed significantly across the seven dimensions.

3.1 Research Instrument

This study involves a series of systematic planning and coordination with the Technical Education and Skills Development Authority in the Province of Davao del Norte. The researcher adopted the British Council-

established Greening TVET Systems Self-Assessment Tool. This instrument aims to assist governments and broader stakeholders within the TVET system in pinpointing their strengths, identifying opportunities for growth, and recognizing key priorities among stakeholders. Additionally, it serves as a foundation for sharing experiences and best practices on an international level, encouraging innovation and learning across countries British Council, 2023).

The instrument was validated and recommended for use in further research to help the TVET sector advance its greening initiatives. According to the British Council (2023) report, the instrument followed a five-stage validation approach to ensure the validity and reliability of its results. The tool consists of open-ended questions related to the greening TVET concept, and the survey questions are divided into 7 dimensions. These dimensions are (1) Policy Coherence (2) Labor Market Intelligence and Skills Anticipation, (3) Employer Engagement (4) Curriculum and Assessment (5) Learner Engagement and Support (6) Institutional Strengthening and the TVET Workforce (7) Financing. These dimensions were identified to examine in the development of a TVET system that supports the transition to a greener economy.

In addition, the study focuses on the TVET administrators and green TVET focal persons in the Province of Davao del Norte. According to the TESDA database, there are 51 accredited assessment and training centers offering various TVET training programs. Moreover, the study uses purposive sampling to identify the intended respondents. According to Etikan, Musa, & Alkassim (2016) purposive sampling is a commonly employed non-probability method that plays a crucial role in qualitative and mixed methods research due to its emphasis on in-depth and contextual comprehension.

The research tool's implementation has been approved by ethics and ensures that informed consent is obtained clearly, in line with the study's ethical standards.

4. Results and Discussion

Table 1 indicates that 61.29% of respondents perceived that the government has a clear priority for greening the economy. It is further noted that 48.39% of respondents perceived that strategies implemented by the government with good standing and sound plans for TVET could support greening the economy. This perception of the respondents provides a context in the Province of Davao del Norte, where there is a significant policy coherence in the transition to a green economy. Policy coherence is vital in the transition of the green economy to ensure proper implementation and coordination, especially in the education sector. Policymakers should focus on creating clear, cohesive policy frameworks that integrate environmental education, industry collaboration, and effective resource allocation.

By doing so, we can put Technical and Vocational Education and Training (TVET) on the right path to unlock its full potential in promoting sustainability. This approach could make a real difference in equipping future generations with the skills and knowledge they need to build a sustainable world. This aligns with Bran, F., Popa, C., & Radulescu, C. V. (2011), who found that the financial programs under the Cohesion Policy will support economic growth, facilitate the uptake of the latest technologies, foster a favourable business climate, and generate employment opportunities. Policy cohesion in the green economy has provided an avenue to advance the transition into a more progressive one.

Table 1 Policy coherence and vision

Policy Coherence and Vision	YES	To some Extent	No	Don't Know
Is there strong evidence that greening of the economy is a priority for the government?	61.29%	29.03%	6.45%	3.23%
Does the government have a clear strategy for greening the economy and ensuring a 'just transition'?	51.61%	38.71%	9.68	-
Is the strategy effectively implemented?	48.39%	38.71%	6.45%	6.45%
Does the government have a good understanding or plan for how TVET can support greening of the economy?	51.61%	38.71%	9.68	
Are there clear linkages between the government's TVET policy and environmental policies and programmes?	48.39%	38.71%	6.45%	6.45%
Are there clear linkages between the government's TVET policy and industrial policy?	51.61%	35.48%	9.68%	3.23%

Table 2 shows that the majority (51.61%) of respondents perceived that their organizations have a good understanding of which new jobs are likely to emerge due to the green transition. Additionally, data show that 54.84% of respondents report having a good understanding of the changes occurring in existing jobs as a result

of the green transition. Yet, a significant proportion of respondents (38.71%) has only a partial understanding, indicating gaps in awareness of how current roles are evolving to align with the requirements for green skills.

Data revealed that the growing number of administrators understand green transition, but there are still a significant number who need awareness and a comprehensive appreciation of the green economy that can generate new types of jobs. Montanari, S. et al. (2023) noted that there is a need to anticipate labor market needs and ensure adequate alignment of curricula with educational objectives to achieve a sustainable green economy. With these, proper awareness and knowledge acquisition play a vital role in implementing green TVET, which will eventually support the green economy.

Table 2 *Labor market intelligence and skills anticipation*

Labor Market Intelligence and Skills Anticipation	YES	To some Extent	No	Don't Know
	%	%	%	%
Does your organization have a good understanding of which new jobs are likely to be created in your country's economy due to the green transition?	51.61	45.16		3.23
Does your organization have a good understanding of which jobs are likely to be eliminated in your country's economy due to the green transition?	51.61	41.94		6.45
Does your organization have a good understanding of which existing jobs will change due to the green transition and how?	54.84	38.71		6.45%
Does your organization have a good understanding of the main skill gaps in your country's economy?	64.52	29.03		6.45

Table 3 show the results for the employer engagement; it indicates a strong presence of employer engagement in various aspects of the green economy transition within the TVET system. A vast majority of respondents (61.29%) felt that the TVET system had a well-functioning mechanism in place to communicate with employers on how the shift towards a green economy might affect the employers' needs for skills. This shows that there is an established channel for employers to communicate their expectations, which reflects a recognition of the importance of collaboration between the TVET system and the private sector in preparing for a green transition. In addition, engagement with the informal sector is reported to be particularly high, with 74.19% of respondents confirming that the green economy engagement includes the informal sector.

This is an important finding, as the informal sector often accounts for a good proportion of employment, especially in developing economies. According to Castaneda Rodriguez, B. et. al. (2024), ensuring that informal sector workers are included in training and skill development opportunities is critical toward attaining inclusive and sustainable growth within the context of the green transition. Grimshaw, D. et al. (2021) noted that engaging informal-sector employers in the green transition can create numerous job opportunities and greater workforce flexibility. Additionally, McGrath and Russon (2020) emphasized that making sure that a fair transition process is crucial. It's important that everyone in society can share in the benefits of going green.

To navigate the green transition effectively, it's crucial for employers and the Technical and Vocational Education and Training (TVET) system to work more closely together. Employers are stepping up to help shape the future workforce by getting involved in governance, developing curricula, and creating hands-on learning opportunities. This partnership shows their dedication to equipping workers with the skills needed to thrive in the emerging green economy and to tackle the challenges and seize the opportunities it presents. This collaboration is important to ensure that the TVET system can adapt to the changing demands of the labor market and contribute meaningfully to the transition towards a sustainable and inclusive economy.

Table 3 *Employer engagement*

Employer Engagement	YES	To some Extent	No	Don't Know
	%	%	%	%
Does the TVET system have a clear, functional mechanism for engaging with employers on how transitionAA to a green economy may impact on their skills needs?	61.29	22.58	9.68	6.45
Does engagement with the green economy include the informal sector?	74.19	19.35		6.45

Employer Engagement	YES %	To some Extent %	No %	Don't Know %
Is there evidence of employers supporting at-risk employees (whose jobs will be impacted through the green transition) to develop their skills and adaptability (e.g. through on-the-job training and access to short-form TVET)?	64.52	19.35	3.23	12.9
Are employers involved in the governance of TVET institutions?	80.65	12.9	3.23	3.23
Are employers involved in the development of the TVET curriculum and TVET training programmes?	80.65	16.13		3.23
Do employers regularly contribute to the delivery of TVET training programmes?	70.97	22.58		6.45
Do employers regularly provide work-based learning or apprenticeship opportunities for TVET learners or graduates?	70.97	29.03		

Table 4 shows that curriculum and assessment integration with the green economy is critical for preparing learners in the Technical and Vocational Education and Training (TVET) sector for emerging occupations. Data shows the respondents' responsiveness to the green economy's evolving skill needs appears to be at a moderate level. Indeed, 51.61% of respondents perceived that processes are in place to review and update curricula rapidly in response to emerging skill demands. However, only 45.16% indicated new curricula for occupations related to the green economy, while 41.94% updated the curricula for "mid-green" occupations.

This suggests that although some progress is being made, full modernization of the curricula remains incomplete. Certainly, Kwauk, C. T. & Casey, O. M., (2022) said that it can be challenging for curriculum changes to occur when there is complexity in integrating green skills across the board, and the processes may be lengthy and require more resources. Studies by Yuan, Y. et al. (2022) have further argued that green skills integration should not be an afterthought but rather be at the center of attention, especially given the urgency of the green transition. In this way, curriculum and assessment shall create green qualifications that transcend the conventional frameworks and bring sustainability into core competency standards. In this way, TVET systems can prepare a workforce that is adaptable, skilled, and capable of driving sustainable economic growth in the green transition if these challenges are addressed.

Table 4 *Curriculum and assessment*

Curriculum and Assessment	YES %	To some Extent %	No %	Don't Know %
Are there processes in place that allow for the curriculum to be reviewed and updated quickly in response to new skills requirements?	51.61	38.71	6.45	3.23
Have new TVET curricula been developed for new occupations related to the green economy?	45.16	41.94	9.68	3.23
Has the TVET curriculum related to mid-green occupations been updated to embed new knowledge and skills required to use new green technologies and approaches? ('Midgreen' – occupations in which the core elements will remain the same, but new knowledge is likely to be required.)	41.94	41.94	9.68	6.45
Does the general curriculum for TVET learners include opportunities to continue to develop foundational skills such as literacy and numeracy?	77.42	19.35		3.23
Do the assessment methods used in the TVET sector provide an opportunity to judge learners' foundational skills?	80.65	19.35		
Does the general curriculum for TVET learners include opportunities to continue to develop transversal skills (nontechnical, soft skills) such as critical thinking, problem solving, leadership and communication skills?	80.65	19.35		

Do the assessment methods used in the TVET sector provide an opportunity to judge learners' transversal skills (nontechnical, soft skills)?	74.19	25.81		
Does the general curriculum for TVET learners include opportunities to develop environmental awareness and an understanding of the fundamental elements of the green economy?	61.29	38.71		
Do the assessment methods used in the TVET sector provide an opportunity to judge learners' environmental awareness and their understanding of the fundamental elements of the green economy?	67.74	25.81	3.23	3.23
Have TVET qualifications been updated to reflect changes in the curriculum and skills demand?	70.97	29.03		
Are there mechanisms in place that allow providers to assess and accredit the skills of experienced workers looking to retrain?	67.74	29.03	3.23	

Table 5 revealed the respondents' very positive responses concerning efforts to engage learners and provide support in the context of the transition to a green economy. 64.52% of respondents answered that targeted efforts to increase public awareness of green skills were indeed underway. In addition, 67.74% of respondents agreed that the TVET system helps providers deliver short-duration, modular, and flexible training to risk workers. In fact, flexibility in TVET programs has been recognized as an important strategy for supporting learning and adaptation in a rapidly changing labor market. This is supported by Sudan, F.K. (2021), who emphasized that short-term and so-called modular training is vital to allow people to reskill and upskill without a deep disruption of existing employment.

Additionally, results suggest that growing recognition of the need for learner-centered initiatives to support the green transition is important. Although significant efforts are underway to raise awareness, expand access to flexible learning opportunities, and equip career guidance providers with the necessary knowledge, challenges persist. In this way, the advancement of learner engagement and support is directly proportional to the advancement of green TVET, promoting faster green economy implementation.

Table 5 *Learner engagement and support*

Learner Engagement and Support	YES %	To some Extent %	No %	Don't Know %
Are there targeted efforts to increase public awareness of the opportunities that green skills offer? (For example, among potential learners and the existing workforce.)	64.52	19.35	12.9	3.23
Does the TVET system enable TVET providers to provide modular, flexible, and short-duration training for at-risk workers and others?	67.74	22.58	6.45	3.23
Are there processes to help those giving career guidance understand the new opportunities and skills needed by the green transition?	67.74	25.81	3.23	3.23
Do career guidance materials include information on these opportunities and required skills?	64.52	29.03	3.23	3.23
Is there evidence of effective graduate-monitoring mechanisms being used across TVET institutions to track student employment destinations (e.g. tracer studies)?	74.19	19.35	3.23	3.23

Table 6 shows that a significant majority of survey respondents (58.06%) indicated that initial teacher training and continuous professional development programs include content on environmental awareness and the green economy. This response highlights the TVET system's awareness of the need to align educator training with the demands of a green economy. About 35.48% respondents perceived that sustainability content is only somewhat present in our education programs, which shows there's still a lot of room for improvement. Edel (2022) emphasizes the importance of integrating sustainability and green economy principles into the training of vocational and technical educators.

By doing this, we can build a workforce that's not just skilled but also capable of tackling environmental challenges. To support this shift to a greener approach in vocational education, it's vital to focus on training and developing our educators. Additionally, TVET institutions need to foster an environment that encourages green

initiatives, especially in workforce development and alignment with sustainability goals. As the green transition is slowly implemented, we should prioritize capacity-building initiatives, enhance our monitoring and evaluation processes, and adopt strategies that align the TVET system with environmental and sustainability objectives. By integrating these important elements into our educational system, we can ensure that our sector plays a meaningful role in the green economy while effectively addressing the needs of the job market.

Table 6 *Institutional strengthening and TVET workforce development*

Institutional Strengthening and TVET Workforce Development	YES %	To some Extent %	No %	Don't Know %
Do the TVET system's initial teacher training and continuing professional development programs include content on environmental awareness and the green economy?	58.06	35.48	6.45	
Do TVET staff in relevant disciplines have opportunities to undertake continuous professional development on how greening the economy impacts their discipline?	64.52	25.81	9.68	
Does the TVET system give TVET providers sufficient capacity and flexibility to be able to respond swiftly to changing demands for skills?	58.06	29.03	6.45	6.45
Is there a quality assurance mechanism that assesses the performance of the TVET system in your country?	77.42	19.35	3.23	
Is there a mechanism for monitoring and evaluating the contribution the TVET system is making to supporting greening of the economy?	58.06	29.03	9.68	3.23

Table 7 reveals that 38.71% of respondents believe there is sufficient funding to support the organizational changes required in the TVET sector, while an equal proportion (38.71%) expressed partial certainty, and 12.9% disagreed. Data suggests that financial requirements in TVET operations are a prerequisite for implementing the green transition. Wood, D. (2023) added that, for the TVET sector to shift to a green economy, it needs clearer, more cohesive financial mechanisms.

Additionally, Makinde, S. o. et. al., (2024) added that a clear, holistic financial plan for retraining, especially for vulnerable sectors, will be crucial to ensure that the workers are sufficiently skilled to be able to take part in the green economy. Furthermore, Ranzato et al. (2021) found that there is growing recognition of the need for green skills training; however, financial constraints limit the development and scaling of these programs. Accordingly, every TVET institution is required to utilize its budget appropriately to support the implementation of the green transition.

Table 7 *Financing*

Financing	YES %	To some Extent %	No %	Don't Know %
Do you think there is sufficient financing and funding available in your country (from all sources including government, employers, citizens (where appropriate), and international sources) to cover organizational change required in the TVET sector?	38.71	38.71	12.9	9.68
Do you think there is sufficient financing and funding available in your country (from all sources including government, employers, citizens (where appropriate), and international sources) to cover retraining at-risk workers for green jobs?	45.16	35.48	9.68	9.86
Do you think there is sufficient financing and funding available in your country (from all sources including government, employers, citizens (where appropriate), and international sources) to cover the costs of delivering training required for new green economy employment?	41.94	38.71	12.9	6.45
Do TVET funding allocation systems consider changes in skills and occupations needed due to the green transition?	35.48	32.26	22.58	9.68

Comparative Readiness Scores Across the Seven Greening TVET Dimensions

Table 8 presents the comparative analysis of the survey results. Dimension-level readiness scores were computed for the seven greening TVET dimensions. The responses were coded as follows: Yes = 3, To some extent = 2, and No = 1. Responses marked as Don't know were excluded from the computation because they indicated uncertainty rather than definite non-implementation. Higher scores indicate stronger perceived readiness or implementation. Results show that Employer Engagement had the highest readiness score ($M = 2.72$), indicating that respondents perceived employer participation as the strongest area in the greening of TVET. It seems that employers are quite actively engaged in various aspects of education, including governance, curriculum development, training delivery, and the provision of work-based learning opportunities. This involvement is clearly reflected in the high number of (YES) positive responses we received in this area.

Curriculum and Assessment received the second-highest ranking ($M = 2.64$), followed closely by Learner Engagement and Support ($M = 2.62$) and Institutional Strengthening and TVET Workforce Development ($M = 2.60$). These results show a moderate to strong sense of readiness regarding our curriculum practices, support for learners, and the capacity of our institutions. However, it's clear that we haven't fully realized these areas yet. There is still important work to do in updating our curriculum, aligning assessments, offering career guidance, enhancing professional development, and providing better institutional support for the development of green skills.

Labor Market Intelligence and Skills Anticipation ($M = 2.58$) and Policy Coherence and Vision ($M = 2.49$) scored lower than the other areas we looked at. This shows that, while existing mechanisms are in place, respondents feel unsure about the system's ability to anticipate new green jobs, identify evolving skill needs, and align TVET policies with environmental and industrial goals. These aspects are really important because successful green TVET planning depends on having accurate labor market information and a clear policy direction to guide us.

The Financing dimension received the lowest readiness score ($M = 2.26$), highlighting it as the weakest area in the effort to green Technical and Vocational Education and Training (TVET). The low percentage of "Yes" responses indicates that many respondents are not confident about the availability of funds. This uncertainty extends to crucial areas, including implementing institutional changes, retraining workers who may be at risk, providing training for new green jobs, and developing funding systems that effectively support the transition to a green economy.

To assess whether there were significant differences in readiness scores across the seven dimensions, a Friedman test was conducted. The results revealed a significant difference, $\chi^2(6, N = 29) = 21.08, p = .002$, with Kendall's $W = 0.12$. This shows that the dimensions were rated differently; however, the relatively small effect size suggests the differences are modest. As a result, we should view these findings as indicators of where strengths and weaknesses lie rather than as evidence of major disparities between the dimensions. Taken together, the findings suggest that green TVET readiness among the participating respondents is strongest in Employer Engagement and weakest in Financing. The results imply that the greening of TVET has support from employers and some institutional mechanisms, but its long-term implementation may be constrained by limited financial support, incomplete policy coherence, and the need for stronger labor market intelligence.

Given the purposive sampling and modest sample size, these findings should be interpreted as exploratory and context-specific. In fact, Ranzato et al. (2021) emphasized that the literature indicates broader issues in financing greening education and training systems. Thus, advancing the green transition in technical-vocational education and training in Davao del Norte requires sustainable financing.

Table 8 Comparative readiness scores across the seven greening TVET dimensions

Rank	Greening TVET Dimension	Mean	Median	IQR	Yes Responses (%)
1	Employer Engagement	2.72	3.00	0.50	76.47
2	Curriculum and Assessment	2.64	2.64	0.59	67.17
3	Learner Engagement and Support	2.62	3.00	0.90	70.00
4	Institutional Strengthening and TVET Workforce Development	2.60	3.00	0.90	65.77
5	Labor Market Intelligence and Skills Anticipation	2.58	2.75	1.00	58.97
6	Policy Coherence and Vision	2.49	2.60	1.00	56.16
7	Financing	2.26	2.00	0.94	42.99

5. Conclusion

This study examined the Technical and Vocational Education and Training (TVET) system in Davao del Norte's readiness to support the green transition using the British Council's Greening TVET Systems Self-Assessment Tool. The findings show that the province is making good progress in adopting sustainable practices within Technical and Vocational Education and Training (TVET). This is particularly evident in areas like employer engagement, curriculum development, learner support, and strengthening institutions. It's encouraging to see that those involved in the TVET sector recognize the importance of sustainability. They are beginning to weave green principles into training methods, workforce development, and partnerships with industry. This shift reflects a growing commitment to create a more sustainable future.

Among the seven dimensions we explored, employer engagement truly emerged as the most impactful. It highlights how essential industry involvement is in shaping curriculum, supporting governance, and creating opportunities for apprenticeships and work-based learning. This finding really brings to light the importance of strong partnerships between Technical and Vocational Education and Training (TVET) institutions and employers. These collaborations ensure that training programs are not only relevant but also aligned with the evolving needs of the green economy.

On another note, there's been some promising progress in curriculum and assessment practices. They're now incorporating elements like environmental awareness and transversal skills, along with better methods for keeping the curriculum updated to reflect new green occupations and technologies. It's a step in the right direction that shows we're becoming more attuned to the demands of a changing world. Despite these positive developments, the study also identified important challenges that hinder the advancement of green TVET in the province. Financing obtained the lowest readiness score, indicating insufficient and inconsistent funding mechanisms for institutional transformation, retraining initiatives, and the delivery of green skills programs. In addition, lower readiness levels in policy coherence and labor market intelligence suggest the need for stronger coordination among government agencies, industries, and educational institutions to ensure that green TVET policies, labor market demands, and sustainability goals are aligned effectively.

The Friedman test revealed some important insights: while there are noticeable differences among the seven dimensions, the variations aren't extremely large. This shows that we are making progress in greening Technical and Vocational Education and Training (TVET), but that progress isn't consistent across the board. To create a more unified and lasting green transition in the TVET sector, we need to bolster financial support systems, improve labor market forecasting, and better integrate policies. These steps will help us move forward more effectively.

The study highlights that Davao del Norte has a solid foundation for promoting green Technical and Vocational Education and Training (TVET) and plays a crucial role in the shift towards a sustainable economy. However, to sustain this momentum, it's important to invest for the long term, strengthen institutional collaborations, focus on continuous workforce development, and implement policies that truly respond to the community's needs. These findings add valuable insights to the ongoing discussion about sustainable technical education. They can help guide policymakers, TVET leaders, industries, and other stakeholders in creating strategies that not only enhance green skills but also foster environmental sustainability and support inclusive economic growth throughout the Philippines.

6. Recommendation

The study emphasizes the importance of integrating green economy principles into the Technical and Vocational Education and Training (TVET) system. To make this happen, we need to focus on aligning policies, finding sustainable funding, and encouraging collaboration between institutions. The Technical Education and Skills Development Authority, along with other government agencies, should work together to craft policies that are tailored to local needs. These policies should ensure that TVET programs not only promote environmental sustainability but also prepare students for the evolving job market.

TVET institutions are encouraged to continuously update curricula, assessment methods, and training programs by embedding green skills, environmental awareness, and sustainable practices across all disciplines. Continuous professional development for trainers and administrators should also be prioritized to strengthen their competencies in delivering green TVET programs effectively.

Moreover, stronger partnerships among industries, government agencies, and educational institutions should be expanded to support apprenticeship programs, work-based learning, and green innovation initiatives. Increased financial investment in green infrastructure, training facilities, and workforce retraining programs is likewise essential to ensure the long-term sustainability of green TVET implementation.

Finally, future studies may expand regional assessments and evaluate the long-term impact of green TVET initiatives on employability, sustainable practices, and economic development.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Francisco, Neri;; **data collection:** Francisco, Neri; **analysis and interpretation of results:** Francisco, Neri; **draft manuscript preparation:** Francisco, Neri. All authors reviewed the results and approved the final version of the manuscript.*

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