



A Model for Developing an Institutional Greening Action Plan (GAP) for TVET: Strategies for Adapting and Alignment with Global Green Policies and Mandated Trends in Sustainable Education

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ABSTRACT: The integration of sustainability into Technical and Vocational Education and Training (TVET) is essential for equipping a workforce capable of addressing contemporary environmental challenges and fostering a green economy. This article explores a comprehensive framework for Greening TVET, emphasizing the importance of curriculum development, stakeholder engagement, and the establishment of clear, actionable goals based on the *UNESCO-UNEVOC Framework ESD-2030* for TVET. A concrete detailed developmental design and plan phases in congruence with the UNESCO framework are proposed and discussed in the light of the TVET's specifics. Analytically it is examined the significance of engaging a diverse range of stakeholders—including educators, industry partners, students, and community members—to cultivate a collective understanding of sustainability's importance. This collaborative approach facilitates the design and implementation of effective Greening strategies that are responsive to local needs and global trends. The necessity of plans and thorough needs assessments, developing strategic action plans, and implementing pilot programs are analyzed to ensure continuous evaluation and improvement of greening initiatives. By prioritizing sustainability in vocational education, institutions can play a pivotal role in shaping a workforce that is not only skilled but also socially responsible and environmentally conscious, thereby driving progress towards a more sustainable future.

KEYWORDS: Greening TVET, GAP, Framework of Greening, Sustainable approaches in TVET.

INTRODUCTION

For the scope of the article, the following term clarification, and initialization of the thematic are made:

Greening TVET: Greening TVET refers to the process of integrating environmental sustainability into TVET programs. This involves adapting curricula, teaching methods (*Sern et al., 2021*), and institutional practices to promote sustainable development (*Ogur, 2023; McGrath & Russon, 2023*), equipping learners with the knowledge, skills, and attitudes necessary to contribute to a green economy (*Jayaprakash, 2024*) and environmentally responsible practices in their future workplaces (*Bagale, 2021*), strategic actions to increase sustainable competitiveness (*Pavlova & Askerud, 2023*).

Global Framework for Sustainability: A global framework for sustainability is a comprehensive set of guidelines, principles, and goals established at an international level to promote sustainable development across various sectors. This framework aims to address global challenges such as climate change, resource depletion, and social inequality, providing a structured approach for countries and organizations to implement sustainable practices and policies. Recent research highlights the need for comprehensive frameworks to address global sustainability challenges. *Van Antwerp & Heun (2022)* introduce a framework for sustainability thinking, while *Liu (2023)* proposes the “meta-coupling” framework to integrate human-nature interactions across scales and borders. This approach reveals effects on UN Sustainable Development Goals (SDGs) and uncovers hidden phenomena in sustainability science. *Fry & Egel (2021)* present a Global Leadership for Sustainability model, emphasizing spirituality and a global mindset as critical components for balanced stakeholder approaches. However, *Bendell (2022)* argues for replacing the Sustainable Development framework altogether, citing failures in SDG progress and critiquing the underlying economic ideology. Instead, Bendell suggests an upgraded Disaster Risk Management framework that focuses on self-reliant resilience and locally led adaptation in response to increasing global crises and disasters. These diverse perspectives reflect the evolving nature of sustainability research and the search for effective global frameworks.



Global Action Program of Education for Sustainable Development (ESD): The Global Action Program on ESD is an initiative launched by UNESCO to enhance the effectiveness of education for sustainable development worldwide. It aims to promote the integration of sustainability principles into education systems, fostering a culture of sustainability through innovative teaching practices, community engagement, and the development of relevant educational resources. *Reis et al. (2021)* proposed a framework with 19 recommendations, guiding these sectors to support global sustainability goals by leveraging insights from top countries in science and technology that uses smart technologies to drive sustainable development across government, organizations, and academia. By aligning TVET with the principles of ESD and focusing on green processing, institutions can contribute to a more sustainable future while equipping students with the skills necessary for success in a green economy.

Greening Concepts: Greening concepts refer to the ideas and principles that underpin the process of making practices, policies, and systems more environmentally sustainable. These concepts encompass a range of strategies and approaches aimed at reducing environmental impact, promoting resource efficiency, and fostering sustainable behaviors in various contexts, including education, industry, and community development.

Whole-Institution Process: The whole-institution process is an approach to implementing sustainability initiatives that involve all aspects of an educational institution, including governance, curriculum, operations, and community engagement. This holistic approach ensures that sustainability is embedded in the institution's culture and practices, fostering a comprehensive commitment to environmental responsibility and sustainable development.

Assessment Framework: An assessment framework is a structured tool or system used to evaluate the effectiveness and impact of programs, initiatives, or practices. In the context of greening TVET, an assessment framework helps institutions measure their progress towards sustainability goals, identify areas for improvement, and ensure accountability in the implementation of greening initiatives.

Greening Plan of Action: A greening plan of action is a strategic document that outlines the specific steps, goals, and timelines for implementing sustainability initiatives within an institution. This plan typically includes priorities for action, resource allocation, stakeholder engagement strategies, and mechanisms for monitoring and evaluating progress, serving as a roadmap for the institution's greening efforts. All terms briefly summarized in *Table 1*.

Table 1. Summary of the Sustainability approaches in TVET.

<i>Sustainability Approach</i>	<i>Description</i>
<i>Integrated Management of Campus Operations</i>	Promotes an integrated management system to strengthen operational sustainability within the institution. Apply sustainability principles to resource deployment and financial management (<i>Sahane et al, 2023</i>).
<i>Curriculum Integration</i>	Embeds sustainability and environmental content into existing curricula. Equips educators to deliver relevant sustainability topics across disciplines (<i>Sern et a, 2023</i>)
<i>Community Engagement</i>	Engage with local communities and stakeholders to align TVET programs with community needs and challenges. Fosters partnerships for collaborative sustainability efforts.
<i>Capacity Building for Educators</i>	Focuses on training educators to effectively incorporate sustainability into teaching practices. Enhances skills and knowledge of educators for better communication of sustainability topics.
<i>Monitoring and Evaluation</i>	Establishes a framework for measuring the effectiveness of sustainability initiatives. Involves setting goals, monitoring progress, and evaluating outcomes for continuous improvement (<i>Puaschunder, 2021</i>) or self-assessing framework – ex. GreenComass (<i>Jovanovski et al, 2024</i>)
<i>Development of Green Skills</i>	Identifies and develop competencies related to green jobs and sustainable practices. Redesigns training programs to include green skills for emerging job markets (<i>Michel, 2020</i>).
<i>Whole-Institution Approach</i>	Integrate sustainability into all aspects of the institution, including governance, curriculum, and operations. Ensures a comprehensive commitment to environmental responsibility (<i>Persson et al, 2023</i>).

Connecting TVET and Greening: The Framework

The greening of TVET and Vocational Education and Training (VET) is crucial for several reasons:



- [1] *Alignment with Sustainable Development Goals (SDGs)*: Greening TVET and VET is essential for achieving the United Nations Sustainable Development Goals. Education plays a pivotal role in promoting sustainable practices, and by integrating sustainability into vocational training, institutions can contribute to broader global efforts to address issues such as poverty, inequality, and climate change.
- [2] *Preparation for a Green Economy*: As economies transition towards more sustainable practices, there is an increasing demand for skilled workers who are knowledgeable about environmental issues and sustainable technologies. Greening TVET and VET ensures that graduates are equipped with the skills and competencies needed to thrive in a green economy, thereby enhancing their employability and adaptability to changing job markets.
- [3] *Enhancing Competitiveness*: Institutions that embrace greening initiatives can improve their competitiveness by producing graduates who are not only technically skilled but also environmentally conscious. This can lead to better job placements for graduates and increased collaboration with industries that prioritize sustainability.
- [4] *Promoting Social Responsibility*: Greening TVET and VET fosters a sense of social responsibility among learners. By understanding the environmental and social impacts of their work, graduates are more likely to engage in practices that contribute to the well-being of their communities and the planet. This can lead to the development of sustainable enterprises and social initiatives that address local challenges.
- [5] *Improving Institutional Practices*: The greening process encourages TVET and VET institutions to adopt sustainable practices in their operations, such as energy efficiency, waste reduction, and sustainable resource management. This not only reduces the environmental footprint of the institutions but also serves as a model for students, reinforcing the importance of sustainability in all aspects of life.
- [6] *Capacity Building for Educators*: Greening TVET and VET involves training educators and trainers to incorporate sustainability into their teaching practices. This capacity building is vital for ensuring that the next generation of workers is well-informed about environmental issues and equipped to implement sustainable solutions in their respective fields.
- [7] *Community Engagement and Development*: Greening initiatives often involve collaboration with local communities and industries, fostering partnerships that can lead to shared benefits. By engaging with community stakeholders, TVET and VET institutions can better align their programs with local needs and contribute to community development through sustainable practices.

The greening of TVET and VET is important not only for enhancing the relevance and quality of education but also for fostering a sustainable future. It prepares learners for the challenges of a rapidly changing world, promotes social responsibility, and contributes to the overall well-being of society and the environment.

In the context of greening TVET, a structured approach is essential for effectively integrating sustainability into educational practices. The process begins with raising awareness and formulating a clear rationale for the greening initiative. This initial step is crucial as it helps stakeholders understand the significance of sustainability in education and the broader implications for society and the environment.

Following this, the development of a vision is paramount. A well-articulated vision serves as a guiding light for the greening process, aligning the initiative with the institution's goals and the needs of the community. This vision should encapsulate the aspirations of the institution and provide a framework for the actions that will follow.

Promoting broader engagement is the next critical step. This involves actively involving a diverse range of stakeholders, including educators, industry partners, and community members. By fostering collaboration and ensuring that various voices are heard, TVET institutions can create a sense of ownership and support for the greening process. Engaging stakeholders not only enhances the relevance of the initiatives but also builds a supportive network that can facilitate the implementation of green practices.

Once engagement is established, assessing current realities becomes essential. This step involves conducting a comprehensive evaluation of the existing situation within the institution. By identifying priorities, resources, and needs, TVET institutions can gain a clear understanding of their starting point. This assessment is vital for recognizing strengths and weaknesses, providing a foundation for developing targeted strategies that address specific gaps while leveraging available resources effectively.

The next phase involves developing an Institutional Greening Plan of Action. This plan outlines the greening priorities, sets clear goals, establishes a timetable for action, and often includes the formation of an advisory committee to guide the process. A well-structured plan is crucial for ensuring that the greening initiatives are organized, focused, and achievable.

The implementation of the Institutional Greening Plan marks a significant transition from planning to action. This step requires the delegation of tasks, consolidation of efforts into core systems, and the deployment of necessary resources. Successful implementation hinges on effective communication and collaboration among all stakeholders, ensuring that everyone is aligned and working towards common goals. Finally, monitoring progress and assessing results is essential for the sustainability of the greening initiatives. Establishing a framework for evaluation allows institutions to track the effectiveness of their actions, identify areas for improvement, and ensure continuous enhancement of their greening efforts. This ongoing assessment not only helps with refining strategies but also reinforces the commitment to sustainability within the institution. The process of greening TVET is a multifaceted journey that requires careful planning, stakeholder engagement, and continuous evaluation. By following these structured steps, TVET institutions can effectively integrate sustainability into their programs and operations, ultimately contributing to a more environmentally responsible and economically viable future.

Key Strategies for Greening TVET as part of Integrating Sustainability

A Structured Approach to Greening TVET

As the world faces pressing environmental challenges, the role of TVET in fostering sustainable practices has never been more critical. Greening TVET not only enhances the relevance of educational programs but also equips learners with the skills necessary to thrive in a rapidly evolving green economy. This structured approach to greening TVET encompasses several key components that ensure sustainability is effectively integrated into educational practices. The first step in greening TVET involves raising awareness among stakeholders about the importance of sustainability in education. This includes establishing a clear rationale for the greening initiative, which helps stakeholders understand the broader implications for society and the environment. By fostering a collective understanding of sustainability's significance, institutions can build a strong foundation for their greening efforts. Once awareness is raised, developing a well-articulated vision becomes paramount. This vision serves as a guiding light for the greening process, aligning the initiative with the institution's goals and the needs of the community. A clear vision encapsulates the aspirations of the institution and provides a framework for the actions that will follow, ensuring that all stakeholders are working towards common objectives.

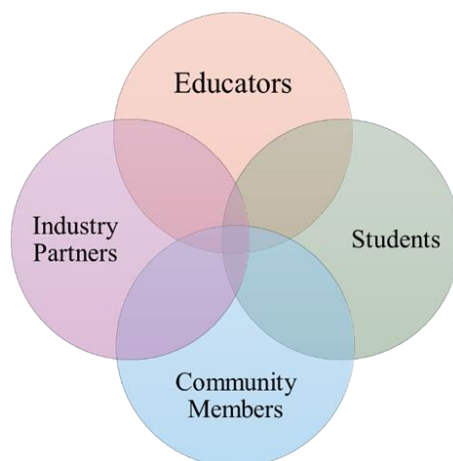


Figure1. Interconnected roles and interests of various stakeholders involved in the greening process of TVET
[source: by author]

To effectively integrate sustainability into TVET, several key strategies must be employed:

- **Curriculum Development and Adaptation:** Institutions should conduct thorough needs analysis to identify the knowledge and skills required for a green workforce. This involves adapting existing programs to incorporate green technologies and practices, ensuring that educational outcomes align with industry needs.
- **Collaboration with Industry and Stakeholders:** Engaging with industry partners is crucial for understanding the evolving skills required in the job market. This collaboration helps institutions stay relevant and ensures that their programs meet the demands of a green economy. *Figure 1.* Depicts the interconnectedness of the various stakeholders in the Greening.

A successful greening initiative relies on the active engagement of various stakeholders:



- **Importance of Collective Understanding:** It is essential to communicate the rationale for greening among all stakeholders, including educators, students, industry partners, and community members. This collective understanding fosters a sense of ownership and support for the greening process.
- **Promoting Broader Engagement:** Actively involving a diverse range of stakeholders enhances the relevance of the initiatives and builds a supportive network that can facilitate the implementation of green practices.

The implementation phase is where the planned strategies “come to life”:

- **Conducting Needs Assessments:** Institutions should start by assessing their current capabilities and identifying specific areas that require improvement. This assessment provides a foundation for developing targeted strategies.
- **Developing an Institutional Greening Action Plan:** A detailed action plan outlines greening priorities, sets clear goals, and establishes a timetable for action. This plan is crucial for ensuring that Greening initiatives are organized and achievable.
- **Pilot Programs and Continuous Evaluation:** Before full-scale implementation, institutions can pilot new curricula or training methods in select programs. Continuous evaluation mechanisms should be established to assess the effectiveness of the greening initiatives and refine them based on feedback.

A structured approach to greening TVET is essential for integrating sustainability into educational practices. By raising awareness, developing a clear vision, employing key strategies, engaging stakeholders, and implementing targeted initiatives, TVET institutions can contribute significantly to a more sustainable future. This multifaceted journey not only enhances the quality of education but also prepares learners to meet the challenges of a green economy.

Implementation of Greening Initiatives and Implementation Recommendations

To effectively implement the recommendations for greening TVET, institutions can follow these steps:

- **Conduct a Needs Assessment:** Institutions should start by assessing the current state of their programs and identifying the specific green skills required in the labor market. This involves engaging with industry stakeholders to understand the skills gap and future workforce needs.
- **Develop a Greening Action Plan:** Based on the needs assessment, institutions should create a detailed action plan that outlines specific activities, timelines, and responsible parties for greening initiatives. This plan should include curriculum changes, training methods, and stakeholder engagement strategies.
- **Pilot Programs:** Before full-scale implementation, institutions can pilot new curricula or training methods in select programs. This allows for testing and refinement based on feedback from students and industry partners.
- **Continuous Evaluation and Improvement:** Institutions should establish mechanisms for ongoing evaluation of their greening efforts. This includes collecting data on student outcomes, industry feedback, and environmental impacts to continuously improve programs and practices.

Importance of the Greening Plan and Benefits of Integrating Sustainability into TVET

Integrating sustainability into TVET programs offers a multitude of benefits that extend beyond the immediate educational environment. These advantages not only enhance the quality of education but also contribute to broader societal and environmental goals. The following sections outline the key benefits of this integration in detail.

Enhanced Employability

One of the most significant benefits of incorporating sustainability into TVET is the enhancement of employability for graduates. As industries increasingly prioritize sustainability, employers are actively seeking individuals equipped with green skills and knowledge. By integrating sustainability into curricula, TVET institutions prepare students to meet the evolving demands of the job market. Graduates who possess competencies in sustainable practices, renewable energy technologies, and resource management are more attractive to employers, leading to better job prospects and career advancement opportunities. This alignment with market demands not only benefits students but also supports businesses in their transition towards more sustainable operations.

Contribution to Sustainable Development

TVET institutions play a crucial role in advancing national and global sustainability goals by training a workforce that understands and values sustainable practices. This contribution is particularly important in the context of pressing global challenges such as climate change, resource depletion, and social inequality. By equipping students with the knowledge and skills to implement sustainable practices, TVET programs help to reduce carbon footprints, promote resource efficiency, and foster social equity. This



alignment with sustainable development goals (SDGs) ensures that graduates are not only prepared for the workforce but also empowered to contribute positively to their communities and the environment.

Innovation and Competitiveness

Integrating sustainability into TVET fosters a culture of innovation within educational institutions. By emphasizing green technologies and sustainable practices, institutions encourage students to think critically and creatively about solutions to environmental challenges. This focus on innovation can lead to the development of new sustainable technologies and practices, enhancing the competitiveness of both graduates and the institutions themselves. As industries increasingly seek innovative solutions to meet sustainability targets, TVET graduates who are trained in these areas can drive advancements in their respective fields, positioning themselves and their employers as leaders in the green economy.

Community Impact

The benefits of integrating sustainability into TVET extend beyond the individual graduate to the broader community. Graduates equipped with green skills can apply their knowledge to benefit local communities, promoting sustainability initiatives and raising awareness about environmental issues. This community engagement can take various forms, such as participating in local sustainability projects, educating community members about sustainable practices, or collaborating with local businesses to implement green solutions. By fostering a sense of social responsibility and community engagement, TVET institutions contribute to the overall well-being of society and the environment.

Improved Institutional Reputation

As TVET institutions embrace sustainability, they enhance their reputation within the community and the education sector. Institutions that prioritize sustainability are often viewed as forward-thinking and socially responsible, attracting students, faculty, and industry partners who share similar values. This improved reputation can lead to increased enrollment, stronger partnerships with industry, and greater access to funding and resources for sustainability initiatives. Furthermore, a positive institutional reputation can enhance the overall quality of education, as institutions are more likely to invest in innovative programs and facilities that support sustainable practices.

Resilience to Change

Incorporating sustainability into TVET programs equips students with the skills and knowledge necessary to adapt to a rapidly changing world. As industries evolve in response to environmental challenges and regulatory changes, graduates who are trained in sustainability are better prepared to navigate these shifts. This resilience is crucial in an era where technological advancements and environmental concerns are reshaping the job market. By fostering adaptability and critical thinking, TVET institutions empower students to thrive in diverse and dynamic work environments.

Long-term Economic Benefits

Investing in sustainability education can yield long-term economic benefits for both individuals and society as a whole. Graduates with green skills are more likely to secure stable employment in growing sectors such as renewable energy, sustainable agriculture, and environmental management. This not only contributes to individual economic stability but also supports the development of a green economy that can drive job creation and economic growth. Additionally, by promoting sustainable practices, TVET institutions can help reduce costs associated with resource consumption and waste management, leading to more efficient and economically viable operations.

Fostering a Culture of Sustainability

Finally, integrating sustainability into TVET programs fosters a culture of sustainability within educational institutions. This cultural shift encourages students, faculty, and staff to adopt sustainable practices in their daily lives, creating a ripple effect that extends beyond the classroom. By instilling values of environmental stewardship and social responsibility, TVET institutions contribute to the development of a more sustainable society. This cultural transformation is essential for addressing the complex challenges of sustainability and ensuring that future generations are equipped to continue the work of creating a more sustainable world.

The integration of sustainability into TVET programs offers a wide range of benefits, including enhanced employability, contributions to sustainable development, innovation, community impact, improved institutional reputation, resilience to change, long-term economic benefits, and the fostering of a culture of sustainability. These advantages not only enrich the educational experience for students but also play a critical role in addressing global challenges and promoting a sustainable future for all.



A Model for Developing an Institutional Greening Action Plan (GAP) for TVET

The Institutional Greening Plan of Action is a strategic document that outlines the specific steps, priorities, and resources needed to integrate sustainability into the operations and curricula of TVET institutions. This plan serves as a roadmap for achieving the institution's sustainability goals and ensuring that greening initiatives are effectively implemented. The Greening Plan consists of several key phases. The first phase is the prioritization of greening initiatives. This involves identifying the most critical areas for greening based on a needs assessment, which might include energy efficiency, waste management, sustainable resource use, and curriculum development. After identifying these areas, priorities are set by ranking initiatives based on urgency, impact potential, available resources, and alignment with institutional goals, ensuring focus on the most significant improvement opportunities.

Next is setting clear goals and objectives. Each greening initiative should have Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) goals. For example, a goal might be reducing energy consumption by 20% within two years. These goals must align with the institution's mission and vision, as well as the needs of the local community and industry.

The plan also includes creating a timetable for action. This involves developing a timeline with start and end dates for each initiative and key milestones along the way. A phased implementation approach is recommended, allowing for adjustments based on feedback and early results.

Another critical component is forming an advisory committee. The committee should include representatives from various stakeholder groups, such as educators, industry partners, community members, and students, ensuring diverse perspectives are considered. Committee members will have clearly defined roles and responsibilities, including overseeing implementation, providing guidance, and facilitating communication among stakeholders.

Resource allocation is essential, involving budgeting and human resources. A budget should outline the financial resources needed for each initiative, including training, materials, and infrastructure improvements. Personnel requirements should also be identified, which may involve hiring new staff, reallocating existing personnel, or training current staff in sustainability practices.

A stakeholder engagement strategy is also vital. This includes developing a communication plan for sharing information about the initiatives with stakeholders through regular updates, feedback mechanisms, and involvement opportunities. Strategies should also be in place to build support for the initiatives through workshops, informational sessions, and collaborative projects that highlight the benefits of sustainability.

Finally, a monitoring and evaluation framework is necessary. Metrics should be established to assess each initiative's success, using both quantitative measures (like energy savings and waste reduction) and qualitative measures (such as stakeholder satisfaction). Feedback mechanisms are essential for collecting stakeholder input throughout the process, enabling continuous improvements to the greening initiatives.

Implementing the Greening Plan in TVET

The Global Action Programme (GAP) on Education for Sustainable Development (ESD) was launched by UNESCO (2021) to promote ESD as a key component of quality education (Olsson, 2021a; Olsson, 2021b).

Key aspects of GAP (by UNESCO-UNEVOC Framework ESD-2030) include:

- ✓ **Advancing Policy:** Encouraging governments to integrate ESD into national education policies and strategies.
- ✓ **Transforming Learning and Training Environments:** Supporting educational institutions in creating learning environments that promote sustainability.
- ✓ **Building Capacity of Educators:** Providing training and resources for educators to effectively teach ESD concepts and practices.
- ✓ **Empowering and Mobilizing Youth:** Engaging young people in sustainability initiatives and decision-making processes to foster a sense of responsibility and agency.
- ✓ **Encouraging Multi-Stakeholder Partnerships:** Promoting collaboration among governments, civil society, the private sector, and educational institutions to enhance the impact of ESD (Vaughter et al. 2022).
- ✓ **Promoting Sustainable Development in Communities:** Encouraging educational institutions to engage with their communities to promote sustainable practices and solutions.

The implementation of the Institutional Greening Plan marks the transition from planning to action. This phase is crucial for translating the strategies and goals outlined in the greening plan into tangible outcomes. Effective implementation requires coordination, communication, and commitment from all stakeholders involved.



Steps in the Implementation Process for TVET- “Greening TVET tree chart” [shown in Figure 2.]

1. Delegation of Tasks

- **Assigning Responsibilities:** Clearly define and assign specific tasks to individuals or teams based on their expertise and roles outlined in the advisory committee. This ensures accountability and clarity in execution.
- **Creating Workgroups:** Form workgroups focused on different aspects of the greening initiatives (e.g., curriculum development, facility upgrades, community engagement). Each group should have a leader responsible for coordinating efforts and reporting progress.

2. Consolidation of Efforts

- **Integrating Initiatives:** Ensure that various greening initiatives are integrated into the institution’s existing programs and operations. This may involve aligning new practices with current curricula, administrative processes, and community outreach efforts.
- **Cross-Department Collaboration:** Encourage collaboration among different departments and stakeholders to leverage resources and expertise. For example, the facilities management team can work with educators to implement energy-efficient practices in classrooms.

Resource Deployment

- **Utilizing Financial Resources:** Allocate the budget as outlined in the greening plan to support the implementation of initiatives. This includes funding for training, materials, infrastructure improvements, and any other necessary expenditures.
- **Human Resource Management:** Ensure that the right personnel are in place to carry out the initiatives. This may involve hiring new staff, reallocating existing personnel, or providing training to current staff to build capacity in sustainability practices.

Training and Capacity Building

- **Educator Training:** Conduct training sessions for educators and staff to equip them with the knowledge and skills needed to implement the greening initiatives effectively. This training should focus on sustainable practices, curriculum integration, and innovative teaching methods.
- **Student Involvement:** Engage students in the implementation process by involving them in projects, workshops, and initiatives. This not only enhances their learning experience but also fosters a sense of ownership and responsibility towards sustainability.

Communication and Engagement

- **Regular Updates:** Provide regular updates to all stakeholders about the progress of the greening initiatives. This can be done through newsletters, meetings, and online platforms to keep everyone informed and engaged.
- **Feedback Mechanisms:** Establish channels for stakeholders to provide feedback on the implementation process. This feedback is essential for identifying challenges, making adjustments, and improving the effectiveness of the initiatives.

Monitoring and Evaluation

- **Tracking Progress:** Implement a system for tracking the progress of each initiative against the established goals and timelines. This may involve regular check-ins, progress reports, and data collection on key performance indicators.
- **Adjusting Strategies:** Use the data collected during the monitoring process to assess the effectiveness of the initiatives. Be prepared to make adjustments to strategies and actions based on what is working and what is not.

Celebrating Successes

- **Recognizing Achievements:** Celebrate milestones and successes throughout the implementation process. This can include recognition events, awards, or public announcements that highlight the efforts and contributions of individuals and teams.
- **Sharing Best Practices:** Document and share successful practices and lessons learned with the broader community. This not only reinforces the commitment to sustainability but also encourages other institutions to adopt similar initiatives.



Figure 2. The “Greening TVET tree chart”
[source: by author]

Once the assessment needs are complete, the next step is to develop a detailed Institutional Greening Action Plan. This plan, as summarized in *Table 2*, should include:

- **Clear Goals and Objectives:** Establishing short-term, medium-term, and long-term goals for greening initiatives provides a structured roadmap for implementation.
- **Specific Activities and Timelines:** The action plan should outline specific activities to be undertaken, along with timelines for completion. This helps to ensure accountability and track progress.
- **Responsible Parties:** Assigning roles and responsibilities to various stakeholders within the institution fosters ownership and ensures that everyone is aware of their contributions to the greening process.

Pilot Programs and Continuous Evaluation

To ensure the effectiveness of greening initiatives, institutions should consider implementing pilot programs. This approach involves:

- **Testing New Curricula and Training Methods:** Before rolling out changes across all programs, institutions can pilot new curricula or training methods in select areas. This allows for real-world testing and refinement based on feedback from students and industry partners.
- **Establishing Evaluation Mechanisms:** Continuous evaluation is essential for assessing the impact of greening initiatives. Institutions should collect data on student outcomes, industry feedback, and environmental impacts to inform ongoing improvements.
- **Adapting Based on Feedback:** The insights gained from pilot programs and evaluations should be used to refine and adapt greening strategies, ensuring that they remain relevant and effective.

The successful implementation of greening initiatives in TVET offers numerous benefits, including:



- **Enhanced Employability and Competitiveness:** Graduates equipped with green skills are more attractive to employers, particularly as industries increasingly prioritize sustainability. This can lead to better job prospects and career advancement opportunities.
- **Contribution to Community and Environmental Goals:** By training a workforce that understands and can implement sustainable practices, institutions contribute to broader environmental goals, such as reducing carbon footprints and promoting resource efficiency.
- **Fostering Innovation:** Institutions that embrace green education can foster innovation in sustainable technologies and practices, enhancing their competitiveness in the global market.

Table 2. Phases of Implementation the Greening in TVET: descriptive summary

PLANNING PHASE	DESCRIPTION
<i>1. Raising awareness and formulating the rationale</i>	Create awareness among stakeholders about the importance of greening TVET and establish a clear rationale for the initiative.
<i>2. Developing a vision</i>	Formulate a clear vision for what greening TVET will achieve, aligning it with institutional goals and community needs.
<i>3. Promoting broader engagement</i>	Involve various stakeholders, including educators, industry partners, and community members, to ensure ownership and support for the greening process.
<i>4. Assessing current realities</i>	Conduct a large-scale assessment of the current situation to identify priorities, resources, and needs for greening initiatives.
<i>5. Developing an institutional greening plan of action</i>	Create a detailed plan that outlines greening priorities, goals, a timetable for action, and the establishment of an advisory committee.
<i>6. Implementing the institutional greening plan</i>	Execute the greening plan by delegating tasks, consolidating efforts into core systems, and deploying necessary resources.
<i>7. Monitoring progress and assessing results</i>	Establish a framework for monitoring and evaluating the effectiveness of the greening initiatives, ensuring continuous improvement.

The implementation of greening initiatives in TVET is a vital process that requires careful planning, stakeholder engagement, and continuous evaluation. By conducting needs assessments, developing a comprehensive action plan, piloting programs, and evaluating outcomes, TVET institutions can effectively integrate sustainability into their educational practices. This not only prepares learners for the challenges of a green economy but also contributes to the overall well-being of society and the environment.

Monitoring progress and assessing results is a vital phase in the greening of TVET institutions.

This step ensures that the initiatives implemented are effective, aligned with the established goals, and capable of delivering the desired outcomes. It involves a systematic approach to evaluating the impact of greening initiatives, identifying areas for improvement, and reinforcing commitment to sustainability within the institution. The process begins with the establishment of clear metrics and key performance indicators (KPIs) that reflect the objectives of the greening initiatives. These metrics should be specific, measurable, achievable, relevant, and time-bound (SMART), allowing institutions to track their progress effectively. For instance, if one of the goals is to reduce energy consumption, a relevant KPI could be the percentage decrease in energy usage over a specified period. Similarly, if the aim is to enhance student engagement in sustainability practices, metrics could include the number of students participating in green projects or initiatives.

Once the metrics are defined, institutions should implement a robust data collection system. This system can involve various methods, such as surveys, interviews, focus groups, and direct observations. Engaging stakeholders—students, educators, industry partners, and community members—in the data collection process is crucial. Their insights can provide valuable qualitative data that complements quantitative metrics, offering a comprehensive view of the initiatives' effectiveness. For example, feedback from students about their experiences with new green curricula can highlight strengths and areas needing improvement. Regular monitoring is essential to ensure that the greening initiatives remain on track. Institutions should establish a schedule for reviewing progress, which could be quarterly or biannually, depending on the scope of the initiatives. During these reviews, stakeholders should come together to discuss the collected data, assess the effectiveness of the strategies implemented, and identify any challenges



encountered. This collaborative approach fosters a sense of ownership among stakeholders and encourages open dialogue about the successes and difficulties faced during implementation. As part of the monitoring process, it is important to conduct a thorough analysis of the data collected. This analysis should focus on identifying trends, patterns, and correlations that can inform decision-making. For instance, if data reveals that certain training methods are particularly effective in enhancing students' green skills, institutions can consider expanding those methods across other programs. Conversely, if certain initiatives are not yielding the expected results, it may be necessary to reassess and adjust the strategies employed. Continuous improvement is a key principle in the monitoring and assessment phase. Institutions should be prepared to adapt their greening initiatives based on the insights gained from the monitoring process. This may involve revising goals, modifying curricula, or reallocating resources to better align with the needs of students and the labor market. The flexibility to pivot and make changes is essential for ensuring that the greening efforts remain relevant and effective in a rapidly changing environment.

In addition to internal assessments, institutions should also consider external evaluations. Engaging third-party evaluators can provide an objective perspective on the effectiveness of the greening initiatives. These evaluations can offer insights into best practices, benchmarking against other institutions, and recommendations for further improvement. External evaluations can also enhance the credibility of the institution's sustainability efforts, showcasing a commitment to transparency and accountability. Finally, it is crucial to communicate the results of the monitoring and assessment process to all stakeholders. Sharing successes, challenges, and lessons learned fosters a culture of transparency and encourages ongoing engagement in sustainability efforts. Institutions can utilize various communication channels, such as newsletters, social media, and community meetings, to disseminate information about the impact of their greening initiatives. Celebrating achievements, no matter how small, can motivate stakeholders and reinforce the importance of collective efforts toward sustainability. Monitoring progress and assessing results is a comprehensive and ongoing process that plays a critical role in the greening of TVET institutions. By establishing clear metrics, engaging stakeholders in data collection, conducting regular reviews, and fostering a culture of continuous improvement, institutions can ensure that their sustainability initiatives are effective and impactful. This phase not only helps in refining strategies but also strengthens the institution's commitment to fostering a sustainable future for students, the community, and the environment.

CONCLUSION

Greening of Technical and Vocational Education and Training (TVET) represents a transformative approach that is vital for preparing a workforce equipped to meet the challenges of a rapidly changing environmental landscape. This multifaceted process requires a comprehensive and collaborative strategy that prioritizes the integration of sustainability principles into educational frameworks. By focusing on curriculum development that incorporates green skills and knowledge, TVET institutions can ensure that their graduates are not only technically proficient but also environmentally aware and socially responsible. The active involvement of all stakeholders—educators, industry partners, students, and community members—is crucial in creating a shared vision and actionable plans that reflect the needs of both the local community and the broader industry. Continuous monitoring and evaluation of greening initiatives will help maintain the relevance and effectiveness of educational programs, allowing institutions to adapt to emerging trends and challenges in the green economy. As TVET institutions embrace sustainability, they enhance the employability of their graduates while making significant contributions to sustainable development, innovation, and the overall well-being of society. By fostering a culture of sustainability within vocational education, we can empower future generations to lead the way in creating a more sustainable and equitable world. The journey towards greening TVET is not just an educational imperative; it is a collective responsibility that holds the potential to drive meaningful change in our communities and beyond.

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