

MAPPING INTEGRATIVE GREEN JOBS STRATEGIES IN TOURISM TVET CURRICULUM: A BIBLIOMETRIC ANALYSIS

**Bimo Kuncoro Jati^{1*}, Riswano², Rachmadina Rafika Triani³, Kezia Elsty⁴,
Meisya Anggraini⁵, Candra Karismawan⁶**

Universitas Negeri Jakarta / Fakultas Teknik, Jakarta^{1,2,3}

Universitas Pradita / Seni Kuliner, Tangerang⁴

Politeknik Pariwisata Palembang / Pengelolaan Konvensi dan Acara, Palembang⁵

Universitas Negeri Jakarta / Usaha Perjalanan Wisata, Jakarta⁶

E-mail: bimo.kuncoro.jati@unj.ac.id^{1*}, riswano@unj.ac.id², Rachmadina.rafika.triani@unj.ac.id³,
Kezia.elsty@pradita.ac.id⁴, meisyaan@poltekpar-palembang.ac.id⁵, candra.karismawan@unja.c.id⁶

Received : 01 March 2026

Accepted : 01 April 2026

Revised : 15 March 2026

Published : 27 April 2026

Abstract

Sustainability has become a priority for the global tourism industry, requiring a workforce equipped with green skills. However, the integration of these competencies within Technical and Vocational Education and Training (TVET) remains fragmented. This study aims to map the scientific evolution of research regarding sustainable tourism competencies in vocational education. Using a bibliometric approach, data was retrieved from Google Scholar, then analyzed using VOSviewer and Biblioshiny. The results demonstrate a significant upward trend in publications from 2015 to 2025. Key research clusters center on "green skill," "green job," "hospitality," and "TVET college". Overlay visualization reveals a thematic shift from foundational concepts (2021–2022) toward specific implementation strategies and curriculum mapping (2023–2024). While TVET institutions are strategic facilitators for the green transition, current curricula often lack an integrative framework. These findings provide a roadmap for educators and policymakers to design competency-based programs that align vocational training with the demands of a circular economy

Keywords: *Bibliometric analysis, green jobs, green skills, tourism education, TVET*

INTRODUCTION

In recent decades, sustainability has become a central issue in the development of the global tourism industry. The rapid growth of tourism activities has significantly contributed to economic development, employment creation, and regional development (UNWTO, 2023). However, this growth has also raised various environmental and social concerns, including excessive resource consumption, increased waste generation, and environmental degradation in tourism destinations (Hall, 2019). These challenges have encouraged governments, industries, and academic institutions to promote sustainable tourism practices that balance economic benefits with environmental protection and social responsibility (Bocken et al., 2014).

The transition toward sustainable tourism requires not only policy support and responsible business practices but also a workforce equipped with appropriate competencies. Human resources play a crucial role in implementing sustainability principles in tourism operations such as energy efficiency, waste management, resource conservation, and responsible service delivery (Hall, 2019). Therefore, preparing a workforce that understands and is capable of applying sustainability principles has become an important priority for both the tourism industry and educational institutions (Daniel et al., 2022).

Technical and Vocational Education and Training (TVET) has an essential role in preparing skilled workers who are ready to meet the demands of the tourism industry. Unlike academic education that primarily focuses on theoretical knowledge, vocational education emphasizes practical skills and competency-based learning aligned with industry needs. In the context of the tourism sector, TVET institutions are expected to equip students with professional competencies that enable them to respond to emerging global challenges, including sustainability issues. Integrating sustainable tourism competencies into vocational education curricula is therefore considered a strategic approach to support the development of a workforce capable of promoting environmentally responsible tourism practices.

Sustainable tourism competencies refer to a set of knowledge, skills, and attitudes required to support sustainable tourism development. These competencies include environmental awareness, efficient resource management, responsible tourism operations, community engagement, and sustainable business practices (Bosanquet, 2012). As the tourism industry continues to evolve toward sustainability-oriented operations, educational institutions must ensure that these competencies are embedded within their training programs (Jiménez-Ortega et al., 2022). Consequently, research related to sustainability in tourism education and vocational training has grown significantly over the past decade (Hall, 2019).

Previous studies have examined various aspects of sustainability in tourism education, including curriculum development, sustainability-oriented learning approaches, and the integration of green skills into vocational training programs (Bosanquet, 2012). Nevertheless, existing studies often focus on sustainability practices in tourism industries or on higher education contexts. Research that specifically examines the development of sustainable tourism competencies within vocational education remains relatively fragmented (Hall, 2019). As a result, there is still limited understanding of how this research field has evolved, what topics dominate the scholarly discussion, and what research directions are emerging.

To better understand the development of a research field, bibliometric analysis has become a widely used methodological approach (Riswano et al., 2025). Bibliometric methods allow researchers to quantitatively analyze scientific publications in order to identify publication trends, influential authors, collaboration networks, and thematic developments within a specific field of study (Donthu et al., 2021a). Through bibliometric mapping, researchers can visualize the intellectual structure of a research domain and identify key research clusters that shape the development of knowledge (Ivan Zupic & Čater, 2015).

Despite the increasing number of publications addressing sustainability in tourism and vocational education, comprehensive bibliometric studies focusing on sustainable tourism competencies within the context of vocational education are still limited. A systematic mapping of the existing literature is therefore needed to provide a clearer understanding of the evolution of research in this area (Okoli, 2015). Such mapping can help identify dominant research themes, emerging topics, and potential gaps that require further investigation (Donthu et al., 2021a).

Based on this background, this study aims to map the scientific development of research related to sustainable tourism competencies in vocational education using a bibliometric approach. Specifically, this study seeks to identify publication trends related to sustainable tourism competencies in vocational education, analyze collaboration patterns among authors and institutions in this field, and explore major research themes and emerging trends in the literature. The findings of this study are expected to provide valuable insights for researchers, educators, and policymakers in developing vocational education programs that support sustainable tourism practices and green workforce development.

LITERATURE REVIEW

The growing global emphasis on sustainability has significantly influenced research in tourism, education, and workforce development. In the tourism sector, sustainability is no longer considered an optional practice but a fundamental requirement for long-term industry resilience. According to (Jiménez-Ortega et al., 2022), sustainable tourism involves balancing environmental, economic, and socio-cultural aspects to ensure long-term benefits for all stakeholders. Previous studies have highlighted that the transition toward sustainable tourism requires not only policy frameworks and industry commitment but also a workforce equipped with appropriate competencies and environmental awareness (Hall, 2019). However, much of the existing research has primarily focused on sustainable practices within tourism operations rather than on the role of education in developing such competencies.

Technical and Vocational Education and Training (TVET) has been widely recognized as a strategic mechanism for preparing a skilled workforce aligned with industry needs. TVET emphasizes competency-based learning and practical skill development, making it particularly relevant for the tourism sector. (United Nations Educational, 2020) emphasizes that education systems must integrate sustainability principles into curricula to equip learners with the knowledge, skills, and values necessary to address global challenges. In this context, the concept of *green skills* has emerged as a critical component of workforce development, referring to the abilities required to support environmentally sustainable practices across industries (International Labour Organization, 2023). Despite this recognition, previous studies indicate that the integration of green skills into TVET curricula, particularly in tourism education, remains inconsistent and fragmented. Theoretical frameworks related to sustainability competencies further support the need for curriculum transformation in vocational education. The European sustainability competence framework (Science & Policy, 2022) identifies key competencies such as systems thinking, critical thinking, and collaborative problem-solving as essential for sustainable development. These

competencies are highly relevant to tourism education, where professionals must address complex environmental and social challenges. Additionally, studies on curriculum development highlight the importance of aligning educational content with industry demands, particularly in the context of rapid technological changes associated with Industry 4.0 (Bocken et al., 2014). However, there is still limited consensus on how these competencies should be systematically embedded into tourism TVET programs.

Several empirical studies have explored sustainability integration in education, focusing on curriculum innovation, experiential learning, and competency-based approaches (Jiménez-Ortega et al., 2022). While these studies provide valuable insights, they often concentrate on higher education contexts rather than vocational education. Furthermore, existing research tends to examine sustainability, green jobs, and tourism education as separate domains, resulting in a lack of integrative perspectives. This fragmentation creates challenges in understanding how green jobs strategies can be effectively incorporated into TVET curricula to support sustainable tourism practices. Another important issue in the literature is the lack of comprehensive mapping of research trends in this field. Bibliometric studies have been widely used to analyze the development of scientific knowledge and identify emerging research themes (Donthu et al., 2021a). However, studies that specifically map the intersection of green jobs, TVET, and sustainable tourism are still limited. As a result, there is insufficient understanding of dominant research clusters, collaboration patterns, and thematic evolution within this interdisciplinary area.

Based on the review of existing literature, several research gaps can be identified. First, there is a lack of integrative studies that combine green jobs, tourism education, and TVET within a unified framework. Second, the implementation of sustainability competencies in vocational curricula remains underexplored, particularly in the context of developing countries. Third, limited bibliometric analyses have been conducted to systematically map the evolution of research in this field. Therefore, this study aims to address these gaps by conducting a comprehensive bibliometric analysis to explore research trends, thematic structures, and emerging directions related to green jobs integration in tourism TVET. This approach is expected to provide new insights and contribute to the development of sustainable tourism education and workforce strategies.

METHOD

This study employed a bibliometric research approach to examine the development of scientific publications related to sustainable tourism competencies in vocational education. Bibliometric analysis is widely used to explore the intellectual structure and development of a research field by analyzing patterns within scientific publications such as citation relationships, authorship networks, and thematic trends (Donthu et al., 2021a). Through this approach, researchers are able to identify influential publications, prominent authors, collaboration networks, and emerging research themes within a specific domain of knowledge (I. Zupic & Čater, 2015). As noted by (Donthu et al., 2021b), bibliometric analysis provides a systematic and transparent method for evaluating the evolution of scientific literature and identifying research directions in a particular field.

The data used in this study were obtained from the Google Scholar database, which is recognized as one of the largest and most comprehensive databases of peer-reviewed academic publications. Google Scholar was selected because it provides broad coverage of high-quality journals across disciplines, including tourism studies, sustainability research, and education. The database also offers detailed bibliographic information such as author affiliations, keywords, citations, and abstracts, which are essential for conducting bibliometric analysis (Ivan Zupic & Čater, 2015). Due to its broad indexing coverage and reliable citation tracking system, Google Scholar is frequently used as a primary data source in bibliometric studies (Jati et al., 2026).

collaboration and thematic clusters within a research field (van Eck & Waltman, 2010). Meanwhile, Biblioshiny was utilized to perform descriptive bibliometric analysis, including annual publication trends, most productive authors, most influential journals, and thematic evolution of research topics (Aria & Cuccurullo, 2017). The data analysis process was conducted in several stages. First, descriptive bibliometric analysis was performed to identify the general characteristics of the publications, including the growth of scientific output over time and the distribution of research across countries, institutions, and journals. Second, network analysis was carried out to examine relationships among authors and research themes through co-authorship and keyword co-occurrence analysis (Ivan Zupic & Čater, 2015). These analyses help reveal collaboration patterns among researchers and identify dominant research topics within the literature. Finally, thematic analysis was conducted to explore the conceptual structure of the research domain and identify emerging research themes related to sustainable tourism competencies in vocational education. Through these procedures, this study provides a comprehensive mapping of the development and structure of research in this field (Donthu et al., 2021b).

RESULTS AND DISCUSSION

The bibliometric analysis of keyword co-occurrence reveals the core intellectual structure and thematic focus of the literature surrounding green jobs in vocational education. The network visualization identifies several distinct, interconnected clusters that map the current research landscape (van Eck & Waltman, 2010).

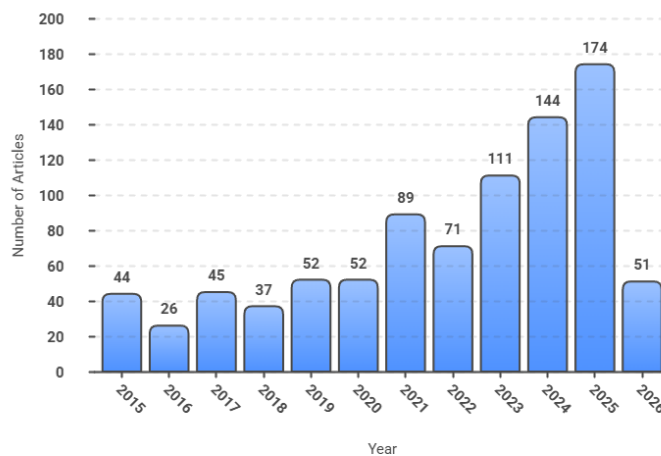


Figure 3. The number of publication from 2015-2026

The bibliometric analysis of publications retrieved from Google Scholar using *Publish or Perish* demonstrates a significant upward trend in research related to green jobs, Technical and Vocational Education and Training (TVET), and sustainable tourism between 2015 and 2025. In the early stage (2015–2018), publication output remained relatively low and fluctuating, indicating that the integration of sustainability concepts into tourism education was still emerging. However, a steady increase began in 2019 and accelerated markedly after 2021, reflecting growing academic attention to sustainability-driven workforce development and curriculum innovation. This trend aligns with the global emphasis on green economies and sustainable development, particularly in response to frameworks such as the Sustainable Development Goals (SDGs) and the increasing demand for green skills in the labor market. The sharp growth observed from 2023 to 2025 suggests that this field has entered a phase of rapid expansion, confirming its status as a highly relevant and evolving research domain. Although a decline appears in 2026, this is likely due to incomplete indexing rather than a genuine decrease in research activity. These findings are consistent with previous studies highlighting the rising importance of sustainability competencies and green skills integration in vocational education and tourism sectors (Science & Policy, 2022). As illustrated in the network mapping, the nodes with the highest occurrence and centrality are "green skill," "green job," "hospitality," and "TVET college." The prominent teal cluster centers around "hospitality" and is closely linked to "competitiveness," "world," and "action," indicating a strong scholarly consensus that sustainable practices and environmental competencies are critical drivers for the global competitiveness of the tourism industry (Hall, 2019).

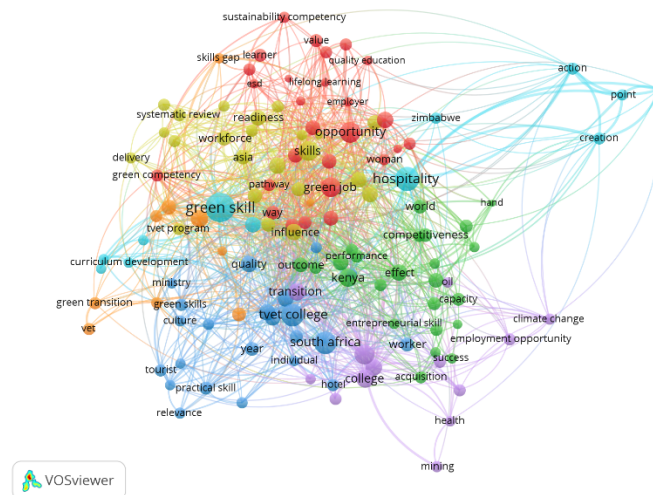


Figure 4. Keyword co-occurrence network visualization of green jobs in TVET

The keyword co-occurrence network generated using VOSviewer illustrates the structure of research on green jobs, TVET, and sustainable tourism. The visualization shows several interconnected clusters, indicating that this field is multidisciplinary and involves strong relationships between education, workforce development, and sustainability. The most dominant keywords include *green skill*, *green job*, *hospitality*, *TVET college*, and *skills*, which form the core of the research domain. Among these, *green skill* appears as the central node, highlighting its role in linking education systems with labor market demands and sustainable practices, consistent with global perspectives on green workforce development.

The clustering results reveal several key themes. The first cluster focuses on sustainability competencies and education, emphasizing concepts such as lifelong learning and quality education. The second cluster relates to the tourism and hospitality industry, showing the importance of sustainability in enhancing competitiveness and performance. The third cluster highlights TVET and curriculum development, indicating the role of vocational education in preparing job-ready skills, although its linkage with sustainability remains limited. Other clusters reflect workforce transition, employment impacts, and emerging discussions on implementation and policy (Jayaprakash, 2024). Furthermore, the light blue and orange clusters, dominated by "green skill" and "curriculum development," highlight a major academic focus on integrating environmental awareness directly into educational frameworks. The dense blue cluster featuring "TVET college," "transition," and "practical skill" signifies the pivotal role of vocational institutions as the primary facilitators in equipping the workforce with actionable, sustainable competencies required for the green transition in the tourism sector (Riswano et al., 2025).

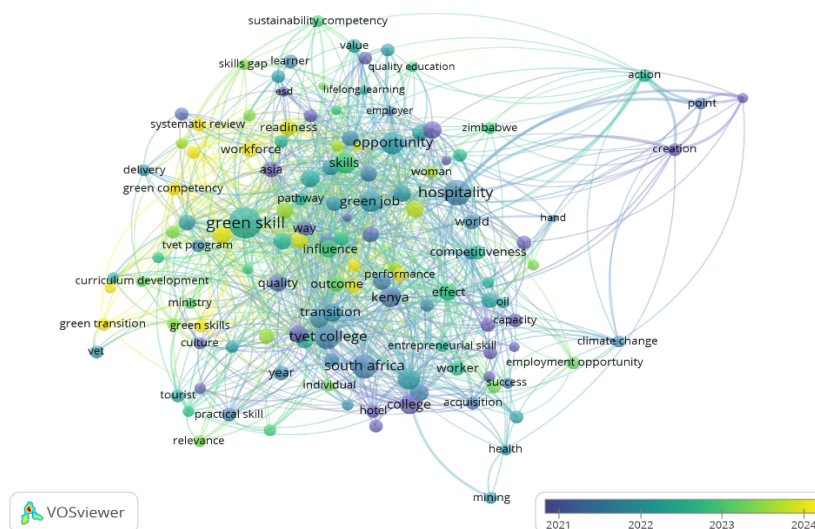


Figure 5. Overlay Visualization

Beyond the thematic clusters, the overlay visualization Figure 5, illustrates the chronological progression of research focus within the field. The color gradient, ranging from dark blue (circa 2021) to bright yellow (circa 2024), reveals a significant shift in scholarly attention from general conceptualization to specific implementation strategies. Earlier publications (2021–2022), represented by darker nodes, were predominantly centered on foundational concepts such as "hospitality," "quality education," "entrepreneurial skill," and "world." During this period, the discourse was largely focused on identifying the broad role of TVET colleges in meeting global sustainability demands.

In contrast, the most recent trends (2023–2024), highlighted in yellow and bright green, indicate an emerging frontier focused on systemic integration and institutional readiness. Keywords such as "green transition," "curriculum development," "tv et program," and "sustainability competency" have become the primary focus of current academic inquiry. This shift suggests that the academic community has moved beyond merely defining "green jobs" toward active "curriculum mapping" and "readiness" assessments within vocational frameworks. Notably, the prominence of "green transition" and "ministry" in the latest timeline signifies an increasing emphasis on policy-driven transformations and the practical delivery of green skills in the tourism sector. This evolution mirrors the global urgency to align vocational training with the rapidly changing labor market requirements of a circular economy (Busari, 2025).

The author density visualization provides insight into the prominent scholars and foundational researchers shaping the discourse on sustainable tourism competencies and vocational training. The density map utilizes color gradients, where warmer colors (yellow) indicate a higher concentration of publications, citations, and academic influence within the analyzed dataset (van Eck & Waltman, 2010).

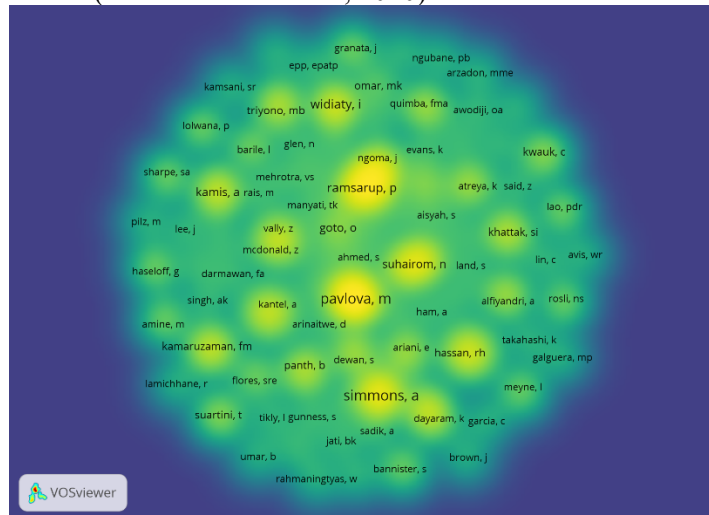


Figure 4. Author density visualization highlighting influential researchers

The visualization highlights significant intellectual hubs centered around key authors such as Pavlova, M., Simmons, A., Ramsarup, P., and Suhairom, N. These high-density nodes represent the most prolific and influential contributors whose work forms the theoretical and empirical backbone of green skills integration in TVET curricula. The proximity of these authors to one another within the central density zones suggests a collaborative or conceptually aligned academic community that frequently cross-references each other's methodologies. Additionally, the presence of localized density pockets (such as Widiaty, I., and Hassan, R.H.) indicates specialized sub-fields or regional focuses that contribute to the broader narrative of green human resource development in the hospitality industry.

The high density of influential authors such as Pavlova, M. and Simmons, A. within this bibliometric map indicates a robust theoretical foundation in the discourse of green skills integration within the vocational sector. Pavlova's work specifically emphasizes the importance of policy responses in the Asia-Pacific region to align vocational education with the global green economy agenda, which is highly relevant to the "green transition" cluster identified in this study. Furthermore, Simmons' contributions provide a strategic framework for TVET institutions to move beyond merely adding environmental content toward a structural transformation of core student competencies. The presence of these central figures within the citation network confirms that the discourse on sustainable tourism curricula has shifted from a peripheral issue to a mainstream necessity driven by the urgent need for international green competency standardization.

CONCLUSION

This study aimed to analyze the development of research on green jobs integration within Technical and Vocational Education and Training (TVET) in the tourism sector using a bibliometric approach. The findings confirm that research in this field has experienced a significant upward trend over the past decade, particularly between 2019 and 2025, indicating increasing global attention toward sustainability-oriented workforce development. The results of the bibliometric analysis further reveal that key themes such as green skills, sustainable tourism, and curriculum development are central to the current research landscape, highlighting the critical role of education in supporting sustainable industry practices.

The study also demonstrates that TVET institutions play a strategic role in preparing a workforce capable of addressing sustainability challenges in the tourism sector. However, despite the growing number of publications, the integration of green jobs and sustainability competencies into tourism curricula remains fragmented and lacks a comprehensive framework. This finding aligns with recent global reports emphasizing the urgent need to strengthen green skills and sustainability competencies in education systems to support the transition toward a green economy (International Labour Organization, 2023).

Furthermore, this study identifies several research gaps, including the limited number of integrative studies that combine green jobs, tourism education, and TVET, as well as the lack of empirical evidence on curriculum implementation in developing countries. Therefore, future research should focus on developing integrative curriculum models that incorporate sustainability competencies, industry needs, and technological advancements such as Industry 4.0. In addition, collaboration between educational institutions, industry stakeholders, and policymakers is essential to ensure the effective implementation of sustainable tourism education.

From a practical perspective, the findings of this study provide important implications for curriculum developers and policymakers in designing competency-based TVET programs that support sustainable tourism practices. Strengthening partnerships between academia and industry, embedding green skills into training modules, and adopting international sustainability frameworks can enhance the relevance and effectiveness of tourism education. Ultimately, this study contributes to the growing body of knowledge on sustainable tourism and vocational education by providing a comprehensive mapping of research trends and offering directions for future development (UNWTO, 2023).

Practically, these bibliometric findings provide a crucial empirical basis for the development of vocational curricula in Indonesia, particularly in anticipation of the implementation of the Phase F SMK/MAK curriculum in 2026. The identification of recent trends (2023–2024) concerning "curriculum mapping" and "readiness" suggests that the design of future tourism curricula should no longer be purely theoretical but must adaptively integrate green hospitality modules into productive subjects (Barth et al., 2007). This includes the digitalization of school asset management through integrated platforms and the development of Project-Based Learning (PjBL) modules focused on resource efficiency. By aligning the Phase F curriculum structure with the global green competency standards identified in this analysis, vocational education institutions in Indonesia can ensure that their graduates possess adaptive job readiness aligned with the demands of a circular economy and a sustainable tourism industry.

REFERENCES

- Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959–975. <https://doi.org/https://doi.org/10.1016/j.joi.2017.08.007>
- Barth, M., Godemann, J., Rieckmann, M., & Stoltenberg, U. (2007). Developing Key Competencies for Sustainable Development in Higher Education. *International Journal of Sustainability in Higher Education*, 8, 416–430. <https://doi.org/10.1108/14676370710823582>
- Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42–56. <https://doi.org/https://doi.org/10.1016/j.jclepro.2013.11.039>
- Bosanquet, N. (2012). From welfare state to entitlement programmes. *Futures*, 44(7), 666–670. <https://doi.org/https://doi.org/10.1016/j.futures.2012.04.005>
- Busari, R. S. (2025). *Fusing green skills into the Technology Education Programmes of Nigerian universities*. 16(December), 46–54. <https://doi.org/10.5897/IJVT2025.0332>
- Daniel, A., Ibarra, A. A., Galeana-pizaña, J. M., & Manuel, J. (2022). *Changes over Time Matter : A Cycle of Participatory Sustainability Assessment of Organic Coffee in*.

MAPPING INTEGRATIVE GREEN JOBS STRATEGIES IN TOURISM TVET CURRICULUM: A BIBLIOMETRIC ANALYSIS

Bimo Kuncoro Jati et al

- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021a). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133(April), 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021b). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/https://doi.org/10.1016/j.jbusres.2021.04.070>
- Hall, C. M. (2019). Constructing sustainable tourism development: The 2030 agenda and the managerial ecology of sustainable tourism. *Journal of Sustainable Tourism*, 27(7), 1044–1060. <https://doi.org/10.1080/09669582.2018.1560456>
- International Labour Organization. (2023). *SKILLS FOR A GREENER FUTURE* :
- Jati, B. K., Amalia, P. V., Sasi, S. C., Keluarga, P. K., Teknik, F., Jakarta, U. N., Pangan, K., & Produk, K. (2026). *Implementasi HACCP dan SSOP dalam Menjamin Kualitas Produk di Industri Pangan UMKM . Narrative Literature Review*. 5(1), 87–96. <https://doi.org/10.55123/toba.v5i1.7286>
- Jayaprakash, S. (2024). Greening TVET for Sustainable Development: A Path to a More Sustainable Future. *International Journal of Academic Research in Progressive Education and Development*, 13. <https://doi.org/10.6007/IJARPED/v13-i1/20877>
- Jiménez-Ortega, A. D., Aguilar Ibarra, A., Galeana-Pizaña, J. M., & Núñez, J. M. (2022). Changes over Time Matter: A Cycle of Participatory Sustainability Assessment of Organic Coffee in Chiapas, Mexico. In *Sustainability* (Vol. 14, Issue 4, p. 2012). <https://doi.org/10.3390/su14042012>
- Okoli, C. (2015). *A Guide to Conducting a Standalone Systematic Literature Review*. 37.
- Riswano, Bimo Kuncoro Jati, & Rachmadina Rafika Triani. (2025). PENGEMBANGAN KURIKULUM TVET UNTUK INDUSTRI PERHOTELAN YANG BERKELANJUTAN: ANALISIS BIBLIOMETRIK ATAS TREN GLOBAL. *Jurnal Pendidikan Dan Perhotelan (JPP)*, 5(2), 16–29. <https://doi.org/10.21009/JPPV5i2.03>
- Science, J. R. C., & Policy, F. O. R. (2022). *GreenComp*. <https://doi.org/10.2760/13286>
- United Nations Educational, S. and C. O. (2020). *Education for Sustainable Development A roadmap*.
- UNWTO. (2023). *Forum on Tourism Trends. October*.
- van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/s11192-009-0146-3>
- Zupic, Ivan, & Čater, Tomaž. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, 18(3), 429–472. <https://doi.org/10.1177/1094428114562629>
- Zupic, I., & Čater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, 18(3), 429–472. <https://doi.org/10.1177/1094428114562629>