



## Introduction

Indonesia is currently actively implementing the Golden Indonesia Vision 2045.<sup>1</sup> This vision is realized through the National Long-Term Development Plan 2025-2045, in which there are four main pillars, one of which is sustainable, which includes sustainable and balanced economic, social, and environmental development. In line with this, Indonesia is also committed to the achievement of the SDGs which were agreed by all UN member states in 2015, particularly SDGs 8 and 9, which emphasize inclusive economic growth and sustainable industrial development.<sup>2</sup> Achieving the Golden Indonesia Vision 2045 and the Sustainable Development Goals (SDGs) requires the implementation of a green economy. The SDGs and the Golden Indonesia Vision 2045 provide a framework that guides the development of the green economy in Indonesia, with clear and measurable targets and resource mobilization.<sup>3</sup> Special Economic Zones (SEZs) play an important role as an instrument to achieve these goals, especially in the aspect of SDGs through the implementation of the green economy.<sup>4</sup>

As one of the Special Economic Zones in Indonesia, Batam SEZs plays an important role in driving national economic growth.<sup>5</sup> In an effort to achieve the Golden Indonesia Vision 2045, KEK Batam is committed to implementing sustainable business practices, in line with the Sustainable Development Goals. Batam SEZs, as one of the driving forces of sustainable development in Indonesia, requires independent auditors with strong green skills.<sup>6</sup> These skills include the ability to audit compliance with sustainability standards and evaluate the environmental-social impacts of development projects.<sup>7</sup> Independent auditors with green skills are one of the keys to driving sustainability development in Batam SEZ. With a deep understanding of sustainability, they can conduct a comprehensive performance evaluation and provide relevant recommendations to improve the company's performance.<sup>8</sup>

Green theory emphasizes the balance of humans and nature, focusing on environmental preservation, ecological justice, and sustainability. According to this theory,

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<sup>1</sup> Ministry Of National Development Planning, "Indonesia Emas 2045, Final Draft Of RPJPN 2025-2045," <https://indonesia2045.go.id/>, (28 Agustus 2024).

<sup>2</sup> UN Department Of Economic And Social Affairs, "The Seventeen Goals Sdgs," <https://sdgs.un.org/goals>, (10 Agustus 2024).

<sup>3</sup> Francesco Vona, Giovanni Marin, Davide Consoli, And David Popp, "Environmental Regulation And Green Skills: An Empirical Exploration," *Journal Of The Association Of Environmental And Resource Economists* 5, no. 2 (2018).

<sup>4</sup> Saniwan Buaban, Vilas Nitivattananon, And Sangam Shrestha, "Sustainability Indicators As A Key For Sustainable Development Of Special Border Economic Zones," *GMSARN International Journal* 14, (2020).

<sup>5</sup> Coordinating Ministry For Economic Affairs Of The Republic Of Indonesia, "Coordinating Minister Airlangga: Batam SEZ Can Be An Example And Make Indonesia Equal To Developed Countries," <https://www.ekon.go.id/publikasi/detail/3067/>, (12 Juni 2024).

<sup>6</sup> Georgeta Vidican Auktor, "Green Industrial Skills For A Sustainable Future," Vienna: Secretariat Of The United Nations Industrial Development Organization (UNINDO), (2020).

<sup>7</sup> Dwi Amalia Sari, Chris Margules, Han She Lim, Jeffrey A. Sayer, Agni Klintuni Boedhihartono, Colin J. Macgregor, Allan P. Dale, And Elizabeth Poon, "Performance Auditing To Assess The Implementation Of The Sustainable Development Goals (SDGs) In Indonesia," *Sustainability* 14, no. 19 (2022).

<sup>8</sup> Karina Nazarova, Mariia Nezhyyva, Anatolii Kucher, Volodymyr Hotsuliak, Tetiana Melnyk, And Olha Zarembo, "Environmental Audit In The Sustainable Development Of Green Economy," *European Journal Of Sustainable Development* 10, no. 3 (2021).

nature has intrinsic value, not just use value for humans, so political boundaries need to be expanded to address environmental issues.<sup>9</sup> With reference to a coherent moral vision, green theory, as explained, advocates limiting material development in favor of preserving non-human nature. Building on this awareness, the concept of environmentally friendly studies has evolved across various disciplines, including the green economy, green culture, green governance, eco-city development, green products, and green design.<sup>10</sup> This ecocentric approach opposes anthropocentrism, asserting that ecology should be the center of consideration in decision-making. Green skills are defined as the skills required by the workforce in all sectors to adapt products, services, and processes to climate change and environmental regulations.<sup>11</sup> These skills are essential in achieving sustainable development, which emphasizes the balance of economic, social, and environmental development. Research identified four main categories of green skills; engineering and technical skills, which include competencies in the design and construction of environmentally friendly technologies; science skills, which involve knowledge of physics and biology for environmental innovation; operation management skills, which are concerned with structural changes in organizations to support green practices; monitoring skills, which include assessing compliance with technical and legal standards.<sup>12</sup>

The essence of green skills is to build the capacity of the workforce to create economic value without harming the ecosystem for sustainable growth. Furthermore, Research outlines ten training fundamentals that are essential to equip graduates with green skills; design skills for integration of green elements in design; leadership & management skills for organizational transformation; lean production for process optimization; life-cycle management to focus on the entire product cycle; city planning & landscaping skills for sustainable city development; energy skills for energy efficiency; Financial skills for environmentally responsible financial management; procurement skills for environmentally friendly material procurement; waste management skills for effective waste management; communication skills for efficient and environmentally friendly communication.<sup>13</sup>

Based on research that highlights the influence of environmental regulation on individual green skills.<sup>14</sup> The results show that environmental regulations encourage an increase in technical and managerial skills related to environmental practices. ONET data confirmed an increase in demand for green general skills (CGS) due to environmental

<sup>9</sup> Hugh C. Dyer, *Green Theory, International Relations Theory*, (England: E-International Relations, 2017).

<sup>10</sup> Rafidah, K. A. Samad, R. Adawiyah, S. Rahma, And A. A. Alwi, "Green Competitive Advantage: The Influence Of Environmental Awareness And Human Resource On SMES," *FINANSIA: Jurnal Akuntansi Dan Perbankan Syariah* 7, no. 2 (2024).

<sup>11</sup> Georgeta Vidican Auktor, "Green Industrial Skills For A Sustainable Future," Vienna: Secretariat Of The United Nations Industrial Development Organization (UNINDO), (2020); OECD/Cedefop, *Green Skills And Innovation For Inclusive Growth*, (Paris: OECD Publishing, 2015).

<sup>12</sup> Francesco Vona, Giovanni Marin, Davide Consoli, And David Popp, "Green Skills," *Massachusetts: NBER Working Paper*, 2015.

<sup>13</sup> Katarzyna Kowalska, Elżbieta Szczygiel, Paulina Szyja, And Renata Śliwa, *Green Skills In The Field Of Social Economy*, (Krakow: The European Commission, Wydawnictwo Naukowe Uniwersytetu Pedagogicznego, 2022).

<sup>14</sup> Francesco Vona, Giovanni Marin, Davide Consoli, And David Popp, "Environmental Regulation And.

regulations, although overall, GGS was not significantly affected by the regulatory changes. Report highlights the importance of green skills in the transition to a green economy,<sup>15</sup> especially in developing countries. This report, which defines green jobs and green skills based on,<sup>16</sup> suggests that the transition to sustainable production and consumption creates significant employment opportunities. As such, the development of green skills is key in the face of a global labor market transformation that increasingly demands sustainable jobs and expertise.

The report in defines green skills as the competencies, knowledge and expertise essential for effective participation in a green economy, which focuses on sustainable practices.<sup>17</sup> National policy frameworks play a crucial role in prioritizing the development of green skills to achieve green growth, emphasizing the importance of training and skills systems in supporting sustainable development goals. The European Commission's 2015 research report on ESCO classification confirms that the concept of green skills encompasses all European labor market activities, covering a wide range of economic sectors from energy production to environmental impact auditing. Through ESCO skills labeling, the research identified 571 green skills concepts, including 381 technical skills, 185 knowledge concepts and 5 transversal skills, validating the broad scope of competencies required in the green economy.<sup>18</sup>

Research highlights the importance of green audit in the environmental management system, emphasizing its impact on environmental sustainability.<sup>19</sup> The study also identified obstacles faced in the implementation of green audits, influenced by economic and social factors. The green audit process, which consists of pre-audit, audit, and post-audit stages, requires continuous follow-up to achieve the desired goals. These findings underscore the complexity and importance of green audits in the context of the European Commission. sustainability. The study on the Green skills Agreement in Australia confirms that green skills, or sustainability skills, encompass the technical knowledge, values and attitudes required to achieve sustainable social, economic and environmental outcomes.<sup>20</sup> These skills are important for a variety of sectors, including energy-efficient construction and environmentally friendly practices.

The findings indicate that high-quality external audits significantly promote green innovation with environmental information disclosure playing a mediating role.<sup>21</sup> The positive relationship between audit quality and green innovation is stronger in larger,

<sup>15</sup> Georgeta Vidican Auktor, "Green Industrial Skills For A Sustainable Future," Vienna: Secretariat Of The United Nations Industrial Development Organization (UNINDO), (2020).

<sup>16</sup> OECD/Cedefop, *Green Skills And Jobs*, (Paris: OECD Publishing, 2014).

<sup>17</sup> OECD/Cedefop, *Green Skills And Innovation For Inclusive Growth*, (Paris: OECD Publishing, 2015).

<sup>18</sup> ESCO, "European Skills, Competences, Qualifications And Occupations," *European Commission*, (2017)

<sup>19</sup> Ameen Zaidan Khalaf And Salah Ben Hamad, "Techniques And Methods Of Green Audit An Exploratory And Analytical Study Of The Opinions Of A Sample Of Workers In The Field Of Control And Audit," *Revenue Journal: Management And Entrepreneurship* 1, no. 1 (2023).

<sup>20</sup> Garry Mcdonald, Linda Condon, And Martin Riordan, "The Australian Green Skills Agreement: Policy And Industry Context, Institutional Response And Green Skills Delivery," *APEC Green Skills* (2012).

<sup>21</sup> Junhua Yang, Ying Li, Yu Zheng, Mengqi Zhu, Yasir Shahab, And Chengang Ye, "External Audit Quality And Green Innovation: Does Environmental Information Disclosure Matter?," *International Review Of Financial Analysis* 103, (2025).

state-owned, and environmentally oriented firms, and is further reinforced by green finance policies. Moreover, the study finds that greater accounting comparability enables firms to learn from their peers about environmental impacts, leading to a reduction in environmental violations.<sup>22</sup> This effect is stronger when peer firms disclose lower levels of toxic emissions, indicating more effective green learning. Overall, accounting comparability supports environmentally responsible behavior and contributes to reducing environmental harm.

Research identified ten green skills across sectors, spanning design, leadership, to waste management and finance, emphasizing the urgent need for alignment between skills training and industry demand.<sup>23</sup> These findings highlight the importance of training institutions to produce a workforce competent in green skills, to support the transition to sustainable industries. Reports highlight the urgent need for green skills among professionals, especially accountants, to address the skills gap in achieving net-zero emissions goals.<sup>24</sup> A shift towards sustainable business models that focus on renewable resources and biodiversity preservation is required. Investment in comprehensive green skills, encompassing environmental, social, and economic dimensions, is critical to building a sustainable future and ensuring long-term business continuity.

The findings show that green skills and capabilities generally boost a company's financial performance in a positive way.<sup>25</sup> That said, things like company size, industry sector, and location play a big role in shaping this connection. Addition, the study reveals that students' green skills remain at a low level, while teachers demonstrate a high level of green skills across cognitive, interpersonal, and intrapersonal dimensions.<sup>26</sup> These findings indicate the need to further strengthen teachers' competencies in green skills-based learning management and to enhance collaboration with broader societal stakeholders to support green skills development. In other hand, the study concludes that assessing skill formation systems cannot be limited to their ability to produce green skills alone, but must also consider resource allocation, equity of access, and broader social impacts.<sup>27</sup> These factors are essential to balance efficiency and equality, ensuring that green skills development supports a socially and politically sustainable green transformation.

This study is motivated by the lack of information and the lack of scientific research that specifically examines the types of green skills needed by independent auditors in

<sup>22</sup> Justin Chircop, Monika Tarsalewska, And Agnieszka Trzeciakiewicz, "Learning To Be Green: Accounting Comparability And Environmental Violations," *The British Accounting Review* 57, no. 5 (2025).

<sup>23</sup> Lai Chee Sern, Adib Farhan Zaime, And Lee Ming Foong, "Green Skills For Green Industry: A Review Of Literature," *Journal Of Physics: Conference Series* 1019, (2018).

<sup>24</sup> Emmeline Skelton, *Green Finance Skills: The Guide*, (The Association Of Chartered Certified Accountants, 2023); ACCA, *Climate Action And The Accountancy Profession: Building A Sustainable Future*, (London: ACCA Global, 2021).

<sup>25</sup> Cece Kóczyás And Pelin Demirel, "The Impact Of Green Skills And Green Capabilities On Firms' Financial Performance: A Systematic Literature Review," *Journal Of Innovation & Knowledge* 10, no. 6 (2025).

<sup>26</sup> Farid Mutohhari, Putu Sudira, Pardjono Pardjono, Suyitno Suyitno, Warju Warju, Fajar Danur Isnantyo, And Nuur Wachid Abdul Majid, "Generic Green Skills: Maturity Level Of Vocational Education Teachers And Students In Indonesia," *International Journal Of Evaluation And Research In Education (IJERE)* 14, no. 1 (2025).

<sup>27</sup> Marius R. Busemeyer, Martin B. Carstensen, Achim Kemmerling, And Jale Tosun, "Foundations For A Green Economy: How Institutions Shape Green Skills," *NPJ Climate Action* 4, no. 27 (2025).

facing the challenges of SDGs in Indonesia, especially in the SEZs Batam. To overcome this limitation, this study adopts the framework developed by in a research entitled environmental regulation and Green skills: an empirical exploration.<sup>28</sup> The framework is then modified by adding 10 new skills from that are relevant to the context of environmental regulation in Batam SEZs.<sup>29</sup> Thus, this research seeks to contribute in identifying and analyzing the essential green skills for independent auditors in supporting the achievement of SDGs in Indonesia.

## Methods

This research is located in Batam City by involving Independent Auditors at the largest Public Accounting Firm (KAP) in Batam as the informant of the research, because Independent Auditors at KAP need green skills to carry out their duties effectively in responding to the SEZs and Sustainability Development in Batam. The method in this study uses a qualitative phenomenological approach to explore the experiences of independent auditors related to the application of green skills in responding to SEZs and Sustainability Development in Batam. The aim is to reconstruct auditors understanding of the knowledge, skills and attitudes relevant for sustainability auditing.<sup>30</sup>

In this study, data were collected through indepth interviews as the main data collection technique and open questions conducted through question and answer sessions by sending questions to respondents, namely four independent auditors from the largest Public Accounting Firm in Batam.<sup>31</sup> Selection of informants using Non-Probability Sampling method with Purposive Sampling type, namely selecting auditors who have certain characteristics in accordance with the research objectives. The interview guidelines are based on the green skills framework.<sup>32</sup>

Table 1. List Of Research Respondents

Respondent Name	Code
KAP Hendrawinata Hanry Erwin & Sumargo	K1
KAP Doni & Partners (Exsus Global)	K2
KAP Charles & Nurlela	K3
KAP Riki Halim, SE, Ak, M. Ak, CPA, BKP	K4

Source: Data Processed By Researcher, 2025

The author selected four senior auditors from the four public accounting firms operating in Batam. Respondents were chosen based on specific criteria, including a minimum of five years of audit experience, prior involvement in auditing companies or

<sup>28</sup> Francesco Vona, Giovanni Marin, Davide Consoli, And David Popp, "Environmental Regulation And.

<sup>29</sup> Katarzyna Kowalska, Elżbieta Szczygiel, Paulina Szyja, and Renata Śliwa, "Green Skills In The Field Of Social Economy," *European Commission And SDG Labs: Krakow*, (2022).

<sup>30</sup> John W. Creswell, William E. Hanson, Vicki L. Clark Plano, And Alejandro Morales, "Qualitative Research Designs: Selection And Implementation: Selection And Implementation," *The Counseling Psychologist* 35, no. 2 (2007).

<sup>31</sup> Wasihun Bezabih Bekele And Fikire Yohanes Ago, "Sample Size For Interview In Qualitative Research In Social Sciences: A Guide To Novice Researchers," *Research In Educational Policy And Management* 4, no. 1 (2022).

<sup>32</sup> Francesco Vona, Giovanni Marin, Davide Consoli, And David Popp, "Environmental Regulation And.

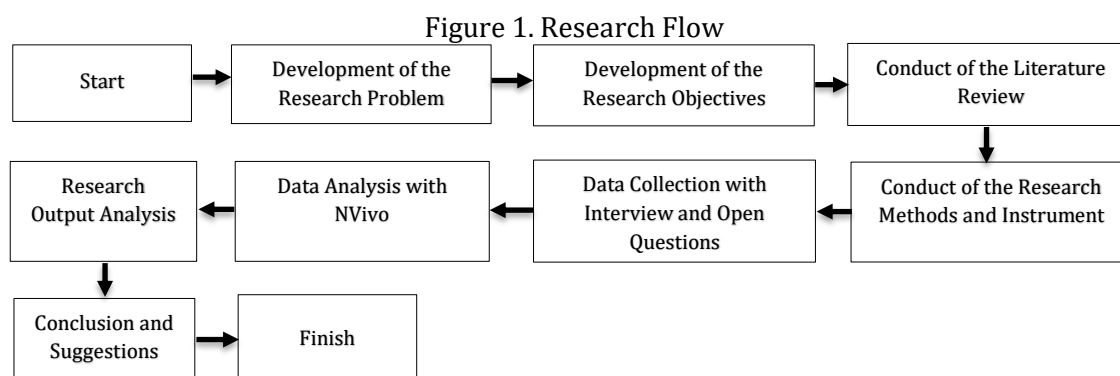
industries within Batam, and a solid understanding of sustainability issues. The data analysis was conducted in depth using Nvivo software for coding, categorization, and theme identification.<sup>33</sup> The research results are expected to contribute to the development of auditor training and HR capacity building policies in the accounting sector for sustainable development in Batam SEZs. The following is the flow of research conducted starting from problem formulation to displaying research results.

Table 2. Stages Of Process

Stages	Stages Of The Analysis Process
1	Interview data were organized in Microsoft Word and prepared for analysis
2	The interview documents were imported into the NVivo 15 software
3	Key data were coded to identify relevant themes and analytical categories
4	Data visualizations were generated using NVivo features to identify patterns and support analysis
5	The analyzed data were presented through diagrams and graphical outputs
6	Conclusions were drawn based on the results of the data analysis

**Source:** Data Processed By Researcher, 2025

This study began with the identification and development of the research problem, followed by the formulation of clear research objectives. A comprehensive literature review was then conducted to establish the theoretical foundation and identify relevant prior studies. Subsequently, appropriate research methods and research instruments were designed to address the research objectives. Data were collected through interviews and open-ended questions to obtain in-depth insights from participants. The collected data were then analyzed using NVivo software to systematically code and interpret qualitative information. Based on the analysis, research outputs were examined to identify key findings and implications. Finally, conclusions were drawn, and recommendations were proposed to guide future research and practical applications. The research flow presented in Figure 1 below:



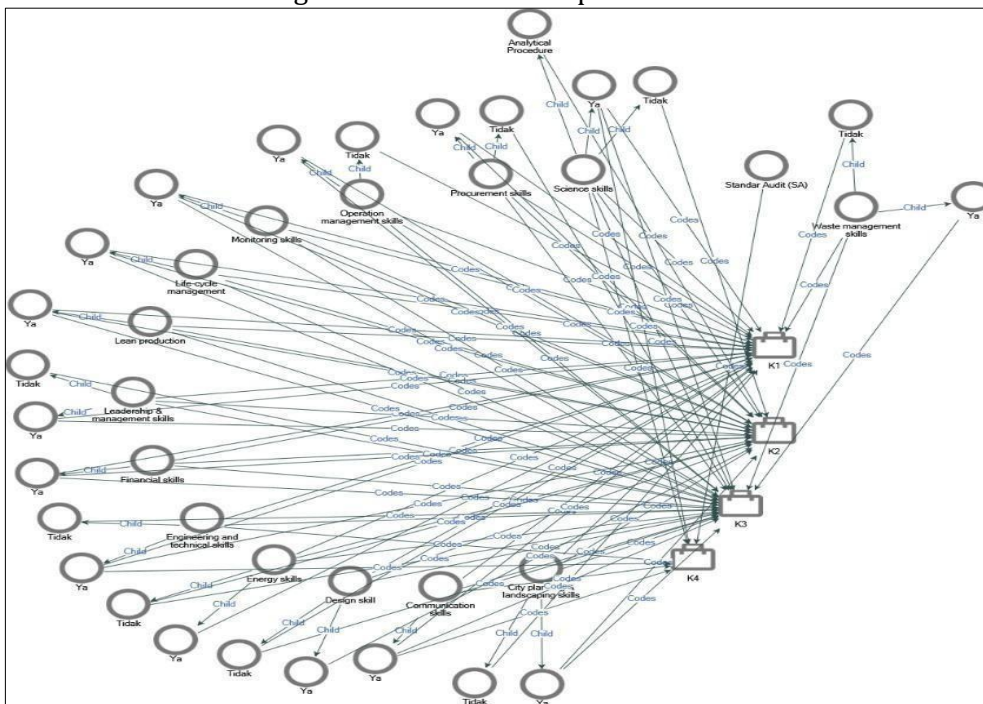
**Source:** Data Processed By Researchers, 2025

<sup>33</sup> NVivo User Help-Windows, "NVivo Getting Started Basics," [nvivo.help](https://www.nvivo.com/help/), (20 Maret 2025)

## Result And Discussion

Based on in-depth interviews that have been conducted with a sample of independent auditors in Batam, analysis shows that the understanding of green skills among independent auditors in Batam is still varied, with most respondents recognizing that this is a relatively new area and has not been the main focus of conventional auditing. However, there is recognition of the importance of these skills in the future, especially given the vision of sustainable development and the presence of SEZs in Batam. The following is a visual representation of the interview results that have been analyzed using NVivo.

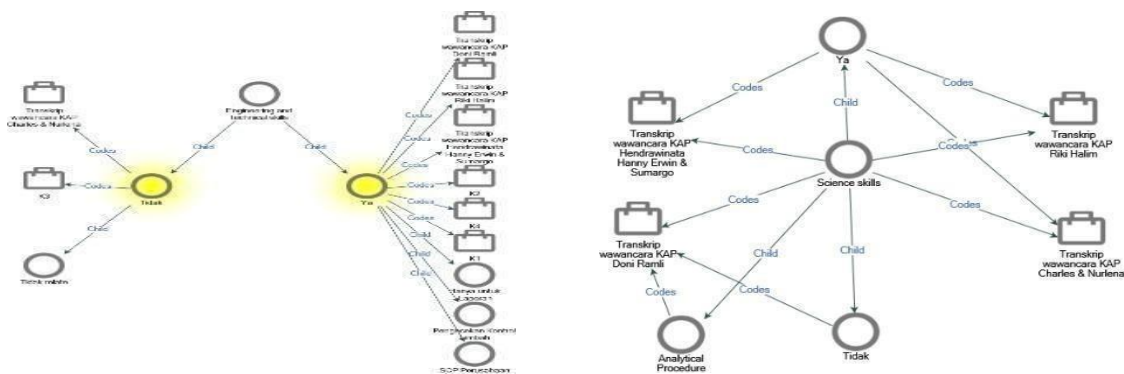
Figure 2. NVivo Visual Representation



Source: Data Processed By The Researcher, 2025

### Engineering & Technical And Science Skill

Figures 3 And 4. NVivo Result (Engineering & Technical And Science Skills)



Source: Data Processed By The Researcher, 2025

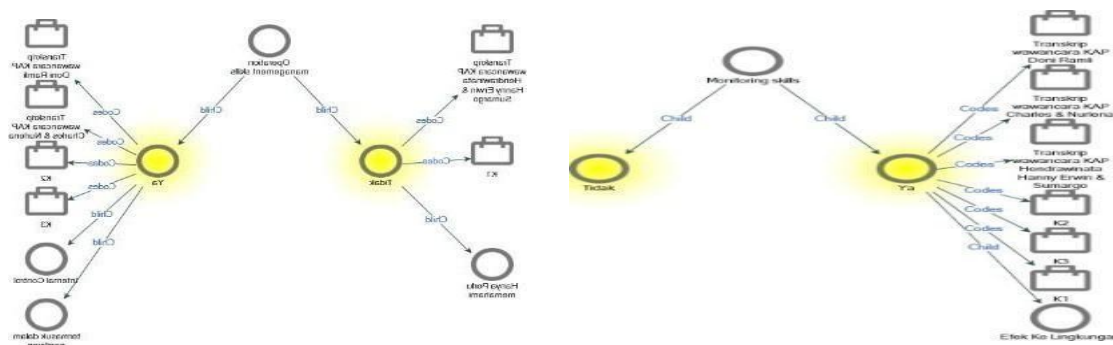
The Interview results presented in figure 3 indicate that auditors need to have a specific, though not in-depth, understanding of engineering and technical skills relevant to

environmental and sustainability audits. Basic understanding of technology or engineering processes makes auditors more relevant... K1. [...emphasizes the importance of understanding waste management or energy efficiency at the plant for identification of audit findings...] K2. [...emphasized that broad engineering knowledge is not mandatory, but specific understanding of green economy machinery for audit working papers is needed...] K3. In contrast, K4 did not focus much on this aspect, considering it less relevant to green skills for financial statements.

As shown in figure 4, K1, K3, and K4 agreed that auditors need an adequate understanding of science skills or "environmental literacy" to identify environmental issues and suggest improvements, such as waste management. For deep technical issues, auditors can utilize experts (as per SA Expert). In contrast, [...auditors only need a basic understanding of environmental science and chemistry, not in-depth skills or licenses, but need to have analytical procedures to identify improvement findings...]. K2.

### Operation Management And Monitoring Skills

Figures 5 And 6. NVivo Result (Operation Management And Monitoring Skills)



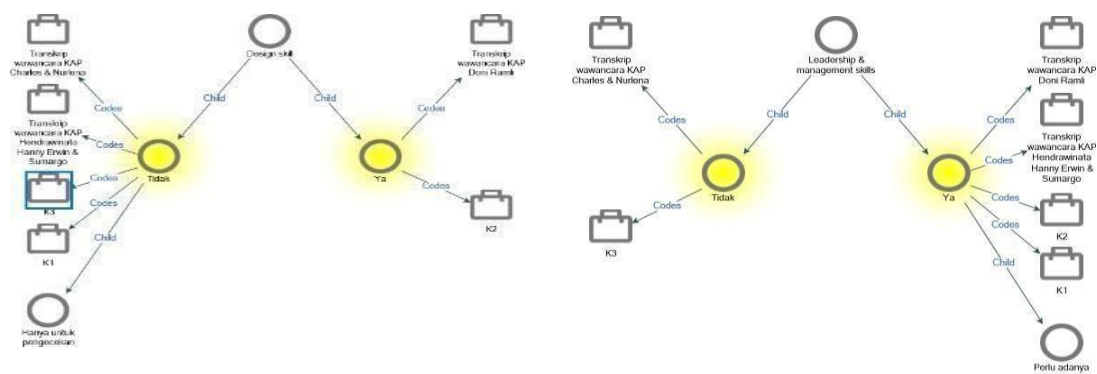
Source: Data Processed By The Researcher, 2025

Statements from K2 and K3 in figure 5 indicate that understanding operations management as crucial for auditors. K2 emphasized its importance in the initial audit procedures, particularly internal control checks and business recognition. K3 reinforced that these skills are essential for the adaptation of green organizational structures, product lifecycle management perspectives, and building strategic partnerships in green activities. K1 argued that auditors do not have to be experts, but need to understand the operational context to assess Environmental Management Systems (EMS), with a focus on environmental systems and controls.

The analysis of the interviews in figure 6 concluded that K1, K2, and K3 agreed that monitoring skills are crucial in audits, especially regarding environmental and social risks. [...the importance of comprehensive monitoring for early detection of environmental and social risks, resulting in a thorough audit...]. K1. [...emphasized the importance of strong monitoring skills to identify potential risks, including understanding the roles of environmental compliance inspectors and waste monitoring technicians...]. K3. K2's findings on waste audits also implicitly highlight the importance of continuous supervision.

## Design And Leadership & Management Skills

Figures 7 And 8. NVivo Result (Design And Leadership & Management Skills)



Source: Data Processed By The Researcher, 2025

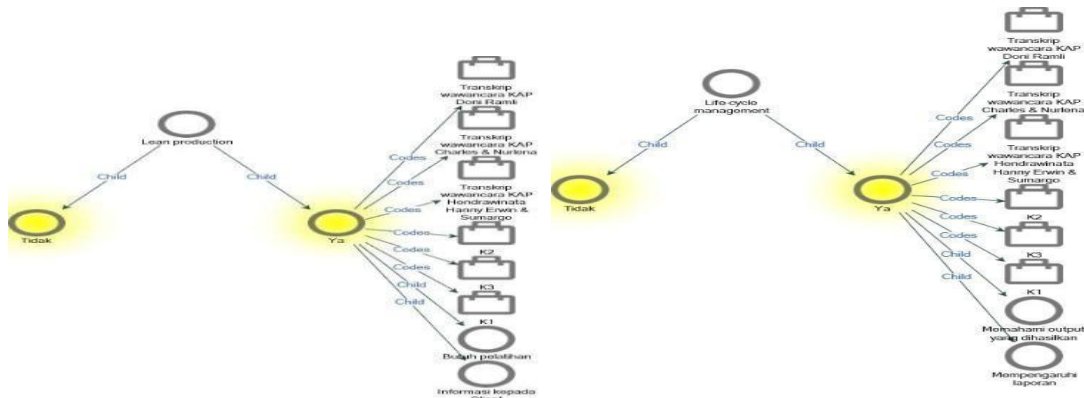
The Interview results presented in figure 7 indicated that K1 and K3 disagree with the notion that auditors must possess the ability to design waste management systems. Both argued that the main task of auditors is to check finances and compliance, not to design systems. K1 even emphasized that they only need to verify the standard certification of existing machines or systems. K2 agrees that expertise in such audits is essential and should be mastered, although specific licenses may not be mandatory, in-depth understanding remains a significant plus.

As illustrated in figure 8, K1 and K2 agreed that understanding and evaluating aspects of management are essential skills. [...emphasized the importance in the complex world of business and regulation to understand operations, risk, and environmental impact management...]. K1. K2, while not directly addressing green skills, the focus on internal control and management checks implies a fundamental need for management understanding. K3 did not initially consider leadership and management skills as a necessity, but after clarification recognized their importance, although not as absolute.

Interview results highlight differing auditor views on technical versus core roles. Figure 7 shows K1 and K3 rejecting waste management design as auditors' duty, focusing instead on financial compliance and certifications, while K2 deems such expertise essential. Figure 8 reveals K1 and K2 agreement on evaluating management aspects like operations and risks-key for internal controls and sustainability audits-despite K3's initial hesitation before recognizing their importance.

### Lean Production And Life-Cycle Management Skills

Figures 9 And 10. NVivo Result (Lean Production & Life-Cycle Management Skills)



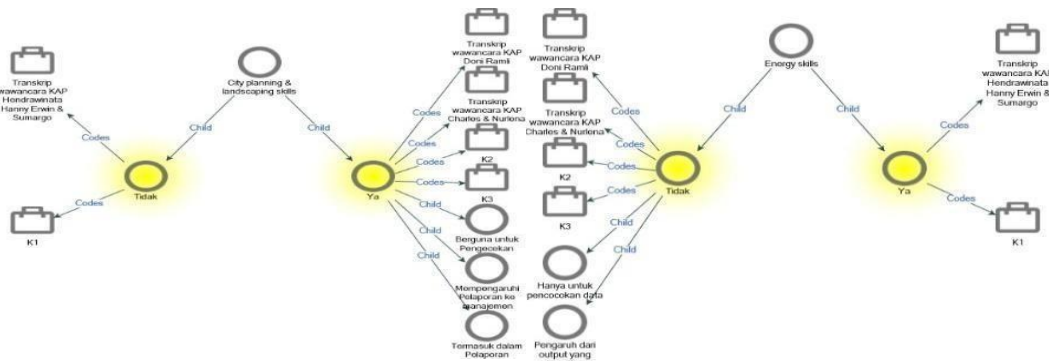
Source: Data Processed By The Researcher, 2025

As shown in figure 9, K1, K2, and K3 agreed that understanding the concept of green skills or environmentally friendly practices, although not always in depth, is very useful and important for auditors. K1 emphasized that a basic understanding of efficiency and waste elimination (lean) enriches the auditor's perspective in identifying green production improvements. K2 stated that this understanding is very necessary, and hopes that the government will be involved in developing related auditor soft skills. K3 also supports that basic knowledge of green skills enables the provision of advice to clients.

As presented in figure 10, K1, K2, and K3 highlighted the need for auditors to see the full picture of a company's operations, particularly its impact on the environment. K3 explicitly stated that the company's view on life-cycle management is crucial in the evaluation of environmental management systems. Q1 reinforces this view, emphasizing that understanding life-cycle management helps to see the full picture of a product's environmental impact. K3 adds a practical dimension, noting that auditors need to understand company inputs and outputs, as well as differences in waste management for a thorough analysis.

### City Planning & Landscaping And Energy Skills

Figures 11 And 12. NVivo (City Planning & Landscaping And Energy Skills)



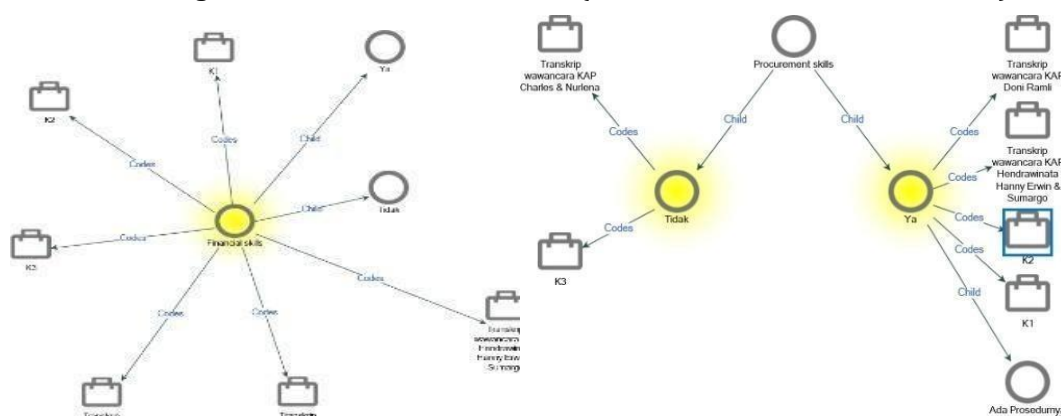
Source: Data Processed By The Researcher, 2025

Based on the result presented in figure 11, K2 and K3 agreed that the physical inspection and traceability of city planning & landscaping skills is very important in the audit process. K3 [...recognizes the inspection of the feasibility of premises and buildings is relevant...]. [...emphasized that auditors should conduct in-depth walkthroughs, from observation of movement cycles to on-site verification, as outward appearances are not enough...] K2.

Results from the interviews with K2 and K3 in figure 12 suggest that deep mastery of energy skills is not a top priority for public accountants. [...the main focus of audits is the conformity of energy usage records with realization, and the relevance of renewable energy adoption...]. K3. [...emphasized that public accountants do not need to master the intricacies of energy use, because the decision lies with company management, what is more important is to assess the impact of energy use output on the environment...] K2. In contrast to K1 who strongly agreed and emphasized the importance of energy skills for auditors in this era as a necessity for relevant and value-added audits.

### Financial And Procurement Skills

Figures 13 And 14. NVivo Result (Financial And Procurement Skills)



Source: Data Processed By The Researcher, 2025

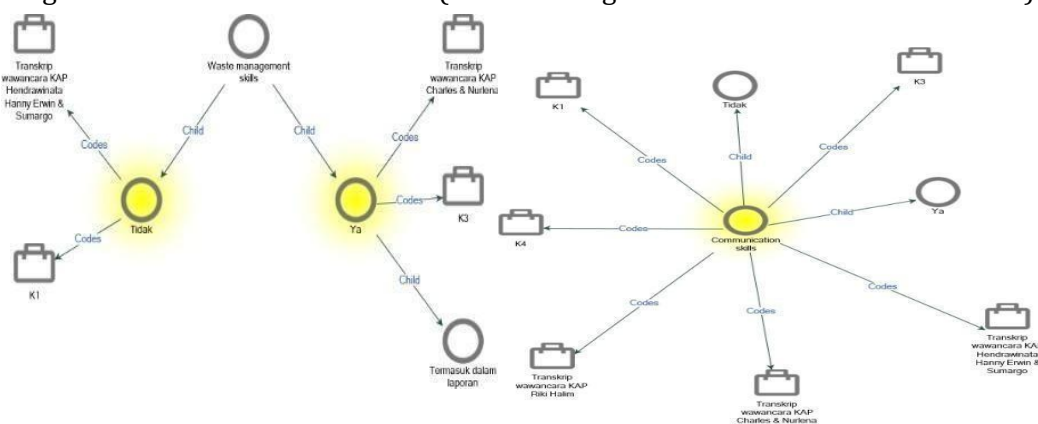
Interviewees K1, K2 and K3 (see figure 13) agreed that financial skills are a core and crucial competency for auditors. While there is recognition of the importance of non-financial issues such as sustainability (as hinted by K1 with green skills and K2 with environmental findings), the main foundation of the auditor's work remains rooted in an in-depth understanding and analysis of the financial aspects of the entity. This suggests auditors should have a comprehensive understanding of finance, the accounting cycle and financial reporting.

As shown in figure 14, Interviewees K1 and K2 agreed on the importance of procurement skills for auditors. [K1] emphasized that understanding procurement is crucial because audit procedures highlight the purchasing process in depth, including the origin of goods, quality, and sustainability...] K2. [...explained that auditors do not have to be technical procurement experts, but a basic understanding of managing the purchase of raw materials and services is absolutely necessary...] K1. K3 believes that procurement skills are not very important in the scope of financial statement audits, the main focus of auditors is the accuracy and compliance of financial presentations.

Interview results affirm the foundational role of financial expertise in auditors' core responsibilities while highlighting complementary skills for modern assurance. As depicted in figure 13, K1, K2, and K3 unanimously emphasize financial acumen-including accounting cycles and reporting-as indispensable, even as they acknowledge sustainability's growing relevance, reinforcing auditors' primary duty in financial analysis. Figure 14 reveals K1 and K2's consensus on procurement understanding as vital for scrutinizing purchasing processes, origins, quality, and sustainability, whereas K3 views it as secondary to financial statement accuracy, collectively illustrating auditors' need to balance traditional financial oversight with operational insights in complex audits.

### Waste Management And Communication Skills

Figures 15 And 16. NVivo Results (Waste Management And Communication Skills)



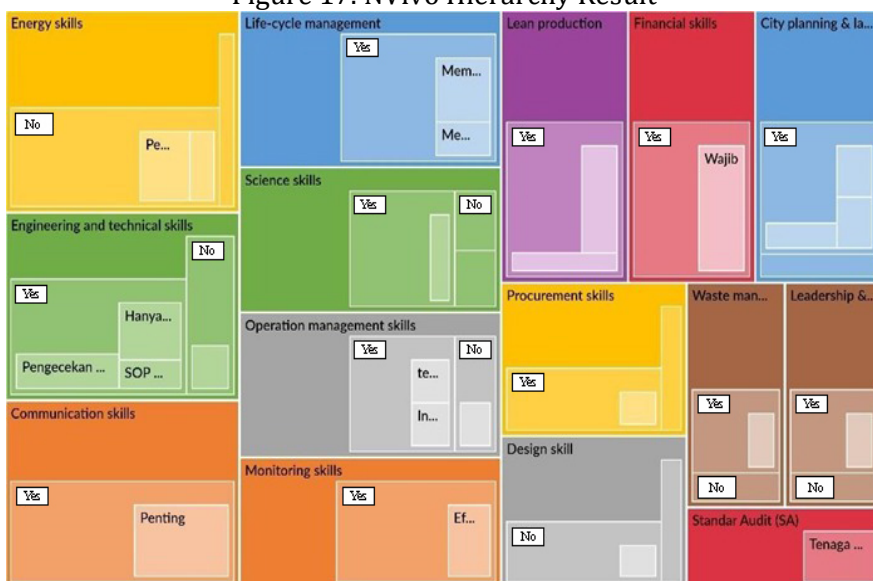
Source: Data Processed By The Researcher, 2025

As presented in figure 15, the interview with K3 clearly indicates that waste management is a relevant and frequently encountered area in the client's operations, indicating that waste management skills are not just a compliance issue, but an important aspect that needs to be understood and analyzed. K1 argues that direct technical skills in waste management are not the core expertise of auditors because the main task is to assess the effectiveness of waste management systems, rather than being involved in technical operations, with a focus on evidence, processes, and compliance with sustainable development standards and objectives.

The Interview results from K1, K2, and K3 in figure 16 voiced a uniform view on the importance of communication skills for auditors, especially in communicating audit findings to clients and stakeholders. All three agreed that effective communication is crucial. K1 and K3 directly stated that communication skills are very important to explain audit findings to client management, because without good communication, the delivery of audit results can be ineffective. K2 provided an in-depth perspective on the implications of poor communication in audit reports, highlighting the strategic role of auditors in maintaining the good name of non-DDK companies. K2 also advises the auditor to suggest improvements to the client before issuing the audit report to avoid any negative impact on the client's reputation or business, suggesting communication is not just the delivery of facts, but also negotiation and client relationship management.

Interview results underscore auditors' evolving roles beyond traditional financial assurance. As shown in figure 15, K3 highlights waste management's prevalence in client operations, necessitating auditors' understanding for effective analysis, while K1 stresses evaluating system effectiveness, processes, and sustainability compliance rather than technical implementation. Figure 16 reveals unanimous agreement among K1, K2, and K3 on communication skills' criticality-not just for conveying findings to clients and stakeholders, but also for strategic negotiation, reputation management, and proactive improvement suggestions that safeguard non-public companies' interests.

Figure 17. NVivo Hierarchy Result



Source: Data Processed By Researchers, 2025

Based on the NVivo data hierarchy visualization above, some green skills stand out as the most frequently appearing or most discussed by respondents. The larger size of the box reflects the frequency of occurrence or emphasis given by participants to the skill. The following are the most prominent green skills and their explanations;

Table 2. Green Skills For Independent Auditors

Green Skill Required	Explanation
Analytical Procedure (New Green Skills)	Although Analytical Procedure does not appear as a separate category in the NVivo hierarchy shown, in-depth analysis of the interview narratives indicates that it is implicitly a crucial additional green skill for auditors.
Engineering and Technical Skills & Science Skills	These two categories also have significant box sizes, shows that technical and scientific aspects, while perhaps not requiring in-depth expertise (indicated by the "Only..." or "No" nodes), are still areas that come up frequently in discussions about green skills auditors.
Communication Skills	Emphasized as "Important" and has a very large "Yes" block. This suggests that effective communication skills are crucial for auditors to communicate sustainability-related audit

Green Skill Required	Explanation
Life-cycle Management	findings to clients and stakeholders, explain implications, and provide constructive suggestions for improvement This category has large boxes with "Yes" nodes, indicating agreement and emphasis on the importance of auditors' understanding of the product or service life cycle and its impact on the environment
Operation Management Skills	With a large "Yes" block, this skill is considered crucial for auditors to understand the context of client business operations, particularly in examining internal controls and adapting environmentally friendly organizational structures.
Monitoring Skills	The prominent "Yes" block indicates the importance of the auditor's ability to comprehensively monitor environmental and social risks, enabling early detection and thorough audits.
Lean Production	This skill also has a dominant "Yes" block, signaling that an understanding of efficiency and elimination of waste in the production process is beneficial for auditors to identify areas of improvement that contribute to green practices.
Financial Skills	This is the most dominant category and has the largest box, explicitly marked with a "Required" node. This confirms that, despite the importance of sustainability, financial skills remain a core competency and an indispensable foundation for independent auditors in performing their duties.
City Planning & Landscaping Skills	While it may seem technical, the "Yes" block demonstrates the relevance of these skills in the context of physical audits and due diligence of client premises and buildings.
Procurement Skills	A clear "Yes" block indicates the need for auditors to understand procurement processes, including sustainability aspects of supply chains, in order to assess risk and compliance in purchasing
Waste Management Skills	With a dominant "Yes" block, this skill indicates that an understanding of waste management is highly relevant for auditors as it is often found in client operations and needs to be analyzed for compliance and effectiveness
Leadership & Management Skills	Significant "Yes" blocks indicate the importance of auditors in understanding and evaluating aspects of client management, including how the leadership and management of the organization are adapting to the demands of sustainability.

**Source:** Research Result By Researcher, 2025

Broadly speaking, the most important skills agreed upon by auditors include financial and communication skills, operational and managerial skills (operation management, lean production, life-cycle management), the ability to manage risks and monitor environmental impacts (monitoring skills), basic environmental skills (science skills), specific management such as waste management, procurement skills, leadership & management skills, and city planning & landscaping skills were also recognized for their relevance in helping auditors perform their duties with a sustainability perspective. In addition to the skills, the

importance for auditors to develop Analytical Procedures as an additional green skill was found. These skills enable auditors to analyze data in depth, identifying trends, anomalies, and relationships that may indicate sustainability risks or opportunities that are not readily apparent, resulting in more incisive and value-added audit findings.

## **Conclusion**

This study identifies 12 essential green skills for independent auditors in Batam to tackle SEZ and sustainable development challenges: financial foundation, operational-managerial (operations management, lean production, life-cycle management), communication-monitoring, basic engineering, scientific understanding, and specialized skills (waste management, procurement, leadership, urban-landscape planning). Analytical procedures are crucial; integrate with traditional expertise for environmental-social impact assessment. Findings align with Green Theory, emphasizing human-nature balance, environmental preservation, ecological justice, and sustainability-supported by skills like monitoring and life-cycle management. Auditors need broad knowledge, not deep specialization; for complex technical areas (e.g., environmental engineering), leverage experts per Auditing Standards. Limited generalizability, respondent scheduling issues, short interview times. Future research suggestions: develop measurable indicators; comparative studies across public/private sectors or SEZs; examine impacts on audit quality and sustainability reporting.

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## **Author Contributions Statement**

The author conceptualized the study, designed the methodology, collected and analyzed the data using NVivo, conducted the interviews, performed the literature review, wrote the original draft, and revised the manuscript. All aspects of the research, including validation, visualization, and final approval, were handled solely by the author. The author takes full responsibility for the integrity and accuracy of the work.

## **Bibliography**

ACCA, A. *Climate Action And The Accountancy Profession: Building A Sustainable Future*. London: ACCA Global, 2021.

Affairs, UN Department Of Economic And Social. "The Seventeen Goals SDGs." <https://sdgs.un.org/goals>, Retrieved August 10, 2024.

Auktor, G. V. *Green Industrial Skills For A Sustainable Future*. Vienna: United Nations Industrial Development Organization (UNINDO), 2020.

- Bekele, Wasihun Bezabih., And Ago, Fikire Yohanes. "Sample Size For Interview In Qualitative Research In Social Sciences: A Guide To Novice Researchers." *Research In Educational Policy And Management*, Vol. 4, No. 1, 2022. <https://doi.org/10.46303/repam.2022.3>.
- Buaban, Saniwan., Nitivattananon, Vilas., And Shrestha, Sangam. "Sustainability Indicators As A Key For Sustainable Development Of Special Border Economic Zones." *GMSARN International Journal*, Vol. 14, 2020. <https://gmsarnjournal.com/home/wp-content/uploads/2020/02/vol14no3-8.pdf>.
- Busemeyer, Marius R., Carstensen, Martin B., Kemmerling, Achim., And Tosun, Jale. "Foundations For A Green Economy: How Institutions Shape Green Skills." *NPJ Climate Action*, Vol. 4, No. 27, 2025. <https://doi.org/10.1038/s44168-025-00234-5>.
- Chircop, Justin., Tarsalewska, Monika., And Trzeciakiewicz, Agnieszka. "Learning To Be Green: Accounting Comparability And Environmental Violations." *The British Accounting Review*, Vol. 57, No. 5, 2025. <https://doi.org/10.1016/j.bar.2023.101240>.
- Creswell, John W., Hanson, William E., Plano, Vicki L. Clark., And Morales, Alejandro. "Qualitative Research Designs: Selection And Implementation: Selection And Implementation." *The Counseling Psychologist*, Vol. 35, No. 2, 2007. <https://doi.org/10.1177/0011000006287390>.
- Dyer, H. C. *Green theory*. England: E-International Relations, 2017. <https://eprints.whiterose.ac.uk/120472/>.
- ESCO, E. *European Skills, Competences, Qualifications And Occupations*. European Commission, 2017. <https://doi.org/10.2767/934956>.
- Help-Windows, NVivo User. "Nvivo getting started basics." [nvivo.help](https://www.nvivo.com/help/), Retrieved March 20, 2025.
- Indonesia, Coordinating Ministry For Economic Affairs Of The Republic Of. "Coordinating Minister Airlangga: Batam SEZ Can Be An Example And Make Indonesia Equal To Developed Countries." <https://www.ekon.go.id/publikasi/detail/3067/>, Retrieved June 12, 2024.
- Khalaf, Ameen Zaidan., And Hamad, Salah Ben. "Techniques And Methods Of Green Audit An Exploratory And Analytical Study Of The Opinions Of A Sample Of Workers In The Field Of Control And Audit." *Revenue Journal: Management And Entrepreneurship*, Vol. 1, No. 1, 2023. <https://doi.org/10.61650/rjme.v1i1.173>.
- Kóczyás, Cece., And Demirel, Pelin. "The Impact Of Green Skills And Green Capabilities On Firms' Financial Performance: A Systematic Literature Review." *Journal Of Innovation & Knowledge*, Vol. 10, No. 6, 2025. <https://doi.org/10.1016/j.jik.2025.100846>.
- Kowalska, Katarzyna., Szczygieł, Elżbieta., Szyja, Paulina., And Śliwa, Renata. "Green Skills In The Field Of Social Economy." *The European Commission*, 2022: <https://doi.org/10.24917/9788380848924>.

- Mcdonald, G., Condon, L., And Riordan, M. "The Australian Green Skills Agreement: Policy And Industry Context." *In Institutional Response And Green Skills Delivery TAFE Directors Australia (TDA)*, 2012.
- Mutohhari, Farid. "Generic Green Skills: Maturity Level Of Vocational Education Teachers And Students In Indonesia." *International Journal Of Evaluation And Research In Education (IJERE)*, Vol. 14, No 1, 2025. <http://doi.org/10.11591/ijere.v14i1.29191>.
- Nazarova, Karina., Nezhyva, Mariia., Kucher, Anatolii., Hotsuliak, Volodumyr., Melnyk, Tetiana., And Zarembo, Olha. "Environmental Audit In The Sustainable Development Of Green Economy." *European Journal Of Sustainable Development*, Vol. 10, No. 3, 2021. <https://doi.org/10.14207/ejsd.2021.v10n3p273>.
- OECD/Cedefop, O. *Green Skills And Innovation For Inclusive Growth*. Paris: OECD Publishing, 2015. <https://doi.org/10.1787/9789264239296-en>.
- OECD/Cedefop, O. *Greener Skills And Jobs*. Paris: OECD Publishing, 2014. <https://doi.org/10.1787/9789264208704-en>.
- Planning, Ministry Of National Development. "Indonesia Emas 2045, Final Draft Of RPJPN 2025-2045." <https://indonesia2045.go.id/>, Retrieved August 28, 2024.
- Rafidah, R. Samad, Khairunnisa Abd., Adawiyah, Rabiyyatul., Rahma, Sri., And Alwi, Ahmad Afwan. "Green Competitive Advantage: The Influence Of Environmental Awareness And Human Resource On Smes." *FINANSIA: Jurnal Akuntansi Dan Perbankan Syariah*, Vol. 7, No. 2, 2024. <https://doi.org/10.32332/finansia.v8i2.11364>.
- Sari, Dwi Amalia. "Performance Auditing To Assess The Implementation Of The Sustainable Development Goals (SDGs) In Indonesia." *Sustainability*, Vol. 14, No. 19, 2022. <https://doi.org/10.3390/su141912772>.
- Sern, Lai Chee., Zaime, Adib Farhan., And Foong, Lee Ming. "Green Skills For Green Industry: A Review Of Literature." *Journal Of Physics: Conference Series*, Vol. 1019, No. 1, 2018. <https://doi.org/10.1088/1742-6596/1019/1/012030>.
- Skelton, Emmeline. *Green Finance Skills: The Guide*. London: Association Of Chartered Certified Accountants, 2023.
- Vona, Francesco., Marin, Giovanni., Consoli, Davide., And Popp, David. "Environmental Regulation And Green Skills: An Empirical Exploration." *Journal Of The Association Of Environmental And Resource Economists*, 2018. <https://doi.org/10.1086/698859>.
- Vona, Francesco., Marin, Giovanni., Consoli, Davide., And Popp, David. "Green Skills." *NBER Working Paper*, 2015. <https://doi.org/10.3386/w21116>.
- Yang, Junhua., Li, Ying., Zheng, Yu., Zhu, Mengqi., Shahab, Yasir., And Ye, Chengang. "External Audit Quality And Green Innovation: Does Environmental Information Disclosure Matter?." *International Review Of Financial Analysis*, Vol. 103, 2025. <https://doi.org/10.1016/j.irfa.2025.104151>.