

SYNERGY OF EDUCATION, BUSINESS, AND POLICY: DEVELOPING GREEN HUMAN RESOURCES COMPETENCE FOR SUSTAINABLE ECONOMIC TRANSITION IN INDONESIA

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Abstract

This study analyzes the synergistic relationship between education, industry (business), and public policy as a triple helix in producing green human resource competence as the main pillar that can support Indonesia's economic transition towards a sustainable green economy. This research is a systematic literature review using the PRISMA data collection methodology. Research data was obtained from publications in Indonesia from 2020 to 2025. The results of the study indicate that the synergy between the triple helix can create superior and competent green human resources. This integration can help Indonesia achieve a golden generation faster and enhance its global competitiveness through innovation and sustainable development.

Keywords: Green economy, education, public policy, business, Triple helix.

Introduction

In order to address the issues of environmental degradation, extreme climate change, and the requirement for sustainable growth, Indonesia has made the shift to a green economy a top priority. Utilizing renewable energy, cutting carbon emissions, making efficient use of human and natural resources, and putting social justice first are all components of sustainability that are highlighted by the idea of a "green economy." Individuals, communities, and governmental organizations must adopt new ways of thinking and acting in order to propel the shift to a green economy (Valdiansyah & Widiyati, 2024). Through public policy and the education sector, both developed and developing nations are starting to adopt the idea of a green economy. Numerous economic advantages result from incorporating a green economy into national development policies, including heightened economic competitiveness, decreased risks of environmental harm and health decline, economic diversification, and enhanced community quality of life via green human resource management. Public policy is the government's main tool for promoting environmentally friendly business practices in this context. It does this by encouraging businesses that are centered around the green economy concept and developing skilled human resources in the green sector through incentive-based regulations. To guarantee that communities can implement these ideas in their everyday lives, cooperation between public policy and education is crucial (Aulia & Nurhadi, 2023).

Instilling sustainable economic ideals and enhancing green economic literacy at a young age are two strategic roles that education performs that are equally significant (Rahmatika, 2020). In this sense, literacy encourages readers to practice environmental responsibility. The green economy, which aims to encourage sustainable economic activities by demonstrating environmental understanding and awareness, is greatly impacted by environmental literacy. Building a younger generation with green capabilities requires education, especially in the areas of entrepreneurship and business management. In addition to teaching students economic skills, education should raise awareness of and incorporate sustainability principles. The formal sector is not the only place where education occurs. The younger generation can be educated by the unorganized sector to raise awareness of the value of a sustainable green economy. In the formal sector, information about renewable energy sources and eco-friendly behaviors can be incorporated into the curriculum. Community campaigns on the value of environmental awareness are needed in the non-formal sector (Abdillah et al., 2021), and these can now be carried out through training, seminars, and workshops. However, there are still a lot of issues with green economy education in Indonesia. Among these are the dearth of educational resources that cover the intricacies of the green economy (Yamin et al., 2022) and the

dearth of green economy-related training for teachers. Support from various sources, including the government, educational institutions, and business process participants, is necessary to address this issue (Baharuddin et al., 2023).

Training and development that emphasizes more ecologically friendly work practices, like waste management and energy efficiency principles, must be used to assist the development of green human resource competences in education. Businesses, as major participants in the industry, have an equally important duty to incorporate green human resource competencies, such as training, career development, and incentives, alongside policy and education. These competencies can enhance environmental performance and inspire human resources within an organization. To encourage businesses to adopt sustainable business practices, the Indonesian government has implemented several supportive regulations, including Law No. 32 of 2009 on Environmental Protection and Management. Waste management, pollution control, and the enforcement of environmental pollution rules are all based on this statute. However, there are often difficulties in implementing green economy legislation. The lack of financial incentives for companies to adopt eco-friendly methods and the lax enforcement of Indonesian legislation are two examples of how rules, despite being in place, still require improvement in their application (Nugraha and Rosmawiah, 2025).

To effectively promote Indonesia's transition to a green economy, cooperation between the government, the education sector, and enterprises (the triple helix) is essential. Businesses incorporate sustainable practices into their operations, the education sector supplies skilled human resources and raises knowledge of the green economy, and the government offers an incentive-based framework through laws and policies. It is anticipated that the triple helix's three synergies will provide skilled and flexible green human resources that meet the demands of the green economy and promote Indonesia's sustainable economic growth.

While prior research has been conducted on this subject, including general sustainable development policies (Elsawy & Youssef, 2023), limited industry-education collaboration (Kusnadi et al., 2022; Husaini, 2023), and specific sustainable education (Asrofi, 2023; Firdaus et al., 2022). Still, there are several problems that require more research. This study examines the systemic synergy between education, business, and policy in producing green human resource competence as the primary pillar that can support Indonesia's economic transition towards a sustainable green economy, in contrast to earlier studies that only explain education, business, and sustainable green economy separately or only combine two of these elements.

Methods

The research was conducted using the systematic literature review (SLR) method as a source of research data in the form of journal publications in Indonesia. The discussion and literature search were conducted independently by three authors.

The research questions (RQ) were formulated in accordance with the focus chosen by the authors. The RQs in this study are as follows:

RQ1: How do public policies in Indonesia promote the transition to a green economy?

RQ2: How does the business management curriculum in the form of entrepreneurship education in Indonesia integrate the principles of sustainable economics to produce competent green human resources?

RQ3: How is the triple helix collaboration implemented to achieve common goals related to economic transition in Indonesia?

This study uses the Preferred Reporting Item for Systematic Reviews and Meta-Analysis (PRISMA) flow, which consists of identification screening, eligibility, and inclusion (Albadarin, et al., 2024). The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) diagram will be illustrated in Figure 1.

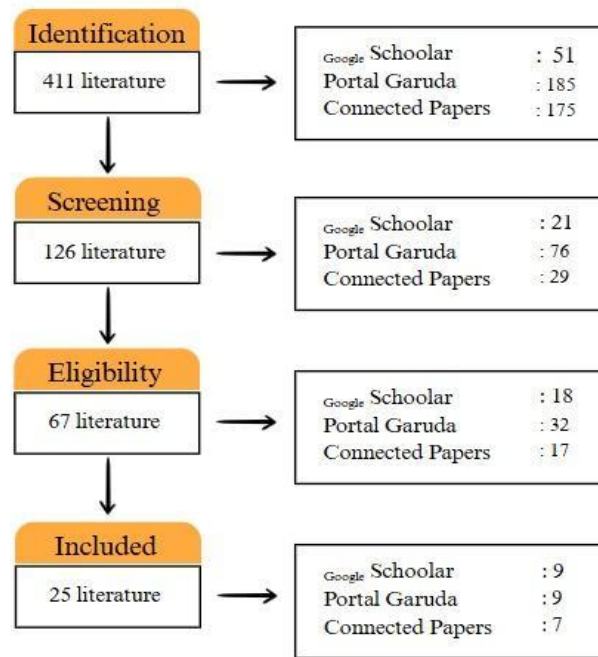


Figure 1. PRISMA Flow Chart
Source: Researcher's compilation, 2025

1. Identification

This study aims to analyze the systemic synergy between education, business, and policy in producing green human research development through published articles. Through searches on several search engines, including Google Scholar, Connected Papers, and Portal Garuda, articles were searched using the keywords green economy, education, public policy, business, and sustainability. The article search used the year range from 2020 to 2025. The articles used were free articles. This search found 411 related articles from 2020 to 2025.

2. Screening

This process aims to determine whether the specified data meets the criteria or not. Researchers read the abstracts in detail and screened the literature according to the inclusion and exclusion criteria in Table 1. From this process, 126 articles met the inclusion criteria.

3. Eligibility

Data quality is assessed using the following evaluation criteria questions

QA1: Does the article demonstrate how public policy in Indonesia promotes a green economic transition?

QA2: Does the article discuss how business management curricula, such as entrepreneurship education in Indonesia, integrate sustainable economic principles to produce competent green human resources?

QA3: Does the article discuss collaboration between the triple helix to achieve common goals related to Indonesia's economic transition?

An article can be considered primary data if it discusses the systemic synergy between education, business, and policy in realizing Indonesia's economic transition toward a sustainable green economy.

4. Included

Based on the eligibility process carried out, 25 articles are identified as suitable for use as primary data. All articles obtained were analyzed and will be discussed in the results and discussion section. The section headings are in boldface capital and lowercase letters. Second level headings are typed as part of the succeeding paragraph (like the subsection heading of this paragraph).

Table 1. Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
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Topic	Discussing the role of education, business, and policy in building a sustainable green economy	Not discussing the three elements
Article Type	Academic article	Not an academic article
Object	Students or university students in Indonesia	Not Students or university students in Indonesia
Publication Year	2020 to 2025	Before January 2020
Language	English or Indonesian	Not English or Indonesian

Results and Discussions

Public Policy in Promoting Green Economy Transition in Indonesia

Public policies mostly drive the shift to a green economy in Indonesia. This push can be interpreted as the government's efforts to achieve sustainable development and integrate sustainability principles into various sectors, even though easily accessible literature like Law number 71 of 2021 on the implementation of green economy policy, Presidential Regulation number 98 of 2021 on the implementation of carbon economy value, and Government Regulation number 79 of 2014 on national energy policy do not specifically detail specific programs or regulations that focus on "green economy" in the context of policy. With a focus on resource efficiency and eco-friendly technologies, the policies developed aim to establish an environment that supports sustainable economic growth. Elsayy and Youssef (2023) define a "sustainable economy" as one that can meet current needs without sacrificing the ability of future generations to meet their own. This idea serves as the philosophical foundation for environmental policies. Studies indicate that policies combined with financial incentives and targeted expenditures can stimulate innovation across various industries, including manufacturing, infrastructure, and agriculture. This is consistent with the idea that successful innovation policies should address market failure and system failure concerns.

Through the implementation of favorable legislation, the government, one of the Triple Helix's pillars, plays a significant role in guaranteeing and upholding the cordial relationship between academia and business (Sumartono & Huda, 2020). The laws and rules in question are designed to facilitate collaboration between industry and academia. rules that safeguard patents and copyrights originating from invention, incentives for businesses that partner with educational institutions, or policies that promote the flow of information from academia to industry are a few examples. These rules facilitate a range of academic discoveries and inventions, enabling the business sector to utilize resources for the benefit of the economy and society (Sumartono & Huda, 2020). The significance of "ecological awareness" in vocational education and HR departments generally demonstrates that policies are not just economic incentives or regulations, but also educational and transformative in changing the workforce's and society's perspective. Green technology and environmental education must coexist with the growth of a green and circular economy. Hardi et al.'s (2024) implications on the "shadow economy, energy consumption, and ecological footprint in Indonesia" also subtly highlight the rise of environmental problems that require specific policy measures. This significant change in policy patterns integrates sustainability concepts into the foundation of economic development, moving away from a growth-only approach and toward an inclusive and sustainable growth model. Policies will face "adverse long-term risks" if they solely focus on GDP growth without taking environmental effects into account. Additionally, the successful implementation of this policy depends on MSMEs developing green skills and utilizing digital technologies, such as e-commerce, which can boost revenue, competitiveness, and support a sustainable economy. Nasution & Sugiharto, 2021; Rahman & Astria, 2023).

More generally, human capital has long been regarded as the most unique feature of the economic system, and the value of education in promoting sustainable economic growth has been objectively shown (Yuliyanto, 2023). The creation of green jobs and a transformation of skills are also greatly aided by public policies, which call for laws that support training and vocational education pertinent to the demands of green industries, offer financial incentives to businesses that invest in green technologies, and create regulatory frameworks that encourage green innovation. In the end, successful policies will establish a

framework in which integrated and responsible behaviors, rather than economic benefits at the price of social or environmental well-being, are used to attain these goals.

Integration of Sustainable Economic Principles in Business Management Curriculum and Entrepreneurship Education in Indonesia

In order to achieve sustainable economic development based on knowledge and high-quality human resources, Indonesia, as a developing nation, must devote substantial resources to establishing a robust education system in accordance with the vision of Indonesia Emas 2045 (Yuliyanto, 2023; Boentolo et al., 2024; Abdillah & Ramadhan, 2023; Amin et al., 2025). In order to develop skilled green human resources, Indonesia aims to incorporate sustainable economic ideas into its business management and entrepreneurship school curriculum. This is made possible by the Kampus Merdeka program, which aims to develop a workforce with critical thinking skills, adaptability, and strong interpersonal competence in addition to qualified technical skills (Kemendikbudristek, 2023; Tarumingkeng, 2025; Khairiyah & Dewinda, 2022; Mardhiyah et al., 2021). For instance, in order to develop top-notch human resources, the Merdeka Belajar Kampus Merdeka (MBKM) policy promotes cooperation between academic institutions and the Business and Industrial World (DUDI) (Kusnadi et al., 2022). This partnership, which encompasses research, internships, and entrepreneurial endeavors, can serve as a means of incorporating sustainability concepts and therefore bolstering the growth of capabilities pertinent to the green economy (Husaini, 2023).

In the context of MBKM, the concept of the "Triple Helix of Economic Education," combined with the Sustainable Development Goals (SDGs), clearly denotes an attempt to ensure that economic education prioritizes sustainable development alongside traditional economic growth (Firdaus et al., 2022). Through education that incorporates Islamic economic principles, students can develop their financial literacy, social awareness, and entrepreneurial skills. This integration helps to achieve SDGs like poverty alleviation and inequality reduction (Asrofi, 2023; Batubara & Tambunan, 2022).

This article review highlights the "importance" of integrating sustainable economic ideas into company management curriculum to develop competent green human resources, even though it does not expressly mention this. To address social and environmental challenges, the concept of "social entrepreneurship and ecopreneurship" is considered essential. Entrepreneurs who receive entrepreneurship education that incorporates sustainability and business ethics will be able to make a good impact on the environment and society. To create capable green human resources, the curriculum should inculcate values that promote sustainability, such as environmental responsibility, green innovation, the utilization of renewable energy, and ethical business practices.

Based on the ideas of Islamic economics, but not exclusively on it, sustainable entrepreneurship in economic education stresses the simultaneous integration of economic, social, and environmental factors at every stage of operations in order to generate long-term profits while also benefiting the environment and society (Rustyawati & Siswoyo, 2023). Additionally, according to Yudandri and Sulistyo (2020), the idea of green human resources, or Green HRM, is viewed as an organizational approach to optimize individual potential in responding to green issues and performance. In the context of the batik craft industry, research shows that Green HRM practices successfully support sustainable business management (Yudiandri & Sulistyo, 2020). The importance of incorporating this idea into the curriculum to create a workforce that is environmentally conscious and capable of supporting sustainable business practices is demonstrated by the fact that green HRM development has gained international attention, including in the G20 agreement to reduce carbon emissions (Mansyur et al., 2023). According to green innovation and technology, entrepreneurship education in this context might concentrate on creating cleantech companies that produce or use clean energy (Ririh et al., 2022; Carter & Carter, 2020). Furthermore, in the context of the global economy, MSMEs' contribution to the development and expansion of the creative economy in the Revolution 5.0 period is also significant (Mas'ud & Susilo, 2023; Pancawati & Widaswara, 2023; Rasyiqah et al., 2023; Latif et al., 2024).

Implementation of Triple Helix Collaboration to Achieve Common Goals Related to Economic Transition in Indonesia

A key tactic to accomplish shared objectives pertaining to Indonesia's economic transition, particularly in the context of sustainability and green human resource development, is the adoption of the Triple Helix collaboration, which unites government, industry/business, and universities. Through the relationships between the three organizations, this partnership helps to provide the best possible environment for university innovation (Husaini, 2023). According to the Triple Helix model, industry or business provides community service needs, the university serves as a center for research and development, and the

government makes policies (Dewi & Suryana, 2024; Ririh et al., 2022). Innovation and the adoption of technology that promote the green economy are stimulated by this synergy (De Sousa Jabbour et al., 2020). Through initiatives including independent studies, research, entrepreneurial endeavors, internships, humanitarian projects, and thematic village development/KKN, the Merdeka Belajar Kampus Merdeka (MBKM) policy specifically promotes cooperation between academic institutions and the Business and Industrial World (DUDI) (Husaini, 2023; Kusnadi et al., 2022; Abdilllah, 2024). Efforts to maintain quality assurance and connect the curriculum with industry needs show a commitment to strengthening this relationship, despite obstacles like mentality shift and collaborative optimization (Husaini, 2023). The development of Bank Sampah's performance using the Triple Helix model, which also involves Universitas Airlangga working with the government and local communities to address waste issues in Surabaya, is an example of how the Triple Helix model is applied for sustainability purposes (Heriyati et al., 2022; Aji et al., 2022). Similarly, the SDGs are included into the "Triple Helix of Economic Education" within the framework of MBKM, demonstrating the collaboration of education, business, and policy to create human resources that are not only economically competent but also socially and environmentally conscious (Firdaus et al., 2022). According to Sumartono and Huda (2020), the Triple Helix model is thought to be able to generate new opportunities to realize "Golden Indonesia 2045" by integrating all available resources and tying them together with big data, communication, and technology to develop intelligent goods and services. Universities play a significant role in this collaborative framework as providers of education, and they must enhance their management of education by forming specific partnerships with businesses or universities to guarantee that the curriculum offered is relevant to industry demands and generates a skilled workforce (Sumartono & Huda, 2020).

Utilizing technologies like blockchain, artificial intelligence (AI), and the Internet of Things (IoT) is crucial for increasing market access, boosting productivity, and facilitating the shift to a green economy (Wiradinata & Malik, 2024; Hidayat et al., 2019; Samputra & Alfarizi, 2025). With cleantech startups emerging as industry leaders in innovation and green technology, pioneering businesses, sometimes referred to as startups, are crucial to the substantial shifts occurring in a number of industrial sectors towards a sustainable circular economy (Ririh et al., 2022; Carter & Carter, 2020). Using Kelurahan Rabangodu Selatan as an example, they demonstrated how the Triple Helix model can be applied to increase people's interest in entrepreneurship during the COVID-19 pandemic and stressed the value of collaboration between businesses (who supply market opportunities and needs), government (who provide regulation and support), and academics (who supply entrepreneurial knowledge and competencies) in order to create an ecosystem that can spur economic growth and produce flexible and fiercely competitive entrepreneurs (Missouri et al., 2021). Through additional research on the relationship between stakeholders, the level of coordination, and the distribution of roles among businesses, the Triple Helix has also proven to play a significant role in promoting the creative economy, including MSMEs. These businesses collectively contribute to the development of a more dynamic and sustainable business ecosystem.

In general, Indonesia's Triple Helix implementation aims to establish a renewal ecosystem that promotes sustainable growth by cultivating high-quality people resources and workable solutions. In order to prepare a workforce that is highly competitive and adaptable to meet global needs in the Industry 5.0 age, this partnership is essential (Tarumingkeng, 2025; OECD, 2021). Effective communication, a common goal, and a dedication from all three sides to actively participate in the innovation and green HR development processes are necessary for the Triple Helix model to succeed.

For Indonesia to have qualified green people resources for a sustainable economic transformation, governmental policy, education (particularly entrepreneurship), and Triple Helix collaboration must work in concert. The traditional growth model is anticipated to change to a more comprehensive model where sustainability and ecological awareness serve as the primary pillars. Public policy also assures strategic direction and fosters a favorable environment. The ideas of sustainability and business ethics are also instilled via entrepreneurship education, as is the development of "ecopreneur real intentions" that serve as the foundation for future business actors' operations (Alfarizi & Herdiansyah, 2024). This aims to demonstrate a change that places an emphasis on education that adds value to society and the environment in addition to profit. As a crucial implementation tool, Triple Helix collaboration makes sure that education is connected to business and industry demands, promotes renewal, and establishes an environment that can adapt to changes in the market and in technology.

All things considered, holistic investments in human capital, bolstered by interconnected policies and robust intersectoral cooperation, continue to be a major component of Indonesia's sustainable economic development. The significance of "ecological awareness" and "skills in green technology" is specifically emphasized in the analysis. This indicates that green abilities are highly sought after and have applications

in both the economic and environmental sectors. All things considered, the narrative of the document alludes to the idea of a "Golden Indonesia 2045" and "strong global competitiveness," suggesting that spending money on green human resources is not only a financial consideration but also a calculated move that might strengthen Indonesia's economy. Aside from technical and legislative considerations, other elements like character development, corporate ethics, and environmental consciousness aim to demonstrate that the shift to a green economy involves more than just structural or technological changes; it also involves a shift in mindset and culture. In addition to their talents, qualified green human resources also hold values that promote sustainability.

Conclusions

Indonesia's shift to a green economy is turning out to require collaborations across industry, education, and public policy. Even though they are not always explicit, pro-environmental government policies have laid a crucial basis for sustainable development. Education is essential for producing environmentally conscious human resources by teaching students the values of sustainability and ecopreneurship. In the meantime, putting ideas into practice and making sure that educational programs are pertinent to the changing demands of the green industry depend heavily on the Triple Helix partnership between the government, business, and academia. Indonesia can raise its global competitiveness with these integrated strategies and solid cooperation.

The results have important theoretical and practical ramifications. Practically speaking, a more thorough revision of the business management and entrepreneurship curriculum is desperately needed, with a clear connection made between green technologies, circular economy principles, and green business ethics. Real-world case studies from ecopreneurship initiatives and green enterprises might enhance this program. The government must also take proactive measures to create and execute more focused incentive programs, like tax exemptions for businesses that use green practices, support for ecopreneurship-related enterprises, and subsidies for green education and skill development. These regulations will reward businesses that have already adopted them while also drawing in new ones. Furthermore, this endeavor can provide a forum for clean and long-lasting cooperation among scholars, business leaders, and the government, encompassing cooperative research, the creation of environmentally friendly products or technologies, and internships with a sustainability focus.

From a conceptual standpoint, the results underscore the need for a new strategy in human resource development that incorporates social responsibility and environmental consciousness, in addition to technical and financial considerations. As a result, sustainable aspects can raise the caliber of human resources. Through the concept of ecopreneurship, entrepreneurship is now viewed as a significant change agent that propels the shift to a green economy, rather than just an economic engine. This method goes against the conventional wisdom that evaluates entrepreneurship solely in terms of financial gains. This study broadens our understanding of innovation in the context of sustainable development while highlighting the significance of collaboration among government, industry, and education as a catalyst for innovation and adaptation required in the shift to a green and sustainable economy.

For Indonesia to transition to a green economy, collaboration among industry, education, and public policy is crucial. Even if they are not explicitly stated, government policies that support the environment lay the groundwork for sustainable growth. To develop environmentally conscious human resources, education is crucial in teaching students the fundamentals of sustainability and ecopreneurship. The triple helix—government, industry, and academia—must work together to develop innovations and ensure that the curriculum is relevant to the demands of green industries. Indonesia may become more competitive globally with well-coordinated policies and close cooperation. To facilitate this shift, it is advised that : (1) the government create more targeted green economy regulations and sustainability incentives. (2) Use project modules centered on ecopreneurship and the circular economy to integrate sustainability themes into the curriculum further. (3) Enhance the triple helix's cooperation by providing a methodical and organized platform for cooperative research, the creation of renewable technologies, and skill development. (4) Raise public understanding of the value of ecological consciousness and the green economy. Building human resources that support a green economy is possible with the help of this advice.

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