

# Revealing the Path to a Green Economy: Insights and Recommendations for Sustainable Development in Malaysia

Nik Athirah Nik Mahdi<sup>1</sup>, Yudi Fernando<sup>1\*</sup>, Azian Ibrahim<sup>1</sup>

<sup>1</sup> *Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA),*

*Faculty of Industrial Management, Lebuhraya Persiaran Tun Khalil Yaakob, Kuantan, 26300, MALAYSIA*

\*Corresponding Author: [yudi@umpsa.edu.my](mailto:yudi@umpsa.edu.my)

DOI: <https://doi.org/10.30880/ijie.2024.16.02.026>

## Article Info

Received: 24 November 2023

Accepted: 13 July 2024

Available online: 25 July 2024

## Keywords

Green economy, sustainable development goals, manufacturing industry, public listed companies, Malaysia

## Abstract

This study proposes a green economy framework leading to Malaysia's green economy roadmap and raising society's sustainability awareness. The framework has catered actionable insight into promoting a green economy to industrial sectors by integrating Environmental, social, and corporate governance (ESG) and Sustainable Development (SD) principles to improve Malaysia's achievement of Sustainable Development Goals (SDGs). This paper has critically analyzed a systematic review from 2209 journal articles indexed from two prominent databases, Scopus, and Web of Science. The data were analyzed using visualizing bibliometric networks and a computer-assisted qualitative method. The thematic pattern result was verified and strengthened using in-depth interviews with industrial business leaders. The result shows that establishing a green economy framework should align with a clear regulatory policy and incentives. This study provided a unique combination of proposing a green economy framework employing advanced analysis techniques and providing specific recommendations for the Malaysian context. Adopting the green economy framework led by integrated ESG, SD, and SDGs would lead to Malaysia's Shared Prosperity Vision 2030. The public listed companies should step ahead in adopting green economy frameworks

## 1. Introduction

Developing countries have attracted more foreign direct investment to support economic growth by empowering sustainability best practices in the industrial sector [15], [17], [38]. The industrial sector often struggles with the Triple Bottom Line challenges, including environmental, social, and economic driven by corruption, increase in population, lack of access to technology, and lack of affordable education and skills. Between 2000 and 2015, the population of developing countries increased by 36%, from 2.9 billion to 4.0 billion. Bai et al. [3] postulated that developing countries' population is expected to expand to 1.3 billion more in the future. Energy usage due to economic growth and population has negatively impacted infinite resources and caused climate changes [2], [38]. Especially during the post-pandemic era associated with the Russian-Ukraine War. Moreover, the never-ending Palestinian- Israel conflict has contributed to a wide range of global challenges in social beings and humanity. These concerns have forced policymakers to devise novel solutions to the emerging issues of energy security, food availability, resource scarcity and peace and justice. Moreover, Chen et al. [8] argued that corruption directly affects the fairness of law enforcement, which can harm the economy, society, and the environment. Past studies proved that there is a mutual effect between corruption and environmental index [25], [26], [35], [51], [59]. Ramzan et al. [52] postulated that a country's effort to protect and preserve the environment and resources, as

well as the health of its people, can be reflected by being green. Therefore, going green means being responsible for environmental preservation, economic progress, and social prosperity.

As the millennium began, developed countries, including Malaysia were able to increase their efforts to incorporate green into their way of life. According to Pavlova [50], greening the economy has been one of Malaysia's top priorities in accordance with the spirit of the Copenhagen and Paris Agreements. The revolution of green in Malaysia has been developed since 2009 when the National Green Technology Policy (NGTP) was issued. The government has consistently ramped up the effort to plan and align policies and launched numerous initiatives which prioritised economic, social, and environmental goals, such as SDGs, green economy, National Economic Model (NEM), Malaysia Plan (11th MP, 12th MP & 13th MP), and SPV 2030. However, Hussain et al. [28] postulated that the United Nations Conference on Trade and Development (UNCTAD) report on trends and policy developments for climate change mitigation and adaptation indicates three important long-term observations. First, the SDG adoption in 2015 significantly increased the green transition. Yet, past studies indicated that realising the SDG can seem very challenging and complex especially in developing countries [4], [9], [49], [53]. Additionally, the growth rate is insufficient to meet UNCTAD's pre-2015 assessment [22], [28]. Second, the report also stated that developed countries are majorly facing regional disparities in green transition investment growth. Third, the report highlighted that international investment in green transition lags significantly behind in renewable energy. Thus, creating new or reshaping policies and strategies is required to maintain the momentum for achieving Paris Agreement objectives.

Some countries' existing policies, strategies, and plans are linked with the green economy (GE) [2]. In Malaysia, for instance, Green Technology Master Plan (GTMP), National Green Technology Policy (NGTP), 12th MP, Circular Economy Approach, Shared Prosperity Vision 2030, and the latest National Energy Policy 2022-2040 (NEP) launched in September 2022. Yet, the carrot and stick standard is ineffective as the government still fails to control and authorise it [31]. Straightforwardly, enforcement needs to strengthen. The transition of GE is linked to the 2008 fiscal crisis, with the idea of shifting the brown economy business to green activities [12]. It can be considered a set of policies and practices to restructure the economy towards sustainable development while minimising the adverse effect of economic growth on the environment. GE creates new economic opportunities and markets, leapfrogs to cleaner technologies, provide job opportunities and reduce poverty. Yet, MIDA argued that shifting toward a green economy for a country or an organisation necessitates a multifaceted approach [41]. It should be viewed through the lens of a multi-criteria decision-making framework as it has a broader scope, encompassing all socio-economic activities in the economy, not only green technological innovation [46]. Moreover, GE is difficult to accomplish with existing greenwashing, non-environmentally friendly technologies, high upfront investment, limited market demand, lack of labour, and inconsistent policies and regulations. Thus, addressing these challenges requires a comprehensive approach involving government policies, the private sector, public awareness, research and innovation, and international engagement [34]. This study proposes a green economy framework leading to Malaysia's green economy roadmap and raising society's sustainability awareness. Therefore, this paper contributes to GE literature development as follows:

- This study proposed a green economy framework developed based on the case study and a systematic review validated by a qualitative-driven case study.
- This study directed nations, industries and companies seeking to shift to more sustainable economic and social prosperity and a greener environment.
- This study contributed to policy recommendations for the Malaysian government to design the proper incentive for the industry.

Bibliometric network visualisation and analysis are carried out to identify and categorise green economy ideas based on concepts, practical approaches, and tools. This study contains the presented in the following order: literature review, data collection and analysis, result, and followed by conclusion.

## 2. Literature Review

### 2.1 Green Economy: Dimension and Characteristics

The green economy is globally described as a dynamic process to shift economic growth into low-carbon enhancement, promote resource efficiency, and utilize technologies and innovations for the population's well-being [19], [42]. Due to evolving, the commitment and initiative to minimize pollution, waste, resource usage, and battle with climate change, it received more recognition and has been widely used. For instance, governments, businesses, and other organizations use GE in various ways, especially in policy development, investment, job creation, sustainable development, and innovation. This strategy has become necessary due to the negative impact of conventional economic development models on the local and global environment [2]. Further, GE is an important framework for promoting sustainable economic growth and development aligned with environmental and social objectives. It addresses the urgent challenges of climate change and environmental degradation while promoting economic prosperity and human wellbeing. Therefore, GE is generally a holistic, systems-level

approach that creates an economic system that supports long-term environmental sustainability and human well-being while promoting economic growth and development.

## 2.2 Green Economy Benefits

### 2.2.1 Economic Performance

Companies have recently begun investing in new green technologies and developed eco-design products as essential strategy components to enhance environmental protection and yield long-term revenue. According to Zhang and Ma [65], green innovation is expected to significantly achieve economic performance by encouraging economic and technological advancement. Applying GE allows businesses to perform better in the industry, which increases economic performance in terms of the capabilities of marketing and finance. Many businesses believe that environmental management reduces the amount of earnings. Yet, many policymakers, businesses and investors pay attention to GE due to its benefits and potential to create a win-win situation toward both environmental impact and economic improvement. As a result, Businesses can offset environmental costs by increasing resource efficiency, reducing pollution, and gaining profitability [65].

### 2.2.2 Environmental Performance

In general, environmental performance indicates the ability of the organization to handle environmental impact. It is the degree of commitment to protecting the natural environment [24]. Chavez et al. [7] referred to environmental performance as the efficient consumption of natural resources. According to Zhang et al. [66], environmental performance incorporates the usage of environmentally friendly elements in products, emission reduction, waste management, and resource efficiency. Fernando et al. [14] argued that waste reduction, environmental improvement, greenhouse gas emissions levels, and recycling rate were utilized to monitor and evaluate environmental performance. Some approaches can be implemented to shift towards a more sustainable and equitable future while also improving environmental performance. Lisitsa et al. [37] postulated that the green economy's main sector included renewable energy, green construction, eco-friendly transport, water resources management, waste management, and land management. Ahmed et al. [1] revealed that the role of green innovation, green trade, and green energy influence the development of GE. According to Khan et al. [32], the choice of green practices is significant in encouraging ecological performance, which can reduce costs and boost the environmental performance of the firms. Thus, a transition toward a GE can enhance environmental performance, decreasing the negative environmental impact.

### 2.2.3 Social Performance

Tasavori and Bhattarai [62] described social performance as the firm's achieving its social mission and objectives and successfully implementing its social strategies. It fundamentally measures the worker's well-being, health and safety, level of stress, ergonomics, and corporate social responsibility. Sancha et al. [57] argued that securing a safe and stable working environment, protecting workers, ending discrimination, enhancing agreement, and enhancing employee perception toward the firm promotes social performance. Social performance can be seen to relate to environmental and operational performance. According to Chavez et al. [7], organizations that esteem their employees can effectively develop environmental and operational performance. For example, the company can provide green training or education for the workers. Previously, Li et al. [36] and Cantor et al. [5], found that employee commitment and sustainable awareness among the staff can impact environmental improvement positively. In operational performance, social performance motivates the worker, resulting in a high productivity level. According to OECD, a GE can stimulate new growth engines, including (i) enhancing productivity by improving resource efficiency, reducing waste and energy consumption, and providing new opportunities for innovation, (ii) boosting investor confidence by improving predictability in how governments deal with major environmental issues and (ii) promoting demand for green goods, green services and green technologies contribute to the establishment of the new market [48]. Thus, GE can contribute to the rise of employability and income-driven by public and private investment in economic activities, infrastructure, and assets.

## 2.3 Green Economy Concept and Approaches

### 2.3.1 Cleaner Production

Giannetti et al. [21] referred to cleaner production (CP) as the (i) processes that incorporate energy-saving, toxic substances usage reduction, reducing the amount of waste and emission, and effectively use raw material, (ii) the product which reduces environmental impacts throughout the life cycle and (iii) services. Rumanti et al. [55] argued that CP is a systematic planning and execution activity to use resources effectively. The use of CP improves

the efficiency, productivity, and quality of goods and services, resulting in cost reduction of infinite resources, water, electricity, and waste.

### 2.3.2 Waste Management (Approaches: Recycling, Reuse, Repair, and Recovery)

Mainly, waste is an environmental issue related to social and economic elements. Nandy et al. [45] argued that plastics, electronics, and medical waste are the three most challenging waste streams. From the perspective of GE, waste has become a resource, whereas a new approach (reuse, recycling, and recovery) has been adopted for sustainable development, innovation, and competitiveness [43]. The waste management framework's strategy consists of a set of initiatives that diminish the environmental impact of processes via products and corporate policies such as reducing energy, waste management and treatment, water consumption, environmental footprint and changing the social attitude and behaviour by implementing the activities related to reduce, reuse, refurbished, remanufactured and prevention. As a result, the new waste approach should positively impact sustainable development, reduction of greenhouse gas emissions, a cleaner environment, and waste prevention.

### 2.3.3 Circular Economy

Because of the popularity of its environmental benefits, the circular economy has provided a new perspective on sustainability [4],[6]. CE allowed the least number of resources used and waste produced [13], [23]. The CE's fundamental principles are based on reduced consumption, reuse, recovery, and recycling of materials and energy. In other words, a waste-free economy utilises sustainable and renewable raw materials effectively and efficiently. Fernando et al. [16] argued that waste is converted into energy as part of the circular economy concept in a well-managed supply chain structure. The circular economy is linked to the GE, which shares a common ideal to harmonise three dimensions (economic, environmental, and social goals). D'Amato, Korhonen, and Toppinen [11] argued that there is an overlap between CE and GE in the aspect of eco-efficiency and clean technology.

### 2.3.4 Bioeconomy

According to the European Commission, the bioeconomy emphasises new growth opportunities in bio-based industry while also considering global challenges and resource and environmental constraints [20]. D'Amato and Korhonen [12] argued that an economy uses renewable biological resources from the land and sea to develop and commercialise goods and services. It is considered as the replacement of fossil-based activities with biotechnology and knowledge-based innovations. Recently, Palahi et al. [67] discovered that a nature-based circular bioeconomy provides a solution to transform industrial sectors, rethink cities, land, food, and health systems, and promote participation and a more equitable distribution of prosperity.

### 2.3.5 Nature-based Solutions (Green Infrastructure)

Generally, Nature-based solutions (NbS) are classified as protecting, restoring, managing natural and semi-natural ecosystems, managing working lands and aquatic systems sustainably, and creating new ecosystems [58]. It is a cost-effective idea contributing to societal challenges encompassing nature to combat climate change and biodiversity loss while achieving sustainable development goals. Davies et al. [10] postulated that seven NbS actions were suggested, which are urban regeneration, urban areas wellbeing enhancement, established coastal resilience, multifunctional nature-based watershed management and ecosystem restoration, sustainable matter, and energy usage, improving ecosystem's insurance value and increase carbon sequestration. In other words, NbS is the capability to execute various functions and provide a set of related ecosystem services (ES).

## 2.4 Sustainable Development Goals (SDG)

According to Nik Mahdi et al. [47], the desire to eradicate poverty, tackle climate change and combat inequalities has established the 2030 Agenda of Sustainable Development Goals (SDGs). SDG, adopted by the United Nations in 2015, is a closely linked GE framework objective that aims to reduce environmental risks and scarcities and vice versa, boosting sustainable economic growth and social inclusion. SDGs provide a framework that measures the progress for a more sustainable and equitable global economy that significantly impacts the economic, social, and environmental elements. Henderson and Loreau [27] postulated that the 17 SDG goals and 169 targets represent a significant achievement within global sustainable practices. However, the satisfaction degree of accomplishment of sustainable development is still low [47]. For instance, Malaysia's current assessment only accomplished SDG 1: No Poverty and has a long way to go to achieve SDGs. Moreover, progress has been uneven due to the Ukraine-Russian war and the Covid-19 crisis. It deteriorates poverty, food insecurity, energy accessibility, health, and climate and biodiversity crises. Supported by Sachs et al., the progress and the global SDG index are getting slower and slightly declined, respectively [56]. Thus, the road to achieving the SDGs by 2030 will be a marathon.

### 3. Methods

#### 3.1 Research Process

The stages taken to conduct the content analysis used in this paper are summarised in Table 1. First, this process is divided into several stages. In stage 1, research is conducted to find GE publications, regardless of field of study. The GE publications were extracted from the Scopus and Web of Science (WoS) database from 2020 until August 2023. Criterion is filtered in stage 2, which only included GE as the keyword in journal articles and excludes chapters of book publications. The results reveal that there are 2,209 publications across all research fields. Vosviewer software is used in the next stages (Stage 3 and Stage 4) to analyse the data. This software interpreted, developed thematic insight and key findings, and reflected the primary research questions.

#### 3.2 Visualisation Bibliometric Network Analysis

Science mapping analysis is an effective bibliometric tool to explore the conceptual structure of a specific research field. Vosviewer is a well-known software with excellent visualisation capabilities and functionality to load and export information from many sources [30]. Compared to other tools, it is easy and accessible by assessing, analysing, and creating maps based on network data [44]. These networks are built using information from the citation, bibliographic coupling, co-citation, and co-authorship relations [17]. This approach aids in analysing the frequency of keywords to construct the framework for the GE, which directly addresses one of the objectives. It establishes connections between each keyword employed in the literature on the GE. This study comprised the database from Scopus, which is the most reliable and trustworthy scholarly database with quality-assured publications [18], [60]. The articles collected for this current study were collected between 2020 and August 2023 to observe the trend of the GE being studied. This range of timespan is chosen to ensure the results match the current trend.

**Table 1** Research process

Stage	All GE Field
Search String	TITLE-ABS-KEY ("green economy") AND PUBYEAR > 2019 AND (LIMIT-TO (EXACTKEYWORD, "Green Economy" ) ) AND (LIMIT-TO ( DOCTYPE , "ar" ) )
Stage 1 Publications from Databases	Step 1: Select Database i. Scopus ii. Web of Science Step 2: Filter i. GE keyword only ii. Time Frame: 2020-2023 iii. No book publication Total: 2,209 Publications
Stage 2 Content Analysis	Step 1: Co-occurrence Analysis Step 2: Bibliography Coupling
Stage 3 Discussion	Step 1: Identify key findings. Step 2: Develop Green Economy Framework Step 3: Answer all research questions. Step 4: Identify literature gap & future research.
Stage4 Search String	All GE Field TITLE-ABS-KEY ("green economy") AND PUBYEAR > 2019 AND (LIMIT-TO (EXACTKEYWORD, "Green Economy" ) ) AND (LIMIT-TO ( DOCTYPE , "ar" ) )

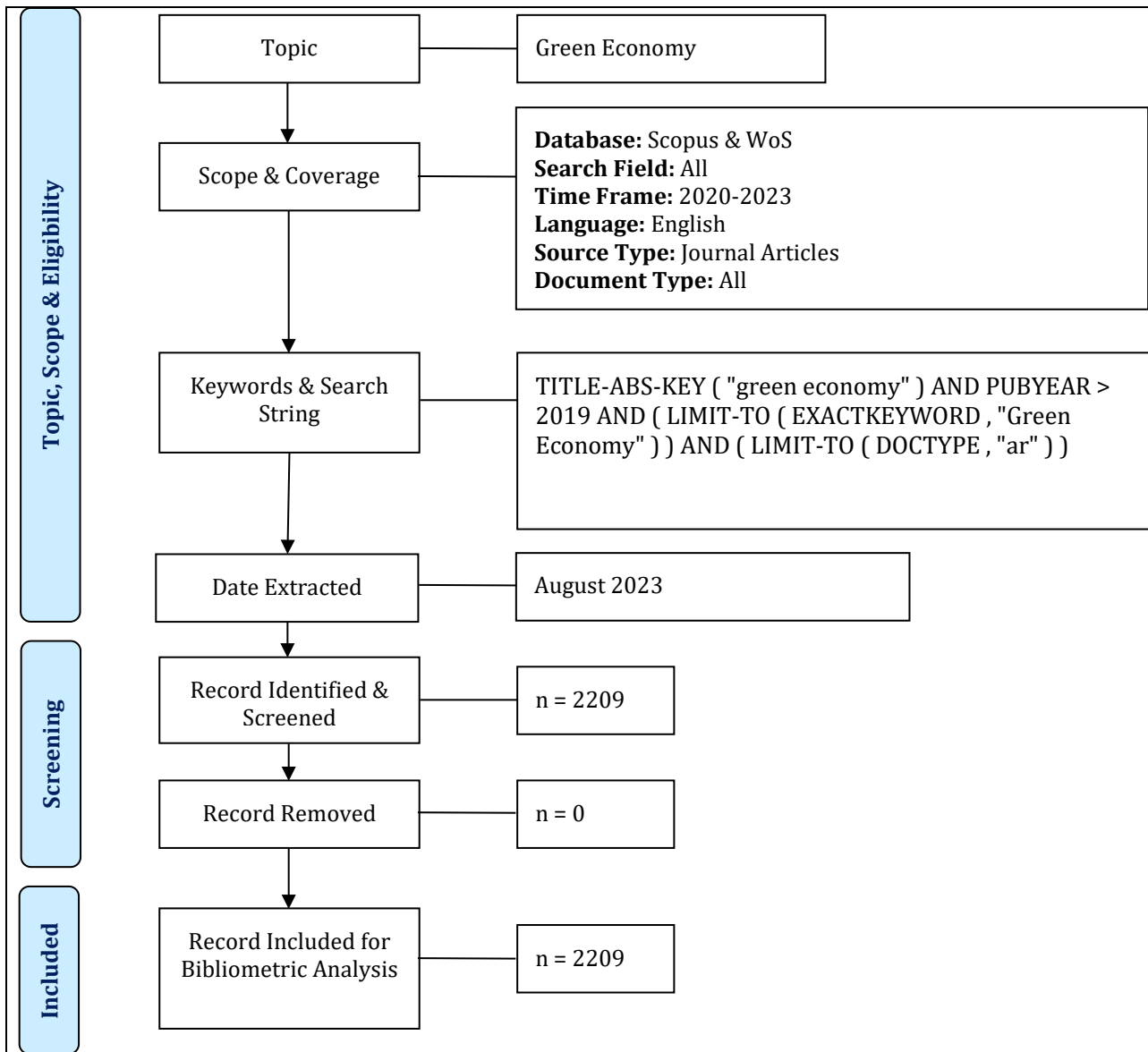


Fig. 1 Flow diagram of the search strategy

### 3.3 Thematic Analysis

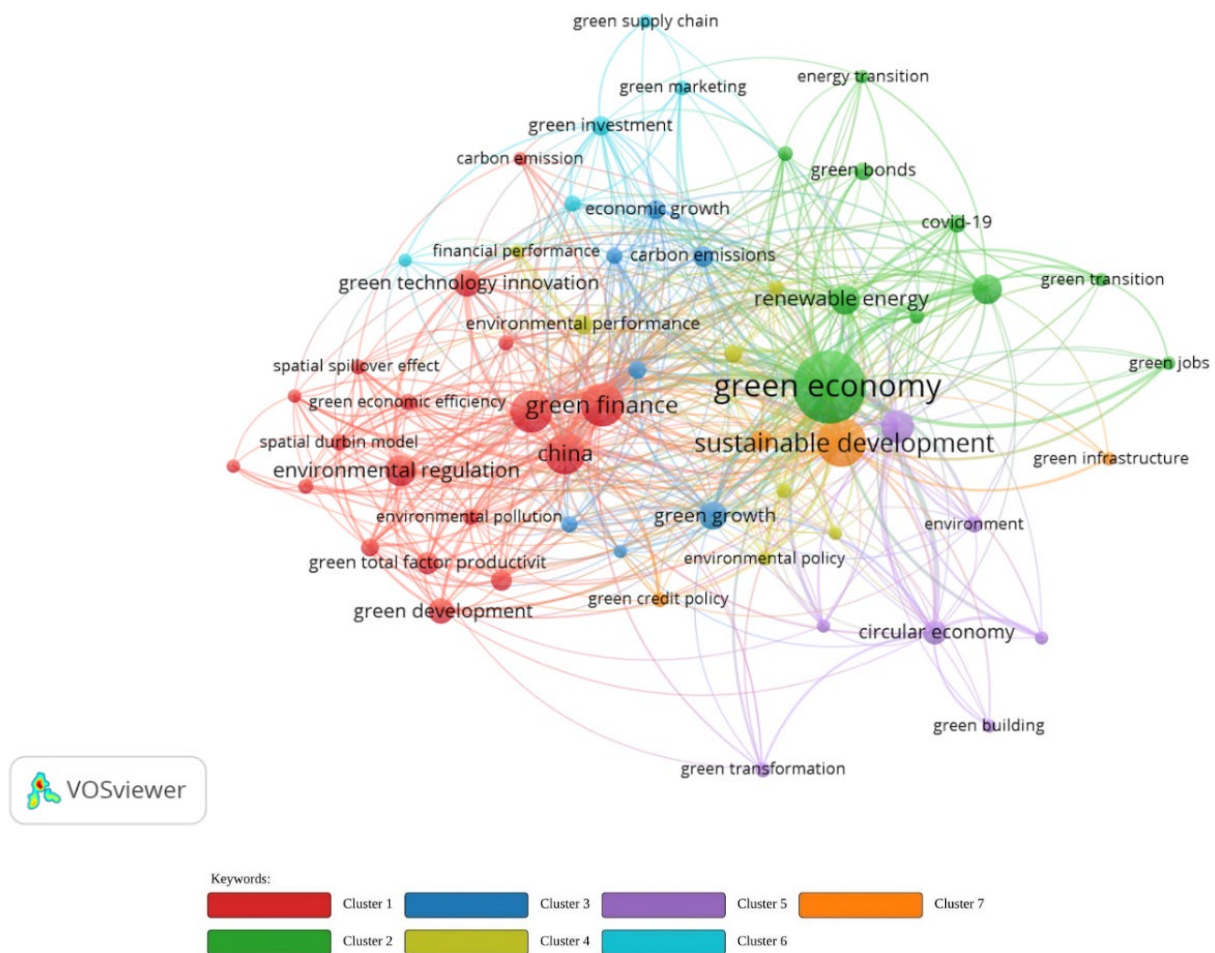
Thematic analysis is a method that enables the study of individuals' experiences and viewpoints within a comprehensive dataset, encompassing both individual and collective perspectives [61]. This study analyses the interview of GE practices by the industry's practitioner experience via Atlas.ti software. This software offers valuable analytical tools that are beneficial for academic research, specifically in the social sciences area [54]. According to Ibrahim et al. [29], the analysis has four stages. During stage 1, the process of data translation commenced by converting the information provided by the participants. Followed all industry jargon and language were also translated in stage 2. Subsequently, in Stage 3, the data collected from the interviewees was reorganised systematically before analysing their responses in Stage 4. Lastly, the transcribed interviews were duplicated into an Excel spreadsheet.

## 4. Results

### 4.1 Visualising Bibliometric Network Analysis

In Fig. 2, cluster 1 encompasses several keywords: carbon emission, China, digital economy, environmental pollution, environmental regulation, green development, economic efficiency, economic growth, finance, innovation efficiency, and technology innovation. These keywords indicated China's path toward sustainable economic growth. Over the past few decades, China's rapid growth in economic has been accompanied by

significant environmental challenges, especially in carbon emissions and pollution. As the world's largest carbon emission emitter, China's efforts and commitment toward green development, environmental regulation, and sustainable economic growth have far-reaching implications for combatting climate change globally. China has been awarding "environmentally exemplary cities since 1997. Thus, past studies depicted that China's green economy is leading and good exemplary cases [39],[40], [64]. Further, the finding identifies the green economy as cluster 2. The cluster keywords included climate changes, covid-19, green bonds, energy transition, green bonds, green economy, green financing, green jobs, green transition, and renewable energy and sustainable development goals. The nexus of the keywords reflected an era of unprecedented challenges and opportunities. A clear and innovative solutions are required to ensure long-term resilience and sustainability. Cluster 3 represented the impact of GE on green growth, carbon emissions, economic development and growth, financial development, and natural resources. The pursuit of GE harmonises the relationship between resource conservation, environmental protection, economic development, and promoting green development.



**Fig. 2** Green economy network visualisation occurrence

The co-occurrence keyword of cluster 4 in Fig. 2 can be themed as the 'Sustainability Metric'. To align the economic activities with the goals of GE, the ability to define and measure the structured approach is crucial. Further, circular transformation, denoted in cluster 5, indicated the significance of the circular adoption and practices with GE element. D'amato and Korhonen [12] findings revealed that the circular economy, bioeconomy, and GE offer unique solutions for sustainability. Cluster 6 emphasises on 'Environmental Responsibility'. The elements encompass various aspects of Corporate Social Responsibility (CSR) shared by individuals, organisations, and government to reduce the ecological footprint and positively impact the GE. It included, for instance, green credit, which offers financial incentives for eco-friendly projects, green investment, green marketing, and a green supply chain. GE seeks to balance economic prosperity with the conservation of natural resources, pollution reduction, and climate change mitigation. It is an integral part of sustainable development. Hence, Cluster 7 demonstrates that green economic sustainability, based on the Sustainable Development Goals (SDGs), is a key focus area for sustainable development initiatives. The concept of GE started to gain prominence





changing the traditional economic growth to green economic growth since 2000 with the 11th Five-Year Plan (2006–2010). Thus, China has made substantial investments in research and development (R&D) related to the green economy since 21<sup>st</sup> century. According to Xu et al. [63], both China's government and enterprises have expanded investment in research and development funds and technical talents. Moreover, the government declared its ambition to become a global leader in scientific research in 2016 and, effectively aligning with China's government's "Made in China 2025" initiative [17].

## 4.2 The Result of The Case Study

### 4.2.1 Green Economy Practices

The interview was conducted semi-formally with structured open-ended questions. The responses to questions about GE practices in Malaysian manufacturing industries were analysed and presented. The results were tabulated and classified accordingly. Table 2 shows the profile of the case study companies. From the information obtained, all three companies were classified as medium companies where the number of each company is between 251-500 employees. Regarding geographical reach or market, the companies that participated in the interview were served locally only. While for international standard certificates, all three companies obtained an international certification, including environmental management (ISO 14001) and quality management system (ISO 19001).

Table 3 shows the summary output for the practices of GE in Malaysian manufacturing companies. Findings from the interview showed that all three companies aggressively practice GE practice in their manufacturing. Implementing environmentally sustainable and resource-efficient methods in their production line, product design, and whole operations. According to an informant from company A, their company is in the transition towards green transportation. Their company also strictly manages waste management and practices reducing, reusing, and recycling. While for company B, they have implemented GE practices in their production by emphasising green processes. According to the informant, these practices aim to minimise the adverse effects of manufacturing activities while at the same time promoting economic growth and social wellbeing. An informant from company B added that they have invested in the latest water waste technology plant to reduce water consumption and, at the same time, improve water quality. For company C, GE being practised includes having a green warehouse and improving energy efficiency by using a natural lighting system (roof transparent), rain watery recycling, and using automated material handling equipment. Besides that, company C also has a program for renewable energy. From the interview, all three companies are aware of the importance of GE, especially in helping Malaysia achieve net zero in 2030 and sustainable development goals.

Table 4 shows a summary output of the policy recommendation. From the interviews, findings showed that policy recommendations from three companies are basically focusing on transitioning towards more sustainable or green alternatives. For company A, the policy recommendations refer to green human capital. According to key informants, to increase awareness among the employees, robust green training is needed. For them, human capabilities play an important role in navigating the transitions toward a more environmental economic system. While for company B, the informant stressed that enforcement from the government related to green or environmental law is very important. He added that we have laws and regulations but lack in terms of enforcement. Finally, from company C, the informant stressed the regulations and policies that make it mandatory for the industry player to start on sustainability development. Instead of a voluntary basis, it is time for the government to impose mandatory regulations for manufacturing industries to start embarking on sustainability practices.

**Table 2** *The profile of the case study companies*

		A	B	C
Company Size (employees)	Micro (less than 100)			
	Small (100-250)			
	Medium (251-500)	•	•	•
	Large (>501)			
Geographical Reach/ Market	Local	•	•	•
	International			
International Standards Certificate	ISO 14001 (Environmental Management)		•	•
	ISO 19001 (Quality Management System)	•	•	•

ISO 50001 (Energy Management)

**Table 3** *The summary output for the practices of GE in Malaysian manufacturing industries*

Respondents	Green Economy Practices
A	Green transportation, waste management. Actively practice 3R's in their company.
B	Green process in the production and using the latest technology in Water Waste Technology Plant
C	Green warehouse, natural lighting system, rain watery recycle and converted from manual material handling to automation, renewable energy (installed solar panel in the lighthouse.

**Table 4** *The summary output for the policy recommendation*

Respondents	Policy recommendation
A	Green human capital provides green training among employees to increase awareness.
B	Enforcement from the government related to green or environmental law
C	Regulation and policies that make it mandatory for the industry player to start on the sustainability development

### 5. Discussion

From the results, this study proposed the GE economy framework, as shown in Fig. 5. GE is an economic system that focuses heavily on long-term viability, equitable distribution of wealth, and environmental safeguards. The good effects of GE may be seen in many areas, from the social to the economic to the ecological. From the social benefits perspective, GE helps to improve public health, job creation, and enhanced equity, as well as increase community resilience. While from an economic perspective, GE encourages innovation and technological advancement, cost savings that drive from a diversified economic base, and would increase export opportunities. For environmental benefits, GE would lead to climate mitigation, resource conservation, and resilient ecosystems.

In terms of policy recommendations, a few areas need to be considered, such as governance, policy and regulations, financing investment, human capabilities, and technology and infrastructure. Firstly, improving management practices in connection to the green economy. Collaboration between the public and commercial sectors to design and carry out projects related to the green economy. In the context of these public-private partnerships, the collaboration would benefit both parties, including the pooling of financial resources, the distribution of risks and obligations, and, finally, the distribution of a variety of talents and knowledge. These three components are necessary to create a green project successfully.

Secondly, it emphasises the policy and regulations related to renewable energy. Previous studies revealed that renewable energy consumption can improve environmental quality. Hence, policies particularly promoting renewables lead to economic growth and environmental sustainability. Other eco-friendly policies on the other hand able to support eco-environmental sustainability. In addition, promoting renewable energy entails enacting laws that encourage the use of energy sources like solar, wind, hydroelectric, and geothermal power. As a result, the shift away from fossil fuels can be encouraged through various incentives, such as subsidies, feed-in tariffs, tax incentives, and regulatory support. Another policy recommendation is energy efficiency standards. Establishing and enforcing energy efficiency standards for buildings, appliances, vehicles, and industrial processes are needed with the intent to reduce energy consumption and lower greenhouse gas emissions. To encourage industries to reduce their emissions and invest in cleaner technologies, policymakers would be able to introduce carbon pricing mechanisms, including carbon taxes or cap-and-trade systems. Therefore, policy integration is necessary to ensure a successful GE framework. These policy integrations combine with coordination across distinct policy areas, such as economic, environmental, and social policies. This policy integration helps prevent unintended negative consequences.

Thirdly, policies related to green investments, such as environmental tax and financial development, have increased the environmental quality and are considered necessary for encouraging clean energy consumption. For instance, green bonds or carbon pricing played an important role in financing the GE. Green Infrastructure investment ll allocate funds for developing green infrastructure projects, including public transportation systems, renewable energy installations, waste management facilities, and sustainable urban planning.

Finally, human capabilities to increase green consumption knowledge and behaviour. A robust policy toward education and awareness campaigns about the importance of environmental sustainability. This would lead to green behaviour, which could help the country pursue a GE transition. Green human capital such as green jobs and skills are needed in the transition to a GE. These two green human capital elements are important to balance economic growth, social well-being, and environmental sustainability. The GE is propelled by human capacities, which include the knowledge, skills, attitudes, and behaviours required to shift to a more environmentally friendly and sustainable economic model.

### 6. Conclusion

The GE is a metaphor for an all-encompassing method of development that seeks to strike a healthy equilibrium between social, economic, and environmental performance. It concludes that developing a GE is necessary for attaining sustainable development and resolving critical global concerns such as climate change, the loss of biodiversity, and socio-economic inequality. There is a close connection between the social, economic, and environmental elements, and the achievement of GE goals is contingent upon successfully integrating these components. GE is an integration that strikes a healthy balance between social, economic, and environmental issues, all of which are necessary for sustainable growth. Societies can attain prosperity, equity, and resilience while protecting the world's ecosystems and resources if they address these issues comprehensively and comprehensively. To make this transformation and realise the full potential of a GE, joint efforts on the part of governments, businesses, civil society, and individuals are required.

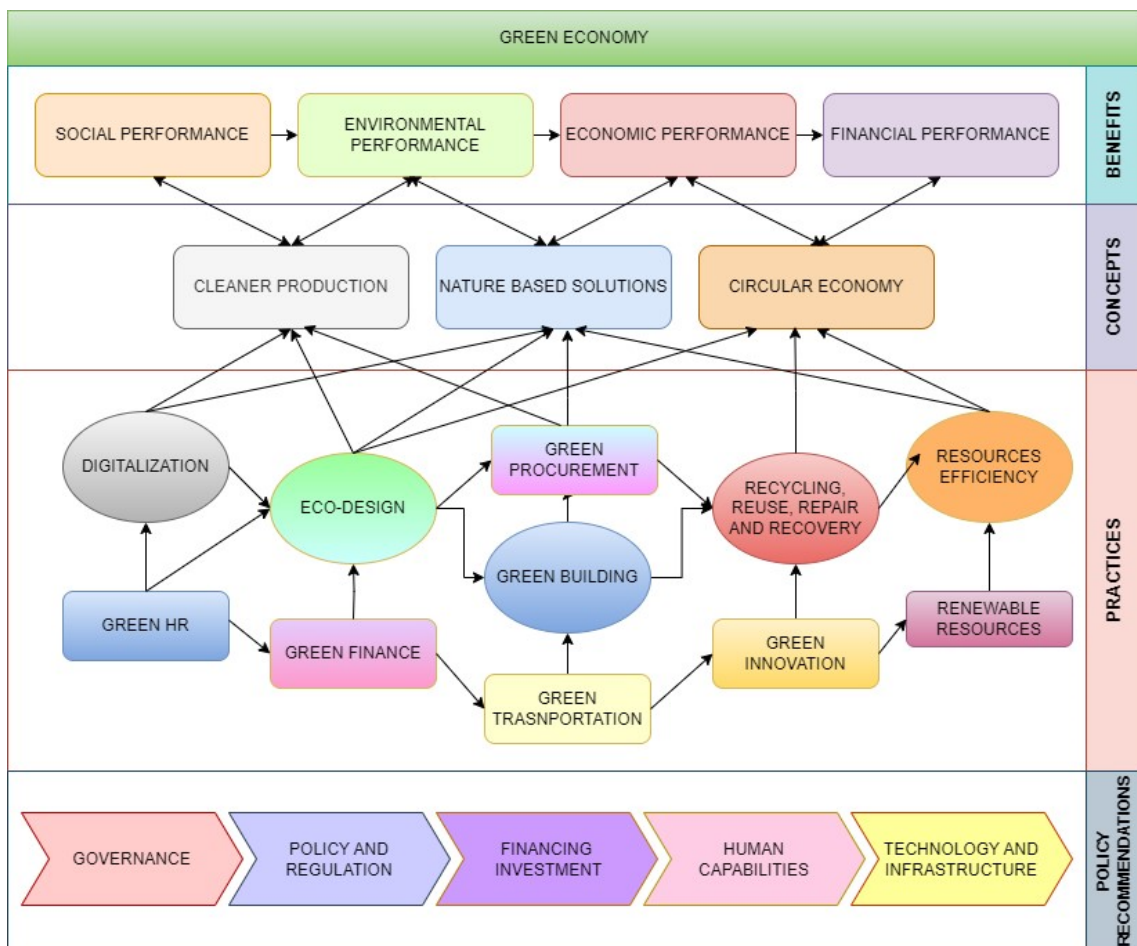


Fig. 5 Proposed green economy framework and policy recommendation

### Acknowledgement

This study is funded by an FRGS grant from the Ministry of Education Malaysia, with project ID FRGS/1/2021/SS01/UMP/02/2 with code RDU210113 and PGRS230331. The authors express gratitude to the Ministry of Education Malaysia and the Division of Research and Innovation at Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) for supporting this project using FRGS and PGRS grants.

### Conflict of Interest

There is no conflict of interests.

## Author Contribution

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

## References

- [1] Ahmed, F., Kousar, S., Pervaiz, A., Trinidad-Segovia, J. E., del Pilar Casado-Belmonte, M., & Ahmed, W. (2022). Role of green innovation, trade and energy to promote green economic growth: a case of South Asian Nations. *Environmental Science and Pollution Research*, 29(5), 6871-6885.
- [2] Ali, E. B., Anufriev, V. P., & Amfo, B. (2021). Green economy implementation in Ghana as a road map for a sustainable development drive: A review. *Scientific African*, 12, e00756.
- [3] Bai, X., Wang, K.-T., Tran, T. K., Sadiq, M., Trung, L. M., & Khudoykulov, K. (2022). Measuring China's green economic recovery and energy environment sustainability: Econometric analysis of sustainable development goals. *Economic Analysis and Policy*, 75, 768-779. doi:10.1016/j.eap.2022.07.005
- [4] Barua, S. (2020). Financing sustainable development goals: A review of challenges and mitigation strategies. *Business Strategy & Development*, 3(3), 277-293.
- [5] Cantor, D. E., P. C. Morrow, J. C. McElroy, and F. Montabon. 2013. "The Role of Individual and Organisational Factors in Promoting Firm Environmental Practices." *International Journal of Physical Distribution & Logistics Management* 43 (5/6): 407-427.
- [6] Cesur, E., Cesur, M. R., Kayikci, Y., & Mangla, S. K. (2022). Optimal number of remanufacturing in a circular economy platform. *International Journal of Logistics Research and Applications*, 25(4-5), 454-470.
- [7] Chavez, R., Yu, W., Jajja, M. S. S., Song, Y., & Nakara, W. (2022). The relationship between internal lean practices and sustainable performance: exploring the mediating role of social performance. *Production Planning & Control*, 33(11), 1025-1042.
- [8] Chen, S., Liu, X., Wang, S., & Wang, P. (2023). Regional Corruption, Foreign Trade, and Environmental Pollution. *Sustainability*, 15(1), 859.
- [9] Cummings, S., Regeer, B., De Haan, L., Zweekhorst, M., & Bunders, J. (2018). Critical discourse analysis of perspectives on knowledge and the knowledge society within the Sustainable Development Goals. *Development Policy Review*, 36(6), 727-742.
- [10] Davies, C., Chen, W. Y., Sanesi, G., & Laforteza, R. (2021). The European Union roadmap for implementing nature-based solutions: A review. *Environmental Science & Policy*, 121, 49-67.
- [11] D'Amato, D., Korhonen, J., & Toppinen, A. (2019). Circular, green, and bio economy: how do companies in land-use intensive sectors align with sustainability concepts?. *Ecological Economics*, 158, 116-133.
- [12] D'amato, D., & Korhonen, J. (2021). Integrating the green economy, circular economy and bioeconomy in a strategic sustainability framework. *Ecological Economics*, 188, 107143.
- [13] Del Giudice, M., Chierici, R., Mazzucchelli, A., & Fiano, F. (2021). Supply chain management in the era of circular economy: the moderating effect of big data. *The International Journal of Logistics Management*, 32(2), 337-356.
- [14] Fernando, Y., Chiappetta Jabbour, C. J., & Wah, W.-X. (2019). Pursuing green growth in technology firms through the connections between environmental innovation and sustainable business performance: Does service capability matter? *Resources, Conservation and Recycling*, 141, 8-20. doi:10.1016/j.resconrec.2018.09.031.
- [15] Fernando, Y., Tseng, M. L., Sroufe, R., Abideen, A. Z., Shaharudin, M. S., & Jose, R. (2021). Eco-innovation impacts on recycled product performance and competitiveness: Malaysian automotive industry. *Sustainable Production and Consumption*, 28, 1677-1686.
- [16] Fernando, Y., Tseng, M. L., Nur, G. M., Ikhsan, R. B., & Lim, M. K. (2022). Practising circular economy performance in Malaysia: managing supply chain disruption and technological innovation capability under industry 4.0. *International Journal of Logistics Research and Applications*, 1-24.
- [17] Fernando, Y., Suhaini, A., Tseng, M.-L., Abideen, A. Z., & Shaharudin, M. S. (2023). A smart warehouse framework, architecture and system aspects under industry 4.0: a bibliometric networks visualisation and analysis. *International Journal of Logistics Research and Applications*, 1-24. doi:10.1080/13675567.2023.2215179
- [18] Firmansyah, E. A., Masri, M., Anshari, M., & Besar, M. H. A. (2023). Factors affecting fintech adoption: a systematic literature review. *FinTech*, 2(1), 21-33.
- [19] Frone, D. F., & Simona, F. (2015). Resource-efficiency objectives and issues for a green economy. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, 15(3).

- [20] Gatune, J., Ozor, N., & Oriama, R. (2021). Modelling bioeconomy futures for Eastern Africa. *foresight*, 23(2), 226-241.
- [21] Giannetti, B., Agostinho, F., Eras, J. C., Yang, Z., & Almeida, C. (2020). Cleaner production for achieving the sustainable development goals. *Journal of Cleaner Production*, 271, 122127.
- [22] Gugler, P. (2015). Book review| World Investment Report 2014: Investing in the SDGs: An Action Plan, UNCTAD, United Nations, Geneva (2014). In: Elsevier.
- [23] Gupta, S., Chen, H., Hazen, B. T., Kaur, S., & Gonzalez, E. D. S. (2019). Circular economy and big data analytics: A stakeholder perspective. *Technological Forecasting and Social Change*, 144, 466-474.
- [24] Haldorai, K., Kim, W. G., & Garcia, R. F. (2022). Top management green commitment and green intellectual capital as enablers of hotel environmental performance: The mediating role of green human resource management. *Tourism Management*, 88, 104431.
- [25] Halkos, G. E., & Tzeremes, N. G. (2013). Carbon dioxide emissions and governance: a nonparametric analysis for the G-20. *Energy Economics*, 40, 110-118.
- [26] Hassaballa, H. (2015). The effect of corruption on carbon dioxide emissions in the MENA region. *European Journal of Sustainable Development*, 4(2), 301-301.
- [27] Henderson, K., & Loreau, M. (2023). A model of Sustainable Development Goals: Challenges and opportunities in promoting human well-being and environmental sustainability. *Ecological Modelling*, 475, 110164.
- [28] Hussain, S. A., Razi, F., Hewage, K., & Sadiq, R. (2023). The perspective of energy poverty and 1st energy crisis of green transition. *Energy*, 275, 127487.
- [29] Ibrahim, A., Fernando, Y., Tseng, M. L., & Lim, M. K. (2022). Low-carbon warehousing practices and challenges: insights from emerging country. *International Journal of Logistics Research and Applications*, 1-20.
- [30] Jia, C., & Mustafa, H. (2022). A Bibliometric analysis and review of nudge research using VOSviewer. *Behavioral Sciences*, 13(1), 19.
- [31] Kasayanond, A., Umam, R., & Jermittiparsert, K. (2019). Environmental Sustainability and Its Growth in Malaysia by Elaborating the Green Economy and Environmental Efficiency. *International Journal of Energy Economics and Policy*, 9(5), 465-473. doi:10.32479/ijee.8310
- [32] Khan, S. A. R., Umar, M., Asadov, A., Tanveer, M., & Yu, Z. (2022). Technological revolution and circular economy practices: a mechanism of green economy. *Sustainability*, 14(8), 4524.
- [33] Khandelwal, C., & Barua, M. K. (2020). sPrioritising circular supply chain management barriers using fuzzy AHP: case of the Indian plastic industry. *Global Business Review*, 0972150920948818.
- [34] Larrue, P. (2021). The design and implementation of mission-oriented innovation policies: A new systemic policy approach to address societal challenges.
- [35] Lisciandra, M., & Migliardo, C. (2017). An empirical study of the impact of corruption on environmental performance: Evidence from panel data. *Environmental and resource economics*, 68, 297-318.
- [36] Li, G., Li, L., Choi, T. M., & Sethi, S. P. (2020). Green supply chain management in Chinese firms: Innovative measures and the moderating role of quick response technology. *Journal of Operations Management*, 66(7-8), 958-988.
- [37] Lisitsa, M., Khutieva, E., Doroshenko, O., Konareva, A., & Trifonova, L. (2022). Circular Economy as an Alternative to Green Economy. Paper presented at the International Scientific and Practical Conference "Young Engineers of the Fuel and Energy Complex: Developing the Energy Agenda of the Future" (EAF 2021).
- [38] Liu, Z., Ahmad, I., Perveen, Z., & Alvi, S. (2023). Do the globalisation and imports of capital goods from EU, US and China determine the use of renewable energy in developing countries? *Carbon Management*, 14(1), 1-12. doi:10.1080/17583004.2023.2165162
- [39] Ma, W. (2022). Research on the coupling and coordination of green finance, higher education, and green economic growth. *Environmental Science and Pollution Research*, 29(39), 59145-59158.
- [40] Mathews, J. A. (2019). 14. The green growth economy as an engine of development: the case of China. *Handbook on Green Growth*, 325.
- [41] Malaysian Investment Development Authority (MIDA). (2021). Towards a Green Economy. <https://www.mida.gov.my/mida-news/towards-a-green-economy/>
- [42] Mikhno, I., Koval, V., Shvets, G., Garmatiuk, O., & Tamošiūnienė, R. (2021). Green economy in sustainable development and improvement of resource efficiency.
- [43] Misztal, P., & Dziekanski, P. (2023). Green Economy and Waste Management as Determinants of Modeling Green Capital of Districts in Poland in 2010-2020. *Int J Environ Res Public Health*, 20(3). doi:10.3390/ijerph20032112.
- [44] Moral-Muñoz, J. A., Herrera-Viedma, E., Santisteban-Espejo, A., & Cobo, M. J. (2020). Software tools for conducting bibliometric analysis in science: An up-to-date review. *Profesional de la Información*, 29(1).
- [45] Nandy, S., Fortunato, E., & Martins, R. (2022). Green economy and waste management: An inevitable plan for materials science. *Progress in Natural Science: Materials International*, 32(1), 1-9. doi:10.1016/j.pnsc.2022.01.001

- [46] Naseer, S., Song, H., Aslam, M. S., Abdul, D., & Tanveer, A. (2022). Assessment of green economic efficiency in China using analytical hierarchical process (AHP). *Soft computing*, 1-11.
- [47] Nik Mahdi, N. A., Fernando, Y., & Abdalla, Y. A. (2023). Understanding The Sustainable Development Goals Concept: Malaysia Report and Trend. *Journal of Governance and Integrity*, 5(3), 317-327. doi:10.15282/jgi.5.3.2022.8938.
- [48] OECD. *Towards Green Growth. A Summary for Policy Makers*; OECD Publishing: Paris, France, 2011.
- [49] Pandey, N., de Coninck, H., & Sagar, A. D. (2022). Beyond technology transfer: Innovation cooperation to advance sustainable development in developing countries. *Wiley Interdisciplinary Reviews: Energy and Environment*, 11(2), e422.
- [50] Pavlova, M. (2019). Emerging environmental industries: impact on required skills and TVET systems. *International Journal of Training Research*, 17(sup1), 144-158.
- [51] Pujiati, A., Yanto, H., Dwi Handayani, B., Ridzuan, A. R., Borhan, H., & Shaari, M. S. (2023). The detrimental effects of dirty energy, foreign investment, and corruption on environmental quality: New evidence from Indonesia. *Frontiers in Environmental Science*, 10, 2636.
- [52] Ramzan, M., Abbasi, K. R., Salman, A., Dagar, V., Alvarado, R., & Kagzi, M. (2023). Towards the dream of go green: An empirical importance of green innovation and financial depth for environmental neutrality in world's top 10 greenest economies. *Technological Forecasting and Social Change*, 189, 122370.
- [53] Razavi, S. (2016). The 2030 Agenda: challenges of implementation to attain gender equality and women's rights. *Gender & Development*, 24(1), 25-41.
- [54] Ronzani, C. M., da Costa, P. R., da Silva, L. F., Pigola, A., & de Paiva, E. M. (2020). Qualitative methods of analysis: an example of Atlas. TI™ Software usage. *Revista Gestão & Tecnologia*, 20(4), 284-311.
- [55] Rumanti, A. A., Sunaryo, I., Wiratmadja, I. I., & Irianto, D. (2020). Cleaner production through open innovation in Indonesian batik small and medium enterprises (SME). *The TQM Journal*, 33(6), 1347-1372. doi:10.1108/tqm-04-2020-0086
- [56] Sachs, J., Lafortune, G., Kroll, C., Fuller, G., & Woelm, F. (2022). From Crisis to Sustainable Development: The SDGs as Roadmap to 2030 and Beyond. *Sustainable Development Report*.
- [57] Sancha, C., Gutierrez-Gutierrez, L., Tamayo-Torres, I., & Gimenez Thomsen, C. (2022). From corporate governance to sustainability outcomes: the key role of operations management. *International Journal of Operations & Production Management*, 43(13), 27-49. doi:10.1108/ijopm-01-2022-0043
- [58] Seddon, N., Smith, A., Smith, P., Key, I., Chausson, A., Girardin, C., . . . Turner, B. (2021). Getting the message right on nature-based solutions to climate change. *Glob Chang Biol*, 27(8), 1518-1546. doi:10.1111/gcb.15513
- [59] Sekrafi, H., & Sghaier, A. (2018). The effect of corruption on carbon dioxide emissions and energy consumption in Tunisia. *PSU Research Review*, 2(1), 81-95.
- [60] Sudikan, S. Y., & Istiq'faroh, N. (2023, January). Trends in Local Wisdom-Based Learning Research: Bibliometrics Using Scopus Data from 2016 to 2022. In *Unima International Conference on Social Sciences and Humanities (UNICSSH 2022)* (pp. 1316-1326). Atlantis Press.
- [61] Szolin, K., Kuss, D. J., Nuyens, F. M., & Griffiths, M. D. (2023). "I am the character, the character is me": A thematic analysis of the user-avatar relationship in videogames. *Computers in Human Behavior*, 143, 107694.
- [62] Tasavori, M., & Bhattarai, C. R. (2022). Understanding the impact of learning orientation and the mediating role of new product development capability on social enterprises' performances. *International Journal of Entrepreneurial Behavior & Research*, 29(2), 530-551. doi:10.1108/ijebr-12-2021-1009.
- [63] Xu, B., Chen, W., Zhang, G., Wang, J., Ping, W., Luo, L., & Chen, J. (2020). How to achieve green growth in China's agricultural sector. *Journal of Cleaner Production*, 271, 122770.
- [64] Zhang, A., Deng, R., & Wu, Y. (2022). Does the green credit policy reduce the carbon emission intensity of heavily polluting industries? -Evidence from China's industrial sectors. *Journal of environmental management*, 311, 114815.
- [65] Zhang, Q., & Ma, Y. (2021). The impact of environmental management on firm economic performance: The mediating effect of green innovation and the moderating effect of environmental leadership. *Journal of Cleaner Production*, 292, 126057.
- [66] Zhang, X., Wang, Z., Zhong, X., Yang, S., & Siddik, A. B. (2022). Do green banking activities improve the banks' environmental performance? The mediating effect of green financing. *Sustainability*, 14(2), 989.
- [67] Palahi, M., Pantsar, M., Costanza, R., Kubiszewski, I., Potocnik, J., Stuchtey, M., ... & Bas, L. (2020). Investing in Nature to Transform the Post COVID-19 Economy: A 10-point Action Plan to create a circular bioeconomy devoted to sustainable wellbeing. *Solutions*.