The Future of Green Economic for Environmental Sustainability: A Bibliometric Analysis Review

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Abstract

The research objective is to explore critical issues in the Green Economic study. The method used is Bibliometric analysis, data source from Scopus, using Vos viewer software. The results of the study describe the productivity of the research that has been carried out and the mapping theme forms a 6 G pattern, namely green innovation, green growth, green development, Governance, Green jobs and Green Finance. The novelty of the research is that there is no research that holistically combines all the research studies from year to year in the subject areas of environmental, economic, business and management. The research implication provides information in the form of gaps for future research to be directed to fill these gaps to enrich science.
Keywords: *Green economic; Bibliometric; Mapping theme; 6 G Pattern*

Abstrak

Tujuan penelitiannya adalah untuk mengeksplorasi isu-isu kritis dalam kajian Ekonomi Hijau. Metode yang digunakan adalah analisis bibliometrik, sumber data dari Scopus, dengan menggunakan software Vos viewer. Hasil penelitian menggambarkan produktivitas penelitian yang telah dilakukan dan tema pemetaan membentuk pola 6 G yaitu *Green Innovation, Green Growth, Green Development, Governance, Green Jobs* dan *Green Finance*. Kebaruan penelitian ini adalah belum ada penelitian yang secara holistik memadukan seluruh kajian penelitian dari tahun ke tahun pada bidang studi lingkungan, ekonomi, bisnis, dan manajemen. Implikasi penelitian memberikan informasi berupa kesenjangan bagi penelitian-penelitian selanjutnya untuk diarahkan mengisi kesenjangan tersebut guna memperkaya ilmu pengetahuan*.*
Kata kunci: *Ekonomi hijau, Bibliometrik, Tema pemetaan, Pola 6G*

INTRODUCTION

Earth provides human resources to live and work by utilizing natural resources (Baležentis et al., 2020) contained therein to be used for human welfare (Gramkow & Anger-Kraavi, 2019). It is appropriate for humans to make efforts (Ali Shah et al., 2020) by using natural resources wisely (Helen & Gasparatos, 2020) by paying attention to the green environment (Li et al., 2020). Green economy is expected to be able to become a bridge in an industry that has environmental conservation insight (Khan et al., 2020). Green economy is an economic idea which aims to improve welfare and social equality of society, accompanied by efforts to reduce environmental damage in a real and significant way (Saparova et al., 2019). Green economy can be defined as an economic condition with low levels or no pollutants to the environment, saving natural resources and social justice (Zhong & Li, 2020).

Green economy is directly related to natural capital, ecosystem and ecological services as economic value based on cost accounting where the costs incurred to society can be traced back which is an obligation, a harmless entity and doesn't neglect assets (Gessesse & He, 2020; Putri et al., 2020; Shuai & Fan, 2020). Based on the international environmental development policy in the United Nation Environment Program (UNEP) program, the focus of discussion is the reduction of toxic gas emissions, overcoming the greenhouse effect , carrying out reforestation programs and carrying out environmentally friendly industrial programs (Ali Shah et al., 2020; X. Gao et al., 2020; Levaschova et al., 2020). Green economy is expected as an economic activity capable of minimizing the negative impact of economic growth on the environment and scarcity of natural resources (Trisna et al., 2020; Zhuo & Deng, 2020). Procurement of materials for production is expected to use green supply chain management and minimize waste (Bai et al., 2020).

Modern society has a lifestyle that makes development exploitative for natural resources and threatens the environment (Bilgaev et al., 2019). Production growth results in improvements in the economic side but has an impact on the consequences of damage to the environment (Briem et al., 2019; Shuai & Fan, 2020). Some examples of pollution and environmental damage include an increase in greenhouse emissions, species and biodiversity scarcity, forest fires, illegal logging (Xu et al., 2020). A series of efforts to overcome environmental problems at the global, regional and local levels, still occurs environmental degradation which continues to occur is systemic, meaning that the factors that cause environmental problems are interrelated and will automatically influence each other. One example is forest fires, the smoke generated will cause air pollution which emits poisonous gases and will cause respiratory-related diseases, damage to groundwater, disturbed ecosystems and the death of plants and animals living in the forest. Several infrastructure developments will result in the narrowing of green land with the conversion of functions from agricultural to non-agricultural land (Hopkins & Van Mullekom, 2019).

Business in the world is still competing in order to win the competition in the industry by ignoring environmental sustainability (Zhong & Li, 2020), so this gives a sense of pessimism that green economy is only a concept. Humans have a tendency to continuously exploit the natural environment (Zhao et al., 2020), while nature takes a long time to provide the necessary resources for production. In the concept of green economy, it is the evolution of sustainable development, the hope that green economy is able to balance between economic development and environmental protection. Nature provides resources to meet human needs, with the potential that can be explored there is a problem of gaps in the use of natural resources that can cause new problems in management (Shuai & Fan, 2020).

Development in industry in general will have a negative impact socio-economic sectors so it is necessary to develop a green economic concept so that it is for sustainable use as well as providing welfare to the community (Zeng et al., 2020). Green

economy needs to be carried out in sustainable development, namely economic, social and ecology to embrace all the interests of related parties to minimize natural damage and be wise in acting to achieve prosperity (Taşkın et al., 2020).

Green economic paradigm is a development paradigm that requires government support and intervention to take and implement policies regarding natural resource management, the use of natural resources in a fair and sustainable manner, maintain renewable resources (Chien, 2020) as well as preventing environmental damage (Yuan et al., 2020). Problems that arise related to the environment need to be integrated into economic development planning, so that policy readiness is needed in all fields regarding the use and management of these natural resources (Adedoyin et al., 2020). The government and all business sectors must take government policies in green economy seriously so that they are not considered as mere logic. Based on the background explanation above, there are several research questions that arise as follows how is the development of Green Economic science based on research that has been carried out from the early period until now and what are the critical issues related to green economics

The research objective is to explore knowledge in the field of green economics on a global scale to get an overview of the body of literature and critical issues in green economics. This research consists of four main parts. The first part about the background why this research is important. This study has a gap analysis, namely the absence of research that combines and visualizes the mapping theme of all research that has been carried out from time to time. In addition, future research on green economics has great potential for exploration in gaps that have not been investigated by other researchers. The second part is the research method used. Secondary data is used to answer research questions, all data is taken from the search engine Scopus. This research method uses Bibliometric analysis where the data will be explored to obtain a mapping map with the help of Vos viewer software. The third part of this paper is the results and discussion which will explain the analysis of all documents relevant to the green economy and make a map suggestion regarding critical points of green economy. And the last part is in the form of research conclusions, along with knowledge implications and practical implications as well as future research.

METHOD

Bibliometric Methods

This research requires secondary data that has been published on a global scale on the Scopus search engine using the Bibliometric method. Bibliometric method is a method for evaluating research publications which is a statistical application and quantitative analysis of published documents (Parker & Crawford, 2003; Saha et al., 2020). The concept of the bibliometric method is the basis for the output of research publications. Researchers will evaluate publication documents based on scientific data preferences including documents produced from year to year, author data, subject area data, collaboration between authors, affiliation, number of citations, country, and the most productive document publisher. Research using Bibliometrics has progressed and can be used in combination with other tools in order to describe the results of research that has been done comprehensively (Kraus et al., 2020).

Research Protocol

There are four steps in conducting a literature review to provide research direction, namely
(1)   Determine inclusion and exclusion criteria's, at this stage the criteria that fall into the scope or those that are not included are determined. At this stage, studies related to the Green Economy were selected, all data sources in this

study used the Scopus search engine with the keywords "green economic" or "green economy" to extract documents, using the initial research period until December 2023. obtained with the keyword "green economic" or "green economy" as many as 7.941 documents;

(2)   Identify the research domain; At this stage it is more focused and narrowed down to the domain of study and after screening the criteria are only in the subject areas of Environmental Science, Business, Management and Accounting, as well as Economics, Econometrics and Finance, and specifically documents in English, 1990 publications documents will be evaluated and extraction to answer research questions;

(3)   Analyze the material related to the relevant document, at this stage check the completeness of the data, whether the document has full text to be analyzed with the Vos viewer software

(4)   Represents data, this section the researcher will interpret from the document data obtained.

RESULTS AND DISCUSSION

With the facilities provided at the old Scopus, from 1990 the document obtained the following analysis results:
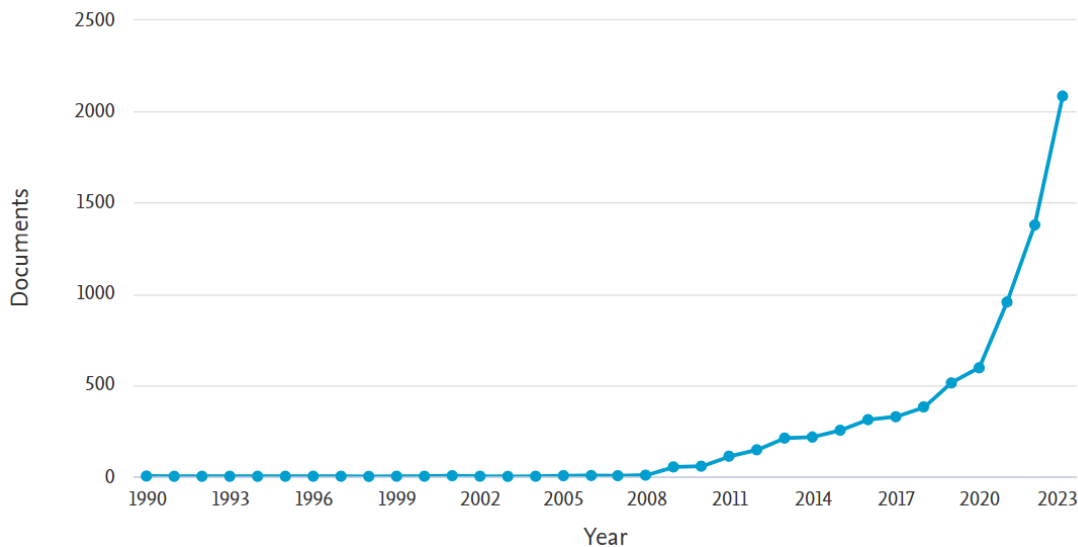
Documents by year

Figure 1. Documents by year Green Economic Study

Publication documents on green economics in the subject area of this study were first published in 1990 by the trend of research on GE in the last five years, which has increased, namely in 2019 as many as 515 documents; 2021 as many as 957 documents; in 2022 as many as 1381 documents; in 2023 as many as 2082 documents and in 2023 as many as 342 documents. From this analysis, GE in future research still provides interest for other researchers.
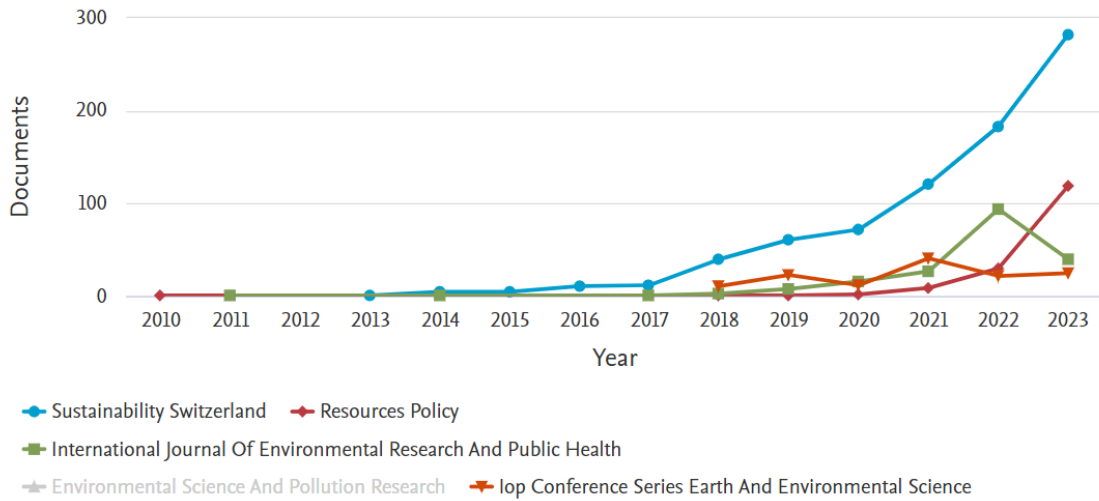
Documents by source

Figure 2. Documents by source

The documents that have been published are 793 documents in Sustainability Switzerland, 424 documents in Enviromental Science and Pollution Research, 191 documents in International Journal of Environmental Reasearch and Public Health, 163 documents in Resources Policy and 134 documents in IOP Conference Series Earth and Environmental Science documents, 38 documents of the International Journal of green economics.
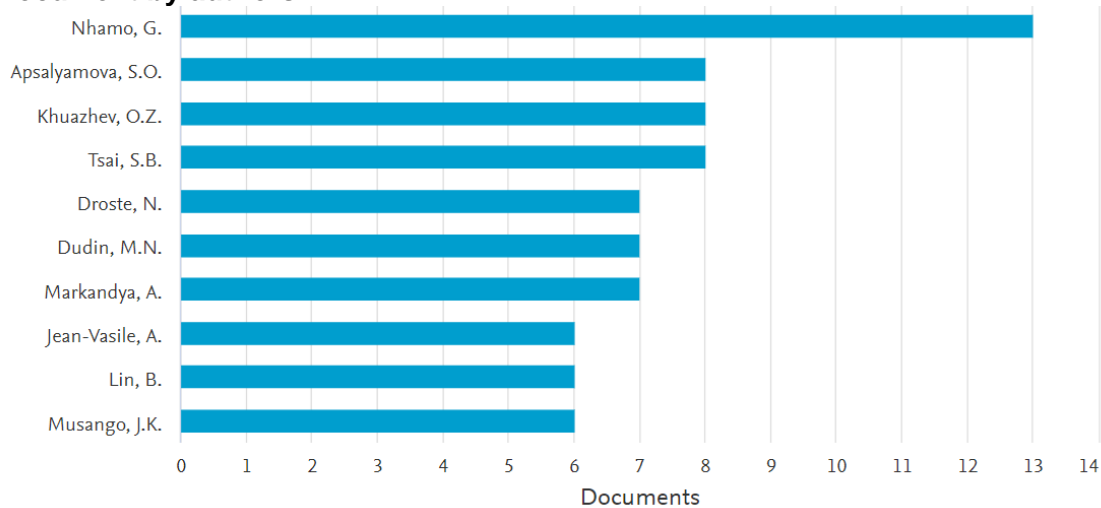
Document by authors

Figure 3. Document by authors

Productive authors in this field are Nhamo, G. with 13 documents, followed by Apsalyamova, S.O., Khuazhev, O.Z., Tsai, S.B., each with 8 documents; Droste, N., Dudin, M.N., Markandya, A. each with 7 documents while Jean-Vasile, A., Lin B., and Musango, L.K., Each with 6 documents. Other authors are still under six documents. Author with a citation count above 150 times (see table 1)

Table 1. The top six authors with the greatest number of citations

| No	Authors	Title	Cite by
1	Binnemans K., Jones P.T., Blanpain B., Van Gerven T., Yang Y., Walton A., Buchert M (2013)	Recycling of rare earths: A critical review	1100
2	Scarlat N., Dallemand J.-F., Monforti-Ferrario F., Nita V. (2015)	The role of biomass and bioenergy in a future bioeconomy: Policies and facts	336
3	Pearce D (1993)	Blueprint 3: measuring sustainable development	271
4	Lorek S., Spangenberg J.H (2014).	Sustainable consumption within a sustainable economy – Beyond green growth and green economies	224
5	Yadav R., Pathak G.S. (2017)	Determinants of Consumers' Green Purchase Behavior in a Developing Nation: Applying and Extending the Theory of Planned Behavior	177
6	D'Amato D., Droste N., Allen B., Kettunen M., Lähtinen K., Korhonen J., Leskinen P., Matthies B.D., Toppinen A. (2017)	Green, circular, bio economy: A comparative analysis of sustainability avenues	176

Documents by affiliation
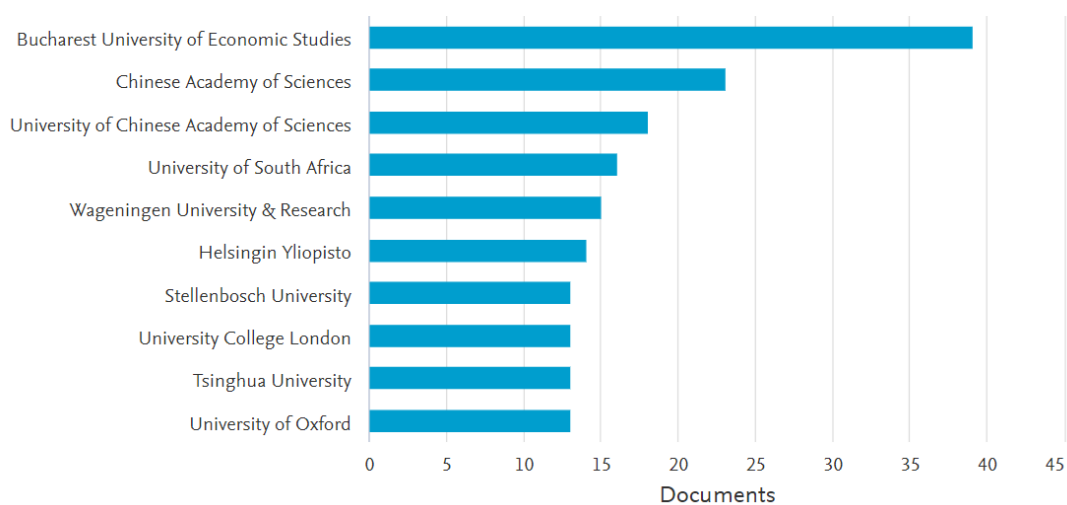
Figure 4. Documents by affiliation

Productive affiliations in this field are Bucharest University of Economic Studies with 39 documents, Chinese Academy of Sciences 23 documents, University of Chinese Academy Sciences with 18 documents, University of South Africa with 16 documents, while Wageningen University & Research with 15 documents, Helsingin Yliopisto 14 documents, as well as Stellenbosch University, University College London, Tsinghua University and University of Oxford each with 13 documents, the other affiliations are still under 13 documents.
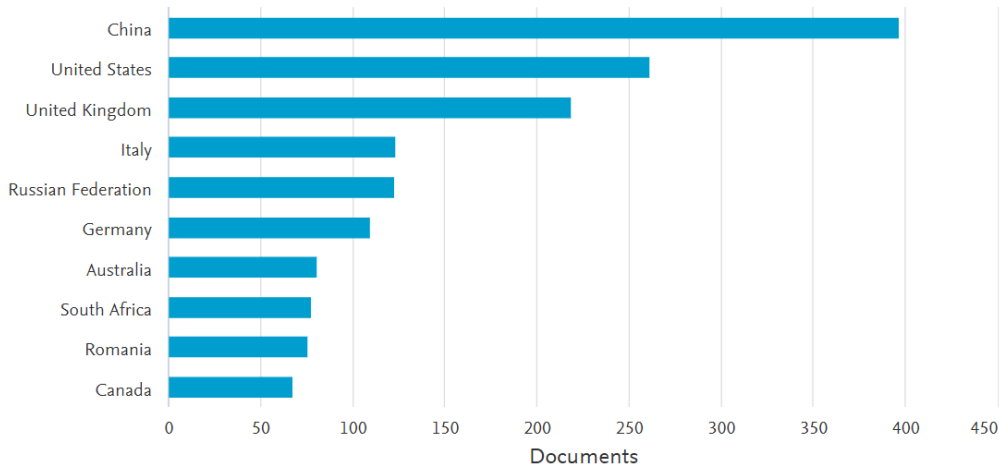
Documents by country

Figure 5. Documents by country

The top ten most productive countries in the GE sector publication are China with 396 documents, United States 261 documents, United Kingdom 218 documents, Italy 123 documents, Russian Federation 122 documents, Germany 109 documents, Australia 80 documents, South Africa 77 documents, Romania 75 documents, Canada 67 documents.

Documents by type
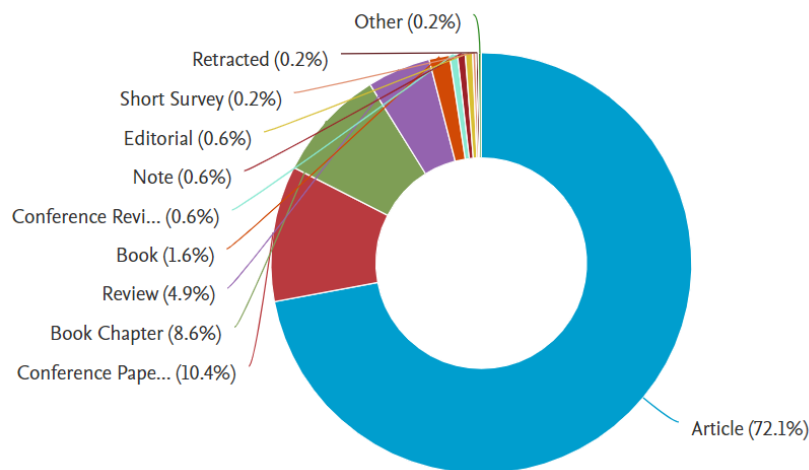

Figure 6 Documents by type

Type of articles are 5498 documents (72.16%), book chapters are 658 documents (8.6%), Conference Paper 797 documents (10.4%), Review 371 documents (4.9%), Book 120 documents (1.6%), Editorial 43 documents (0.6 %), Note 45 documents (0.6%), Conference Review 46 documents (0.6%), Short Survey 19 documents (0.2%), Erratum 12 documents (0.1%) and others (0.2%).
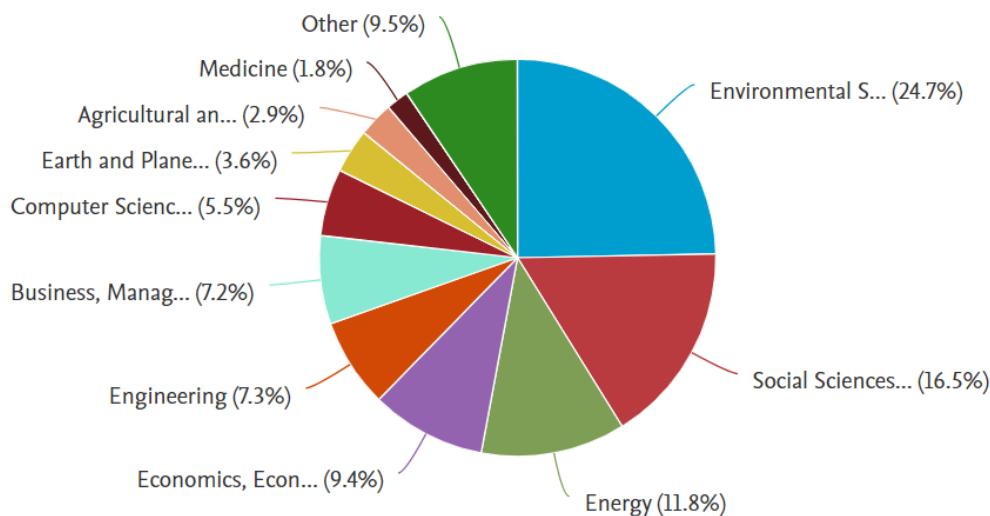
Documents by subject area

Figure 7. Documents by subject area

Documents based on the subject area consisted of Environmental Science 4115 documents (24.7.%), Social Sciences 2743 documents (16.5%), Business, Management and Accounting 1199 documents (7.2%), Economic, Econometrics and Finance 1546 documents (9.4%), Energy 1964 documents (11.8%), Engineering 1212 documents (7.3%), Agricultural and Biological Sciences 477 documents (2.9%), Earth and Planetary Sciences 597 documents (3.6%), Medicine 303 documents (1.8%), and other (9.5%).
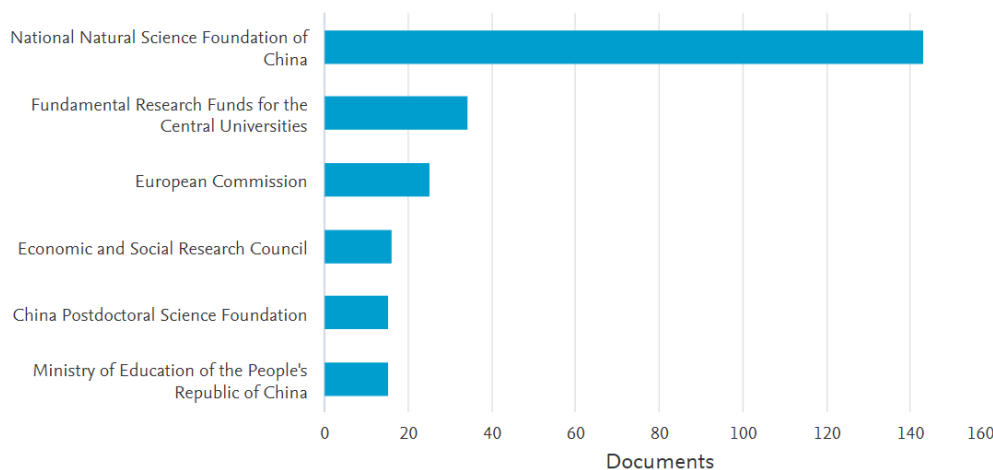
Documents by funding sponsor

Figure 8. Funding sponsor

The top five funders in this research field are the National Natural Science Foundation of China with 143 times, Fundamental Research Funds for the Central University for 34 times, European Commission 25 times, Economic and Social Research

Council 16 times, China Postdoctoral Science Foundation 15 times. Ministry of Education of the People's Republic of China 15 times.

Author Collaboration

Collaboration between authors with a minimum collaboration of 5 documents, there are 43 authors who meet the threshold which is divided into 7 clusters, namely
1) Cluster 1 (red), namely Chen X, Guo Y, Li Y, Wang C, Wang Y, Xu Z, Yang Y, Zhang F, Zhang X, Zhang Z.
2) Cluster 2 (green), namely Cheng Z, Li C, Li F, Li W, Li X, Liu H, Sun Y, Zhang Y
3) Cluster 3 (blue), namely Liu Y, Wang H, Wang X, Yi H, Yu Y, Zhang l, Zhao X
4) Cluster 4 (yellow), namely Chen Y, Li J, Lin B, Wang S, Zhang J.
5) Cluster 5 (purple), namely Liu C, Wang L, Wang Z, Xia Y, Zhou Y
6) Cluster 6, namely Chen H, Wu Y, Xu J, Zhang H.
7) Cluster 7, namely Li G, Tsai s-b, Wang W, Wang J

This is the description of the collaboration between authors based on the required criteria.
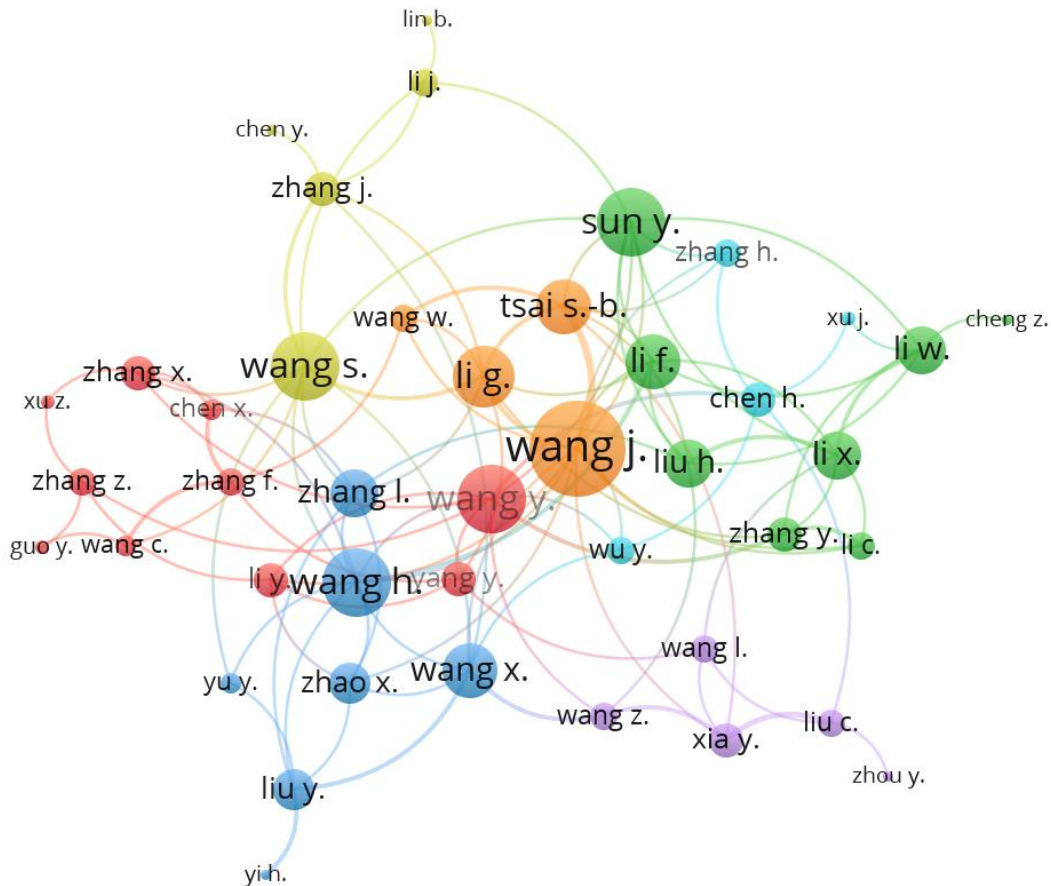
Figure 9. Collaboration between authors

The body of literature of green economic
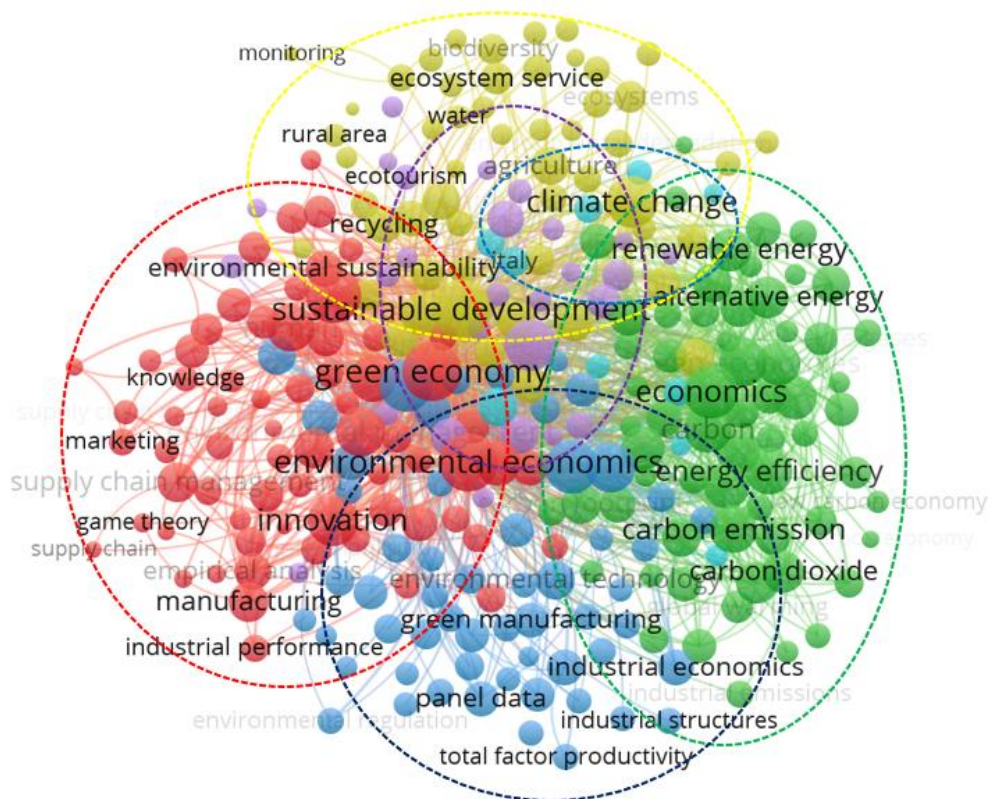
Figure 10. Mapping themes in green economic studies

By using Vos viewer software from 8733 keywords with a minimum repetition of ten times and through manual screening, removing keywords that are deemed unrepresentative is obtained 150 keywords that are formed, after an in-depth analysis is formed into 6 clusters related to green economics by forming a "6 G" pattern namely Green innovation, Green growth, Green development, Governance, Green jobs and Green Finance.

Critical Issues of green economies

Each cluster from Figure 11 has a strong network between the key words that have been extracted by Vos viewer, presented in Table 2 which is a critical issue in the field of Green Economic study.

Table 2. Critical Issues by mapping theme in green economic study

1. Green Innovation cluster (red)		
business	environmental performance	information management,
circular economy	environmental planning,	information technology
commercial phenomenal	environmental sustainability	market conditions
competitiveness	green economy	performance
consumption behavior	green innovation	stakeholder
corporate social response	green marketing	resource management
corporate strategy	green products	technology development
eco-innovation	green supply chain management	technology adaption
environmental economic	green technology	willingness to pay
environmental impact assessment	environmental management	industrial enterprise

2. Green growth cluster (green)		
Alternative energy	energy conservation	green growth
biofuel	energy consumption,	greenhouse gas
carbon	energy efficiency	gross domestic product
carbon emissions	energy market	industrial emissions
climate policy	energy planning	low carbon economy
competition (economic)	energy policy	pollution tax
economic activity	energy resource	policy implementation
economic and social effects	energy use	renewable energies
economy growths	energy utilization	renewable resource,
economy impact	fossil fuel	system dynamics,
emission control	global warming	taxation.
emission inventory	green energy	

3. Green development cluster (blue)		
Air pollution	environmental factor	industrial economics
atmospheric pollution	environmental quality	industrial production
capital	environmental regulation	industrial research
chemical industry	environmental technology	industrial structures
conservation of natural	foreign direct investment	natural resource
development strategy	government	pollution control
economic aspect	green development	regional development
economic development	green manufacturing	regional economy
economic growth	growth rate	environmental assessment
efficiency	industrial development	water pollution

4. Governance cluster (yellow)		
adaptive management,	food security	quality of life
agriculture	forest management	recycling
biodiversity	future prospect	environmental impact.
biomass	governance	sustainable development
climate change	green infrastructure	trade-off
mitigating conservation	land use change	urban area
deforestation	lifecycle assessment	urban planning
ecological economics,	natural capital	valuation
ecosystem	nonhuman	waste management.
environmental degradation,	participatory approach	water management

5. Green jobs cluster (purple)		
capitalism	entrepreneur	green jobs
certification,	environmental issue	labor market
construction industry	environmental justice	urban economy,
developing world	environmental policy	urban development
ecotourism	global economy	
employment	green building	

6. Green finance (light blue)		
environmental risk	finance	investment
assessment method	green finance	risk assessment.

Proposed green economic pattern
This study provides an overview of the 6 G pattern as follows

Figure 11. 6 G pattern

Green innovation is the role of a mix of business strategies at the macro level (Tu & Wu, 2021). Green innovation encourages companies to make innovations that are driven by the environment by involving aspects of technology used, knowledge, products, procedures and systems that are applied in maintaining sustainable development which in turn will give the company a competitive advantage. Green innovation also has a proactive nature towards competitiveness and is in line with global environmental governance (Karakaya et al., 2014). Green innovation in the perspective of environmental economics has a relationship with environmental regulations as a tool to regulate the environment and create company competitiveness. External driving factors for green innovation are changes in technology, market demand and policies. Meanwhile, the internal driving factors are resources and capabilities that affect the performance of green innovation and have an influence on the company's economic performance (Du et al., 2018). The creation of green innovation in a sustainable and proactive manner will foster a green image for the company in a positive manner and increase production efficiency which in turn will increase the company's competitive advantage.

The role of gross domestic product (GDP) as the main indicator of economic prosperity has experienced a shift in the measurement of growth, not only in quality of life and poverty alleviation, but in a range that holistically takes into environmental quality degradation, such as air pollution, water and increasingly narrow forest areas and accompanying natural resources (Consoli et al., 2016). Economic production depends on the level of natural resources and the quality of the environment. Green growth emphasizes on development and economic growth, while maintaining and preserving natural wealth and environmental resources. Awareness to protect natural resources to create sustainable growth and to make the environment a natural capital for growth. Green economic growth rests on output growth without damaging or using up the environment. Support for green growth, by replacing or diverting non-renewable resources with more environmentally friendly inputs (Taşkın et al., 2020).

Green development is development that focuses on the quality of development and encourages development efficiency which includes environmental protection and efficient utilization of resources in a comprehensive manner (Wang et al., 2020). Green development is the embodiment and extension of green development in all industrial

sectors. Green development is a new development model that pays great attention to low-pollutant and low-carbon energy conservation and conservation of natural resources, Green development is also a sustainable consumption and production pattern for expansion on an industrial scale in creating jobs with efficient resource use, low waste, low pollution, low carbon emissions to create a healthy green environment (Khan et al., 2020).

The quality of economic development towards economic development which is supported by limited resources and environment, encourages urban ecological efficiency, efficiency of resources, energy allocation, and factor productivity, all of which illustrates the concept of green economy efficiency (Zhang & Chi, 2020). In maintaining a green environment, government support is needed in carrying out proper governance so that the expected balance occurs in the form of environmental regulations, for resource conservation and environmental protection, control and intervening of the government in the use of resources by companies. The right environmental regulations can encourage companies to increase efficiency through modern technological innovation (W. Gao et al., 2019). Manage and process resources so as to gain a competitive advantage which in turn will increase industrial efficiency and company performance.

Green jobs have higher human resource standards such as formal education, on-the-job training and work experience (Consoli et al., 2016). Green jobs were identified from various literature sources and a compilation of new jobs that resulted in three main groups according to Consoli et al., (2016): (1) Green economy encourages existing jobs to experience significant employment growth in the preservation of resources and the environment (Green Demand); (2) Green economic in terms of task content experiencing significant changes in relation to the required skills requirements (Green Enhanced Skills); (3) Green economy creates new jobs in response to special needs as awareness in creating a green economy (Green Emerging).

Green Finance is a basic activity to achieve green growth. Managing the green environment is a shared responsibility of stakeholders involving the community (Barbier, 2010). Green finance has a target in pursuing economic growth by making environmental improvements along with the development of the financial industry at the same time and is a type of financing that aims to encourage the flow of funds to the target through the intervention of public agencies appointed in certain markets to meet sufficient funds for green economic activities in autonomous market mechanism. Financing with a specific target market because it is considered profitable to support green economic activities (Soundarrajan & Vivek, 2016).

CONCLUSION

This study provides the conclusion that the productive writer in this field is Nhamo G. with 13 documents. The largest source of publication on Sustainability Switzerland is 197 documents, productive affiliation in this field is Bucharest University of Economic Studies 39 documents, the country that does a lot of research in this field is China with 396 documents. The most cited authors are Binnemans K et al (2013) in a work entitled Recycling of rare earths: A critical review of 1100 citations. The party with the most productive funds in this research study is the National Natural Science Foundation of China as much as 143 times. Collaboration that is formed between authors is seven clusters. This study also finds an overview of the body of green economic literature with the proposed active axis convergence with the 6G pattern, namely green innovation, green growth, green development, Governance, Green jobs and Green Finance along with the proposed image patterns in addition, an understanding of critical issues related to green economy is provided, which consists of 6 clusters.

Research Implications

This research has implications for science in the form of a proposed clustering of the convergence axis in the study of green economics in the form of 6 G, namely green innovation, green growth, green development, Governance, Green jobs and Green Finance along with drawing patterns and exploration results in the form of critical issues. Meanwhile, the practical implications of the identification of key themes in this study provide understanding and direction in the development of studies in understanding the general context and topics as well as research gaps or gaps. Most of the themes discussed in research are closely related to green environmental and ecological economics which aim at sustainable development.

Future Research

With the mapping of research results from time to time until December 2020, researchers can see the gaps in this study so that future research can be formulated to fill the gaps to enrich and develop science.

Acknowledgements

The authors are grateful to the colleagues and lecturers of Universitas Airlangga, Universitas 45 Surabaya and translator.

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