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Investigating on Investment Pattern in Sustianable Finance and Its Contribution Towards Environmental Social and Governance- Bibliometric Analysis

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ABSTRACT

The Term Sustainable finance has taken a paradigm shift in the recent times. The investment in sustainable finance has taken an rapid shift in transforming towards the greener future. The transformation towards the industry 5.0 has given a large impact in focusing on protection of environment and sustainability. The entire globe is shifting its focusing on giving more importance towards the United Nations Sustainable Development Goals. This has impacted several nations in bringing sustainable investment for achieving the UN SDGs. The current study is to identify the research work that are being shaped towards the Environment Sustainable Governance (ESG). The research aims to understand the investments that are carried out towards sustainable finance and brings ways for shaping the future. The research also tries to bring impact of the future scope of the research that has to be carried out with the impact of the investment in the green finance..

1. INTRODUCTION

Investment is in which to make a potential product to generate the return which is needed for receiving profit for the business. Capital appreciation is an increase to the value of asset over a period of time. Investments are generally made for future requirement of the business. In Financial terminology, a product which has potential to meet the demand for generating revenue of can be said to generate the revenue at a future date. In todays scenario the modes of investments are taken paradigm shift in business scenario across the world. A brown investment refers to dirty or polluting investment which simply means investing in activities which causes destruction for the environment which brings challenges for the earth which leads to destruction of the surrounding and which affects the life of the people. A brown investment which has been considered which creates damage and causes pollution for the surroundings affecting the environment. Therefore it is necessary to bring the earth a safer place to live for the mankind and other livin, The cong creatures. Therefore it is necessary to adopt for the green investments which gives a commitment for protecting the environment., conservation of natural resources and less reliant on usage of fossil fuels. In the recent times , the concept of sustainable development has taken an importance across the globe in alignment with the rapid changes on the disruptions towards environment, climate change. This has lead to the increase in sustainable investments in the global need of financial decision making. The awareness of Environmental Sustainable Governance (ESG) has led to investors lead ways to collaborate investment towards sustainable development. The entire world is now focusing on the United Nation Sustainable Development Goals envisioning on the 2030 Agenda. This agenda for 2030 is the main objective focused on reshaping the entire world towards the sustainable development. The recent changes towards the carbon emissions in industries which has reflected in the disruption of the mankind and also changes in climate. Therefore in order to reduce the carbon emissions green finance initiatives are brought as important means to reduce to the destructions of the environment.

In recent times corporate companies are focusing towards on reducing harmful effects which affect the environment and take various initiatives towards protection of environment to bring sustainable livelihood for human beings and other creatures. This has been a main reason for the raise of the Sustainable Finance and bringing investment towards Environment, Social and Governance (ESG) investment. The raise of the ESG awareness among investors, entrepreneurs and politicians on the need of the adopting the environmental social and governance factors which are to be implemented for the investor decision making.

Background of Sustainable Finance

Sustainable Finance includes financial activities which consider the environmental, social and governance factors for making investment decisions. The main aim is to promote economic growth which address global issues such as climate variations, social injustice and governance concerns. Sustainable finance helps the economy in reshaping fair environmentally sustainable planet. Sustainable finance has gained popularity in the recent times due to the rapid scenario affecting environment which in turn affects the earth and bring calamities which are mankind.

Principles for Responsible Investment (2005)

The UN Principles for Responible Invesment (PRI) is a international organisation which work towards establishment of environmental, Social and Governance (ESG) into the investment factors for decision making. This was started in 2005 and was launched in 2006 with around 4900 Institutions in 2021. The main objective of the organization is to promote environmental and Social Responsibility among the worlds investors with their voluntary disclosures. The PRI manages over $121 trillion in assets worldwide which includes investors who are influential around the globe. The aim is to consider the environment and social issue as an important part in the process of investment. There were several negative signatories relating to outline of ESG for the investors

Paris Agreement

In 2015, The UNFCCC brough some instruments to fight the global warming scenario. The intention of Paris agreement is to create a legal binding with an international treaty on climate change. This was adopted by 196 parties at COP 21 in Paris which came into effect on 4th November 2016. The goal of the agreement is to reduce the global warming scenario to below 2 or 1.5 degree Celsius with an objective to reach the height of global reach of greenhouse gas emission immediately to achieve a neutral climate across the world. The Paris Agreement is a historic event bringing multilateral climate change which brings all the nations together for a common cause on mitigating the climate change and adapt to the effects through implementations of the agreement for transformation in social economic scenario. The agreement has a period of tenure of 5 years on the actions taken for the climate mitigation by the countries. The countries contribute their plans which are known as Nationally Determined Contributions (NDCs) were the countries come together to communicate the actions to reduce the green house gas emissions in order to attain the goals of the Paris Agreement. The agreement was a starting point towards shaping the globe and combat towards the climate change and other effects reflecting the environment through greenhouse gas emissions.

Sustainable Finance Disclosure Regulations

The regulation is established by European Regulation which was started to improve the trasnpeency in the market for sustainable investment products, to prevent greenwashing to increase transparency around sustainability claims made by financial market participation. It provides a comprehensive sustainable requirements which covers broad area of environmental, social and governance metrics at both entity and product level. The provision of SDFR are applicable from March 2021 with a statutory instrument known as delegating act containing proper disclosure guidelines which will be adopted by European Commission. It is a foundation pillar of European Union Sustainable Finance Agenda which are being introduced by Euopean Commission as a part of 2018 Sustainable Finance action plan.

Sustainable Action Plan

The European Commission published the Sustainable Action Plan in March 2018 which establishes a financial system which are capable of development which are genuinely sustainable through economic, social and environmental point of view with implementation of Paris Agreement on Climate Change. The action plan has ten action to be taken at the European level which is to facilitate the categorizing of financial investment towards the sustainable development, consider sustainability in risk management procedures and enhance transparency

Net Zero banking alliance

United Nations Convened Net zero banking alliance in collaboration with industry leads with 43 banks participating from 23 countries with USD 28.5 trillion of assets to align with the target of the Paris Agreement. The member banks have the commitments such as transition in green house gases emissions from their lending and investment portfolios to align the target to net zero by 2050. The targets for 2030 and 2050 are to engage with their clients own transition and decarbonization, promoting real economy transition. This alliance also joins in hand with the UN Race to Zero and the banking element of the Glasgow Financial alliance for Net Zero (GFANZ). The is to bring together in a formal forum to provide exiting and new net to zero initiatives into one sector forum and now which includes more than 160 financial institutions across different race to zero initiative bank

2. REVIEW OF LITERATURE

Theoretical Background

With environmental problems like resource depletion and climate change endangering sustainable growth, the global economy and society face previously unheard-of opportunities and challenges in the twenty-first century. A new financial paradigm known as "green finance" emphasizes the incorporation of environmental, social, and governance (ESG) considerations into investment and financial decision-making. Through instruments like green bonds and sustainable development loans, this paper examines the meaning, traits, and international practices of green finance, emphasizing its function in advancing economic sustainability. The literature review highlights important issues and research findings in green finance, including how it affects sustainable development and the difficulties it encounters, like a lack of standardized evaluation methods and information asymmetry. The evolution and difficulties of green finance in China are also discussed, with notable advancements fueled by governmental initiatives and the expansion of the green bond market coexisting with enduring problems including uneven standards and a lack of transparency. This thorough analysis highlights how green finance can promote global collaboration, improve financial stability, and propel the economy's green transformation—all of which will ultimately lead to a more sustainable future for all.(Chuan Tang 2024). As a catalyst for sustainable development, more businesses have adopted Environmental, Social, and Governance (ESG) principles in recent years. Green finance is one example of how ESG investment concepts have become widely accepted. This study examines the issuance costs and economic impacts of SF Holdings' green bonds using the event study method and SF Holdings as a case study. The purpose of this analysis is to further enhance the theoretical research on green finance and offer insights for similar businesses involved in green finance.(Cai Gao 2024). The contribution of sustainable finance to the global shift to renewable energy sources is clarified by this study. The study examines sustainable finance mechanisms, the influence of Environmental, Social, and Governance (ESG) factors on investment choices, the importance of regulatory frameworks, and the strategic ramifications for stakeholders in the green energy ecosystem through a methodical literature review and content analysis. The methodology, which focuses on innovations, challenges, and opportunities in sustainable finance, includes a thorough analysis of peer-reviewed articles, industry reports, and policy documents published between 2013 and 2024. Although the study emphasizes the importance of green bonds, loans, and investment funds in raising money for green energy projects, it also points out that there are still obstacles in the form of standardized ESG standards and regulatory uncertainty. Important conclusions show that although sustainable finance is essential for both economic growth and environmental sustainability, its efficacy depends on strong regulatory backing and well-defined standards. Furthermore, the study emphasizes how crucial innovative financial products and stakeholder collaboration are to overcoming obstacles and promoting the use of green energy. In order to enable a successful transition to green energy, the study highlights the vital necessity of developing sustainable finance mechanisms, strengthening regulatory frameworks, and encouraging stakeholder collaboration. It provides insightful information about the changing landscape of sustainable finance and advice for investors, policymakers, and business professionals who want to meet long-term sustainability targets. Keywords: Green energy transition, sustainable finance mechanisms, environmental, social, and governance (ESG) standards, and regulatory frameworks.(Augusta Heavens IkevujeDavid Chinalu AnabaUche Thankgod Iheanyichukwu 2024) One of the best ways to finance fixed asset investments through bonds or loans is covered in this article. One tool that can draw in some of the capital required to meet the ambitious objectives of the chosen strategy is the green financing mechanism. Since any change or transformation in business and economic conditions frequently necessitates a large amount of investment, the ESG (environmental, social, and governance) agenda has recently grown to be one of the most well-liked and extensively discussed topics in international communities, including financial ones. The E (environmental) component, which is in charge of ecology, raises the most questions. These include how to ensure that economic and social processes decarbonize, how to adapt to the difficulties posed by the global energy transition, how to preserve and increase natural capital, and how to lessen the negative effects of human activity on the environment. A methodology for figuring out how much greenium investors are willing to pay the issuer is also included in the article. The process of creating a greenium in the Russian green finance market and a thorough analysis of the state of the green bond market are given top priority in order to assist investors in making well-informed investment decisions.(US Karimov 2024). Conclusions regarding the status of national economies and the global economy at large can be made by taking into account the degree of development of financial markets, their effectiveness, and economic growth rates. In order to identify the vector of stock market instruments, investors and scientists have been thinking about, researching, and evaluating a variety of models for a long time due to their strategic significance for economic development. This is still a challenging task today. The volatility of stock market prices has increased even further. Numerous factors, from specific to economic, influence this. Real-world events, crises, and consequently stock market volatility necessitate an urgent search for adaptable and efficient investment instruments and forecasting techniques. This is exactly what makes this study relevant. Not just investors find the ESG trend intriguing. To further finance sustainable development projects, there is every chance to broaden the offers and concentrate on green bonds. (N Gumar and E Telagussov 2023). The resources presented in the article demonstrate the government's aim to create a green economy and draw in private funding for environmental initiatives. In light of mounting demands on natural resources, the introduction of green bonds into the debt market is linked to the advancement of ESG (environmental, social, and corporate governance) principles of sustainable business development. The authors want to provide conditions for improving the efficiency of water resources in the national economy, which is why they have proposed a solution—the issue of water bonds. General scientific techniques and the self-organizing Kohonen map of artificial intelligence, which visualized the project, served as the study's methodological foundation. The study's hypothesis was that the issuance of water bonds would support the environmental standardization of irrigated agriculture, boost agricultural production efficiency, and draw financial resources to land reclamation. The study's goal was to advance theoretical approaches to the green economy that were founded on judgments regarding water bonds. The conclusions include calculations for the issuance of water bonds for the development of land reclamation as well as justification for advancing the green economy(Yul l Sizov and Lyudmia and N Medvedva 2024) Concerns about global climate change and its effects on the environment have brought people together more than anything else in recent years. The world is aware of the detrimental effects industrial development has on the environment, and the situation is concerning. Finance and investments play a vital role in addressing the growing demand for environmentally sustainable solutions. In order to accomplish sustainable environmental projects, green and sustainable finance and investments are becoming more and more important. Environmental, social, and governance (ESG) factors are also becoming increasingly important when making financial and investment decisions. Examining the function of sustainable finance and investments in Western Balkan nations is the goal of this paper. The nature of this study is primarily exploratory. Analyzing the current state of affairs and looking for opportunities to develop green finance products, such as green bonds, are the goals. The goal is to identify incentives in the field of sustainable finance to advance the growth and development of the local capital market.(RakocevicNevenka Žarkić Joksimović 2022)

RESEARCH GAP

The research studies suggest only an overview on the investment of sustainable finance and does not provide detailed studies. The studies reflect on the policies that are need for the ESG and does not provide studies on the performance of ESG. There were only few studies that reflect on the green bonds with the effect in financial markets.

AIM OF THE RESEARCH

- Understand the research carried out on the impact of investment towards sustainable finance
- Identify the important key words towards the research contributing the research
- Analyse the organisations that are associated in iterating the research carried out in view of green finance
- Evaluate the citations and research metrics in connection towards the research.

3. RESEARCH METHODS

The research design focuses on the qualitative research which examines the researches that are carried out in the area of green finance investment and coping with environmental impact through the investment. The data collection are well structured which are collected from **Scopus Databases** reflecting with the key words. The inclusion criteria dates with the range from 2012 to 2025. The data extraction are done from the scopus indexing database which are condensed in CSV format. The tools used are VOS viewer.

Data Process

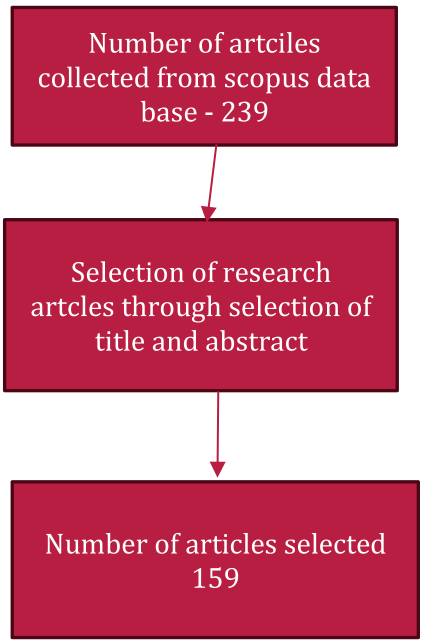
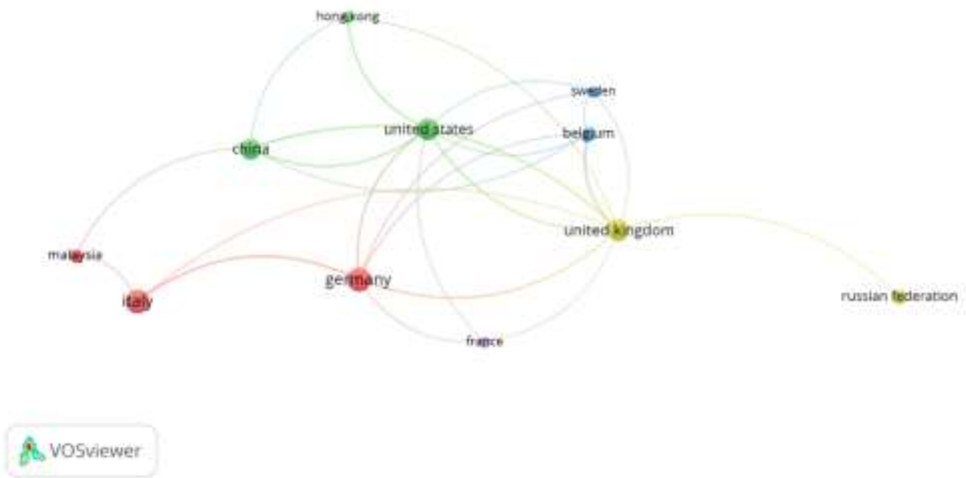


Fig 1 – Data analysis flow diagram

ANALYSIS AND INTERPRETATION



Source – VOS Viewer

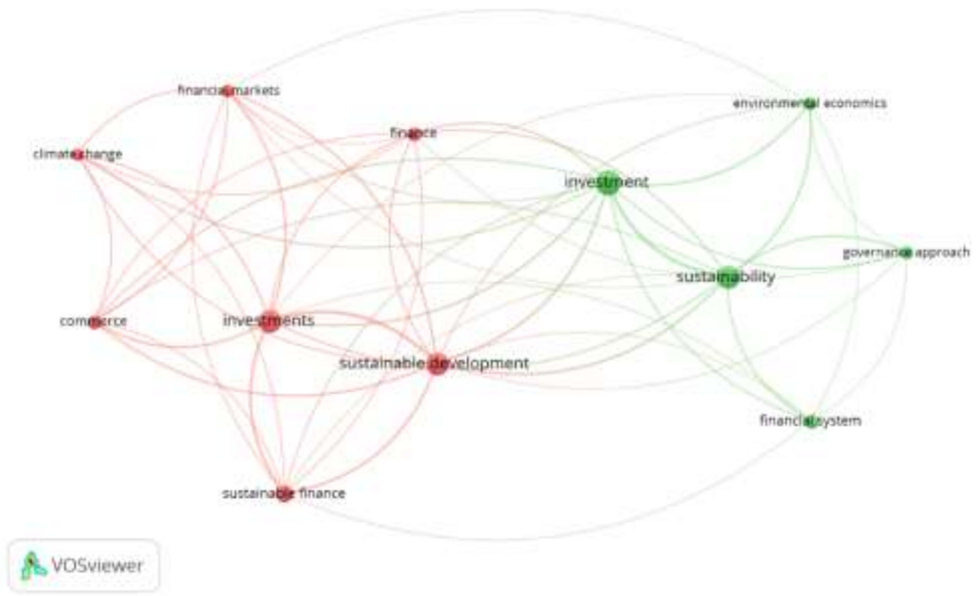
Fig 2 Coauthorship with Countries

A network map of international partnerships or connections between various nations is displayed in the visualization created with VOSviewer. Nodes represent these partnerships, and links show the connections between them. The nodes' sizes indicate the relative importance of each nation in the network, and the colors stand for various groups of related countries. According to the network structure, Germany, the United States, and the United Kingdom act as major hubs with close ties to numerous other nations. Notably, a clear cluster formed by Germany and Italy suggests close regional or bilateral ties, especially with Malaysia. In a similar vein, Hong Kong and China show up as a part of another unique cluster, indicating regional connectivity. Transnational partnerships are suggested by the United States' close ties to China and Hong Kong and the United Kingdom's strong ties to Belgium, Sweden, and the Russian Federation. The different connecting line thicknesses also suggest different levels of cooperation, with stronger ties probably denoting more frequent or significant alliances. All things considered, the network demonstrates the structural dynamics of global interactions by exposing regional and transcontinental connections that could be the result of political, scientific, or economic cooperation.

Source – VOS Viewer

Fig 3 – Co-authorhsip with Organisations

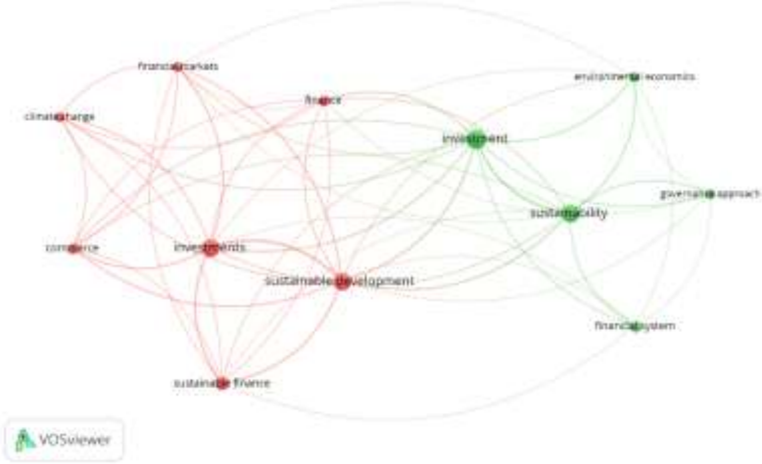
An institutional collaboration network based on co-authorship or citation relationships is displayed in the visualization, which was created with VOSviewer. The colors and relative placement of the nodes in the diagram show their relationships and potential thematic clustering, while the nodes themselves represent various academic or research institutions. Four organizations can be seen in this illustration: Yale University in New Haven, Connecticut; the Department of Management at the University of Connecticut; and the Institute of Islamic Banking at CEPR in the United Kingdom. Every institution is given a unique color that represents various areas of research or areas of collaboration. The Institute of Islamic Banking is shown in blue, the Department of Management in green, the United Kingdom's CEPR in red, and Yale University in yellow. There is little direct cooperation between these institutions, as evidenced by their spatial dispersion and lack of apparent proximity or clustering. Instead of being a part of a closely knit network, the absence of dense linkages raises the possibility that these institutions are working on distinct but possibly related research areas. Additionally, the inclusion of specialized organizations like the Institute of Islamic Banking implies the existence of a specialized area of study, most likely in Islamic finance, that might not have close co-authorship relationships with more general centers of economic or management research. Although their placement here implies that they have little direct interaction with the other institutions in the network, Yale University and CEPR are internationally renowned organizations that may be engaged in high-impact research. All things considered, this visualization draws attention to the dataset's fragmentation of institutional collaboration while highlighting the possibility of more interdisciplinary research and closer academic ties between institutions. To further contextualize these findings, future research could examine thematic overlaps, co-authorship frequency, or citation relationships.



Source – VOS Viewer

Fig4 – Co – Occurrence with Author Keywords

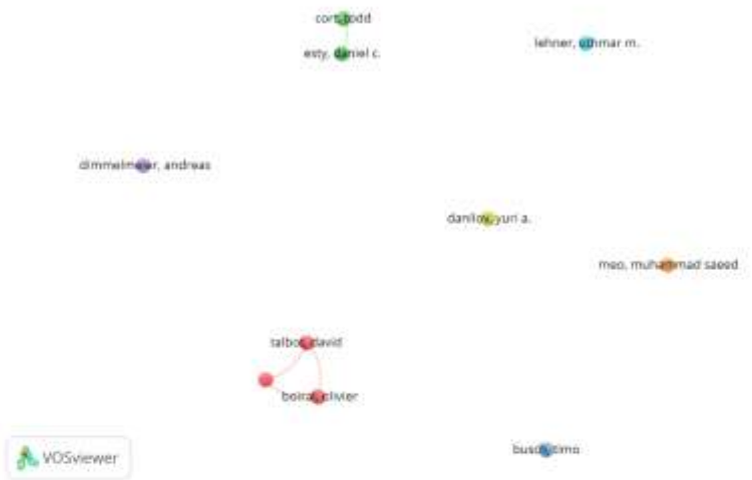
The subfields within sustainable finance are revealed by the various colors used to distinguish the thematic clusters. The red cluster, which is focused on environmental, social, and governance (ESG), links to related subjects like sustainability, COVID-19, and corporate social responsibility (CSR), indicating that ESG issues are closely related to more general sustainability issues and crises. The green cluster highlights the financial tools and investment approaches that propel sustainability transitions and includes green bonds, sustainable development, responsible investment, and impact investment. Climate change, financial performance, and ESG investing are all included in the blue cluster, which reflects the expanding body of research on the financial effects of sustainability-focused investments. The yellow and purple clusters, on the other hand, focus on regulatory frameworks and the difficulties of sustainability compliance while addressing climate finance, green finance, EU taxonomy, and greenwashing. Overall, by combining aspects of financial performance, environmental responsibility, regulatory frameworks, and ethical investment practices, this visualization emphasizes the multidisciplinary nature of sustainable finance. The network's structure indicates that ESG principles are a key tenet of sustainable finance research, which is developing into an interconnected field. Future research could examine how strong these connections are over time and evaluate how global sustainability initiatives and regulatory changes affect financial markets and investment strategies.



Source – VOS Viewer

Fig5 – Co- occurrence with indexed key words

The VOSviewer-generated visualization shows a network analysis of investment, finance, and sustainability-related keywords grouped into two different thematic clusters. Mostly associated with terms like "climate change," "commerce," "financial markets," and "finance," the red cluster is centered around "investments," "sustainable development," and "sustainable finance." This shows that traditional financial mechanisms and investment strategies related to sustainability are strongly correlated. The green cluster, which is dominated by the terms "investment," "sustainability," and "financial system," shows links to "environmental economics" and "governance approach," suggesting a thematic focus on incorporating sustainability principles into frameworks for governance and the economy. The connections between the two clusters show how financial investment and sustainability initiatives intersect, indicating the increasing importance of sustainable finance in discussions about the economy and the environment. The thickness of the lines, which represents the strength of the links, highlights the multidisciplinary nature of sustainable investment research by further illuminating the differing degrees of association among these concepts.



source Vos Viewer

Fig 6 – Co authorship with authors

A network analysis of co-authorship is presented in the visualization created with VOSviewer, highlighting the connections between academics in the field. The network's numerous disjointed clusters and individual nodes suggest a disjointed environment for research collaboration. Boiral, Olivier, and Talbot, David, collaborate the most, forming a clear red cluster that suggests a recurring academic partnership. Likewise, a small green cluster connecting Todd Cort and Daniel C. Esty indicates a common research agenda. Meo, Muhammad Saeed, Dimmelmeier, Andreas, Lehner, Othmar M., Danilov, Yuri A., and Busch, Timo are among the other authors who show up as isolated nodes, suggesting that there are few or no co-authorship connections in this dataset. The general arrangement implies that there may not be many networks of scholars working together, and that research activities in this field may be largely autonomous. These results demonstrate how more interdisciplinary cooperation could improve the field's research integration.

4. DISCUSSION AND CONCLUSION

Critical insights into the structural dynamics of institutional collaborations, global partnerships, and thematic trends in sustainable finance can be gained from the network analyses displayed through VOSviewer visualizations. The importance of Germany, the United States, and the United Kingdom as major hubs in the global network highlights their crucial roles in promoting connections around the world, which are probably fueled by influence in politics, the economy, or science. China-Hong Kong and Germany-Italy-Malaysia are two examples of regional clusters that highlight bilateral or multilateral ties that may go beyond geographic proximity and reflect specific strategic alliances. For example, Malaysia's membership in a cluster with a European focus points to specialized partnerships, possibly in industries like technology or trade. In a similar vein, the United States' ties to China and Hong Kong highlight how competition and collaboration interact in international finance and innovation. These trends show that shared strategic interests and regionalism both influence global networks. On the other hand, networks of institutional collaboration present a different image of fragmentation. Siloed research efforts are indicated by the absence of close ties between organizations like Yale University, CEPR, and the Institute of Islamic Banking. There may be opportunities for interdisciplinary bridges because specialized organizations like the Institute of Islamic Banking may work in niche fields (like Islamic finance) with little connection to more general economic or management research. Even high-impact institutions like Yale and CEPR may prioritize independent or internal projects over collaborative endeavors due to their spatial dispersion, which could impede the synthesis of knowledge. A multidisciplinary field combining ESG principles, financial instruments, climate research, and regulatory challenges is revealed by thematic analyses in sustainable finance. The green cluster's emphasis on green bonds and impact investment represents market-driven solutions, while the red cluster's focus on ESG and COVID-19 highlights how global crises speed up sustainability discourse. The conflict between innovation and compliance is emphasized by regulatory frameworks (purple/yellow clusters), especially when it comes to combating greenwashing. Terms like "climate change" and "financial markets" combine environmental and economic agendas, further reinforcing the convergence of sustainability and finance. Together, these clusters show how sustainable finance is developing into a complex and interconnected ecosystem. Co-authorship patterns further expose fragmentation, with isolated researchers and small clusters like Boiral-Talbot or Cort-Esty dominating. This suggests that while individual partnerships thrive, broader academic integration remains limited, potentially constraining the field's holistic development. This study elucidates the dual nature of global academic and institutional networks: while international partnerships demonstrate robust hubs and cross-border synergies, institutional and co-authorship networks reveal significant fragmentation. Thematic clusters in sustainable finance emphasize its multidisciplinary nature, integrating environmental, economic, and regulatory dimensions, yet also highlight the need for stronger interdisciplinary collaboration.

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