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IMPLICATIONS OF FINANCIAL-BANKING ENTITIES IN FINANCING CLIMATE ACTION AND ENVIRONMENTAL SUSTAINABILITY

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Abstract
For most countries, implementing climate policies and stimulating green finance is an important concern. The transition to a low-carbon economy can create new financing opportunities for the financial and banking system. While many studies focus on the role of environmental and climate change policies to support the transition to a low-carbon and climate-resilient economy, this research aims to highlight the implications for the financial-banking system and other financial institutions in financing climate action and environmental sustainability.

Keywords: *climate policies; low-carbon economy; green finance*

JEL Classification: *F15, O52*

I. INTRODUCTION

The effects of climate change are at the center of attention of central banks, financial regulators and supervisors. Climate and environmental risks may affect financial stability, but they also offer new opportunities for green finance: the financial sector can become an important driver in mobilizing trillions of much-needed climate finance (WB, 2024). The banking sector's commitment to net zero targets is an indicator of the growing popularity of sustainable banking practices. In 2023, the United Nations (UN) convened the Net-Zero Banking Alliance (NZBA), which includes 138 of the world's leading banks from 44 countries and representing 41% of all banking assets, to address this emerging threat. The global banking sector, which manages more than $9.5 trillion in assets, has taken up the challenge to strategically align its operations and gear its lending and investment portfolio towards net zero GHG emissions by 2050, in line with the Paris Agreement.

Financial-banking organizations' participation in funding climate action and environmental sustainability is becoming crucial in the context of globalizing efforts to combat climate change, and incorporating artificial intelligence into decision-making processes can improve the effectiveness of resource allocation and the discovery of sustainable investment opportunities (Dragomir & Alexandrescu, 2017).

In this context, financial-banking entities play a pivotal role not only in mobilizing resources for climate action but also in ensuring that these resources are allocated securely and efficiently. The integration of advanced tools for hierarchical security modeling can enhance the robustness of financial systems by safeguarding transactions and ensuring compliance with environmental, social, and governance (ESG) standards. These tools provide a structured approach to identifying and mitigating risks at various levels, which is essential for maintaining trust and stability in the financial sector while pursuing sustainability goals (Dragomir et al., 2019). By leveraging such technologies, credit institutions can align their operations with global climate objectives, ensuring that their investments contribute to both environmental preservation and long-term financial resilience (Chelba & Cosmulese, 2024). The implications of financial-banking entities in financing climate action and environmental sustainability highlight an emerging trend in the literature, and a bibliometric analysis of bankruptcy risk assessment models emphasizes the importance of integrating sustainability criteria into risk management strategies, thus strengthening the role of these entities in the transition to a green economy (Grosu et al., 2024) Thus, the aim of this paper is to carry out a bibliometric analysis of the literature on the involvement of banking institutions in climate finance and environmental sustainability by consulting the papers identified on the Web of Science (WOS). The results obtained are represented by the construction of a research agenda in which information is recorded that provides a broad perspective on the evolution of the topic under analysis.

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II. LITERATURE REVIEW

The sustainability transition process is changing the role and functions of banks, in particular their products and services in relation to their stakeholders (Buboi (Danaila) & Cosmulese, 2024). Banking institutions are seen as one of the main actors supporting the transition towards a sustainable economy (Macovei, 2024). New trends in economy such as: eco-taxes, green investment funds, green public procurement, eco-innovations in industry, low-carbon economy or alternative energy sources have become important sources of financing in economic and social processes (Ryszawska & Zabawa, 2018).

Banks are considered as important financial intermediaries in the economy, collecting liquidity from excess units and distributing it to those with shortages. Thus, banks through their financial activities help the economy to progress in a stable way. So, in order to face the fulfillment of sustainable development goals, banking institutions need to get involved in green activities. The development of policies and guidelines, combined with their effective application, can successfully ensure the implementation of green finance by credit institutions (Julia & Kassim, 2020), while integrating artificial intelligence techniques to enhance cybersecurity and safeguard financial transactions (Dragomir, 2017).

The relatively small scale of funds to finance massive investments for the shift to a green economy is a big challenge. The European Investment Bank is seen as an important investment banking institution in the EU that will become a green bank in the near future, as 50% of its lending is earmarked for the green economy by 2025 (Griffith-Jones, 2022).

Between 2012-2020, the EIB reported that it provided €197 billion in financing, supporting investments worth €670 billion in projects that protect the environment, reduce greenhouse gas emissions and help countries adapt to the effects of climate change. The EIB aims to increase its share of financing for climate action and environmental sustainability to 50% by 2025, which is expected to generate €292 billion of EIB financing between 2021-2030.

Table 1. BEI financing and investments supported for climate and environment (€ billion)

Period	2012-2020	2021-2030 (estimate)
BEI		
Total funding over the period	599	630
Climate and environment funding	197	292
Of which climate actions financed by the FEIS (Invest EU)	19	23
FEI		
Total funding over the period	54	100
Climate and environment funding	unregulated	10
BEI and FEI		
Total investments supported for climate and environment	670	1000

Source: European Court of Auditors, based on information from the EIB Group.

Globally, the sustainable finance market is expected to grow significantly, with projections indicating that it will increase from USD 3.6 trillion in 2021 to USD 23 trillion by 2031 (PWC).

At the level of national banking sectors, a special category of banks can be identified, namely green banks. They facilitate and leverage private investment in national projects to reduce carbon emissions and contribute to building an infrastructure that is resilient to current climate change. In response, a lot of governments and countries have created the so-called public green investment banks to definitely facilitate the financing of global projects to meet some or all of the Sustainable Development Goals by the end of 2030 (Niyazbekova et al., 2021).

In the United States, Congress, together with President Biden, approved the creation of a federal green bank with an initial public capital of $27bn. The key roles of investment banks include facilitating counter-cyclical financing and providing resources for structural transformation. In addition, they are expected to help create broad inclusion, finance public goods and meet new challenges to support the post-cyclical recovery and ensure that it is aligned with green goals and standards (Stephany Griffith-Jones, 2022).

These banks use green bonds as their primary tool for attracting finance. Green bonds are considered one of the most important innovations in sustainable finance known in the last decade. Based on Figure 1, it can be seen that the green bond market during 2014-2023 satisfactorily dominated with bonds being issued with a cumulative total of $2.2 trillion, and the highest value was in 2021 with an approximate value of $600 billion. The 2022 period is marked by a decline in the number of green bonds, the main cause being the war in Ukraine which caused increases in energy prices, inflation and market interest rates.

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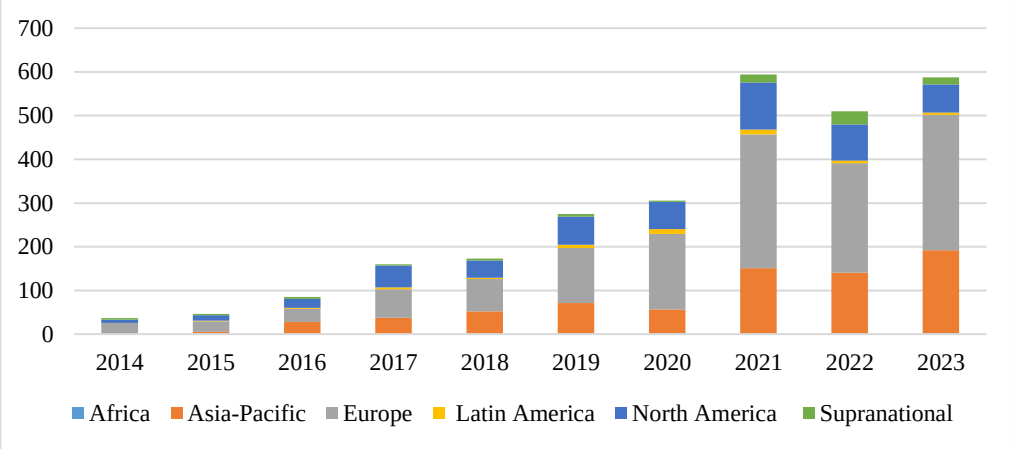

Figure 1. Green bonds issued by region 2014-2023, $ bn

Source: Climate Bonds Interactive Data Platform, Retrieved 3 May, 2024 from: https://www.climatebonds.net/market/data.

Banks in Romania play a crucial role in green financing. Many banks in Romania have started to offer green loans dedicated to financing renewable energy, energy efficiency, sustainable production and other sustainable initiatives. These loans are offered with more favorable interest rates, technical assistance or other advantageous conditions to encourage investments in green projects.

Banks are also active in issuing green bonds on the Romanian market. They are used to mobilize private capital exclusively to finance sustainable projects.

III. RESEARCH METHODOLOGY

In order to achieve the proposed objectives, we conducted a bibliometric analysis, the reason why we opted for this type of analysis is that it allows the management of hundreds or even thousands of articles, but also of other indicators specific to quality research. Within this approach, we managed to collect data using the international Web of Science (WoS) database where the search protocol applied was the following:

Table 2. Grouping of WoS research results

Database	Web of Science Core Colletion	Results
Topic	„banking institutions and climate action financing” și „banking institutions and sustainability financing”	**252**
Analysis period	2002 – november 2024	
Published works	All types of documents	
Application of exclusion criteria		**177**

Source: own elaboration using WoS database

This resulted in 252 published scientific papers on banking institutions in climate action and sustainability finance, but the following exclusion criteria were applied: eliminating papers such as corrections and reprinted publications, and restricting the WoS research categories to nine, namely Management, Business, Economics, Business Finance, Environmental Studies, Environmental Sciences, Ethics, Ecology. Thus, we obtained 177 papers published between 2002 and November 2024. The data were exported from the WoS platform with the Full record and Cited references option and further processed in the VoSViewer program to perform a keyword and citation-based biliometric analysis.

IV. RESULTS AND DISCUSSIONS

In order to profile the topic of banking institutions in climate finance and environmental sustainability we have presented below the evolution of publications according to the data obtained by applying the search protocol mentioned in the previous section on WoS.

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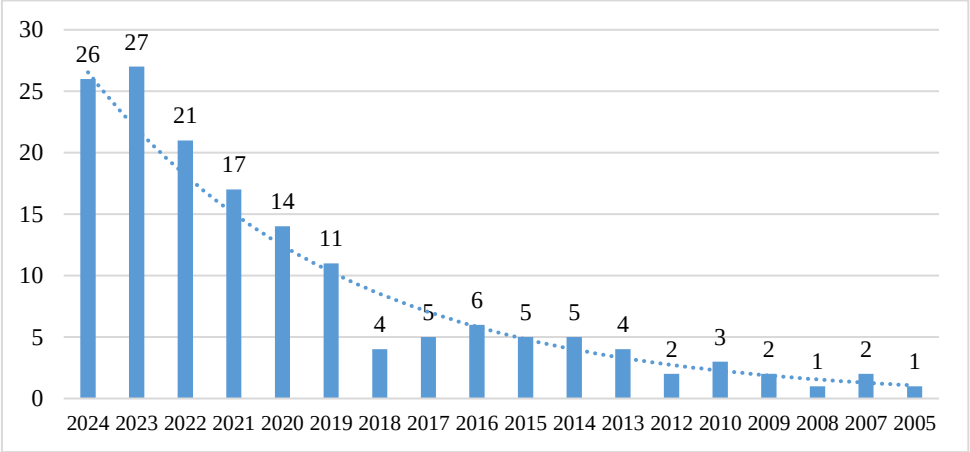

Figure 2. Evolution of papers by year of publication

Source: Source: own elaboration using WoS database

In Figure 3, we observe an oscillating evolution of papers published between 2005 and November 2024, but with considerable growth points between 2019 and 2024 and in 2023 the highest number of papers is recorded when 27 papers were published and indexed, which shows the increased interest of researchers on this topic during that period.

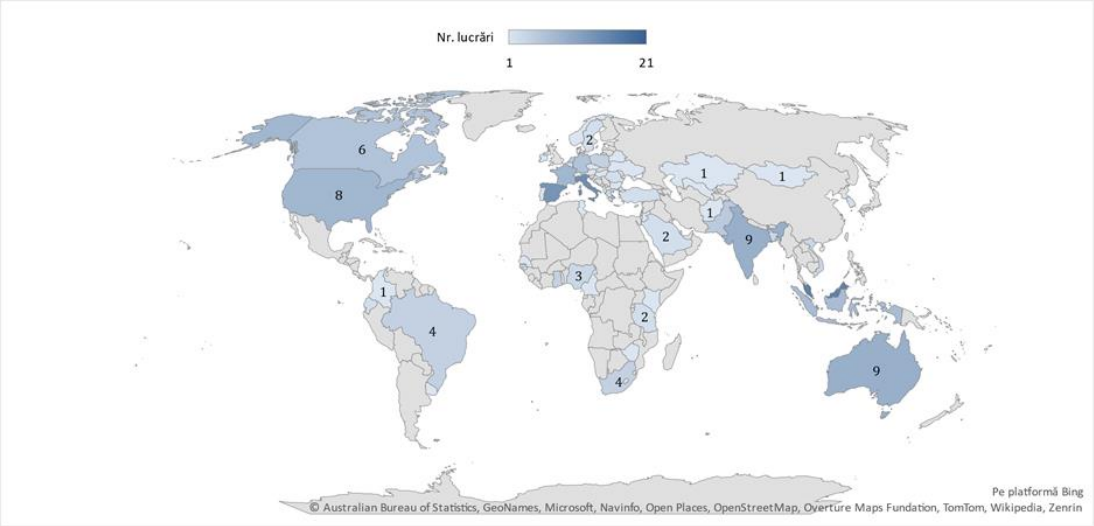

Figure 3. Number of scientific research published globally based on WoS data

Source: own elaboration using Microsoft 365 software (2024)

Regarding the analysis by country on the Web of Science database, it can be seen in Figure 3 that China ranks first with 21 papers, then the second place is occupied by Malaysia with 16 papers, followed by the third and fourth place, occupied by Italy (with 14 scientific papers) and Spain (with 13 scientific papers). It is worth noting that Romania also appears with 2 papers, which shows that our country shows an interest in this topic.

Based on the data downloaded from the WOS platform and with the help of the VOSviewer software, we performed a quantitative mapping of the topic banking institutions in climate action and sustainability finance through a bibliometric analysis of publications to highlight the importance of this topic.

From Figure 4 we observe that the network groups the terms into five clusters according to their relevance, where their frequency is highlighted by the size of the circles. The first and largest cluster comprises 15 terms (highlighted by red color) and is focused on the concept of sustainability, encompassing terms such as world banking, climate finance, green finance, renewable energy, economic growth and others. The second cluster, consisting of 14 items, brings to the fore the concepts of performance, banks, financial institutions, stakeholders, industry, governance, impact and others. The third cluster (dark blue color in Figure 3) consists of 10 items and focuses on banking along with terms such as bibliometric analysis, microfinance institutions, credit, determinants, financial inclusion, etc. The fourth cluster (yellow color in Figure 3) consists of 7 items and includes the following terms: sustainable finance, sustainable banking, finance, sustainable development, ESG, model, etc.

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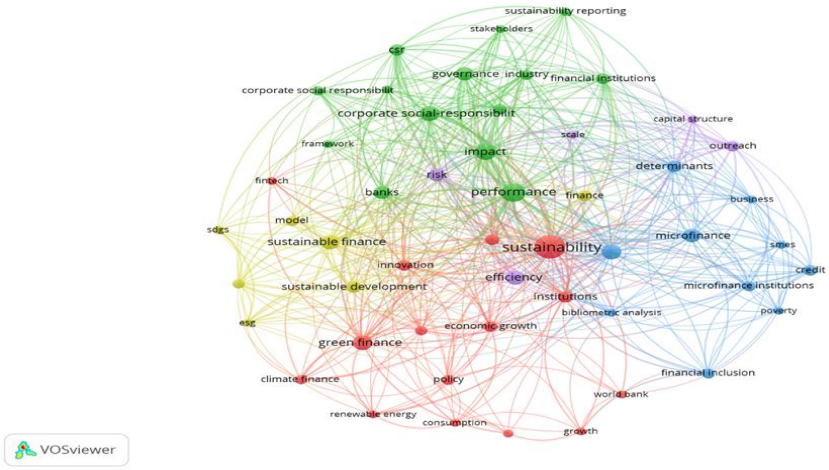

Figure 4. Keyword frequency network for the theme banking institutions in climate action and sustainability finance on WoS (2002- November 2024)
Source: own elaboration using VOSviewer software

The fifth cluster (purple color in Figure 4) and last cluster emphasizes efficiency, being circumscribed around five concepts including: capital structure, risk, scale and others.

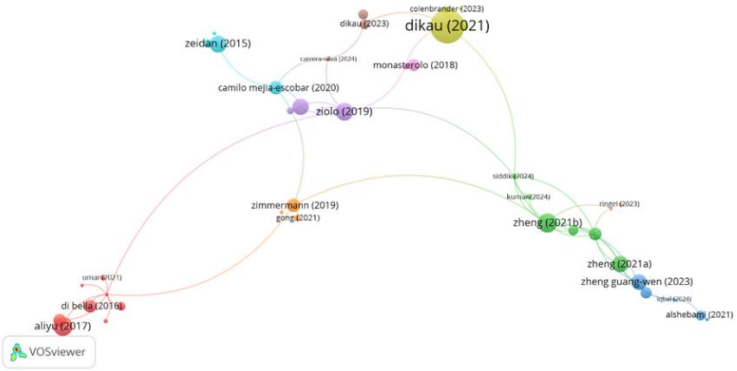

Figure 5. Network of published papers by number of citations
Source: own elaboration using VOSviewer software

Figure 5 shows the network of scientific research papers published on the topic of banking institutions in climate action and sustainability finance, by number of citations and links between them.

The network illustrated in Figure 5 classifies the cited papers into 10 different color groups according to citation frequency. The broadest cluster is represented in the network by the color red and comprises 8 significant research papers on banking institutions in climate action and sustainability finance, where Aliyu (2017) has the most citations in this cluster. Cluster number 8, which is colored in yellow, presents 3 papers which contains one paper that has the most citations in the entire analysis namely Dikau (2021), this author has contributed significantly to the study on the topic banking institutions in climate action and sustainability finance. Table 2 presents the top 10 papers that have the most citations of academic papers that have addressed the theme banking institutions in climate action and sustainability finance.

Table 3. Top 10 most cited scientific papers on banking institutions in climate action and sustainability finance

Authors (year)	Title manuscript	Number of citations	Number of links
Dikau & Volz (2021)	Central bank mandates, sustainability objectives and the promotion of green finance	195	6
Zheng et al. (2021)	Factors affecting the sustainability performance of financial institutions in Bangladesh: the role of green finance	71	8
Aliyu et al. (2017)	Islamic banking sustainability: a review of literature and directions for future research	68	2

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Ziolo et al. (2019)	How to design more sustainable financial systems: the roles of environmental, social, and governance factors in the decision-making process	59	6
Zeidan et al. (2015)	Developing a sustainability credit score system	55	3
Urban & Wójcik (2019)	Dirty banking: probing the gap in sustainable finance	53	4
Zheng et al. (2021)	Green finance development in Bangladesh: the role of Private Commercial Banks (PCBs)	51	5
Zheng & Siddik (2023)	The effect of Fintech adoption on green finance and environmental performance of banking institutions during the COVID-19 pandemic: the role of green innovation	47	5
Mejia-Escobar et al. (2020)	Sustainable financial products in the latin america banking industry: current status and insights	36	4
Zimmermann (2019)	Same same but different: how and why banks approach sustainability	35	5

Source: own elaboration using VOSviewer software

The most cited paper (195 citations) is by Dikau & Volz (2021) and examines how addressing climate risks and supporting mitigation and adaptation policies fit within central bank mandates. The second scientific paper presented in Table 2 belongs to Zheng et al. (2021), this study examines the dimensions of green finance and their effects on the sustainability performance of financial institutions in developing economies. The next article by number of citations belongs to Aliyu et al. (2017), this paper reviews the literature on the sustainability of Islamic banks and presents directions for future research. This article also presents the views of scholars and practitioners on the two perspectives of sustainability in relation to the objectives of Islamic banking and finance.

V. CONCLUSIONS

We note that banks today have an important role to play in financing the transition to a new zero-carbon economy. Green banks are those banking institutions that stimulate and incentivize investors to turn to green sources of finance to support a green environment. The concept of net-zero banking, which seeks to integrate financial services with environmental and social sustainability objectives, is thus becoming increasingly important for global efforts to combat climate change.

With regard to the bibliometric analysis of the thematic area, a significant increase in research on sustainable finance after 2019 has been observed over the period analyzed (2005 - 2024).

Regarding the limitations of this study, we mention however that there may be other valuable studies, but they are not indexed in the WOS database and as such could not be included in the analysis. Likewise, regarding the top most cited scientific papers, we considered as the most relevant papers those that have registered the highest number of citations. Thus, the paper with about 200 citations (195 citations) is written by Dikau & Volz and examines how addressing climate-related risks and supporting mitigation and adaptation policies fit within the mandates of central banks.

REFERENCES

1. Aliyu, S., Hassan, M. K., Mohd Yusof, R., & Naiimi, N. (2017). *Islamic banking sustainability: A review of literature and directions for future research. Emerging Markets Finance and Trade,* 53(2), 440-470. https://doi.org/10.1080/1540496X.2016.1262761.
2. Buboi (Danaila), A., Cosmulese, C.G. (2024). The basics of ESG integration in the banking sector: Effects on asset management and the growth of the green bond market. European Journal of Accounting, Finance & Business 12 (1), 76-82.
3. Chelba, A. A., & Cosmulese, C. G. (2024). Methods of resilience of venture funds in business. USV Annals of Economics & Public Administration, 24(1(39)), 202-208.
4. Climate Bonds Interactive Data Platform, Retrieved 3 May, 2024 from: https://www.climatebonds.net/market/data.
5. Curtea de Conturi Europeană. Retrieved https://www.eca.europa.eu/ro
6. Dikau, S., & Volz, U. (2021). *Central bank mandates, sustainability objectives and the promotion of green finance. Ecological Economics,* 184, 107022. https://doi.org/10.1016/j.ecolecon.2021.107022.
7. Dragomir, F. L., Alexandrescu, G., & Postolache, F. (2019). Tools for Hierarchical Security Modeling. eLearning & Software for Education, 4. 34. Retrieved 3 May 2024 from: https://proceedings.elseconference.eu/index.php?paper=0aef59d60bc72e184c9bac848aa6b9bc
8. Dragomir, F. L., & Alexandrescu, G. (2017). Aplicații ale inteligenței artificiale în fundamentarea deciziei. Buletinul Universității Naționale de Apărare „Carol I", 4(2), 56-61. Retrieved 3 May 2024 from: https://revista.unap.ro/index.php/revista/article/view/342
9. Dragomir, F. L. (2017). Artificial intelligence techniques cybersecurity. In International Scientific Conference" Strategies XXI" (Vol. 3, p. 147). " Carol I" National Defence University, Bucharest. Retrieved 13 May 2024 from: https://www.proquest.com/docview/1890238220?pq-origsite=gscholar&fromopenview=true&sourcetype=Conference%20Papers%20&%20Proceedings

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Volume **12**/2024 ISSN 2344-102X
Issue 2 / **June** 2024 ISSN-L 2344-102X

10. Grosu, V., Chelba, A. A., Melega, A., Botez, D., & Socoliuc, M. I. (2023). Bibliometric analysis of the literature on evaluation models of the bankruptcy risk. Strategic Management-International Journal of Strategic Management and Decision Support Systems in Strategic Management, 28(2). https://doi.org/10.5937/StraMan2200035G
11. Julia, T., Kassim, S. (2020). *Green Banking*. In: Haron, R., Md Husin, M., Murg, M. (eds.), Banking and Finance, IntechOpen, London, United Kinfdom pp. 91-95, doi: 10.5772/intechopen.93294.
12. Macovei, A.G. (2024). Optimization of resources through modern decision-making technologies as a function of capital invested, European Journal of Accounting, Finance & Business, 12(1), 100-107.
13. Niyazbekova, S., Troyanskaya, M., Toygambayev, S., Rozhkov, V., Zhukov, A., Aksenova, E., & Ivanova, O. (2021). Instruments for financing and investing the "green" economy in the country's environmental projects. In E3S Web of Conferences (Vol. 244, p. 10054). EDP Sciences. https://doi.org/10.1051/e3sconf/202124410054.
14. Ryszawska, B., & Zabawa, J. (2018). *The Environmental Responsibility of the World's Largest Banks*, Revista Economics and Business, 32(1), 51-64. https://doi.org/10.2478/eb-2018-0004
15. Griffith-Jones, S. (2022). *The key roles of development banks*, Revista Tempo do mundo, 29, 16-17, http://dx.doi.org/10.38116/rtm29intro.
16. Zheng, G. W., Siddik, A. B., Masukujjaman, M., & Fatema, N. (2021). *Factors affecting the sustainability performance of financial institutions in Bangladesh: the role of green finance.* Sustainability, 13(18), 10165. https://doi.org/10.3390/su131810165.
17. PWC, Net-zero banking creating a long term and sustainable financial services economy. Retrieved 3 May, 2024 from: https://www.pwc.in/blogs/net-zero-banking-creating-a-long-term-and-sustainable-financial-services-economy.html

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