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CLIMATE RISK IN BANKS – THE CASE OF POLISH BANKING SECTOR

ABSTRACT

Objectives: The issues of environmental protection, including stopping the degrading climate change, are currently a subject of particular interest of the scientific community, policymakers, practitioners, but also all people around the world. Banking institutions, as a giver of capital, play a special role in financing climate protection activities. On the other hand, they are particularly exposed to climate risk, identified with the probability that extreme natural hazards may cause adverse effects, including the loss of people's lives, their property or other economic assets, which became the main research topic in the article. The main purpose of the paper is climate risk exegesis and to analyze the degree of climate risk inclusion in the bank risk management process in the case of the Polish banking sector. The conducted empirical research verified the research hypothesis stating that the Polish banking sector is becoming more and more oriented towards the climate risk among the bank risk management systems.

Material and methods: The following research methods were used in the paper: survey questionnaire method, case study analysis, observation method and synthesis method. The research procedure included two stages of questionnaire research, followed by the analysis and evaluation of the obtained results.

Results: It has been shown that the Polish banking sector defines its climate goals and is increasingly sensitive to the climate risk management, including them in its risk management systems. It also assesses exposure to climate risk in terms of physical and transitional risk.

Conclusions: The research and results presented in this study are important in building political awareness as well as public, social and economic activities in the field of counteracting climate threats. However, banks' awareness is very important for financing projects that reduce degrading impact on climate.

KEYWORDS: *climate risk, climate risk management, ESG factors, climate change, bank risk management system*

INTRODUCTION

Climate change that have been occurring since the industrial revolution, but intensifying in recent decades, is the subject of interest and socio-political discussions of nearly all people around the world. It is predicted that the scale of climate threats by the end of this century will be significant enough to cause life-threatening conditions for many thousands or even millions of people, while economic losses – difficult to estimate at the moment – will be significant enough that can lead to the recession of areas particularly exposed to these phenomena. Progressive climate change can make that many areas of the world uninhabitable for most of the year (Sherwood & Huber, 2010), that's why they are considered as a threat to cultural heritage (Fatorić & Seekamp, 2017).

Changes in climate variables, such as temperature, wind and precipitation, not only hinder normal life on Earth. At the same time, they are a component of a new type of risk – *climate risk*, which has developed along with more and more frequent and intense extreme weather conditions. The Intergovernmental Panel on Climate Change (IPCC) indicates that limiting the average temperature increase to less than 2°C above pre-industrial level is a fundamental step towards protecting life on earth and limiting the growing climate risk (Field et al., 2014). An important role in the process of curbing climate change is undoubtedly played by banking institutions as providers of capital to finance transformation of economies and companies towards low-emissions. The issue of the banks' involvement in the financing climate-responsible projects is an increasingly popular research subject. However, while bank's activity in the context of sustainable financing and climate aspects is gaining importance, which is manifested by growing number of research and publications on this subject, the issue of climate risk, i.e. the risk associated with climate change, is still a poorly explored research area. Climate risk in this study is understood as the probability that extreme natural hazards may cause adverse effects, including the loss of people's lives, their property or other economic assets. The identified research gap was the main motivation to undertake this research. Therefore, the main aim of the article is climate risk exegesis and to analyze the degree of climate risk inclusion in the bank risk management process in the case of the Polish banking sector. The conducted empirical research

enabled to verify the research hypothesis stating that the Polish banking sector is becoming more and more oriented towards climate risk among the bank risk management systems.

The article has a theoretical and empirical nature. In the first section, a broad literature review was carried out, covering foreign literature on the climate change and climate risk management. The second section presents the methodology of conducted research. It was indicated that the following research methods were used in the empirical research: survey questionnaire method, case study analysis, observation method and synthesis method. The research procedure included two stages of questionnaire research, followed by the analysis and evaluation of the obtained results. The third section is a presentation of the results obtained regarding a degree of banks' involvement in the concept of sustainable finance, projects aimed at curbing climate change and banks' orientation to climate risk. The article ends with the *discussion and conclusions* section, which includes the final considerations and summarizes main research conclusions.

LITERATURE REVIEW

Climate is a combination of various physical variables such as precipitation, temperature and wind. Any changes in time and space in these climate variables cause transformation in the climate system in a long term. The concept of risk in relation to climate change has been developed since the 1980s (Brundt & Margreth, 2015). Initially, these studies focused mainly on the identification of climate threats, an attempt to develop a concept of newly created on this basis climate risk, or the assessment of exposure and vulnerability to this risk of various areas and stakeholder groups (Hewitson et. al., 2014; Cardona et. al., 2012; Jurgilevich, Räsänen, Groundstroem & Juhola, 2017). However, considerations regarding a need to stop climate change were intensified in the following decades along with the increasingly common socio-political conviction about the degrading impact of human activity and technological progress on the natural environment.

In recent years, there has been a significant increase in the number of studies and publications among the scientific community on climate change,

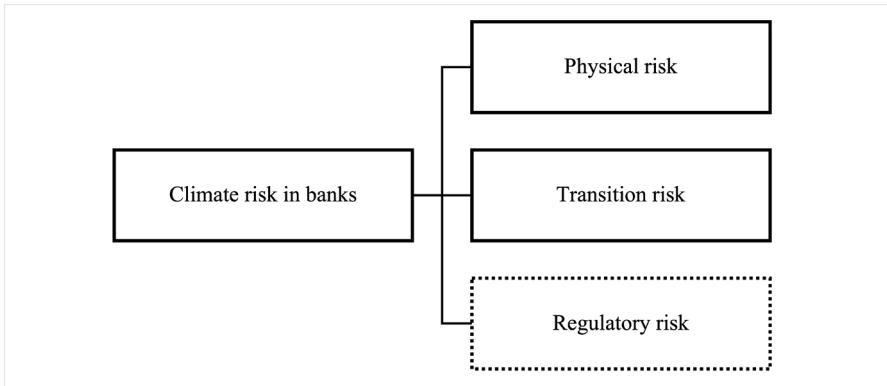
its effects on the global economy, as well as the climate risk accompanying the ongoing changes. The concept of *Environmental-Social-Governance* (ESG), including the location of environmental and climate aspects in it, has become the subject of scientific and political dialogue at various levels – local, national and international (Pyka & Nocoń, 2021). However, appropriate assessment of the consequences of changing natural environment, including climate risk and its factors for individual groups, f.e. enterprises and financial institutions, is extremely difficult and complicated. On the other hand, knowledge on this subject seems to be essential for effective climate risk management.

In the literature, there are many studies and publications that try to define climate risk, its essence and characteristics. Risk and vulnerability to climate change have been defined in different ways. To a large extent, these approaches focus on scientific and technical factors, marginalizing socio-cultural and political-economic ones. Wang, Pan, Ke, Wang & Wei (2014) in research for the period of 1991–2012 on the scale of interest of the scientific community in climate change showed that since 2006 the number of studies and publications on this subject has increased dramatically. The second decade of the 21st century saw a further increase in the number of research undertaken on climate change, determined by global concern and the awareness of a need for urgent intervention and stopping further changes. The third decade of the current century, which is already characterized by a significant level of knowledge and awareness on this subject, is a continued increase in interest in climate risk and strategies for managing this new type of risk.

Climate risk is the likelihood that extreme natural hazards may cause adverse effects, including the loss of human life, property or other economic assets (Balica, Wright & van der Meulen, 2012; Esnard, Sapat & Mitsova, 2011). While Cervest (2022) points out that climate risk is the potential for climate change to create adverse consequences for human or ecological systems. This includes impacts on lives, livelihoods, health and wellbeing, economic, social and cultural assets and investments, infrastructure, services provision, ecosystems and species. Since 1992, the Intergovernmental Panel on Climate Change (IPCC) has been publishing reports focusing on the concept of climate risk and the components of climate change. In the IPCC Fifth Assessment Report of 2014, the concept of climate risk was presented, while indicating that humans are the

main cause of global warming, and the scale of environmental damage since the 1950s is unprecedented (Field et al., 2014). Since 1951, more than half of the increase in global average temperature has been due to human influence on climate (Knutson, Kossin, Mears, Perlwitz & Wehner, 2017). Field et al. (2014) in the IPCC report also states that the more human activity disrupts the climate, the greater risk of severe and irreversible impacts on people and ecosystems and long-term changes to all components of the climate system. In turn, costs of stopping the growing climate risk are getting higher and in the future may exceed the economic capacity of individual countries. The Basel Committee on Banking Supervision (2021) defines climate risk drivers. It states that climate risk drivers have a number of distinct features, including unprecedented frequencies, speeds and intensities and the non-linear form that the risks are expected to take. Together, these factors give rise to a material level of uncertainty as to how climate risk drivers and their impacts will evolve. Woetzel et al. (2020) add that addressing climate risk will require more systematic risk management, accelerating adaptation and decarbonization.

Nowadays, it is recognized that climate change, generating climate risk, is a source of financial risk. They affect security of individual participants of the financial system, including security of a banking sector, through physical threats (such as extreme weather phenomena), as well as transformation-related risks – e.g. uncertainties associated with the transition to a low-carbon economy. From the banking institutions point of view, the analysis and assessment of climate risk helps them to increase their resilience to climate and transformation shocks, which in turn helps to maintain their stability and financial condition. Colas, Khaykin & Pyanet (2020) indicate that climate risk in a banking institution can be of a twofold nature (figure 1). The first dimension of climate risk is *physical risk*, when sudden weather events (intensive storms, floods, mudslides, heat waves) destroy assets of an institution itself or when they reduce the value of collateral for loans granted (e.g. real estate), and thus increase the risk of insolvency of bank customers. However, physical risk has little importance in relation to the damage to assets of banks themselves. From the perspective of banking institutions, it refers mainly to the credit exposures of their clients – enterprises or sectors that will experience negative effects of climate disasters.

Figure 1. *Climate risk dimensions in banks*

Source: own work

The second dimension of climate risk in banks is the *transition risk*, which is associated with the transition to a low-carbon economy, which means transformation of banks' customers and their activities (especially those related to coal mining, power generation, oil and gas distribution), through more stringent regulations, implementation of breakthrough technologies or changes in their business models and operations. Therefore, transition risk is important both for recipients of capital and for donors of capital – banks.

In the literature, there are also an approach in which, apart from physical and transition risk, the third dimension of climate risk is mentioned, which is *regulatory risk* (figure 1). With the increased awareness and involvement of central banks and financial supervision authorities in the need to curb climate change, the regulatory discipline in the field of risk management, including climate risk in banks increases. Climate stress tests are already being carried out in many countries, indicating to banks initiatives that should be taken and adapted to the growing scale of climate risk. This may generate the risk of having to comply with increasingly stringent standards and regulations.

Following global guidelines and regulations at the national and international level, the latest research trend on climate risk in banks focuses on the analysis of ongoing strategic and organizational changes in order to effectively manage climate risk (ECB, 2020; Chenet, Ryan-Collins & van Lerven, 2021). Toma & Stefanelli (2022) created a spectrum of climate risk standards, and

then, on this basis, made a strategic assessment of selected banks in Italy, presenting a map of their positioning based on strategic and organizational aspects that they have achieved in managing climate risk. They showed that banks should put more organizational effort into specific areas of financial management in order to strengthen the fight against climate change. Mueller & Sfrappini (2022) identified an impact of regulatory risk related to climate change on lending activities of banks. Their results indicate that the financial effects of climate change-related regulations are the main factors influencing banks' behaviour and changes in their lending policies. Li, Li & Lu (2022) studied an impact of climate risk on the supply of loans to the private and public sectors in a sample of 174 countries in the years of 2000-2019. They proved that climate risk has a significant negative impact on the supply of loans to the private sector and a positive impact on the public sector. They also provided evidence that the effect of climate risk has a more significant effect on credit supply in high-income countries than in low-income countries, suggesting a rapid spread of risk in high-income countries. Li & Wu (2023) also analyzed an impact of climate risk on the supply of bank loans on a sample of 403 commercial banks from China in the years of 2008-2018. They proved that climate risk has a significant negative impact on the supply of credit, but this impact can be mitigated by appropriate state policy in the field of climate protection and monetary expansion. In turn, Feridun & Güngör (2020) reviewed regulatory and supervisory practices in relation to climate risk in a banking sector. They indicated that the main regulatory and supervisory expectations can be divided into the following four areas: a) drawing bank managers' attention to climate risk and including it in internal management systems, b) incorporating climate risk into banks' strategies, c) identifying significant exposures to climate risk and disclosure of key ratios, d) assessment of climate risk impact on capital through scenario analysis and stress tests.

METHODOLOGY

The following research methods were used in the empirical studies: survey questionnaire method, observation method as well as synthesis method. The research procedure included two stages of questionnaire research, followed by the analysis and evaluation of the obtained results, which enabled verification of the research hypothesis stating that the Polish banking sector is becoming more and more oriented towards the climate risk among the bank risk management systems.

Questionnaire research was carried out in two periods among representatives of the 10 largest commercial banks in Poland, due to the fact that the share of these banks in the total assets of the Polish banking sector is 79.00% (Pyka, Nocoń & Pyka, 2021). Thus, it was assumed that the results obtained from surveys are representative and reflect the results for the whole banking sector. The first stage of the questionnaire survey was carried out in Q2 2021, while the second one in Q1 2023 with 129 respondents, of whom 26.36% held managerial positions and 73.64% represented risk management departments. 49.61% of the respondents had at least 10 years of work experience in a bank. The research sample included the following banks: PKO BP S.A., Bank Pekao S.A., Santander Bank Polska S.A., mBank S.A., ING Bank Śląski S.A., BNP Paribas Bank Polska S.A., Bank Millennium S.A., Alior Bank S.A., Citi Handlowy S.A. and Getin Bank S.A./VeloBank S.A.^[1] The purpose of the questionnaire research was to analyze and assess environmental aspects, social responsibility and corporate governance among commercial banks in Poland in the following areas: banks' policies regarding ESG factors, ESG risk and climate risk.

RESULTS

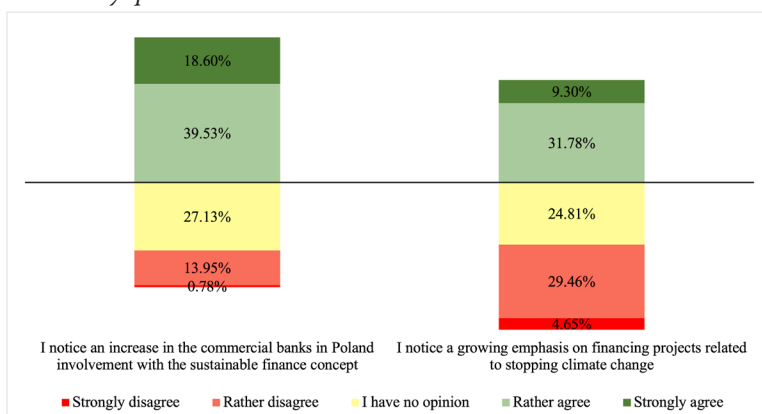
The first stage of the survey questionnaire concentrated on verifying commercial banks' in Poland awareness of a need to increase their involvement in aspects related to ESG factors, green finance and climate risk. 58.14% of the respondents (who marked the answers strongly and rather agree) indicated that they noticed an increase in banks' involvement in the sustainable finance concept (fig. 4). Only 14.73% of the respondents do not see changes in the functioning of the Polish banking

sector in terms of sustainable finance, and 27.13% of them have no opinion on this matter. The concept of sustainable finance is understood as a long-term support for sustainable development of the economy and building lasting relations with clients and other bank's stakeholders. The idea of sustainable finance, implemented into the mechanisms of the financial sector's functioning around the world, including the EU and Poland, results from the adopted climate policy and the European Green Deal, which the main aim is to direct a new stream of capital on investments in the real economy that will meet the postulates of sustainable development and will improve the operation of climate and environmental risk management mechanisms to ensure stability of the whole financial system. Currently, orientation towards implementation of sustainable finance assumptions for banking institutions is no longer just a global fashion or trend, but a kind of imperative for their further functioning on the market. Banks that will not support activities for sustainable development in the near future may not only lose their credibility and image, but also incur real losses in the form of decrease in the trust of their clients, which may be manifested by the loss of a significant clients' portfolio. This applies not only to banking institutions, but also to all business entities that want to function in a responsible and sustainable global economy. However, involvement in the concept of sustainable finance is not only related to their public declaration to achieve the indicated goals, but primarily concerns practical activities taking place in the area of transformation of banks' business models, adopted strategic assumptions and changes in their lending policy.

The conducted survey questionnaire also proved that commercial banks in Poland increase their activity in financing projects related to stopping climate change (figure 2). 41.09% of the respondents (who marked the answers strongly and rather agree) indicated that investments to combat climate change have an increasing chance of obtaining financing in the bank they represent. 34.11% of respondents do not notice such changes, and 24.81% are unable to determine it. As argued earlier, climate change significantly determines life on Earth. This applies to all aspects and spheres of socio-economic life. In 2021, the EU and its Member States allocated 23.04 bln EUR to finance climate actions, making them the world's largest source of public funding for this purpose (European Council, 2022). However, to achieve the climate goals, public investment is and will be insufficient, but it can help to mobilize and use private capital, which is necessary to redirect investment at the required

scale. Thus, private investments are key to achieving these objectives. Banks therefore play a special role as capital providers towards a low-carbon and climate-resilient society. Therefore from bank' perspective, it is important to consistently and fully disclose climate risk by potential recipients of capital, which is a precondition for decisions on the allocation of credit capital by banks. The effects of climate change must be taken into account to a greater extent by banks financing countries, industries and companies, primarily in their credit policy and risk assessment of financed projects.

Figure 2. Survey questionnaire results – Part 1

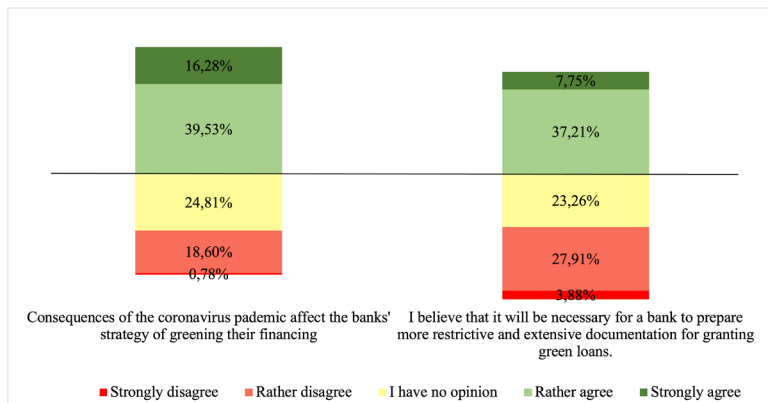


Source: own work

The conducted research in the following part showed that the coronavirus pandemic has influenced the greening of banks' lending policy in Poland (figure 3). This view is shared by 55.81% of respondents. 19.38% of them are against this opinion, and 24.8% have no opinion on this topic. The COVID-19 pandemic and the economic slowdown have posed new challenges to the banking sectors around the world. At the same time, they increased awareness of the concept of the global economy as a *global village* by H.M. McLuhan (McLuhan & Powers, 1989) and the unity of all its participants in achieving common goals. Banks, in addition to increasing lending, determined by a low level of interest rates and supporting economic growth during the lockdown, became even more involved in socially responsible activities. They intensified initiatives aimed at financing *green* investments, supporting inhibition

of climate change. One of their manifestations is development of banking products and financial instruments to support transition to a sustainable economy.

Figure 3. Survey questionnaire results – Part 2



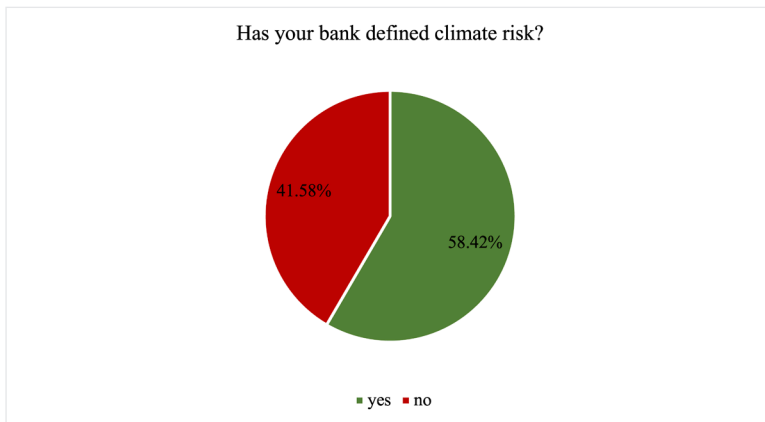
Source: own work

At the same time, the process of greening banks' loan portfolio will determine changes in the area of *green* products management and servicing. 44.96% of the respondents believe that it will be necessary to prepare more restrictive and extensive documentation for granting *green* loans (figure 3). 31.78% of them are of the opposite opinion, and 23.26% have no opinion on this matter. *Green* loans undoubtedly impose additional obligations on both donors and recipients of capital. First of all, even before granting a loan, a bank requires potential borrowers to clearly define purposes of using funds and to justify real benefits for the natural environment from their use. Banks also demand that in the description of the ecological project, clients should include all risks and possible problems that may potentially interfere with the project's implementation. In addition, it is required to present all certificates, permits or other documents related to the financed project. These projects are a subject to a more thorough and rigorous assessment by banks from the point of view of their possibility to achieve the assumed goals. Thus, even at a stage of the initial assessment of the financed *green* loans and a decision to undertake financing, banks are obliged to collect, develop and analyze much

more extensive documentation than that accompanying classic loans. The implementation stage of such projects also entails additional obligations on the part of both a recipient and a donor of capital. In order to ensure transparency, funds from green loans are made available in a special bank account and are not mixed with other borrower's financial resources. Moreover, a client should write down the internal policy rules regarding a control of funds used. Then, it is obliged to report to a bank successively on the use of funds and progress in the implementation of financed project. In some cases, additional monitoring of project implementation is carried out, independent of a borrower. Sometimes banks may also request certificates or ratings from professional environmental institutions. At the end of the implementation of *green* project, an extensive report is required, which should be approved by a bank, in which a client presents a degree of achievement of the assumed goals and the final assessment of its real impact on environmental protection.

An important aspect of the conducted survey questionnaire was also the analysis of climate risk in commercial banks in Poland. 58.42% of respondents declared that climate risk was defined in their bank (figure 4). On this basis, it can be concluded that in most commercial banks in Poland, climate risk has become an important element of the risk management system.

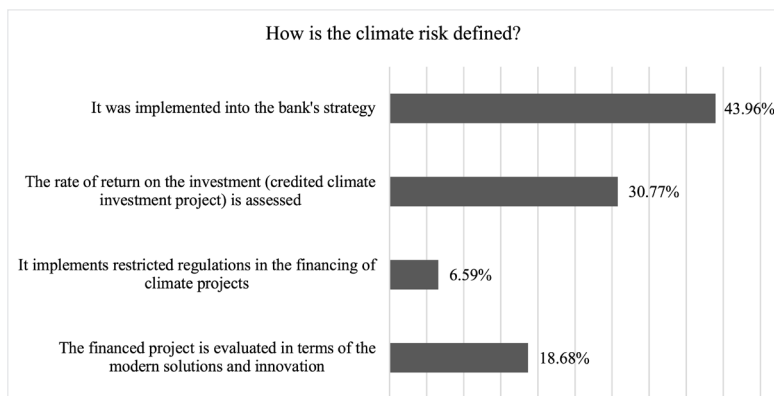
Figure 4. Survey questionnaire results – Part 5



Source: own work

Among the respondents who declared that the bank they represent defined climate risk, the way how they formulated it was also analyzed (figure 5). Thus, 43.96% of respondents indicated that climate risk was included in their bank risk management systems. 30.77% of them stated that as a part of the credit risk analysis banks assess the rate of return on climate investment and, on this basis, estimate exposure to climate risk. 18.68%, in turn, answered that climate projects are subject to a detailed assessment from the point of view of modern solutions and a degree of innovation. On the other hand, 6.59% of the respondents declared that restrictive regulations in the financing of climate projects are implemented in commercial banks in Poland.

Figure 5. *Survey questionnaire results – Part 6*



Source: own work

DISCUSSION AND CONCLUSIONS

Orientation to stop climate change, including climate risk assessment, is extremely important for limiting degrading atmospheric activities and reducing future human casualties. The research conducted in the article has shown that commercial banks in Poland are aware of the concept of sustainable finance and the role of actions undertaken to stop climate change. Moreover, currently investments aimed at curbing climate change have an increasing

chance of obtaining financing in the Polish banking sector. This financing is also characterized by preferential interest rates and terms of granting loans. It has also been proven that the coronavirus pandemic has intensified banks' activities to finance socially and climate-responsible projects. On the other hand, it involves a need for banks and their clients to prepare more restrictive and extensive documentation for granting *green* loans. The research has also shown that most commercial banks in Poland have defined their climate target, which is mostly understood as balancing emissions that cannot be reduced by increasing their absorption, taking place through changing the agricultural culture, planting trees, rebuilding tree stands in forests and carbon storage in wood products. Moreover, banks in the Polish banking sector are aware of the existence of climate risk and what's more they define and include it in the overall bank risk management system. They also assess the rate of return on climate investment and, on this basis, estimate exposure to climate risk. Climate projects are also subject to a detailed assessment from the point of view of modern solutions and a degree of innovation. The regular climate stress tests will be their next step in climate awareness, which will allow to determine an impact of climate risk on banks through their exposure to non-financial companies, which will materialize in the form of credit losses (credit risk) and reduction of corporate bond portfolios (market risk). Thus, the conducted empirical research allowed to positively verify the adopted research hypothesis stating that the Polish banking sector is becoming more and more oriented towards the climate risk among the bank risk management systems. This made it also possible to achieve the main objective formulated in the paper.

The research and results presented in this study are important in building political awareness as well as public, social and economic activities in the field of counteracting climate threats. Also, the awareness of banking institutions is very important for financing projects that reduce degrading impact on climate. However, undoubtedly further research is needed in this area to better understand a degree of uncertainty associated with future climate threats. An important aspect of these studies and analyzes is their orientation on assessment of climate risk exposure of banking institutions, exposed to it not only as any other business entity, but also as donors of capital for projects that have an impact on the natural environment and climate.

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ENDNOTES

- ^[1] VeloBank S.A. is a commercial bank in Poland, which was established as a result of the forced restructuring of Getin Noble Bank S.A. carried out in 2022 by the Bank Guarantee Fund. The Bank continues to service the portfolio of clients transferred from Getin Noble Bank S.A. However, this brand was liquidated and replaced with the VeloBank S.A. brand. Therefore, in the second stage of the survey questionnaire, Getin Bank S.A. was replaced in the research sample on VeloBank S.A.