SUMMARY

OF THE DISSERTATION "BANK RISK MANAGEMENT IN THE TRANSITION TO CIRCULAR ECONOMY"

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I GENERAL CHARACTERISTICS OF THE DISSERTATION

Relevance of the research

This study examines the changes that are taking place in the business environment as a result of climate and environmental change and some financial dimensions of the course adopted by a number of countries to move from a linear economic model to a circular one.

Although for many at first glance these two topics seem unrelated, the reality shows the opposite. What are the main financial dimensions of climate change and the transition to circular economy? The concept of circular economy appeared in the second half of the twentieth century, although the perception underlying it is very old. It can be said that it is related to the development of economic relations, but has been left in the background during the years of rapid economic growth as a result of industrialization. A closer look reveals that in human history until modern times, economic relations were mostly "circular". Materials that were used to produce various goods over time either became new or were discarded but, due to their organic nature, decomposed. Until the twentieth century, there were virtually no synthetic materials (such as plastic today) that could not degrade naturally in nature. As a result of technical progress, which began in the middle of the 19th century, the linear economic model gradually became the dominant one. In this model, raw materials are used to create goods that are discarded at the end of their useful lives. Disposal is generally necessary because it is not possible or it is very difficult to reuse the raw materials and the materials that make them up. It became needful to create and maintain landfills to store unnecessary goods. Due to the presence in the composition of some of them of toxic substances, processes of environmental pollution began. Of course, pollution begins with the extraction of some raw materials and subsequently in the production of some products, when due to various chemical processes in the atmosphere harmful gases are released, and other components fall into the soil and water. Gradually, a number of alarming phenomena related to environmental pollution and deteriorating quality of life began to be observed. Many weaknesses of the linear model of economic development started to be revealed. The concept of circular economy offers a completely different approach - once they have performed the functions for which they were created, the goods (the various objects and materials) must be recycled and put back into the composition of new goods. In this way, the circle of materials in use will be closed and a state of waste-free economy will gradually be reached. Most leading countries in the world already recognize the need to make the transition from a linear to a circular economic model and have accepted this goal as a priority in their economic development. However, the question of how exactly to make the transition remains open. It faces a number of significant, often fundamental, difficulties that require strong political will and a lot of analytical work to be overcome.

Purpose and tasks of the research

The main purpose of this study is to offer answers to these increasingly debated questions in the public, applying facts from world practice. **The objects of the study** are climate change, environmental problems and the characteristics of the circular economy. **The subject** is the financial dimensions of these phenomena and in particular their manifestation for banks.
Banks should be interested in evolution of the problems relating to climate change and environmental protection for the following main reasons:

1) The changes that occur in the environment lead to changes in the needs and preferences of consumers. In order to grow, banks must be able to meet them by offering demand-intensive products and services;
2) The emergence and expansion of environmental legislation, which puts ever higher demands on bank customers. Although it does not directly affect banks, its indirect significance for them is great, as it defines a number of frameworks for the very functioning of companies. In case of non-compliance, the relevant type of business activity must be sanctioned or terminated. This is already of direct importance to the partner financial institutions, as it has the potential to undermine the customer's solvency - hence - an increase in credit risk for the bank that finances him or costs for an insurance company that partners with him;
3) Adequate credit risk management, the assessment of which should include an assessment of the environmental risk of the clients;
4) Reduction of reputational risk. No bank would want its name to be involved in a scandalous situation of lending to a highly polluting industry / company, etc.;
5) Improving the public image and purely ethical motives.

The hypotheses of the present study are, that among the main problems in front of the transition to circular economy can be outlined:
First of all, the way the financial system works. Banks, which are the main sources of financial resources, especially in Europe, continue to finance the linear economy. This is because there are no regulations to create rules in which areas to direct funds. Similarly, the capital markets operate in their familiar direction, although for the last ten years there have been trends of investor interest in the shares of companies, which to one degree or another, in one way or another follow environmentally friendly practices;
Secondly, the lack of standardization in the ways of accounting for and tracking progress in this direction. At present, in the field of accounting and financial reporting, there are almost no clear, mandatory for all economic entities, rules for recording and tracking aspects of the circular economy. This leads to difficulties both in tracking trends at company level and in the formation of government statistics on these issues, which in turn makes managing the process extremely difficult.
In the present study, we limit ourselves to examining the problem of environmental accounting, corporate reporting and statistics, given that they present a significant aspect of the problem.

Research methodology
The methodology applied in the study is a combination of quantitative and qualitative analysis. Qualitative analysis is used to illuminate the subject and object of the study, and quantitative analysis - simulations of different algorithms for calculating and assessing environmental and social risk in bank lending - for the purposes of implementing and testing the author's proposed model for managing these risks.

Limitations of the research

The limitations of the research are imposed by the multifaceted nature of the problems related to the change of the linear economic model into a circular one. This study examines the emergence of the idea of circular economy, the theoretical concepts that justify its particular aspects and some of the practices in countries that have adopted as a policy change the circular economic model. However, the current research is far from being exhaustive on the issues at hand, mainly due to their extreme complexity. The aim is to highlight some basic points that give an idea of the nature of the circular economy and the many issues that the desire to change

the economic model raises. Special attention is paid, on the one hand to the role of banks and capital markets, on the other - to environmental accounting and reporting, for the implementation of the transition, presenting a brief analysis of what, according to the author, the main problem areas for the transition to circular economy are and how some of them could be overcome.

Given the central role of banks in Europe and Bulgaria in financing economic systems, in the last part of the study the author proposes a mathematical model for assessing environmental and social risk in lending to help manage these new risks. Other important topics related to the transition to a circular economy, such as the importance of the use of different types of energy sources, waste treatment, processing of various raw materials, etc. are not covered in this study.

II. VOLUME AND STRUCTURE OF THE DISSERTATION WORK

The dissertation consists of 297 pages, of which 277 pages are main text and 18 pages are appendices. The main text contains 7 figures and 13 tables. The literature used covers 158 sources. The study consists of an introduction, five chapters, a conclusion and appendices.

The first chapter focuses on climate change and some key environmental issues and how they affect the business environment;

The object of the second chapter is the emergence of clarification of the concept of circular economy in theoretical terms and the policies and practices in some of the developed countries related to the imposition of a circular economic model;

The third and fourth chapters address some of the main problems of financing the circular economy on the one hand, and environmental accounting and reporting on the other.

The fifth chapter proposes an author's model for environmental and social risk management in bank lending as a key tool for assessing and managing this type of risk for lending institutions. The author’s concept for “green bank” is presented in theoretical terms, outlining the main levels of this perception, and then assessment of the stage the banks in Europe and in Bulgaria currently are at towards it is proposed.

The conclusion presents the main inferences of the study.

III. SYNTHESIZED PRESENTATION OF THE DISSERTATION CONTENT

CHAPTER ONE. NATURE AND MANIFESTATION OF CLIMATE CHANGE

The subject of the first chapter are environmental problems and climate change, their main characteristics and their impact on the macro environment. Emphasis is placed on the taxonomy of financial risks from the manifestation of climate change and their consequences for businesses and households. Over the last 30 years, there has been a growing interest in the issue of pollution caused by human activity and its consequences for ecosystems, and hence for the economy. Environmental problems have numerous dimensions in almost all areas of nature and human life. One of the most debated topics of public interest is climate change. From an economic point of view, climate change is already affecting a number of key sectors, and one reason for this is that the frequency of extreme weather events is rising sharply. This has serious

long-term consequences, especially for the insurance sector. Eliminating greenhouse gases takes decades, which means that adaptation policies are needed to deal with the deteriorating effects for at least 40 years. Within this time frame, the cost of disasters could reach $ 1 billion. dollars in just one year. Climate change caused by human activity is in fact a progressive shift in the Earth's meteorological system with significant consequences for society and natural ecosystems. Minimizing its effects requires both voluntary and mandatory action to limit greenhouse gas emissions (mitigation), as well as a willingness to manage the inevitable consequences (adaptation) by the public and private sectors. In the first chapter of the research, we focus on how climate change affects the financial sector through both direct and indirect effects - through the actions of the private sector and public authorities. The amount of financial flows related to climate change is huge. As mentioned, the two approaches to tackling climate change are adaptation (managing the effects already occurring) and mitigation (working towards reducing greenhouse gases). While adaptation may have positive effects in the near and distant future, mitigation does not affect climate improvement for decades, but it does change the way the financial sector works in the present, as it affects the price of carbon and pollution immediately and increases or slows down the demand for certain products and technologies that are relevant to the fight against global warming. These effects vary by industry due to differences in the life expectancy of different products and assets. Evaluating the rissk associated with climate change and pollution is key to managing them properly.

There is no single typology of risk categories in the field of finance. Some of the most commonly used categories of financial risk include the following concepts:

• The risk that the prices of securities or their volatility will be different in the future;

• Interest rate risk - covers fears that the price of capital will change when interest rates change;

• Currency risk - covers unforeseen changes in interest rates and volatility of the price of a currency against others;

• Commodity risk, which combines the risks in the supply chain of companies due to changes in prices or price dynamics of goods such as fuels, precious metals and agricultural products;

• Liquidity risk - the risk that an asset will not be realized quickly enough to prevent or minimize its loss;

• The risk associated with foreign investment includes a variety of risks that may lead to unexpected changes in accounting, reporting, auditing standards in a country, as well as risks of nationalization, conflict, changes in tax legislation and policy that may to have a direct impact on the profitability and even the functioning of a business;

• Credit risk or the risk that the borrower will go bankrupt and will not be able to repay its interest, principal or both;

• Operational risk - it also covers a wide range of factors, including regulatory and legal risks, reputational risk and physical risk, which is particularly important in the context of climate change. The Basel Committee on Banking Supervision defines operational risk as the risk of loss from inadequate or faulty internal processes, people or systems, or risks from external events;

• Climate risk, as discussed in previous chapters, covers one of the following two phenomena: the likelihood of extreme natural events such as floods, fires, storms, droughts, strong winds, rising ocean levels, insect calamity attacks, or slower, gradual changes in the amount of rain, rising average temperatures and ocean levels;

• Investors also recognize the existence of carbon risks (apart from climate risks) associated with greenhouse gas emissions. These risks may include regulatory, legal and reputational risks.

Ten years ago, in 2010, in response to a petition from a number of institutional investors, asset managers and non-profit companies in the United States, the Securities and Exchange Commission issued a guide to companies on how to account for opportunities and the risks they face as a result of climate change. Risks arise with rising global temperatures and materialize in the financial performance of market participants through five modes of manifestation according to the Commission's systematization: regulatory, legal, physical, reputational risk and supply chain risk. However, almost every risk also creates financial opportunities. For example, any legal risk may create opportunities for the company, which is potentially threatened, to improve its way of working in order to start operating in accordance with the new regulations. In these cases, the company may need additional financing, which, in turn, is an opportunity for banks to absorb the niche.

Inferences

Climate change poses a number of risks to both financial institutions and economic systems in general. These risks have diverse dimensions throughout the value chain of a number of goods and services. They need to be known to ensure the success of the relevant activities. This is the place of financial institutions - banks that can offer adequate credit terms to their customers, insurance companies - to properly identify risks, value them and price the necessary products and companies that manage assets - to assess which are the sectors for which stable profitability is emerging and which carry excessive risk.

The identification of climate change and the subsequent changes in the demand and supply of goods and services lead to the emergence of various sectoral and global alliances at the level of governments, industries and civil society, within which participants could learn about problems, work together, grow from each other's experience and last but not least lobby for the implementation of various changes in legislation and regulations. It turns out that even when the participants in a forum or association do not deny the reality of climate and environmental issues, achieving unity is a long and arduous process. An example of this is the ratification of the Kyoto Protocol, which takes years. However, despite the difficulties, combating climate and environmental problems is already part of state-level policy in a number of countries, with the European Union leading the way.

CHAPTER TWO. THE CIRCULAR ECONOMY: THE RESPONSE TO THE CHALLENGES CAUSED BY CLIMATE AND ENVIRONMENTAL PROBLEMS

An interesting pattern has been observed over the past hundred years. On the one hand, the consumption of resources worldwide has been increasing, but on the other hand, the way in which these resources have been consumed is clearly proving its inefficiency. The inefficiency can be outlined in two planes, which leads to two main defects of the linear model. **First**, there is an uneven consumption of resources - most of them are consumed in highly developed countries at the expense of developing countries, and **second**, there is an accumulation of huge amounts of waste that are not used after being disposed of. The economic model currently being

followed is linear: extracting natural resources, processing them into finished products and consuming the products, which ends with their disposal. According to a number of studies, the current linear economic model cannot ensure high economic development and growth by all countries in the world, as the available natural resources are insufficient.[1]

The circular economy model seeks to solve precisely the above two main defects of the linear model. The idea of the circular economy draws inspiration from the way nature works, and in particular the individual biosystems. Just as each of them has its own cycle - birth, development, decline, death and rebirth, so the individual systems within the economy have similar cycles. Therefore, the life of a product should not end with its disposal in the form of waste that can no longer be used, but on the contrary - each product should be seen as an eternally existing set of materials, each of which after the conditional end of the life of a given product must be included in the creation of a new one. Thus, at some point in the future, society should reach a state where virtually no waste is disposed of, and all products are recycled or used in some way. In order to achieve this state, it is not enough just to find ways to recycle individual types of goods, but to reduce the total amount of waste disposed of. In support of the efforts in this direction, ways should be sought to extend the life of products, to encourage their longer use, and also to share the use of certain categories of goods, leading to fewer of them in circulation.

It is difficult to determine exactly when and where the term "circular economy" itself has appeared. Today, "almost all international business operations are experiencing changes due to the pursuit of nature conservation" and efforts to make the transition from a linear to a circular model reflect this trend.[2]

International perspectives on the circular economy

The subject of this part of the study are some policies and practices in countries around the world that are leaders in efforts to transform the linear economic model. Each of these countries has adopted its own political line in the direction it has chosen. Some countries focus on recycling activities, others encourage industrial symbiosis, and others implement comprehensive measures to stimulate the circular economy.

Japan

Historically, Japan was the first country in the world to systematically apply the principles of circular economy in its development. The basis of the policy pursued in Japan are the so-called 3 R (Reduce, Reutilize, Recycle) - reduction, reuse and recycling. The roots of this policy should be traced to the geographical, geological and historical features of this country. Territorial scarcity, combined with poverty of natural resources, has forced Japanese governments over time to look for ways to organize the economy and society so as to consume minimal resources. Oil shocks in the 1970s played a particularly strong role in shaping such a policy by Japanese governments. These episodes made it clear to the country that in order to have a leading economic power, it must find a way to reduce as much as possible its dependence on fuel imports. However, this could only happen by redefining the economic model and

[1] Haas, W. et all. How Circular is the Global Economy? An Assessment of Material Flows, Waste Production, and Recycling in the European Union and the World in 2005. Journal of Industrial Ecology. Volume 19, N 5, www.wileyonlinelibrary.com/journal/jie, p. 765

[2] Боева, Б. и др., „Промените във формите на международен бизнес в контекста на глоблните усилия за опазване на околната среда". Икономически и социални алтернативи, УНСС, брой 4, 2015 г., стр. 5.

directing it to the optimal use of different types of raw materials. Of course, such an endeavor would not have been possible without the necessary knowledge and level of awareness in Japanese society. Governments have systematically been working to build a comprehensive culture in the country aimed at optimizing the use of resources at all levels. This has not proven to be very difficult, as such a way of thinking has been ingrained in the Japanese culture for centuries. Progress in establishing a circular society is being monitored strictly and continuously. Today the country has reached results to beenvied. For example, in the packaging sector, almost 100% recycling of materials has been achieved, with the exception of cardboard and glass packaging. In the sector of household appliances 85% recycling is achieved, and in the segment of construction waste for some materials such as concrete and wood 95% recycling is achieved, in the case of batteries - between 50% and 80% in the individual categories.

It can be summarized that Japan is a pioneer in the efforts to establish a circular economic model. Long before the idea of a circular economy was theorized in detail and gained social significance globally, it had been embedded in the very foundation of the state philosophy of economic model in Japan. Of course, the roots of this philosophy should be sought in the historical past of the country, as well as in its geographical features. Awareness of the need to ensure optimal efficiency of all economic processes is part of Japanese culture. It is precisely this culture and public consciousness that is responsible for the success of state policy in implementing a circular economy.

China

China is the second Asian country to demonstrate an active policy towards circular economy. Characteristic of this country is the high rate of economic growth over the past few decades. Growth means the growing creation of goods of all kinds, and this in turn is linked to both the extensive extraction and processing of resources and the increasing consumption and therefore disposal of waste. Gradually, in the 1990s, the need to organize recycling activities and minimize waste in general became clear at the highest level of government in China. In 1999, the establishment of a special State Administration for Environmental Protection with the rank of a ministry was announced, which subsequently in 2008 grew into the current Ministry of Environmental Protection.

Since the beginning of 2000, the Chinese president has constantly proclaimed that the circular economy is a priority of the state, and has insisted on work at all levels in this direction. The policy towards circular economy was formalized in the Eleventh Five-Year Plan for the Development of the Country, adopted in 2006, when the circular economy was declared a priority of the Chinese state. Despite the real and diverse difficulties facing the development of the circular economy in China, the strong commitment of the country's efforts in this direction is impressive. In China, a comprehensive legal framework for the circular economy has been developed and is in place, which defines both specific incentives and sanctions for economic agents and thus supports micro-level efforts. This development of legislation in China could probably be attributed to the territorial proximity to Japan, which has historically had the longest-running various circular economy policies, and whose experience is undoubtedly of great practical value to all other countries in the world.

EU policy on the circular economy

Resource efficiency is also a priority for EU member states. It is enshrined in the 2020 Strategy and in the Roadmap for a resource-efficient Europe, adopted in 2011. This document sets out the specific actions that each member state must take to achieve the overall goal. As defined in the 7th Environment Action Program, this goal states: The EU should "become a resource-efficient, green and competitive low-carbon economy".[3] To date, the EU has not set specific targets for either the use of resources or the efficiency of this process. Germany makes an exception, with clear goals.

At the national level, the development of programs and strategies for efficient use of resources is observed - and in these documents, as a rule, the aim is naturally to address the problems of the specific economy. Initially, these problems covered energy consumption and waste recycling, but over time they gradually spread to other areas. Such are, for example, environmental pollution, the need to ensure security of supply of key raw materials, which are depleted over time, trends in rising energy and raw material prices, climate change and their impact on ecosystems, and more.[4] As a result of the already existing individual policies and initiatives in some of the countries, at the end of December 2015, with a decision of the European Commission, the EU declared as its priority the gradual transition from a linear to a circular model of the economy.[5] Since then, work has gradually begun to build a comprehensive concept of how this transition will take place, and analyzes and documentation have been formed into a special package. The main emphasis is placed on the legislation in the field of waste treatment, as it is its improper accumulation and closure within landfills that leads to a number of negative consequences for both the economy and the environment. The analyses that are being performed show that the economic benefits of changing the model will be significant. In addition to measures aimed at waste management, the Circular Economy Action Plan created for this purpose covers the entire production cycle - from the creation of individual products to the ways of their processing. Specific objectives in this direction are outlined in the annex to the Action Plan.

As waste management, as already mentioned, plays a key role in the transition to a circular economy, it is important to note the new goals that the EU is setting in this area. First of all, by 2030 it is planned to recycle 75% of packaging waste and 65% of municipal waste. Secondly, it is envisaged that a maximum of 10% of the waste generated by municipalities will be disposed of in landfills. A ban on the operation of landfills for separate waste disposal is also introduced. In addition to these measures, various economic incentives are introduced to close landfills, specific measures to stimulate industrial symbiosis (the use of waste from one industry as a raw material for another), to support various recycling schemes, etc.

The implementation of the plan for the transition from a linear to a circular economy requires concentrated efforts in all areas of economic life. A document of the European Bureau of

[3] Decision no 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environment Action Programme to 2020 'Living well, within the limits of our planet.', Official Journal of the European Union, 28.12.2013, L354/171.

[4] The European environment — state and outlook 2015 / Cross-country comparisons / Resource efficiency — material resource efficiency and productivity. Briefing Published 18 Feb 2015, достъпен на: http://www.eea.europa.eu/soer-2015/countries-comparison/resource-efficiency#tab-related-interactive-charts

[5] Circular Economy Strategy. Closing the loop - An EU action plan for the Circular Economy. Available at: http://ec.europa.eu/environment/circular-economy/index_en.htm

Ecology from March 2015 presented to the European Commission a concentrated analysis of the necessary measures to be taken in the EU. Of interest are the policies of some EU countries that are making active efforts in the transition from a linear to a circular model. Below we focus on some of them.

Germany

Germany is one of the most active countries in the EU in its efforts to move to a circular economy and a key supporter of this policy at EU level. Since 2000, the efficient use of natural resources, the recycling of used items and materials, and the closure of the production cycle so that waste is minimized have been at the heart of Germany's sustainable development policy. German governments want the environmental challenges to become economic opportunities. In addition, it is recognized that the country must provide a certain amount of metals for its export-oriented economy and strives to do so, as far as possible, on the basis of recycling, thus optimizing the extraction and import of these metals. In Germany, the Circular Economy Promotion and Environmental and Rational Waste Management Act has been adopted and is in force. Within this law, the following definition of the circular economy is given: "waste prevention and recycling". The circular economy, according to the interpretation of this law, covers several important aspects of economic activities. In the first place, the strengthening of the control over the waste management activities has a direct relation to it. Secondly, the rules for monitoring the fate of waste products that are exported from Germany and which the German economy is practically losing. Next, very important for the functioning of the circular economy is the awareness of consumers about its nature. Last but not least is the role of municipalities in the proper management of the waste collection process. It is emphasized that it is very important to do this according to clear rules, paying special attention to separate disposal in specially designated waste containers of recyclable materials.

Germany is among the EU countries that are the first to start systematic efforts to impose the circular model across its economy. What is specific is that this country is highly export-oriented, its industry consumes huge amounts of raw materials and produces products for markets around the world. In order for German goods to be competitive on the world market, they must be made with the most efficient use of resources. This, to a certain extent, naturally necessitates the need to work hard to study the efficiency of resources, the search for funds to be constantly increased, the stimulation of various innovations to support this process to be in place, and last but not least - the cultivation of appropriate public consciousness to support these efforts to be constant.

The Netherlands

The practical application of the "cradle to cradle" concept is very popular in the Netherlands. As in Japan, the state plays a very important role in promoting this basic concept of the circular economy. The Ministry of Environment is a key player in encouraging companies to share experiences in implementing this idea. In 2009, a special club of companies was established to share experiences of good practices in this field. The "cradle to cradle" concept becomes part of the National Waste Management Plan and stimulates the identification of seven pilot areas of application. The industrial symbiosis in the form of eco-parks is also widely used in the country. Sixty percent of Europe's eco-parks are located in the Netherlands.

An important direction in the Dutch policy aimed at the transitiotn to circular economy is the activities related to waste treatment. The stimulus in this case is the high population density in the Netherlands, which, as in Japan, is proving to be an important factor in finding appropriate solutions to the problem. This also explains the fact that waste recycling efforts in the Netherlands have been a tradition for decades. These efforts are gaining momentum, especially since the 2002 special reform to centralize waste treatment activities. For example, at present 80% of waste is recycled (compared to 50% in 1985), in addition 12% is incinerated and 3% is buried.[6] In 2010, a National Natural Resources Program was established in the Netherlands. This document is a summary of existing policies in various fields aimed at sustainable management and use of natural resources.

It is noteworthy that in the Netherlands, sectoral policies for the circular economy are very well developed, but what is lacking, unlike the practice in Japan and China, for example, is full integration between them. In addition, the Netherlands is characterized by exceptional activity at the micro level to increase the efficiency of the use of various resources, to reduce the environmental footprint of certain types of economic activities, to sharpen public attention to these issues. It could be said that, if in Japan and China, and to a large extent in Germany, the policy of transition to a circular economy is formed from top to bottom - from the government to individual economic entities, in the Netherlands this process seems to go in the opposite direction. The explanations for this phenomenon can be of various natures, probably a significant role in it is played by Dutch national psychology, a country whose people have historically been extremely combative and innovative to ensure their survival.

France

In contrast to the countries examined so far, in France the idea of a circular economy gained wide popularity relatively later, it can be said since 2007. In 2007 was the first meeting of the Greney movement, founded on the initiative of the then French President Nicolas Sarkozy. The movement is an open forum for discussing environmental issues and sustainable development, with the participation of politicians, members of the public and other representatives of civil society.
Parallel to the public debate, the French Agency for the Environment and Energy Management have prepared an analysis according to which the manifestations of the circular economy should be sought at three levels:
• waste management;
• in terms of aggregate supply;
• consumption by economic operators. [7]
The role of the individual regions of the country and in particular the active policy at the local level is important for the success in these three areas. The realization of the circular economy is based on a number of local activities, such as the decentralization of production and access to electricity through the use of so-called smart grids, which, like the Internet in the communications space, supply energy to any point. In this sense, especially for large countries such as France, the rationalization of actions towards a circular economy is essential.

[6] OCDE "sustainable materials management", European Environment Agency – Country assessments – Netherlands; Eionet - European Topic Centre on Sustainable Consumption and Production – Country Factsheets
[7] Agence de l'environnement et de la maîtrise de l'énergie (ADEME), http://www.ademe.fr/expertises/economie-circulaire

Denmark

Denmark, like Germany and France, is among the most active EU countries in efforts to transform the current linear economic model into a circular one. This can be seen from a number of policies of the Danish governments, which aim to systematically support efforts in this direction at all levels of society. Noteworthy is the example of the Danish city of Kalundborg, where the application of the principles of the circular economy began many years before the term itself appeared and was introduced into the economic scientific literature. In 1961, a project was launched to use water from Lake Tisza for the purpose of a new oil refinery so as not to deplete the limited amounts of groundwater in the area. The municipality of the city is in charge of organizing the construction of the pipeline. The refinery finances the venture. On the basis of the partnership created in this way, a number of other interactions are being built, which have so far led to the fact that the waste products from the operation of the power plant in the city are used as raw materials for other industries. Studies of the economic effects of the industrial symbiosis built in Kalunborg unequivocally show that its financial and environmental effects are significant. [8]

Inferences

The circular economy as a concept unites many different concepts – "cradle to cradle", eco-efficiency, biomimicry, industrial ecology, cascade systems, etc. What they all have in common is the desire in the process of creating goods to apply the basic principles that form the circular model – "waste is food", "diversity is strength", "energy must be generated from renewable sources", and "thinking must be done in systems". However, there are many problems in applying these principles and they stem from the way the traditional linear economic model works. The world's leading countries have already recognized the need for an active policy in this direction. The leaders are Japan, China, Germany, the Netherlands, France, Denmark and many countries in the European Union.

These countries create and implement government policies and good practices that will set an example for the rest of the world. Despite the declared desire to change the economic model, the efforts of individual countries, even within the EU, remain fragmented. In some countries, such as Japan and China, the circular economy can be said to be at the center of economic life. Comprehensive legislative frameworks have been established, which define the rights and obligations of individual economic agents. A number of specific incentives and sanctions have been created for the individual actions they take. Such detailed legislation is not yet a fact in the EU. Individual countries within its borders pursue their own national policies, have their own priorities and principles. In order for change to happen, all countries in the world need to follow a common management philosophy. This is due to the fact that the modern globalized world is open and countries consume many goods that are not produced on their territory, so it is very difficult to pursue an effective policy aimed at circular economy. The policies of the Netherlands and Germany are indicative in this respect - they seek to take into account the impact of imports and exports when shaping their decisions to act in various aspects of the circular economy. However, this practice must be transferred to all countries to ensure the effectiveness of efforts.

[8] Jacobsen, Noel Brings. Industrial Symbiosis in Kalundborg, Denmark: A Quantitative Assessment of Economic and Environmental Aspects. Journal of Industrial Ecology, Volume 10, Issue 1-2, pages 239–255, January 2006, Available at: http://onlinelibrary.wiley.com/doi/10.1162/108819806775545411/abstract

CHAPTER THREE. FINANCING THE CIRCULAR ECONOMY

The financial system as a whole - in Europe the banks, in the USA mainly the stock exchanges - is oriented mainly towards financing the linear economy. It is the dominant economic model; the production cycles, hence the business cycles of individual industries and products, are well known. This ensures relative predictability of the amount of expected profits they generate, and it gives the financial markets the necessary degree of probability for the return on investment. In order for the banks and the capital market to provide the much-needed resource for the transformation of the linear economy into a circular one, they themselves must undergo a serious transformation. This transformation is multi-layered and, of course, has many specific characteristics, on the one hand in relation to banks, on the other - in the capital market, and in turn within the specific capital market or bank, respectively, there are a number of features characteristic for them only. As banks definitely play a dominant role in financing the economy in Europe, the analysis in this study focuses on them, with less attention paid to capital markets. For capital market, some main trends related to the circular economy and relating to the future development of individual segments within their framework will be presented.

Banks are among the main sources of capital for the activities of companies. Their role in the development of modern economic systems is leading - they redistribute funds among individual economic agents. To a large extent, they are in charge of granting credit resources and determining the conditions for financing. That is why the policies that banks adopt in this area are extremely important when it comes to the transition from a linear to a circular economic model. In general, the following problem areas can be identified for the banks that will be addressed in this study:

- Regulatory - like all for-profit organizations, banks will naturally continue to finance the linear economy in all possible forms when it is profitable for them. In order to start restricting access to finance for activities that run counter to the circular economy, banks must be subject to at least two types of "incentives":

1) pressure from the regulatory authorities on banks, i.e. by the state thorgh the central bank;

2) pressure from regulatory authorities on their customers to transform their activities. This pressure could take the form of various barriers to linear proceeds, fines and other sanctions, which together increase the risk of losses for banks because they would not be able, for example, to collect their receivables from customers whose products are no longer marketable (due to a government ban on trading in them, for example, as these appear to be the result of linear production);

- Management - the need for bank management to realize the necessity for change. This is a prerequisite for the implementation of any policy, especially when it leads to a sharp turn from the traditional way of functioning. However, this awareness will emerge naturally under the pressure for change from regulators. In the context of such awareness, bank management will be able to play its key role in identifying the new products and services that their banks will start offering to individuals in the context of the transformation to a circular economy;
- Building and maintaining internal administrative capacity. Not only the management, but also the employees of the banks will have to acquire knowledge about the new features of the circular production of various goods. This will be necessary because the circular productions

have a different cycle and features in terms of their economic dimensions - costs, revenues, profits, life expectancy of products, etc.

Asset management companies, major players in the capital markets, manage huge amounts of funds in the form of various types of securities. They are interested in focusing on the shares of those companies that are most promising. According to Eurosif statistics, over the last ten years, despite the financial crisis, more and more investors have been turning to different types of "green securities". The important thing is that this strategy has so far proved to be very profitable, which is the reason for the growing interest in it. In this sense, the activity of asset management companies is extremely important for the transition from a linear to a circular model of the economy.

From the activity of financial institutions, as well as of any company, there are two types of environmental consequences (impacts) - direct and indirect. The direct ones are related to the carbon emissions and the consumption of raw materials for the purposes of the company's operations. The indirect impacts are those that stem from the operations of the company's customers. In the case of financial institutions, especially banks, the indirect effects stem from their core activity - ie. from the lending they provide. For obvious reasons, these effects are much more significant than the direct effects associated with the use of, for example, electricity, car fuel, paper and water.

The environmental risk for banks has the following two main aspects:

• the risk of a client damaging nature and, after being sanctioned by the supervisory authorities, being unable to pay his obligations to the creditor bank;

• the risk that the bank will acquire collateral for a loan that is fraught with environmental problems so seriously as to lead to a drop in its price and / or the bank will have to invest significant funds in eliminating these problems in order to be able to sell it on the market.

Environmental risk is usually considered together with social risk, as these are the two are considered the main humanitarian dimensions of economic activity. Due to the limited scope of the present study, we consider only some, according to the author, main problems of environmental risk management.

What are the steps that banks must follow to keep up with the current developments, taking into account climate and other changes in nature and subsequent changes in regulations and customer needs?

One side of the issue is building a system for environmental risk management, the other is - identifying and using the opportunities of the changing macro environment. Before these two sides of the problem develop, the following several key factors need to be present:

• The top management of the banks is convinced that it is necessary to go in this direction;

• Adoption of an Environmental Strategy, where there is a clear description of the goals set by the organization;

• Adoption of internal procedures for environmental risk management and for the development of new products that take into account the changed environment;

• As a result of the above - revision of key banking processes to include environmental risk assessment and management in:

o The lending process, making the necessary modifications to the methodologies for this between lending to individuals and lending to small, medium and large companies, as each of these processes has its own characteristics;

o Trade financing - especially in the issuance of bank guarantees and letters of credit;

o Other operations - leasing, investment operations, etc.

International practices and methodologies for environmental risk management

Among the international organizations that have developed methodologies for environmental risk assessment and management are the International Finance Corporation (IFC), the European Bank for Reconstruction and Development (EBRD), the Equator Principles. The IFC and the EBRD have detailed elaborations on the various manifestations of environmental risk in different types of financial operations - lending, leasing, trade finance, etc. The Equator Principles apply environmental risk assessment in the field of project financing. The methodologies of the three organizations are essentially similar, the differences are mainly in the details of risk categorization and tracking. They serve as starting points for the development of internal procedures for environmental risk management in a number of financial institutions around the world.

Typically, the banks in Eastern Europe that take this path rely mainly on the EBRD's methodology - as they are often recipients of funds from it and undertake to follow its policies, while banks from other parts of the world, such as Central and Latin America, rely primarily on IFC instructions. The Equator Principles are accepted and applied by all banks that are their members.

The banking system as the main source of attracted resources for the transition to a circular economy

The transition from a linear to a circular model of the economy requires a number of changes in the way banks operate. This transition creates both opportunities and risks for them. A recent ING Bank study on this topic outlined the main opportunities and challenges for banks. In general, they can be linked to five main business models.[9]

The first model is aimed at transforming production so that only raw materials from renewable sources or those that are subject to full recycling are used. In this way, waste will be eliminated and the depletion of natural resources will be stopped. Proponents of this model share the belief that this is the only way to move from a linear to a circular model of the economy.

The second business model concerns the repeated use of the materials from which the products are made to make new goods.

At the heart of **the third model** is the concept of extending the life cycle of products by repairing and improving them, as well as as a result of additional efforts to market them.

[9] Rethinking Finance in a Circular Economy. Financial implications of circular business models. ING. 2015

Extending the life of goods will not only delay their disposal in the form of waste, but will also generate profits from their sale, rent and use.

The fourth business model offers the replacement of the individual use of different goods with a collective one. For example, sharing cars, various appliances, etc. This will eliminate the low efficiency inherent in the use of such goods, which in individual use are often depreciated without being used for a long time.

The fifth model offers a fundamental change in the way goods are viewed: from assets owned by their owner to services that are used only when necessary. Thus several effects will be achieved. On the one hand, the efficiency of the use of goods will increase. On the other hand, because they will not need to be acquired for significant amounts of money in some cases, more people will have access to them. Third, as a result of more people using more goods, a number of ancillary markets will be created where other, complementary goods and services will be offered.

As there is great public interest in introducing different variants of the five circular models, the market for products and services related to them is generally expected to reach a net growth of between 1% and 4% in the next ten years. This is an opportunity for banks to offer their products and services and expand their customer base and market share. In addition, such a policy resonates with the intentions announced by more and more banks to support sustainable development. Research shows that customers who work in the field of sustainable development in one way or another are more innovative, demonstrate better financial results and have better credit ratings, which for banks means lower credit risk and higher security of portfolios.

At the same time, financing of the circular economy poses some challenges for banks.

First of all, due to the extension of the life of products, it is necessary to reconsider the way of assessing collaterals. This naturally impacts risk assessment, especially the credit risk of the respective transaction and client, and hence all indicators relevant to the monitoring of credit risk, such as expected losses (EL), exposure at default (EAD) and loss given default (LGD). The other important principle in the circular economy, related to the actions of exploiting goods within their extended life, means not only that they must have the functional characteristics for a longer life, but also that they are actually used on the market. An example is Philips' policy to seize medical equipment from its solvent customers after it has been exploited for some time and resell it on the secondary market, where customers are less solvent companies. Seizures often occur after the equipment has been fully depreciated from an accounting point of view. This raises the question of depreciation rates for such equipment. If the company that buys it on the secondary market does so using a loan and provides the equipment as collateral, then the bank will have to evaluate it in some way.

Second, the tendency to rent products, when it is possible, instead of buying them, also affects banks in at least two ways. On the one hand, they no longer accept the leased product as collateral for the loans, it remains the property of the company from which the bank's customer takes it for use. Therefore, banks need to rethink the model in which they finance such customers. On the other hand, renting an item instead of buying it actually expands the market for it, as more people can afford it. The expansion of the market for the product in question theoretically leads to an expansion of the market for banks, but they will have to change their risk assessment schemes for this new category of customers. The expectations are that the

customers who use rented goods for the most part will not be highly solvent. So banks will take additional risks when financing such customers. In addition, ownership of the commodity is unlikely to be transferred to banks as collateral, and this will further increase the riskiness of such transactions.

Therefore, it can be said that the trend in the financing of the circular model is characterized by a shift of focus from the importance of collateral to that of cash flows. Such a shift requires a complete change in the concept of banking and fundamental changes in banks' credit policies.

Third, the importance of the leasing form of financing will increase. Banks can play the role of leasing goods on a much larger scale than at present. Demand for leased goods will increase, as already mentioned, and this is an additional opportunity for banks. The challenges arising from the expansion of leasing portfolios both in terms of the types of goods offered on lease and the types of customers are related to the need to know the characteristics of these goods, as well as the characteristics of customer behavior. The extension of the useful life of the goods will have to be reflected in the calculation of the risk of the clients in the leasing portfolio. On the other hand, here as well as in the loan portfolio, banks will have to redefine their leasing financing policy, taking into account the extended life of goods and the relatively lower solvency of customers.

Fourth, due to changing consumer preferences on the one hand, and the growing number of regulatory requirements for business on the environment, banks will need to develop and integrate into their existing credit risk assessment and management models the environmental risk. Monitoring the environmental risk in loan portfolios, including the leasing part, will gradually become an imperative. **The difficulties in this area are due to the lack of a uniform methodology currently adopted for environmental risk assessment, which raises uncertainty that it can be evaluated properly and hence a reluctance to start work in this direction.**

Environmental risk management in the core banking activities is of key importance for the contribution of banks to the development of the circular economy. As long as lending continues to companies that support the linear model and lack a strategy and vision for change, it will be very difficult to achieve a transition to circular economy. For their part, banks are profit-oriented and this is natural - the pursuit of financial success is part of the rational thinking of any economic agnet. Therefore, if there are no incentives for banks to refuse financing to highly profitable but environmentally harmful companies, they will not do so. Nor will they fund very innovative, inherently excellent ideas supporting the circular model, which, however, have questionable, at least in the short term, profitability. Banks cannot be blamed for this course of action and no change can be expected on their part without good reason.

At this stage, the picture from the point of view of banks looks as follows and this makes it difficult to deploy and manage environmental risk:

1. There are no regulatory requirements (Basel III and IV, regulations of national banks) to impose on banks the obligation to monitor in detail the environmental risks associated with corporate lending. This immediately means that this activity remains in the sphere of wishes and views of the management of the banks.

2. Banks wishing to implement an environmental risk management system face a lack of a unified methodology for doing so. Currently, perhaps the most applied methodology is that of the EBRD. It is clear and well developed. However, even with its application, many additional methodological issues naturally arise, stemming from the need to adapt it on the one hand to the specifics of national laws and industry classifications, and on the other - to the specific characteristics of the portfolios of individual banks.

3. A third problem, however, which can hardly be avoided, even if there was a standardized and globally accepted methodology, is the purely technological, software integration of environmental risk assessment into the credit risk assessment information system(s) within banks. This usually has to be the subject of a separate serious intra-bank project, which takes a lot of resources and time, and which would be difficult to initiate, if there is no regulatory pressure to implement it.

Despite the declared desire of the countries (the EU as a whole and each individual country within its framework, and this applies to a greater or lesser extent to all other countries in the world) - to change the model from linear to circular, in practice, there are not enough well-developed tools to support this change. The development of the five models related to the realization of a circular economy, mentioned above, requires serious funding. In many cases, funding must take place before it is clear exactly what the market for a given product or service will be, whether there will be demand for it, whether consumers will want to change their habits and, if so, with what time lag compared to the introduction of new products and services will this happen. If we look, for example, at a model that relies on shifting consumer preferences from instead of buying a product and paying for it, to renting it when they need it - when could that happen? Can the transition be made for all goods at the same time, or will it be possible for some goods as soon as the possibility of renting appears, while for others it will take years of changing consumer habits? Undoubtedly, contrary to the theory of rational thinking of economic entities, it will turn out that for some groups of goods, especially those in the luxury segment, ownership will be a matter of prestige and buying them will continue to make sense.

These are important issues that require very serious consideration in order to find an adequate form of financing for ventures aimed at implementing such new business models. It would not be realistic to expect banks to readily take the risk of experimenting with financing activities for which they themselves cannot determine, at least to some extent, the future return. Without the ability to determine the expected future return on a loan, it is difficult to calculate other parameters, such as the problability of default (PD), the LGD, the EAD, and finally – the EL. Therefore, the state must intervene at least at the initial stage of the transition to a circular economy, standing behind various new ventures.

State support can be realized in the form of state guarantees and participation in various activities. If the state creates a guarantee fund for initiatives aimed at implementing one of the five business models of the circular economy, banks would provide the necessary credit resources to entrepreneurs. After years of experience in such projects, the answers to at least some of the above questions are established and the transition to a circular economy gains momentum, the state will be able to withdraw. **Therefore, it can be said that banks expect the state to take the initiative to be actively involved in financing the circular economy. And the state should not expect them to take the first step on a market basis (as practice**

shows, this does not happen). The uncertainty at the beginning of any transition is too great, and it is necessary to recall that banks are conservative institutions.

Environmental risk management is not just a passive activity, consisting of the application of a procedure in which various documents of the client are considered, or in the calculation of scoring for him on the basis of exposure parameters and other indicators. It also has a proactive part, which consists not only of assessing the customer's compliance with the existing conditions and the existing product range in the bank, but also in developing such products and services which could meet his new needs, and which, so to speak, would make him a suitable beneficiary for various credit products that banks offer. However, in order to create such products, serious work is needed inside the banks. The necessary level of expertise must be built, which includes knowledge of the latest market trends, customer purchasing power, demand trends, and last but not least, the demographic characteristics of society. It should not be forgotten that young people are more likely to change their consumer habits. Middle-aged people, as well as retirees, are in most cases not among those ready to change their behavior. In order to create products that are aimed at protecting the environment in one way or another, and to find a market for these products, banks need to explore this whole range of problems, and perhaps many more, which at this stage cannot be foreseen.

China

It can be said that the Chinese Banking Regulatory Commission acts to support the development of proactive environmental risk management in banks - by incentivising them towards financing environmentally sustainable projects and requiring banks in their contracts with customers to put clauses to comply with certain environmental standards. This policy was launched in 2007 by the Banking Commission and the Ministry of the Environment in the form of a document entitled "Green Credit Policies". In 2012, the publication of the "Guidelines for Green Lending" went out, consisting of instructions to banks on how to implement the policy and reach compliance with credit requirements. The Commission obliges banks to collect and pass on statistics on the financing they provide to companies in the construction and transportation sectors. Through these statistics, the commission, together with the Ministry of Environment, monitors the country's progress in achieving national environmental goals. Another interesting feature of the requirements introduced back in 2012 to banks is the obligation to monitor whether their customers comply with environmental standards and laws and in case of violations to sanction them by making changes to loan agreements. The main sanction that is applied is a requirement for early repayment of loans, in the event that after establishing the violation and subsequent warning, the client does not take corrective action within the period specified by the bank. In case of proven non-compliance with the environmental legislation, a client may be denied a loan at all. Another measure is the granting of loans not directed towards the environment at higher interest rates, as well as providing generally difficult access to financing from banks for such projects.[10]

Brazil

Brazil is the next example of proactive environmental risk management by banks as a result of regulatory requirements, but China is ahead in this regard. In 2014, the Central Bank of Brazil

[10] Notice of the CBRC on Issuing the Green Credit Guidelines. CBRC. 2012. Available at: http://www.cbrc.gov.cn/EngdocView.do?docID=3CE646AB629B46B9B533B1D8D9FF8C4A

issued a guidance document on the application of the requirements of Pillar II of Basel III regarding the review of assets and process assessments in banks, requiring them to take into account the extent to which they are exposed to environmental and social risk. This document also requires banks to prepare and disclose environmental and social risk reporting in their portfolios, dressing it in the form of following the regulations of Pillar III of Basel III. Penalties are provided for non-compliance with this requirement.[11]

Peru

The approach of the Financial Regulator in Peru differs from that of the Chinese and Brazilian central banks. It definitely deserves to be defined as innovative and aimed at creating a lasting culture of assessment and management of environmental and social risk both among banks and the corporate world in the country. The Peruvian regulator requires banks to prepare a report on the environmental and social risks associated with a project apploying for credit before funding is granted. Only after the report is considered together, of course, with the other documents of the company applying for a loan, and after the bank is convinced that the risks are acceptable, can financing start. According to a 2014 report by the director of the Peruvian regulator, Dr. Daniel Szydlowski, this requirement has led to a significant improvement in the overall financial risk in Peru and the number of bad loans has decreased significantly.[12]

Inferences

Unlike China, Brazil and Peru, the most developed countries in the world have not created regulations to encourage proactive management of environmental risk and hence - lending to environmental projects. Basel III and IV definitely have the potential to set requirements for banks in this area, but this is a matter of reaching consensus at international level. One can think of formulating requirements within all three pillars. In particular: to expand and specify the requirements regarding the quality of capital in Pillar I, to set such requirements in Pillar II in the part dedicated to the assessment of the exposure of the portfolios to systemic environmental risks, and to supplement Pillar III with mandatory requirements for banks to disclose information on environmental risk according to well-defined criteria.

Consideration must be given not only to the manifestation of environmental risks at the level of the transaction or individual client, but also at the macro level in order to be able to make a comprehensive assessment of how and in what way the banking system is exposed to them and therefore to what extent it contributes for the transformation of the linear model into a circular one.

In conclusion, it can be said that in the field of assessment, monitoring and disclosure of information on environmental risk at this stage there is no standardization internationally, as well as well defined mandatory requirements for banks to monitor this risk. The existing requirements in Basel III are vague and general. The way they are formulated allows banks to

[11] Stability and Sustainability in Banking Reform. Are Environmental Risks Missing in Basel III? 2014 University of Cambridge Institute for Sustainability Leadership, p. 18.

[12] Interview, Dr Daniel Schydlowsky, Director Peru's Financial Regulation Authority, and Paul Collazos, Economist, Peru's Financial Regulation Authority (4 June2014), вж. Stability and Sustainability in Banking Reform. Are Environmental Risks Missing in Basel III? 2014 University of Cambridge Institute for Sustainability Leadership, p. 18.

circumvent the monitoring of environmental risk, giving priority to clear financial benefits for themselves in financing various transactions.

Therefore, the current state of regulation in most of the world encourages the neglect of environmental risks. This is due to the lack of sufficient understanding of the problem at the state level. Proof of this are the examples of China, Brazil and Peru. These countries have specific requirements for banks in terms of environmental risk management and the results of this policy, as shown by the practice in Peru, are encouraging. The Chinese authorities, on the other hand, have come to a deep understanding that the economy of this huge developing country would not have a sustainable future, if the imperatives of the environment were ignored. This has pushed them from now on to set strict requirements for both banks and companies from all sectors of the economy to comply with environmental legislation. The severe sanctions provided for in infringement cases are a good enough incentive for market participants to follow the law. Thus, as in Peru and Brazil, China is working to build a holistic culture in a society centered on environmental protection.

Capital markets and the transition to circular economy

Asset management within the capital markets is the other important area of financial activity that is essential for the success of the transition to circular economy. In a market economy, efficient use of financial resources is achieved through the financial markets. In this presentation we focus on some phenomena that are observed at stock markets. We pay special attention to them, because the information from these markets, due to its transparency and volume, provides a favorable opportunity for analysis. In addition, the trends observed in the stock exchange trade largely reflect the processes taking place both in purely economic and political terms.

As already mentioned, the transition to circular economy could not have taken place without the active participation of financial institutions and markets. The role of banks, which undoubtedly play a significant and in many cases leading role in setting the “rules of the game” on the credit market, has already been examined. The stock exchanges and securities trading that take place on them, and in which the asset management efforts of the various market participants are practically materialized, should also be studied in order to highlight the main trends that would support the transition to a circular economy. Exchange trading in some of its segments is indicative of the preferences of the third important group of participants in the financial sector - insurance companies. As they are significant institutional investors due to the large amount of funds they attract through the collected premiums, the trends in their preferences are particularly indicative of the assessment given to certain market segments in terms of profitability and especially long-term stability.

What has been observed during the recent years? There is a particularly clear trend of increasing interest from more and more investors in the assets of companies, which in one way or another are defined (or the market defines them) as “green”, i.e. as such whose activities support the protection of the environment, including the fight against climate change and pollution, and therefore actively work for the long-term sustainability of business. Because, due to the nature of their activities or the presence of targeted efforts in this direction, such companies practically prove to be socially responsible, investments made in securities issued by them are known by the terms “socially responsible investments” as well as “sustainable and responsible investments” (SRI). Indeed, in the scientific literature at the moment there is heterogeneity in

relation to their definition.[13] On the one hand, investments are defined as socially responsible if they are oriented to one or another social cause. The term is often used interchangeably with "ethical investments" or "value-based investments" ("value-oriented investments") and refers to "the integration of certain non-financial considerations - ethical, social or environmental - into the investment process".[14] The term is also used in connection with the corporate social responsibility of a company, which includes the consideration of social and environmental principles, and which, as mentioned, in recent years has been the subject of growing interest from investors and a common practice.

There are several well-established typologies of socially responsible or sustainable and responsible investments in the scientific literature. Typology helps investors and analysts to identify the desired type of investment, as well as to follow the trends specific to each of them.

The main sources of regular information on stock market trends in SRI are Eurosif, the Global Sustainable Investment Alliance (GISA), the Principles of Responsible Investment (PRI) and the European Funds and Asset Management Association (EFAMA). Each of these organizations conducts its own analyses based on stock market data and various surveys of investors' views on socially responsible investment trends[15].

Typology of Socially Responsible or Sustainable and Responsible Investments

Defining a precise typology of responsible, sustainable and socially responsible investments is not an easy task. First, these concepts are relatively new to both financial practice and the scientific literature. Second, they cover too many factors and phenomena that affect the financial performance of companies issuing securities and this makes it difficult to define them simply. For these reasons, there are several terms (mentioned above) that are in many cases used as synonyms, while in the literature it is debated how appropriate it is to do so. Another difficulty stems from the complexity of defining the concept of "responsible" and "sustainable" for a company.

In many cases we are faced with contradictions arising from the very peculiarities of the companies. For example, can a company be defined as responsible to society (and therefore investing in its securities to be considered "responsible") if that company, on the one hand, produces high quality cosmetics using environmentally friendly methods without adding harmful ingredients such as preservatives, parabens etc., but for the collection of some of the raw materials needed for the production process is used child labor? And, if it is still defined as responsible, because the products it produces have certain qualities, in which category of responsible companies should it be placed - in this case it should be considered environmentally responsible, but not to socially responsible. In such cases, asset managers should apply their own logic and assess whether investing in such companies is "sustainable". It is very important for them to determine to what extent a company is responsible and in which category to be

[13] Von Wallis, M., Klein, C. Ethical requirement and financial interest: a literature review on socially responsible investing. Business Research DOI 10.1007/s40685-014-0015-7, Springer, 2014, p. 3.
[14] Sandberg, J., C. Juravle, T.M. Hedesstro¨m, and I. Hamilton. 2009. The heterogeneity of socially responsible investment. Journal of Business Ethics 87(4): 519–533.
[15] Kent, B. H., Norsinger, J. R. Socially Responsible Finance and Investing: An Overview. CourierWestford, 2012., p. 3

placed, because this leads to market expectations for its performance, and these expectations are then reflected in the prices of the respective securities.

An alternative approach is the desire to determine what it means for a company not to be responsible and sustainable and on this basis, applying the exclusion method, to conclude which companies can be defined as such. However, this approach, as noted in the scientific literature on the subject, applies a significant degree of subjectivity, due to the lack of clearly defined criteria for categorization of companies.[16] The way in which sustainable and responsible investments are defined is not a purely theoretical issue. It affects the return on portfolios, in the formation of which strategies for responsible investment are applied.

In theory and in practice, two modifications of the exclusion method are applied to determine whether a company is sustainable and responsible - exclusion in the broad sense and one in the narrow, concrete sense. The first modification of the method involves defining a wide range of characteristics that companies do not need to have in order to be categorized as sustainable and responsible. The second modification is usually based on the definition of so-called "sin stocks".[17] "Sin stocks" or "Sinful securities" are issued by companies whose activities are inherently harmful to the environment or to the physical or mental health of people. Definitions of sinful securities vary, but perhaps the best known are associated with the so-called "triumvirate" of alcohol, cigarettes, and gambling, although there are other definitions.

Another slightly broader definition of "sinful securities" is offered by Lobe and Walkshäusl. According to them, alcohol, tobacco, gambling, weapons and pornography are the so-called "Sextet of Sins".[18] The term "medical sin", on the other hand, refers to the securities of companies that perform ethically and healthily contradictory medical activities such as abortion, animal testing, production and distribution of contraceptives, genetic engineering, embryonic stem cell extraction and more.[19]

One of the most widely used definitions of sustainable and responsible investment remains that of Eurosif: "Sustainable and responsible investment includes all the strategies that an investor can implement and that take into account environmental, social and management aspects and analyzes".[20]

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[16] Jan Trinks, Pieter, and Scholtens, Bert. The Opportunity Cost of Negative Screening in Socially Responsible Investing. Journal of Business Ethics, 2015. Available at: http://link.springer.com/article/10.1007/s10551-015-2684-3/fulltext.html

[17] Renneboog, L., ter Horst, J., & Zhang, C. (2008). Socially responsible investments: Institutional aspects, performance, and investor behavior. Journal of Banking & Finance,32(9), 1723–1742, Fabozzi, F. J., Ma, K. C., & Oliphant, B. J. (2008). Sin stock returns. The Journal of Portfolio Management,35(1), 82–94, and MSCI (2013). Business involvement screening research. definitions and scope. Available at: http://help.riskmetrics.com/Screener/Content/Methodology/Business_Involv_Meth.pdf

[18] Lobe, S., & Walkshäusl, C. (2011). *Vice versus virtue investing around the world*. Unpublished working paper, University of Regensburg. Available at: http://dx.doi.org/10.2139/ssrn.1089827.

[19] Jan Trinks, Pieter, and Scholtens, Bert. The Opportunity Cost of Negative Screening in Socially Responsible Investing. Journal of Business Ethics, 2015. Available at: http://link.springer.com/article/10.1007/s10551-015-2684-3/fulltext.html

[20] Eurosif. European SRI Study, 2014. Available at: http://www.eurosif.org/our-work/research/sri/european-sri-study-2014/.

Sustainable investment strategies on the capital markets

As already mentioned, large organizations such as GSIA, Eurosif, EFAMA, PRI have developed their own typologies of the main strategies applied by investors willing to invest in sustainable and responsible companies. The distinction between strategies is extremely important, as the implementation of each of them carries with it certain risks, which correspond to different levels of expected and realized returns. Strategies are mainly associated with the choice of one or another type of sustainable and responsible companies in which to invest and rather can be said to correspond to the typology of these companies themselves. Knowledge of the main investment strategies is useful in terms of the fact that the data about them give a good idea of market trends – the market interest in securities of companies that can be defined as sustainable and responsible. It can be said that there are seven types of investment strategies. All four organizations - GSIA, Eurosif, EFAMA, PRI define them in a similar way.

Leading organizations that study the market for sustainable and responsible investments use similar, almost identical classifications of the strategies that investors apply when investing in such a direction.

These classifications are especially useful when looking for answers to the three key questions of interest to investors:
• What exactly are the strategies currently in place on the market?
• What are the preferred strategies?
• What is the growth of managed funds in each of these strategies?

Inferences

In recent years there has been an increased interest on the part of the investment community in investing in securities of companies that can be defined as responsible to the environment and society. This trend is indicative of the general market attitudes and resonates with the policies of the world's leading countries to work actively towards circular economy. Without the support of the financial markets, this could hardly have happened. At the same time, financial markets are a kind of barometer of overall social and economic attitudes and expectations.

The very fact that there are currently several leading international organizations such as GSIA, Eurosif, EFAMA and others, uniting the interests of investors in this type of securities, speaks very clearly about market trends.

CHAPTER FOUR. THEORY AND PRACTICE IN THE FIELD OF ENVIRONMENTAL ACCOUNTING AND REPORTING AND THEIR RELATIONSHIP WITH THE TRANSITION TO CIRCULAR ECONOMY

Over the last 20 years, the topics related to environmental pollution and the need to take action to limit its harmful effects have become increasingly important. Attention is also paid to the ways in which the effects of the activity of the enterprises are reported. The main way in which this reporting should be done is through the integration of the relevant rules within the accounting of companies. This requires subsequent control over the information presented in this part of the reports.

A growing number of companies present non-financial information about their activities in their reports. This therefore requires this type of information to be verified in order there to be certain about its authenticity.

The purpose of this part of the present study is to summarize some key issues of environmental accounting and then to address the principles and problems associated with the preparation of ex-post reporting. The choice of the topic is justified by the growing relevance of environmental accounting and reporting of non-financial information, as well as by placing environmental protection and expanding the scope of the circular economy among the priorities of the EU, of which Bulgaria is a part.

Under modern conditions, environmental accounting and the disclosure of non-financial information should henceforth be seen as an integral part of modern accounting and reporting, and not as side and optional activities.

Environmental accounting. Nature, trends and problems.

In order to be able to implement the policy, adopted by a number of countries towards circular economy, it is crucial to have the necessary data on how the economy works at both macro and micro levels. This would not be possible, if there were no relevant standards for accounting for the impact of individual activities of enterprises and the state on the environment. The need to monitor and manage changes in the environment, which materialize both in the pollution of the biosphere and in various manifestations of climate change, raises the need to create and implement standards and rules in accounting to provide adequate information about this important question. In the globalized modern world, in which the independent existence of any country is almost unthinkable, the implementation of international comparisons and the aggregation of information at global level is a prerequisite for efforts to eliminate environmental pollution. That is why the global intergovernmental organizations - the UN, the World Bank (WB), the International Monetary Fund (IMF), the EU, the Organization for Economic Cooperation and Development (OECD) are the forums in which the main debate on the nature and characteristics of environmental accounting and worldwide rules in that field are being created and revised.

In terms of its scope, environmental accounting is divided into three types: corporate, national and global (international).

System of Environmental Economic Accounting (SEEA): Nature, features and application

The Environmental Economic Accounting System (SEEA) is designed to establish internationally accepted standard concepts, definitions, classifications and accounting rules that are valid for all countries. Unification of the rules facilitates the management of environmental efforts worldwide and makes the preparation of various international comparisons possible. In essence, the SEEA follows the approach adopted in the system of national accounts (SNA). All concepts, classifications, definitions and terms are compatible with the SNA. The aim is to facilitate the integration of environmental statistics into economic statistics.

Environmental accounting practices in the EU

Regulation (EU) 691/2011 provides for the use of European environmental accounts. The purpose of the regulation is to create and establish a standard for harmonization of data from

individual EU member states, as well as from countries that have signed a free trade agreement with the EU. The development of European environmental accounts has been planned within the framework of the European strategy for environmental accounts for the period 2014-2018. The European environmental accounts are compatible with the Central Framework of 2012. They are built on modules, the total number of which is currently six, only some of them are used in practice. These modules cover the following topics:[21]

• Atmospheric emissions. They report the emissions of six greenhouse gases, which are considered the most dangerous, one of them is carbon dioxide. In addition, the release of seven air pollutants is monitored. These accounts present the results of 64 polluting industries, as well as households.

• Material flows throughout the economy. They reflect the quantities of raw materials involved in economic activities, the accumulation of materials in the economy and their disposal back into nature. Physical raw materials are classified into 50 categories - biomass, metal ores, non-metallic minerals and mineral energy raw materials. Tracking the results of this group of accounts creates space for various analyses, such as the assessment of resource productivity, the material footprint of economic activities, the separation of economic growth from the extraction of natural resources and others.

• Energy flows. They take into account the energy flows from nature to the economy, within the economy and from the economy back to nature. An interesting feature is the reporting of energy flows by species, on the one hand from the point of view of the source (minerals, hydropower, biomass, etc.), on the other - according to the products and waste generated in the process, and on the third - according to suppliers and consumers, who in turn are categorized into 64 industries, plus households. The purpose of collecting this information is to create an opportunity to compile various analyzes and models for tracking and managing the productivity of the use of different types of energy, as well as to monitor energy efficiency. These accounts became mandatory from 2017.

• Environmental taxes. Environmental taxes are reported in this group of accounts. This is done within four broad groups: energy, transport, pollution and resources, as well as the distribution of 64 industries that pay these taxes, including households.

• Environmental goods and services sector. These accounts shall reflect information on the production of goods and services that are specifically aimed at environmental protection or resource management. 21 industries are covered. With the help of the information from these accounts, various analyzes can be made for the growth of the economy, for the expenses for the protection of the environment, green jobs, etc. The collection of information on these accounts is mandatory from 2017.

• Environmental protection costs. This category of accounts takes into account mainly the costs incurred by individual economic operators in order to protect the environment. The collection of information on this category of accounts is also mandatory from 2017.

[21] See "Environmental accounts - establishing the links between the environment and the economy". Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Environmental_accounts_-_establishing_the_links_between_the_environment_and_the_economy

In addition to these six groups of accounts, the EU is currently working on setting up additional groups of accounts to cover activities related to forests and environmental subsidies and similar transfers. The EU plans to develop and introduce accounts to account for and track the various effects on ecosystems and waters.

Carbon accounting

One of the important aspects of environmental accounting is related to the tracking of data on the carbon footprint of companies. The term "carbon accounting" refers to the process of measuring the amounts of carbon dioxide that an economic entity has generated in its activities. Keeping records of this dimension of companies' activities is extremely difficult and controversial, due to a number of purely methodological problems that arise in the process of collecting and compiling the necessary data.

So far, the problems of carbon accounting have not been thoroughly studied. This is a relatively new territory for both accounting and applied research.

The need for carbon accounting in the EU is due to the adopted emissions trading scheme, which came into force in 2005 and is currently the largest such scheme in the world. It regulates trade both between countries and between companies. According to the rules of this scheme, each country must set an emission ceiling, after which the so-called greenhouse gas emission permits are allocated to it. With these permits, it can trade on the European carbon market. However, in order to achieve their individual goals, each EU country must ensure that individual companies within its own borders also have the appropriate emission ceilings and comply with them. Businesses, in turn, can also trade in permits that are allocated to them. However, in order for this to be possible, it is necessary to keep records of the emissions consumed in the process of their actual activity, and this reporting must be traceable. In this context, in December 2004, the International Accounting Standards Board (IASB) issued a special guidance document on how to keep accounts of emissions and marketing authorizations under the IFRIC 3. However, once they have been implemented, it turns out that these guidelines are not complete and cause many contradictions in practice. Therefore, in 2005 they were withdrawn from the IASB, after which a discussion on their improvement was initiated, which has not been completed to this day.

Inferences

The need for environmental accounting will not disappear, despite the many unresolved issues related to it, which make it difficult to implement in some cases to the point of impossibility. On the contrary, this need will increase in the future. This is because environmental protection is among the priorities of all developed and developing economies in the world and is an integral part of the policy of transition to a circular economic model.

Prioritization is invariably associated with the need to specify goals for its implementation, and to achieve the goals it is important to have specific indicators that track progress. Such indicators can be provided only by the accounting of the organizations, as it reflects in numerical form all their activities.

This determines the exceptional relevance of environmental accounting as a new direction in accounting science and practice, as well as its particularly important role in the transformation of the linear economic model into a circular one.

Environmental reporting standards. Nature, problems and application

The traditional and dominant thinking in the corporate world is that reporting should present to companies only such data that are required by law, by the accounting standards or according to the requirements of a given exchange (in order to list a company on it). Any other type of accountability that goes beyond these requirements is often seen as the result of enormous work, the benefits of which are not very clear.

The last twenty years have seen a trend of change in this way of perceiving reporting and accountability. This trend is due to many different factors. On the one hand, for the reasons presented so far, individual countries, mainly developed ones, place environmental protection policies among their priority areas for action. The pressure on the companies is intensified due to the requirements for keeping records on certain indicators so that the state has a view on the overall impact that the activities of individual companies in their entirety have on the environment. Society also demands information on the extent to which companies are involved in these issues, especially against the background of the threatening levels of environmental pollution and the often frightening climate change.

An important question is in what form environmental reporting is prepared. Here, too, there are a variety of practices, as there is no mandatory form in which this should take place. Some organizations include environmental reporting in their annual reports, others prepare separate documents from the annual reports, which have different lables - environmental reports, sustainability reports, corporate and social responsibility reports. Others take a different approach - the prepared environmental reporting data is presented directly on the organization's website and this is done not only for information, but also for marketing purposes - many organizations want to be perceived by society as environmentally concerned and thus attract customers.

What are the pros and cons of the different approaches to reporting? A leading positive aspect of preparing an environmental performance report, separate from the main and most important report - the annual financial report of the organization, is that in this way the information on environmental reporting is differentiated from other financial data, it is given more space. However, due to the need to compile a complete separate document, a relatively larger amount of information is necessary compared to the cases where environmental reporting is part of the financial statements. A major weakness of this approach is the need for a team to take care of this type of reporting or a consultant to assist the organization. This complicates and increases the cost of compiling a separate report and engages a considerable internal resource for the organization. In order to compile such a document, it is necessary to have a high level of expertise within the organization regarding environmental issues, the impact of the particular company on it and the identification of what exactly indicators are relevant for assessing this impact. Also, in order to create and maintain indicators, even in cases where guidelines are used by various organizations engaged in such activities, it is necessary to make considerable efforts to clarify the methodology by which data are collected.

At the same time, if the environmental reporting data is presented as part of the annual financial statement (which in this case is renamed the "annual financial and environmental report" or otherwise), then there is no need to prepare detailed information about the environmental performance of the organization. The reporting is reduced to selected indicators, usually in tabular form, accompanied by the presentation of their dynamics or features in a concise text.

Therefore, more and more organizations are moving towards this approach, and the preparation of a separate document on environmental impact is done by certain companies only. Such organizations are companies whose direct environmental impacts are significant, such as companies in the chemical, mining, metalworking, oil refining industries, as well as the world's largest companies, which do not lack the resources to prepare the necessary documentation.

At this stage, environmental reporting is not mandatory in most countries around the world. Its preparation and maintenance by individual organizations is voluntary. In practice, however, especially large companies in highly developed countries are increasingly turning to the perception of such accountability. In this way, they create and maintain a reputation in society that helps them build their overall image and supports their efforts to expand their market share.[22]

Environmental reporting frameworks

The voluntary nature of environmental reporting allows individual companies, as already mentioned, to choose the ways in which they will implement it. World practice in this area knows various voluntary environmental reporting schemes. They provide a kind of framework for its preparation, accompanied by guidelines on how to collect the information, what indicators need to be compiled, and what kind of evidence on the validity of the data should be provided by the reporting organizations.

A study by the Federation of European Accountants on such existing reporting frameworks identified the following five frameworks as the most commonly used:

1. The project of the Prince of Wales for sustainability reporting, or as it is known - A4S (from "Accounting for Sustainability");

2. The environmental, social and governance key performance indicators (KPIs for ESG) of the German Association for Financial Analysis and Asset Management (Deutsche Vereinigung für Finanzanalyse und Asset Management, DVFA);

3. Sustainable Value of the European Academy of Business in Society;

4. The Sustainability Reporting Guidelines of the Global Reporting Initiative (GRI);

5. UNCTAD guidelines for the preparation of indicators in the field of corporate social responsibility and the documents related to them.[23]

In addition to these five frameworks, the study examines the methodology of the Sustainability Accounting Standards Boards (SASB) with a view to its widespread use in practice.

Inferences

As in the field of environmental accounting, and in terms of reporting, summarizing information on the performance of organizations on various environmental issues, there is currently no

[22] Environmental Accounting and Reporting. ACCA Global. Available at: http://www.accaglobal.com/za/en/student/exam-support-resources/professional-exams-study-resources/p1/technical-articles/environmental-accounting-and-reporting.html

[23] Environmental, Social and Governance (ESG) indicators in annual reports. An introduction to current frameworks. FEE Sustainability Group. May 2011. Available at: http://effas.net/about-us/commissions/cesg-environment-social-and-governance.html

single, universally accepted framework. The lack of a single standard leads to a number of difficulties in compiling environmental reporting, to doubts among company management as to whether such reporting is needed, to problems in interpreting related data, especially when it is necessary to make comparisons between different companies with investment goals.

On the other hand, at this stage, considerable experience has already been gained in creating methodologies for compiling environmental reporting. These methodologies usually treat environmental reporting together with two other new types of reporting - those for the activities of organizations in relation to society and the management, or governance, aspects of their operation.

For the time being, the application of any of the above mentioned frameworks is not mandatory. This gives organizations the freedom to choose how to report. The indisputable trend is that despite the voluntary nature of environmental reporting, more and more organizations are focusing on its preparation.

CHAPTER FIVE. ADAPTED MODEL FOR ASSESSMENT OF ENVIRONMENTAL AND SOCIAL RISK IN BANK LENDIND

Comprehensive environmental risk management or the green bank concept

In order for banks to contribute to the real realization of the circular economy, they themselves must be oriented towards it. When we talk about the environmental aspects of the circular economy, at the micro level, this should mean for banks that they must be “green”, in the sense that they must take environmental protection as their philosophy and strategy. This coincides with the introduction of a comprehensive environmental risk management system in the banking sector - and this system not only covers the internal consumption of resources and monitors the level of environmental risk in lending post factum, but means being proactive in the development of banking products and services aimed at the preservation of environment.

The author proposes a model of four levels of environmental risk management in banks.

The first level is related to the management of the environmental risk, which arises from the so-called direct effects of the activities of the bank. These are the consequences of its very existence, for the needs of which it uses energy from various sources, paper, water, generates waste, etc.

The second level builds on the first and also involves the development of environmental risk management policy in the core business of the bank, in the case of European banks, mainly in the field of corporate lending (here at this stage we include leasing, factoring and other forms of commercial financing).

The third level covers the first two and extends to environmental risk management through the development of appropriate environmentally friendly banking products, or, as mentioned above, proactive risk management.

The fourth, highest level builds on the third and presupposes the orientation of the deposit policy to sources of funds that have a proven positive attitude towards the environment.

While many banks have already reached the first and second levels, the third (especially in the area of creation of a comprehensive product policy aimed at the environment, and not just the sporadic appearance of some exotic "green" products) and the fourth belong entirely to the future.

The International Banking Community, represented by the United Nations Environment Program Finance Initiative (UNEP FI), recognizes the need for a fundamental change in banks' approach to the economy. In the context of this way of thinking is the Positive Impact Manifesto adopted by this organization in May 2016. It declares that banks must use their unique position as intermediaries between the real economy and capital markets and begin to reorient their business models to financing sustainable development, an integral part of which is environmental protection. The aim of this change must be to achieve an overall positive impact of their activities, which in turn is defined as "demonstrably leading to a positive impact on the economy, society and the environment, after proper consideration and minimization of all negative impacts."[24]

The Banking Commission of UNEP FI has initiated a project to develop this new paradigm, which includes the creation of a roadmap to change the model.

Another recent study, again initiated by UNEP FI and the Institute for Sustainable Leadership at the University of Cambridge, outlines the main reasons why banks urgently need to take action to shift from conventional line financing to support the circular model through environmental risk management at all levels.[25]

First of all, this study points out that environmental risks are increasing in both number and intensity. Therefore, there is an increasing interaction between them and other socio-economic trends, which already in their entirety affect the financial stability in different places.

Secondly, a number of indirect effects of increasing environmental risks also occur. Indirect effects are related to the public response to these risks, which is often carried over into certain regulatory initiatives. All this affects the environment in which banks operate and the success of their business models.

Third, environmental risks are beginning to manifest in an increasingly complex way. This is due to several reasons:

- the growing interconnectedness among the different types of environmental risks;
- the uncertainty about the time horizons in which these risks will manifest, their frequency and intensity;
- the development of the manifestation of some of the these risks and the creation of various interdependencies between them over time.

Stages of environmental risk assessment and management in corporate lending

[24] Positive Impact Manifesto. UNEP FI. May 2016. Available at: http://www.unepfi.org/fileadmin/documents/PositiveImpactManifesto.pdf

[25] Banking & Sustainability Time for Convergence. A Policy Briefing on the links between Financial Stability and Environmental Sustainability. UNEP FI. 2015. Available at:: http://www.unepfi.org/fileadmin/documents/BankingSustainability_TimeForConvergence.pdfp. 5,6

Since the assessment of environmental risk in Bulgaria is important mainly for corporate lending in Bulgaria, the focus here is on the methods for its assessment and the management in this type of activity.

Although there are some differences in the methodologies adopted by each bank that performs environmental risk assessment and management, the stages are essentially similar. They follow the EBRD and IFC methodologies described above.

In the first place, upon receipt of a loan application, along with the initial assessment of the client's overall financial risk, a specific environmental risk assessment is made. This is done by filling in a scoring card, including the following characteristics of the loan application:

• Type of industry in which the applicant is operating

• Loan amount

• Loan term

• Type of collateral

Usually, each of these four categories is assigned a specific weight, with the weight of the industry type being the largest, and the other three categories being weighted equally. Why is this so? Due to the fact that the type of industry, ie. the type of activity of the borrower, determines the degree of pollution or the potential for environmental problems. Therefore, it is believed that the importance of this factor is the greatest for the degree of environmental risk. The other factors - the amount and term of the loan and the type of collateral are of secondary importance. The principle is: the larger the loan amount, the greater the risk for the bank. Thresholds are usually set for this indicator, for example: a loan of up to EUR 200 k (or USD) is considered small, a loan between EUR 200 k and EUR 1 m (or USD) is considered medium, and a loan of over € 1 m (or USD) is considered large. The principle regarding the following indicator is similar - the longer the loan term, the greater the risk for the bank. Why is this so? Because the longer the repayment period of the loan, the more likely it is that before its repayment there will be changes in the conditions and solvency of the borrower, as well as in the legal framework treating the environment that is relevant to his activities.

In addition to these two risks, there is a third one - over a longer period due to poor environmental risk management on the part of the beneficiary of the loan, real environmental problems might be caused. In terms of maturity, banks also set certain thresholds, which, for example, according to the EBRD methodology are as follows: up to 6 months the loan is considered short-term, between 6 months and 2 years - medium-term and over 2 years - long-term.

The type of collateral is also important and collaterals with different liquidity and other qualities have different contributions to the overall environmental risk assessment. Thus, the collateral type with the lowest risk is considered the most liquid collateral - cash, deposits and cash guarantees, because, in case of a problem with the solvency of the client, the bank can recover its losses almost without additional costs and efforts. Next in terms of risk are considered land plots not used for industrial production or close to such, fixed assets, and illiquid current assets. This is because real estate assets may lose their value in the period in which they are pledged as collateral, and, if the bank has to cash them at some point, it may not be able to realize the desired value and, as a result, will have to write a loss. Lands used for industrial purposes or

close to those with a proven degree of pollution are considered to be the most risky collaterals from the point of view of environmental problems.

A special problem for banks is the assessment of the last of the three types of collateral: illiquid assets (real estate - land, industrial and farm buildings, etc.), which could have environmental problems, or which could be known to have environmental problems in the past - there was information in the media, the owner company was sanctioned by the control authorities or there were protests by local residents and NGOs. In this case, the bank faces the problem of how to treat such collateral - whether to accept it, and if so - at what value to be valued, whether to reject it, and if it rejects it, what to ask in addition from the borrower. This issue is important because the role of the collateral is to serve to cover losses for the lending institution in the event that the client is unable to meet its loan obligations. When a bank accepts collateral, it must consider what it would do with it, if it acquires it at some point in time. In the context of the legislation in Bulgaria, if it is established that an enterprise pollutes the environment, the owners are obliged to take care to clean the nature, returning the situation as it was before the pollution (Law on Liability for Prevention and Elimination of Environmental Damage, promulgated in the State Gazette in April 2008). If it is proven that a facility is polluting and it has already been acquired by the bank as collateral for a bad loan, then the bank will be liable and will be obliged to take action to repair the damage. In some cases, this can be an extremely expensive endeavor. To these must be added the reputational risk associated with such activities. The purification of nature will inevitably get in the media and then the bank will have to take care not only to purify nature, but also its own name.

Due to the importance of the problem with real estate as collateral, the author's recommendation is, when making the initial environmental risk assessment and where there are several collaterals of different types - for example, deposit (high liquid collateral with low risk), land or other real estate for which there is no history of an environmental problem or no potential for such type of problems (i.e. residential buildings, office premises, etc.) and a property with a risk of environmental problems and a history of this type of problem (i.e. a dairy whose owner has been fined in the past for lack of a wastewater treatment plant), when calculating the risk, to assume the weight corresponding to the lowest liquidity and highest risk collateral. Of course, this will lead to an increased overall level of the risk of the deal, which would be the main objection to the proposed approach. However, it will give the bank more certainty when deciding whether to grant a loan or not.

Finally, after calculating the risk, within the scoring card used to calculate the risk, the credit expert may enter his own opinion if he considers that a particular feature of the client needs to be addressed. For example, the type of collateral, the type of industry and the region in which the client operats, etc. This information is intended for the members of the body that decides whether the loan should be granted or not (Credit Committee, Credit Council, etc.).

After the initial assessment of the environmental risk (low, medium or high), representative of the bank makes an on-site visit to the client. This visit is a standard practice in corporate banking and it is done in order to get to know the client and his business. During the visit, a standard reporting form is completed, which in terms of environmental risk assessment is reduced to answering several key questions. Of course, bank employees could not be expected to become environmental experts, and this is not necessary. The idea is that when visiting the client, they

should try to pay attention to some important aspects of his work, as this has a direct bearing on his solvency - current and future.

In addition to the above four criteria, the initial assessment of environmental risk according to the EBRD methodology must take into account the importance of four other qualitative characteristcs:

1. Financial soundness

2. Management capacity

3. Degree of innovation

4. History

These are very important, as they provide a greater completeness to the outcome of the initial assessment. An enterprise may, by its nature, have the potential to cause significant environmental problems and therefore its lending may be assessed as carrying a high risk for the financing bank. However, taking into account the second category of criteria - qualitative, it may turn out that the assessment, which is technically obtained when filling out the scoring card must be adjusted. The first criterion - financial soundness - is important in terms of the possibility to meet possible fines and other sanctions from the control authorities, as well as to build facilities to control pollution (sewage treatment plants, etc.). Management capacity is important because it shows how much the importance of environmental problems is realized by the management of the company and hence - how whether it seeks to deal with it effectively. The degree of innovation is relevant, as it reflects the extent to which the company introduces new technologies to reduce pollution and thus meet the legal requirements for different types of standards. History as a criterion is not to be underestimated. The information about it shows us to what extent the management of the company-borrower has sought to eliminate environmental problems in the past and thus not be exposed to the risk of sanctions, as well as the extent to which the company has been subject to control by the relevant authorities, etc.

After the initial risk assessment has been prepared and calculated and the report from the client's visit has been filled in, the two documents accompany the rest of the loan documentation and are considered by the body that grants the loans in the bank.

As is clear from the analysis so far, the environmental risk assessment and the findings of the client's visit are informative. They do not hinder the lending process, but simply complement the information about the risk that the bank assumes in its relationship with a client. The body that makes the final decision has the right to refuse financing or to request the preparation of an additional detailed study of the environmental aspects of the client's activity, if it considers that the environmental risk for the bank is unreasonably high.

The author considers this approach to be the most suitable especially for Bulgaria, as in our country the environmental legislation and its application is still under development. In addition, society's sensitivity to environmental issues in general is still not high enough to provoke systematic monitoring of environmental issues. However, the picture is changing, albeit slowly, so banks need to reflect this phenomenon, if they are willing to both protect themselves from risks and identify new opportunities.

Model for environmental and social risk assessment in corporate lending and its approbation in a systemic bank in Bulgaria

As mentioned, the methodology proposed by the EBRD for assessing environmental and social risk in lending is widely practiced by banks around the world. This methodology is preferred because of the simplicity and clarity of the concept behind it. The scorecard model, consisting of four variables with clearly defined weights, is easy to apply and can be integrated into both basic banking lending software and, if desired, in the banks' automated models for credit risk assessment, which is actually of the greatest importance in terms of the interest of banks. The weaknesses of this model are actually rooted in its strengths - in its simplicity and in the small number of factors that determine the scoring, the result of which refers to one of the three levels of environmental and social risk set in the scorecard - low, medium and high.

The first weakness - the simplicity, which implies setting one-way criteria for assigning the maturity, amount and collateral to the concepts of low, medium and high risk based on strictly defined characteristics, makes the application of the EBRD scorecard as proposed by the bank, not sufficiently suitable for the characteristics of the loan portfolios of individual commercial banks. This is due to the fact that each bank has its own internal lending policy and rules, which affect the structure of its loan portfolio in terms of its maturity, average loan size and types of collaterals that are accepted.

If a bank applies the EBRD scorecard as proposed without taking it into account the specifics of its own portfolio, it is likely that the results will show some artificial increase or decrease in environmental and social risk, which will mislead management in taking decisions, as well as in the subsequent monitoring of loans. For example, according to the EBRD methodology, a loan should be considered low-risk under the maturity indicator, if it is granted for a period of six months to one year. The practice of some of the systemic banks in Bulgaria shows that they very rarely grant company loans for a period of less than one year. Therefore, if the indicator is applied to the evaluation of their loans as proposed by the EBRD, it will contribute to the artificial increase of the environmental and social risk assessment as a whole. Therefore, the author's recommendation is that, before proceeding to the application of a ready-made methodology, a thorough analysis of the characteristics of the bank's portfolio should be performed and, if necessary, the methodology should be adapted to correspond to them.

Furthermore, the second weakness of the EBRD's discussed methodology, reflected in its scorecard, is that it covers only four, although these are the most important, factors for obtaining an environmental and social risk assessment, and that this assessment is of three levels – "low", "medium" and "high" environmental and social risk. Indeed, structured in this way, the scorecard fulfills its purpose of producing an indicative assessment of this risk, but does not allow for a more detailed assessment.

Practice shows that the parameters in the EBRD scorecard regarding the criteria "loan amount" and "maturity" often do not meet the characteristics of the loan portfolios of banks in Bulgaria. This requires their revision and setting of such characteristics of the parameters, which, applied to the loans, would give an adequate assessment of the level of environmental and social risk that they carry for the bank. For this reason, in the specific systemic bank in which the present study was conducted, after consultations with internal experts and a number of simulations on the portfolio data for several consecutive years, it was found that the following adaptation of the criteria "loan amount and "maturity" is necessary. Based on the fact that the data that was

handled were significant in volume and that the bank in which the survey was implemented is systematic for the Bulgarian market and therefore representative of local lending practice, we came to the proposal for an adapted scorecard.

In order to explore the possibilities for upgrading and improving this adapted scorecard, with the permission of the bank's management, a study was conducted using anonymous data on the bank's corporate loan portfolio for a period of four calendar years - 2016, 2017, 2018 and 2019. For each year the records were on average about 15,000, which allowed to make simulations on a significant amount of data for different variants of combinations of factors to form a new, upgraded, more detailed scorecard for environmental and social risk assessment.

As a result of teamwork and numerous consultations with experts from the bank for a period of a year and a half, a proposal was reached on what such a scorecard should look like, so that, on the one hand, it is not very complicated conceptually, on the other - it allows a more objective view of the level of environmental and social risk of corporate loans.

The highest weight in the EBRD scorecard is the criterion "Sector in which the beneficiary operates" - it is assigned 40 percent of the weight in the final assessment of environmental and social risk of the loan. We believe that the specifics of the sector in which the client operates are crucial for the level of environmental and social risk of the loan and therefore in the adapted scorecard we propose to keep its weight. In the EBRD's scoreboard, the other three criteria: "Loan amount", "Maturity" and "Type of collateral" have equal weights - each of 20 percent of the total credit risk assessment. In the adapted scorecard, we propose to reduce these weights at the expense of the other four new criteria that we introduce. We propose that the amount of the loan and the type of collateral should have a weight of 15 per cent in the overall risk assessment, and we envisage 10 per cent for the maturity. The reason for this difference in weight is our understanding that the importance of the maturity for the overall assessment in this case is relatively less than that of the loan amount and the type of collateral, as both of the latter indicators have a relatively stronger impact on expected losses and hence on key indicators of the bank, such as provisions and reserves.

In the upgraded adapted scorecard of the new four additional criteria: "Type of loan product", "Type of beneficiary (large, medium, small customer of the bank according to its internal classification)", "Method of loan repayment" and "Number of years of activity of the client in the bank" and we propose to place a 5 percent burden on the formation of the final overall assessment of the environmental and social risk of the loan. We suggest that they need to be assigned such weights, as we believe that each of them has approximately equal importance for the formation of the overall assessment of environmental and social risk, and this importance alone is not great. We have chosen these criteria precisely because there is information about them in the core banking information system and this would allow a very easy extension of the algorithm for calculating the risk in the scorecard and its automated tracking later.

Further, each of these four criteria in the EBRD scorecard and eight in the upgraded adapted scorecard are assessed on three scales, depending on the ranges we have assigned to them, and fall into either low, medium or high environmental and social risk. This is the logic behind the EBRD scorecard, we leave it in the upgraded adapted scorecard, because we believe that this creates a very good and clear opportunity to adequately detail the assessment of environmental and social risk of the loan.

Then the approbation and the upgraded adapted scorecard were tested on the data on the bank's corporate loan portfolio for the years 2016, 2017, 2018 and 2019.

We then made a comparison between the results obtained regarding the risk profile of the bank's corporate loan portfolio when applying the simple, four-factor model of the adapted scorecard and the one we upgraded with the additional four factors adjusted scorecard.

The comparison shows that, when applying the upgraded adapted scorecard, the share of the number of loans with high and medium environmental risk in the total number of loans for each of the observed years decreases, and that of loans with low risk increases. When considering the share of the volume of high-risk loans from the total volume of existing loans for each year, it decreases, and that of medium-risk and low-risk loans increases.

Inferences

As the assessment of loans takes place on a transaction and not depending on the volume of the loan, the application of the eight-factor model will not only give a more accurate assessment of the risk for the bank, but will also reduce the administrative burden in the bank when examining loans. This is because a smaller number of loans will be classified as high and medium risk and therefore for a smaller number of loans additional documents will have to be prepared since, according to the criteria of the European Banking Authority and the bank's internal procedures, for loans classified as having medium and high risk, Site Visit Reports, discussed earlier in the study, must be collected.

CONCLUSION

The circular economy is a new term for a millennial concept. Historically, due to a number of circumstances, mankind has followed mainly a circular economic model in which raw materials were used to create goods, and after the end of the useful life of these goods were used to create new ones. The lack of technologies for processing raw materials as we know them today has necessitated this type of economic behavior. Scientific and technological progress led to new opportunities to create a variety of goods at affordable prices, which gradually, on its part, led to the expansion of consumption. As a result of these processes, the linear economic model gradually began to emerge. It is characterized by the disposal of goods in landfills after the end of their useful life. This over time raises a number of environmental problems and the need arises to rethink this way of functioning of the economy.

The policy of transition to a circular economy in developed countries, caused by climate change and growing pollution problems, requires the adoption of policies at the state level to address the new challenges. In this direction are the decisions of the EU to define environmental protection a priority area of policies and actions of the countries in the union.

The transition to a circular economy is unthinkable without the active participation of banks. These main sources of funds for the economy at this stage function entirely in favor of the linear economic model. It turned out to be profitable in the short term and this explains the difficult reorientation of banks towards change.

Achieving the desired goals is difficult, if there are no ways to measure the progress of efforts. The main source of information about the results of each organization is accounting, as it

evaluates all activities within its framework. In this line of thinking, it is essential to find adequate ways, firstly, to account for the environmental aspects of organizations' activities and, secondly, to compile environmental reports based on data from accounting systems to support the decision-making process.

Despite the importance of the problem of tracking the information on the environmental performance of individual organizations, there is no single, internationally accepted standard that provides guidelines for accounting for various environmental aspects of the activities of enterprises. The IASB's attempt in 2004 to introduce guidelines in this regard (the well-known IFRIC 3) has failed miserably. It turns out that there are too many unresolved issues and this led to the withdrawal of the IASB guidelines in 2005.

In terms of accountability, things are a little different. And in this area there is still no single international standard. As environmental reporting is not mandatory for most organizations (with some exceptions for those listed on some exchanges), each company follows a standard or guidelines that it chooses from among those in the world. The most commonly used such guidelines are GRI's G4 - Global Accountability Initiative. These guidelines cover not only the reporting of the activities of organizations relating to the environment, but also key indicators in the field of its impact on society, as well as the impact of good management practices within the organization for its overall performance. The coverage of these three aspects of the companies' activity is generally characteristic of all established international standards and guidelines for reporting non-financial information.

It can be said that internationally, in the field of non-financial and in particular environmental reporting, there is a clear trend towards standardization. The difficulties in unifying the ways of accounting for the environmental aspects of the activities of the organizations turn out to be more numerous and more significant than expected. This is natural and understandable, as the degree of complexity in accounting is much greater than that in reporting. Ultimately, it is easier to reach a consensus on which indicators are important for an organization's performance than to develop them in practice.

At present, despite the voluntary nature of environmental reporting for the majority of companies, more and more organizations are focusing on its preparation. This is very indicative of modern trends in accounting and reporting.

With the advent of climate change and the growing importance of environmental challenges, the need for banks to measure and manage environmental and related social risks as part of the credit risk for their portfolios is increasingly coming to the fore. To date, however, there is no uniform methodology adopted at regional or global level in this regard. Leading are the approaches offered by the EBRD and IFC. They, like any methodology, have both advantages and disadvantages. While the IFC's approach is rather towards applying a qualitative analysis to the assessment of environmental and social risk, the EBRD has compiled a concrete and clear scorecard that answers the question on the level of this risk by offering systematization of it at three levels - low, medium or high. It is the simplicity and clarity of the EBRD's approach that has made its approach recognizable and preferred by commercial banks in Europe. However, when it is implemented, it becomes clear that it needs to be adapted to take into account the characteristics of the portfolios of the banks that use it in order to have adequate results.

The author proposes to upgrade this scorecard, consisting of four elements, with four more, so that the results of its application give a more specific idea of the level of environmental and social risk for the banks that will choose to apply it. The results of the simulations of this upgraded scorecard on the data on the portfolio of company loans of one of the systemic banks in Bulgaria for four years - 2016, 2017, 2018 and 2019 - and their comparison with the data from the application of the simple EBRD scorecard show that the upgraded scorecard leads to a lower overall level of the environmental and social risk for the bank. According to the author, this assessment is more objective than the assessment from the application of the EBRD scorecard, as it is based on more - eight - factors.

The upgraded scorecard for environmental and social risk assessment proposed by the author of this study will help banks in their efforts to assess the level of these risks in lending and this will make them more confident in the overall assessment of the condition of potential beneficiaries applying for loans.

IV. SCIENTIFIC AND APPLIED CONTRIBUTIONS IN THE DISSERTATION

1. Theoretically, the role that banks are called to play in the transition from a linear to a circular economy is clarified.

2. The link between climate change, environmental risks and the specific policies of transition from a linear to a circular economy that the world's leading economies are pursuing is substantiated.

3. A conceptual model of a "green bank" is proposed. Four levels of this model are outlined and their existence is motivated. The connection between the different levels is explained and the author's interpretation of the stage banks in Europe and in Bulgaria are at the moment is given.

4. The need to transform the philosophy of the main process in banks - that of lending - in the direction of its orientation to taking into account the non-financial aspects of risk (those related to environmental problems) is analyzed and motivated.

5. Some existing and widely used international methodologies for environmental risk assessment in lending are analyzed, based on four-factor scorecards for risk assessment, their strengths and weaknesses in the process of application in banking practice are outlined.

6. An alternative, eight-factor author's model for environmental and social risk assessment in lending is proposed. The model was tested on the basis of data on the portfolio of corporate loans of one of the systemic banks in Bulgaria for a period of four years. The results show that the application of the alternative model leads to a more accurate assessment of the environmental risk in lending and the benefits of its application are analysed.

V. LIST OF SCIENTIFIC PUBLICATIONS ON THE TOPIC OF THE DISSERTATION

BOOK CHAPTERS

Zhelyazkova, V. The Role of Banks for the Transition to Circular Economy. Chapter in Book: "Circular Economy - Recent Advances, New Perspectives and Applications," an Open Access book edited by Dr. Tao Zhang, IntechOpen, DOI: 10.5772/intechopen.94522, DOI: http://dx.doi.org/10.5772/intechopen.94522

STUDIES

Zhelyazkova, V. Modelling the Evaluation of Environmental and Social Risk in Bank Lending. VUZF University Yearbook, 2020, in print
(in original: Желязкова, В. Моделиране на оценката на екологичния и социален риск в банковото фирмено кредитиране, Годишник на ВУЗФ, 2020, под печат)

ARTICLES IN JOURNALS INDEXED IN SCOPUS/WEB OF SCIENCE

Zhelyazkova, V. The Road to Circular Economy: What Can Europe Learn from Germany and Japan? Economic Studies, Vol 27 (6), 2018, pp. 167-178

ARTICLES IN REFERRED JOURNALS

1. Zhelyazkova, V. Automating Environmental Risk Management in Bank Lending: Methodology and Practice, ICIB 2019 proceedings, University of Macedonia, Greece, ISBN 978-618-5255-16-9 (book, hard copy), pp. 115-120

2. Zhelyazkova, V. The Transition from Linear to Circular Economy in Japan: Policies and Good Practices, New Knowledge Academic Journal, Vol.7, № 3 (2018), ISSN 2367-4598 (Online), pp. 17-24) (in original: Желязкова, В. Преминаването от линейна към кръгова икономика в Япония: политики и добри практики, Списание за наука „Ново знание“, Vol.7, № 3 (2018), ISSN 2367-4598 (Online), стр. 17-24)

3. Zhelyazkova, V. Environmental Accounting – Principles and Main Challenges for Financial Managers, Economy & Business ISSN 1314-7242, Volume 13, 2019 Journal of International Scientific Publications www.scientific-publications.net)

4. Zhelyazkova, V. EU Policy Towards the Circular Economy, VUZF Review, № 3 (2018), стр. 34-42) (In original: Желязкова, В. Политиката на ЕС по отношение на кръговата икономика. VUZF Review, № 3 (2018), стр. 34-42)

5. Zhelyazkova, V. International Banking Practices in the Area of Circular Economy, Bulgaria of Regions, 2019, ISBN 978-619-203-281-4 (on-line), pp. 77-85 (in original: Желязкова, В. Международни банкови практики в областта на кръговата икономика. Сборник доклади от Международна научно-практическа конференция "България на регионите", 2019, ISBN 978-619-203-281-4 (on-line), стр. 77-85)

6. Zhelyazkova, V. Creating a Unified Environmental Risk Management System in a Commercial Bank: Key Steps. Pari i Kultura, 1, 2021, ISSN 2653-0965 (in print)

7. Zhelyazkova, V. Environmental Reporting: Principles and Main Challenges. Ecology & Safety ISSN 1314-7234, Volume 14, 2020, Journal of International Scientific Publications www.scientific-publications.net, pp. 1-8

8. Zhelyazkova, V. Circular Economy: International Policies and Practices. Izvestia. Journal of Varna University of Economics. 2020, Vol 64, № 3, pp. 239-256

9. Zhelyazkova, V. Innovative Approaches to Reporting: Essence and Main Directions of Environmental Reporting. Money and Culture, ISSN 2683-0965, vol. 4, 2020, VUZF, pp. 5-17, available at: https://sites.google.com/vuzf.bg/money-and-culture/2020?authuser=0#h.du9o6zutyvb3 (in original: Желязкова, В. Иновационни подходи в отчетността: същност и основни направления на екологичната отчетност, сп. "Пари и култура", ISSN 2683-0965, бр. 4, 2020 г., ВУЗФ, стр. 5-17, https://sites.google.com/vuzf.bg/money-and-culture/2020?authuser=0#h.du9o6zutyvb3

10. Zhelyazkova, V., Comparative Analysis of Methodologies for Environmental and Social Risk Management in Lending Applied By International Financial Institutions, Journal of International Scientific Publications: Ecology and Safety, Volume 8, 2014, ISSN 1314-7234 (Online), Published at: http://www.scientific-publications.net, pp. 617-624*

11. Zhelyazkova, V., SRI Strategies in Asset Management: Typology And Application Trends, Economy & Business, Economy & Business, Journal of International Scientific Publications, ISSN 1314-7242, Volume 9, 2015, pp. 516-522*

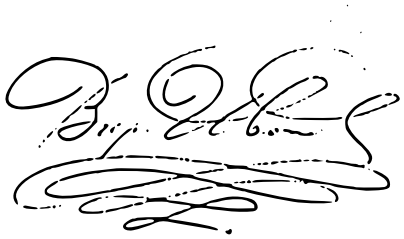
12. Zhelyazkova, V., Eco-Efficiency Indicators: Concept, Types and Applicability, Economy & Business, ISSN 1314-7242, Volume 10, 2016, pp. 322-331*

** Articles not used for the purposes of validation for the academic position of "professor" at VUZF*

DECLARATION

from prof. Virginia Ivanova Zhelyazkova, PhD

I declare that the contributions in his dissertation are my personal work, they are original and do not repeat the contributions from the dissertation for the acquisition of the educational and scientific degree “Philosophae Doctor”.

Signature: 

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