

INSURANCE OF ENVIRONMENTAL RISKS IN THE CONTEXT OF THE CORPORATE SECURITY OF THE INDUSTRIAL ENTERPRISE²

The study examines the issue of the place and role of environmental insurance in the security concept of the industrial enterprise. The priority importance of liability insurance against the risk of “environmental pollution” in economic entities is outlined. Emphasis is placed on the positioning of environmental insurance among the mechanisms for increasing environmental security in the context of corporate risk management. The results of the marketing research among operating companies in the Bulgarian insurance market are presented and give an idea of the state, problems and guidelines for the development of insurance for environmental risks in our country. The analysed marketing information is supplemented by the results of similar research among companies in the chemical industry as consumers of environmental insurance in order to cover the two elements – supply and demand – in the market of environmental insurance.

Keywords: environmental insurance; environmental risk; risk management; corporate security; insurance company; industrial enterprise

JEL: G22; Q59

Introduction

Global problems related to environmental pollution require economic units to improve their risk management in the direction of conducting environmental assessments and taking measures to prevent and minimise the consequences of environmental risks. In the context of the “green transition”, the aim of industrial enterprises is to increase their corporate social responsibility by implementing policies to strengthen environmental prevention (Tonchev, 2022): the use of renewable energy sources, the application of mixed green hydrogen combustion with conventional fuels, purification of carbon and other harmful gases, application of green technologies, etc.

Additional challenges relate to supporting European Union (EU) action on the road to a zero-emission economy by 2050 and the new EU legislative package “Prepared for 55”. It

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enhances ambition at the EU level in primary and final energy consumption by 2030 through indicative national energy efficiency targets in all sectors (<https://www.me.government.bg>).

A number of environmental risks and new threats are manifested in the functioning of industrial enterprises in a dynamic external and internal environment. The author systematises the variety of ecological hazards into four main groups: (Markova, 2021, pp. 84-102) ecological risks of natural character, ecological risks of technogenic nature, ecological risks of anthropogenic nature and ecological risks of public nature. We believe that the risks of these groups have an adverse impact on the activities of legal entities, respectively, on the corporate security of enterprises. Therefore, environmental risks must be monitored, studied, overcome and managed in accordance with the possibility of quantitative and qualitative assessment of the consequences of their manifestation. In this sense, “an assessment of the extent of environmental risk can only be made if there is some knowledge of the nature of the risk, because the greater the likelihood of damage, the longer the monitoring period, and the greater the larger the size of the insured population for which the monitoring is made, the more accurate the results obtained” (Draganov, 2017, p. 23).

The most vulnerable to environmental pollution are enterprises with hazardous production, such as existing economic units in the field of nuclear energy, chemical industry and others. On the one hand, the risk of transboundary pollution as a result of environmental risk is an essential prerequisite for increasing corporate social responsibility. On the other hand, the probability of the complex impact of environmental risks implies the accumulation of losses, which reflects on the financial stability of the enterprise. In this sense, the most appropriate compensation among environmental protection mechanisms is the insurance of environmental risks.

In today’s socio-economic and market conditions, insurers specialising in environmental insurance are facing new challenges and the need for innovation in terms of environmental insurance products. With the help of the application of adequate marketing tools, insurers can provoke the demand for environmental insurance and stimulate the use of insurance protection among legal entities. In addition, through appropriate marketing research, insurers specialising in environmental insurance can study the formation of new insurance needs and interests among industrial enterprises. The results of marketing research serve as a basis for conducting a flexible market policy of insurers. Today, companies specialising in environmental insurance are increasingly focused on responding to changes in the national insurance market, although in the period of the COVID crisis, they were forced to work in conditions of uncertainty in the market environment.

The aim of the study is to identify the attitudes, barriers and prospects of the insurance sector in relation to covering environmental risks, as well as to derive the effects of environmental insurance for legal entities, respectively to justify the importance of insurance services and products to increase corporate security of large, medium and small enterprises.

To achieve the formulated research goal and substantiate the hypotheses, the author conducts empirical research among insurers, and the results of the survey help the author to justify the role of environmental insurance in the risk management of the business unit and its positioning among other environmental mechanisms in industrial enterprise risk management.

The obtained, analysed and summarised results are supplemented by the results of another marketing research conducted among consumers of environmental insurance, such as industrial enterprises in the chemical industry.³ The study of the two elements of the market – supply and demand – should give a clear idea of the state and trends in the future development of environmental risk insurance in Bulgaria. We believe that in this way, the attitudes, opinions and behaviour of insurance companies and industrial enterprises as subjects in the insurance relationship, respectively as parties to the insurance contract, will be better studied and analysed.

The main **research thesis** is that there are opportunities to increase corporate security in the industrial enterprise by including environmental risk insurance in corporate risk management in the chemical industry. In connection with the formulated research thesis, the following **hypotheses** can be presented:

First hypothesis. Despite the benefits of insurance protection, the demand for security through environmental insurance by industrial enterprises is still weak, respectively, business units do not take sufficient advantage of the benefits of insurance products in the context of corporate security.

Second hypothesis. Despite the importance of insuring environmental risks for the financial sustainability of the industrial enterprise, the provision of security through environmental insurance is still in the process of development and gaining experience from companies in the Bulgarian insurance market.

Third hypothesis. The effectiveness of the insurance of environmental risks would significantly increase the effectiveness of the risk management of the industrial enterprise in the direction of protecting the economic interests of the legal entity and stimulating corporate responsibility for environmental protection.

In accordance with the purpose of the development, the following **research tasks** are set in the study:

First, to monitor, in general, the dynamics of the market of insurance of environmental risks on the basis of the results of marketing research among non-life insurance companies in Bulgaria and on this basis to make suggestions for improving the activities of companies;

Second, to study the specifics and opportunities of environmental insurance to increase corporate security in industrial enterprises, highlighting the problems in the supply and demand of environmental insurance products.

Third, to outline the challenges and guidelines for the development of environmental insurance in the national insurance market, including to make recommendations for improving the insurance legislation.

³ The marketing research was conducted in the period 2019-2020 among enterprises that are members of the Bulgarian Chamber of Chemical Industry (BCCI). The results are presented in the author's monograph: Markova, Ir. (2021). *Ekologichno zastrahovane e korporativna sigurnost v himicheskata industriya*. Sofia: Izdatelski kompleks – UNSS.

Fourth, to study the experience of current insurers in the national insurance market, which practice liability insurance against environmental pollution, as the main type of insurance in the insurance branch “Environmental Insurance”.

Fifth, to analyse the expert opinion of insurance specialists and to compare with the expert opinion of specialists in the chemical industry on the possibilities and role of environmental insurance in increasing corporate security and its place in corporate risk management.

The wide-ranging issues determine the fact that outside the perimeter of the study remain some issues that the author identifies as **limitations of the study**.

First of all, it should be noted that the role of environmental insurance must be sought at both the macro and micro levels. The nature and importance of environmental insurance and its socio-economic nature are considered in macroeconomic terms and are substantiated in another author’s publication.⁴ In the present study, the emphasis is on the importance of insuring environmental risks at the micro level, from the position of the industrial enterprise, which is reflected in the effects, respectively, in the benefits of environmental insurance for the legal entity and the ability to increase corporate security.

On the other hand, in the present study, the focus is on the activities of insurance companies specialising in environmental insurance, among which marketing research was conducted. As already mentioned, another author’s publication presents the results in detail of marketing research conducted among industrial enterprises on the importance of environmental insurance in the context of corporate risk management. The conclusion of the present study outlines conclusions based on the author’s two marketing researches.

Given the wide range of environmental insurance products available on the insurance market, the author focuses on the insurance of liability for environmental pollution as a necessary element in the concept of security of the business unit.

1. Theoretical Substantiation of the Place of Ecological Insurance among the Mechanisms for Corporate Security in the Industrial Enterprise

At the present stage of development of insurance relations, the development of environmental insurance follows the general principles of functioning of the national insurance market in a market economy and depends on the following **conditions**:

- The pursuit of sustainable development of the national economy is related to the achievement of economic and financial security of members of society, which is largely determined by the degree of development of insurance protection.

⁴ The nature and importance of environmental insurance and its socio-economic nature are considered in macroeconomic terms and are substantiated in another author's publication, namely: Misheva, Ir. (2015). The social and economic nature of environmental risk insurance. – *Economic Thought*, Economic Research Institute at BAS, Sofia, UNWE Printig House, 2/2015, ISSN 0013-2993, pp. 74-91.

- As part of the financial system in the country, insurance, respectively environmental insurance is influenced by the disparities between the level and scale of development of subsystems, such as – monetary, budgetary, credit, currency, insurance and pension (Dimitrov, S., 2019).
- Improving the quality of life of the population in the country is determined by ensuring effective insurance protection of the property interests of the population.
- The economic growth in the country is determined by the capabilities of financial and credit institutions, including the financial stability of insurance companies.
- Investment and integration processes in the world economy require the orientation of insurance companies to changes in the external environment and the application of adaptive risk management.
- There are difficulties on the part of the state budget in covering the costs of eliminating the consequences of environmental disasters, including technogenic accidents and natural disasters related to environmental pollution in our country, as well as cross-border adverse effects.
- There is a tendency to increase the motivation of legal entities to achieve a high degree of corporate security by including internal and external disruptive factors in the risk strategy of the industrial enterprise. “Moreover, the priority of risk management is growing in conditions of increased uncertainty in both the external and internal environment, as well as the emergence of new risks” and identifies the need for management action to address them (Dimitrov D. a., 2021, p. 179).
- In the era of technological changes and the rapid penetration of information technology in all sectors of the economy, the preconditions are created for greater work efficiency, which determines the need for high specialisation of human resources in the field of environmental insurance (Evgeniev, 2021, p. 62) and the search for opportunities to increase of the emotional intelligence of the insurance specialists in order to improve the organisation of the insurance activity (Evgeniev, 2021, pp. 29-31).
- In a period of enhanced cooperation between EU Member States with a view to aligning the EU’s climate and energy legislative framework with the aim of reducing net greenhouse gas emissions by at least 55% by 2030 compared to with 1990 levels, the Fifth Session of the United Nations Environment Assembly (UNEA-5).⁵ The general theme of the session is “Strengthening actions for nature protection in order to achieve the goals of sustainable development”. In this context, the Commission informs of a new proposal for a directive on the protection of the environment through criminal law, which identifies new crimes against the environment and introduces more detailed provisions on sanctions, enforcement rules and measures to support people who report violations and cooperate with law enforcement. The Commission called on the Member States to take urgent action to ratify the multilateral environmental agreements. In this context, the issue

⁵ The Fifth Session of the United Nations Environment Assembly was held from 28 February to 2 March 2022 in Nairobi, Kenya according to <https://www.consilium.europa.eu/bg/meetings/env/2022/03/17/>.

of changes in the insurance legislation regarding the inclusion of the risks related to environmental pollution in the insurance liability comes to the fore.

- Concretization of measures for prevention against environmental risks and mitigation of threats from environmental disasters, compliance with safety standards and clarification of safety criteria are some of the main practical issues that determine the development of corporate risk management today. The search for security through insurance is one of the main measures to increase the economic and corporate security of the business unit.

The process of risk management in the business unit is related to the development of a security concept and the implementation of the best alternative security strategy. The risk strategy includes a set of security measures and defines the methods and mechanisms of risk management. Determining “the correct method or set of risk analysis methods is essential to obtain a satisfactory result on the basis of which a good risk assessment can be made” (Dimitrov D. a., 2021, p. 194).

Practically the most applicable **methods** of corporate risk management are: risk elimination, risk prevention, risk transfer, risk-taking, risk avoidance, risk reduction, risk retention, risk standardisation and risk control. Among them, insurance is the main compensation method, which aims to compensate for accidental losses in the business unit and maintain its financial stability and competitiveness. In this regard, the author believes that the process approach to risk management in enterprises with hazardous production reveals the regulatory potential of insurance on corporate environmental risk management (Misheva I., *Environmental insurance – an element of risk management in enterprises utilising hazardous*, 2016, pp. 66-80).

The main **mechanisms** for environmental quality management, known in theory and practice, are divided into three groups, namely – environmental, economic and legal (Misheva, I., 2016, pp. 42-44). In the context of corporate risk management, insurance is relevant to all three groups of mechanisms. However, when it comes to seeking security by insuring against environmental risks, the issue becomes complex.

From the point of view of the risk strategy in the industrial enterprise, the insurance of ecological risks is considered as an important ecological mechanism, which has a connection and interaction with the other mechanisms (Scheme 1).

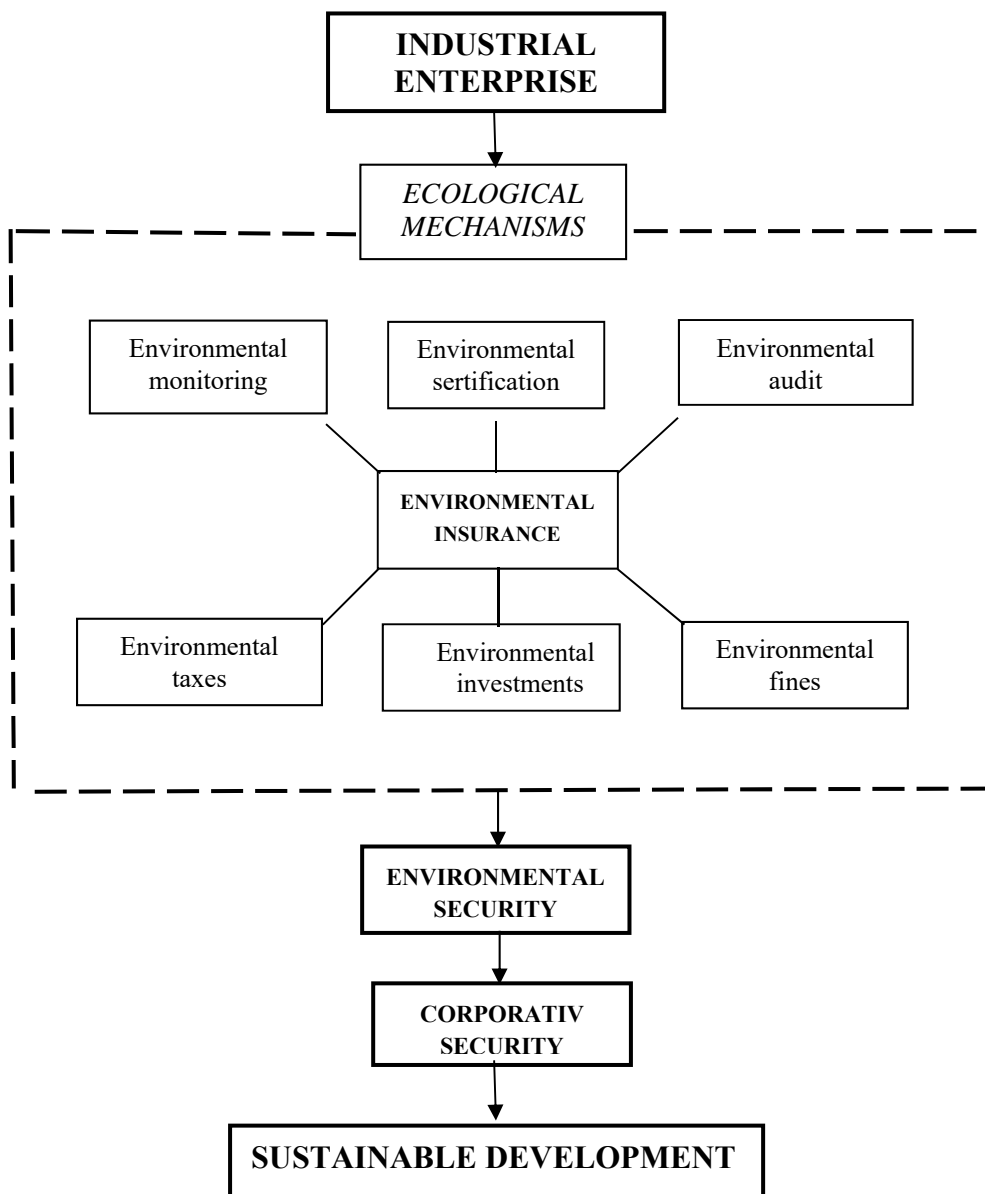
The positioning of insurance, among other environmental mechanisms, determines its growing role as a guarantee and a key element of the modern concept of corporate security. In this sense, the advantages of insurance should be sought in its ability to increase environmental and economic security, in the context of corporate security of the business unit. The dynamics in the demand and supply of environmental insurance products are determined by **the effects** they have on consumer companies.

In the first place, the effectiveness of the use of environmental insurance can be determined by *mapping the environmental risks* depending on the probability of their occurrence and the expected amount of losses, as well as determining „a tolerance line that reflects the company’s internal attitude to risk. For example, it is effective to transfer risks outside the tolerance to the insurer. It is better for the business unit to take on the risks of falling into the zone of tolerance” (<https://www.raexpert.ru>, n.d.). Thus, the risks associated with

environmental disasters and environmental pollution should be transferred to the insurance company.

Scheme 1

Positioning of the ecological insurance among the ecological mechanisms for corporate security in the industrial enterprise



Source: the author.

It should be noted that the effects of insurance protection are clear in large industrial enterprises, which have “powerful means of risk management, and their activities are closely related to management decisions by the company’s management, both in terms of production and economic activities, such companies such as RUSAL, Aeroflot, Gazprom, Lukoil, etc.” (<https://www.raexpert.ru>, n.d.). Small and medium-sized enterprises lag significantly behind, both in terms of risk management and environmental risk insurance. According to risk management experts, “in medium and small businesses, completely different people are involved in solving insurance issues in this area, such as: lawyers, HR specialists, secretaries, etc. In companies with risk management departments, *a systematic approach to insurance protection* is applied. Specialists from these departments make a real assessment of the need for different types of voluntary insurance” (<https://www.raexpert.ru>, n.d.). Subinsurance for medium-sized enterprises is estimated at around 50%. Risks for small businesses are usually left unmanaged. The level of sub-insurance of small business risks is close to 100% (<https://www.raexpert.ru>, n.d.).

In medium and small enterprises, insurers almost always act as consultants on risk management issues, and sometimes in large enterprises. In such cases, *advice is provided on a number of insurance issues* related to: risk exposure analysis, selection of the required amount of coverage, establishing the limits of insurance liability, advising on insurance legislation and the procedure for consuming insurance services and can choose the optimal insurance program. However, the complete transfer of risk management functions to insurers may lead to some negative consequences that need to be taken into account, namely – abuse by the insurer, an increase in the costs of the business unit and others.

When building a risk management system, it is considered justified to use *the services of insurance brokers*, which not only represent the client’s interests in relations with insurance companies, but also provide risk management consulting services. Today, the role of insurance brokers as experts in the field of risk management is constantly growing. Specific services of insurance brokers include “advice on alternative risk management options, including the creation of own insurance companies (own funds management), mergers and acquisitions (mergers and acquisitions advice), asset management services, strategic planning and others” (<https://www.raexpert.ru/researches/insurance/risk-insurance/>, n.d.).

Activities in the chemical industry, such as the production, transformation, distribution, transport and storage of chemicals, generate significant risks that require research and anticipation of the possible effects of these risks on the environment and on third countries. The chemical industry includes areas of activity where the scale of environmental risk can be catastrophic due to the ubiquitous presence of chemicals in everyday life (pharmaceuticals, cosmetics and other industrial chemicals). To this end, multidisciplinary teams of approved experts provide all their experience and technical knowledge for the implementation of *appropriate preventive measures* and better coverage of the risks inherent in the chemical and pharmaceutical industry. The teams support the search for the most appropriate solutions for insuring potential risks. In other words, they develop *a specific insurance program* resulting from the identification and analysis of risks and seek the best insurance conditions with coverage at the lowest cost. At the same time, the client is provided with support in terms of advice, assistance and follow-up of claims throughout the insurance period.

The economic efficiency of the insurance of environmental risks, respectively the benefits in the properties of the insurance products for the consumer enterprises, should be assessed with the help of specific *indicators*, namely: (Rudakov, 2018, p. 14)

- Probability of occurrence of environmental risk;
- Amount of possible loss from the manifestation of environmental risk;
- Amount of the insurance tariff;
- Amount of the insurance premium – determined by basic price factors (Misheva I. , 2016, pp. 94-95).
- Form of insurance;
- Ratio between the payment of the insurer and the amount of the loss from the manifestation of environmental risk;
- Mathematical expectation – is the average expected amount of loss of the enterprise when concluding /not concluding/ an insurance contract;
- Absolute indicator for the effect of the insurance – amount of the received insurance indemnity after deduction of the amount of the paid insurance premium.

The effectiveness of environmental insurance must be sought in the possibility of *increasing the economic security of the industrial enterprise*. Making an adequate management decision in the business unit is impossible „without constant monitoring of potential threats to both the external and internal environment” (<http://eav.ru>, n.d.) and without adequate insurance protection. In this sense, the effects of insurance protection are reflected in terms of insurance contracts, which are subject to negotiation between the parties. The consumption of environmental insurance products by legal entities depends not only on the value of the insurance contract, but also on the temporarily available free funds, some of which are set aside as insurance costs. Given that the company receives an economic benefit when concluding an insurance contract, it can be said about the economic efficiency of insurance protection. The full effect of the insurance of environmental risks can be achieved if as a result of the payments to the insurer all the negative economic consequences for the enterprise are compensated. In other words, the economic potential of insurance is manifested in the realisation of the insured event, when by compensating for losses, the main goal of the legal entity is achieved – increasing financial security, which is expressed in maximising the market value of the business unit.

The effectiveness of environmental insurance is manifested in the implementation of *the main goal of the insurer – satisfaction of needs*. However, when providing insurance services, insurers are looking for greater benefits. It is possible that a conflict of interest may arise with regard to the price of environmental insurance between the parties to the insurance contract (Misheva, I., 2016, pp. 97-104). Given that a balance is found between the financial interests of the parties in the insurance relationship, one can speak of the effectiveness of insurance protection.

The fulfilment of the goal “satisfaction of needs” can be established with the help of the indicator “completeness” of the insurance protection, i.e. what part of the incurred losses are reimbursed through the payments of the insurer. This summary indicator “can be decomposed by areas of the target areas, obtaining indicators of completeness of insurance protection in relation to: covered risks, covered types of losses, objects of insurance” (Iliev, 2008, p. 44).

Ultimately, the effects of environmental risk insurance are a kind of guarantee of environmental security in the industrial enterprise. The search for security through environmental insurance is an indicator of increasing the environmental responsibility of the business unit and is a key prerequisite for increasing corporate security. The harmonious combination of environmental insurance with other environmental mechanisms in the context of corporate risk management should lead to a sustainable development of the legal entity.

The effectiveness of insurance against environmental risks is manifested in the ability *to protect the environment by carrying out preventive activities*, both by the insured, stimulated by insurance conditions and tariffs and by insurance companies through direct financing of preventive measures. In this sense, environmental insurance indirectly contributes to the implementation of the national environmental strategy and to the establishment of the principles of: sustainable development; prevention and reduction of the risk to human health and the environment; prevention and reduction of the risk for biological diversity; reduction of harmful effects on the components of the environment as a result of natural processes and phenomena; optimal use of natural resources and energy.⁶

The effectiveness of environmental risk insurance in the future will increasingly be determined by *the application of innovative technologies*, such as the use of artificial intelligence in the processing of large amounts of data; financial engineering and mathematical modelling in risk assessment; methods of risk forecasting statistics; expert systems in risk identification; new environmental technologies of enterprises regarding the preventive activity on environmental protection, stimulated by the insurance conditions and tariffs, for example in connection with the disposal and treatment of wastewater, treatment and disposal of waste, etc. (Markova, 2021, p. 42). In this regard, „information and computing technologies and artificial intelligence will be increasingly important for risk analysis. Risk analysis methods will certainly be standardised and the role of the individual in the risk identification process will be minimised” (<https://buduysvoe.com/ru/>).

2. Methodology and Data

The methodological basis of the research is based on the use of traditional research methods, as well as modern methods of analysis and evaluation, such as comparative method, method of analysis and synthesis, inductive and deductive method, statistical methods and methods of expert evaluation. In other words, both statistical and non-statistical research methods were used in this work, on the basis of which conclusions and summaries were formulated.

⁶ Zakon za opazvane na okolnata sreda (ZOOS). Obn. DV. Br. 91 ot 25 septemvri 2002, ... izm. DV br. 21 ot 12 mart 2021, chl. 76 (2).

In order to study consumer demand for environmental insurance, a survey was conducted among the insurance companies in the Non-life insurance branch in Bulgaria, covering the period July 2016 – March 2017.⁷

Empirical research is used to analyse the opinion of insurers about the benefits and role of environmental insurance. The author's aim is to study the experience of current insurers who practice liability insurance against environmental pollution in the national insurance market.

The empirical research in the study reveals the main causes, factors and dependencies that shape consumer behaviour in the environmental insurance market. The analysis of the results of the research should serve the insurance practice to detect problems in the development of environmental insurance in Bulgaria, as well as to forecast consumer demand for liability insurance against environmental pollution by industrial enterprises. The conclusions of the author of the study can be used by insurance companies specialising in environmental insurance to improve insurance business and to make marketing efforts to stimulate consumer demand for insurance products.

The questionnaire is composed of 15 questions and is provided to all insurance companies in the field of Non-life insurance branch in Bulgaria.

Several statistical methods such as group methodology, comparative method, descriptive analysis methods and non-parametric methods for analysis of the "factor-result" relationship (correlation analysis and Chi-squared analysis) are used in the analysis of the survey results.

Out of 29 companies licensed in the industry by mid-2016 (Financial Supervision Commission, н.д.), 20 participated in the survey and filled-in survey card were received. Therefore, in a relative share, 69% are surveyed insurers, 14% refuse to participate in the survey and 17% do not respond to the inquiry. Thus, over 2/3 of the insurers in the industry are involved and about 1/3 have not participated in the survey.

Of the surveyed 20 insurance companies, 14 are licensed to practise General Liability Insurance. Of these, only 7 companies carry out operations under the Liability Insurance policy against environmental pollution.

In the process of marketing research and for the analysis of the survey results, statistical methods for the analysis of relationships and dependencies, in particular for the study of relationships and dependencies (correlation analysis) in weak scales, were used. Weak scales are those in which the meanings of the attribute are not represented by a number or measure but verbal, descriptive. The nominal, the dichotomous, the ordinate and the range scale are considered as weak scales. The statistical methods used in the study for analysis of dependencies are the following (Saykova, Stoykova-Kanalieva, & Saykova, 2002) (Goev, 2010) (Pavlova & colleagues, 2009); (Petrov, Angelova, & Slaveva, *Statisticheski metodi za izsledvaniya v sotsialnata sfera*, 2006); (Petrov, Angelova, & Slaveva, 2004, p. 67); 2004; (Angelova & Slaveva, 2012, pp. 68-69); (Slaveva, 2018, pp. 134-140) correlation analysis, respectively coefficients of four-cell correlation – coefficient of association, coefficient of

⁷ Marketing research was conducted with the institutional support of the Prof. Dr.V. Gavriiski Foundation and with the assistance of the Financial Supervision Commission (FSC) and the Association of Bulgarian Insurers (ABI).

contingency, coefficient of colligation, coefficients of interconnection – coefficients of Kramer, Chuprov and Pearson.

The questionnaires received from the insurance companies were processed and summarised. Of interest to the scientific community, as well as to insurance companies, are both the distribution of answers to individual questions and the possible links between them. The study analyses the results obtained, focusing on the opinion, positions and expectations of insurers about the benefits and role of environmental insurance and common complicating factors in the insurance business.

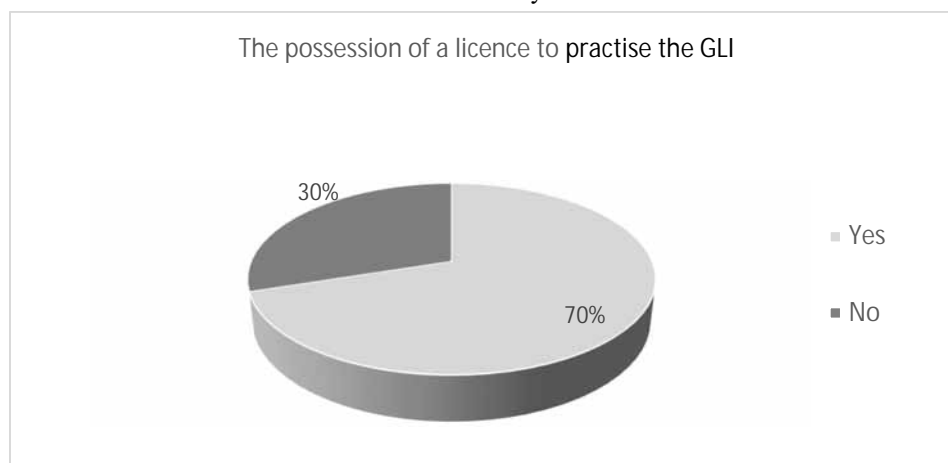
3. Empirical Results

The current marketing research is conducted in order to analyse the expert opinion of insurers on the need and role of environmental insurance in corporate risk management. The focus of the survey is on the knowledge and use of liability insurance against environmental pollution and the study of consumer opinion on the benefits of the insurance product.

The results show that 70% of the insurance companies participating in the survey have a licence from the Financial Supervision Commission (FSC) for practising the General Liability Insurance (GLI), which is very important for the range and completeness of the study, for the correct characterisation of the conditions for development of this type of insurance, difficulties, possible risks and expectations (Figure 1).

Figure 1

The distribution of insurance companies according to the possession of a licence to practice the General Liability Insurance

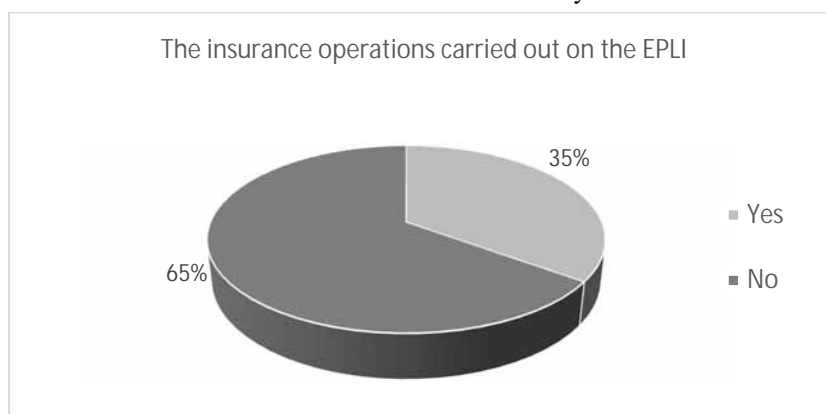


Of the surveyed insurance companies, 35% (7 insurance companies) carried out insurance operations on the Environmental Pollution Liability Insurance (EPLI) and 65% (13 insurance companies) did not carry out operations on this type of insurance (Figure 2). Such are the results if the total number of companies participating in the survey is taken into account. If

the total number of companies participating in the survey refers to the number of companies, which have a licence to practice the GLI, the results differ significantly. It is found that 50% of the companies holding a licence have carried out insurance operations on the EPLI. This gives us enough reason to state that this study covers a sufficient number of insurance companies and the results of the survey will contribute to the revealing of the state, needs, problems and expectations for the development of this type of insurance.

Figure 2

The distribution of insurance companies according to the insurance operations carried out on the Environmental Pollution Liability Insurance



None of the insurance companies has paid an insurance sum or compensation under the EPLI. It should be concluded that this fact is evidence of the lack of insurance cases during the analysed period in Bulgaria.

Answers to the question “Do you think that the Environmental Pollution Liability Insurance (EPLI) must be compulsory?” show that there is no full consensus and striving for a common position on this type of insurance. The results show that 40% do not consider this to be necessary, 35% think that it must be compulsory and 25% cannot decide whether this is necessary (Figure 3).

The statement is also confirmed by the answers to the question “How do you see the development of the Environmental Pollution Liability Insurance (EPLI) within the General Liability Insurance Class?” The largest share of the respondents (40%) think that the development of the EPLI within GLI Class has a good development, 30% cannot give an opinion, 25% identify it predominantly as bad and 5% – as bad (Figure 4). The special point here is that no answer to the questionnaire indicates that EPLI has a very good development.

The reasons for the significant difference in responses are varied and the main ones are: insufficient knowledge of this type of insurance; low interest and insufficient demand for such insurance products; significant difficulties in assessing risks; insufficient popularisation of the advantages of this type of insurance.

Figure 3

The distribution of the responses according to the necessity the Environmental Pollution Liability Insurance to have obligatory character

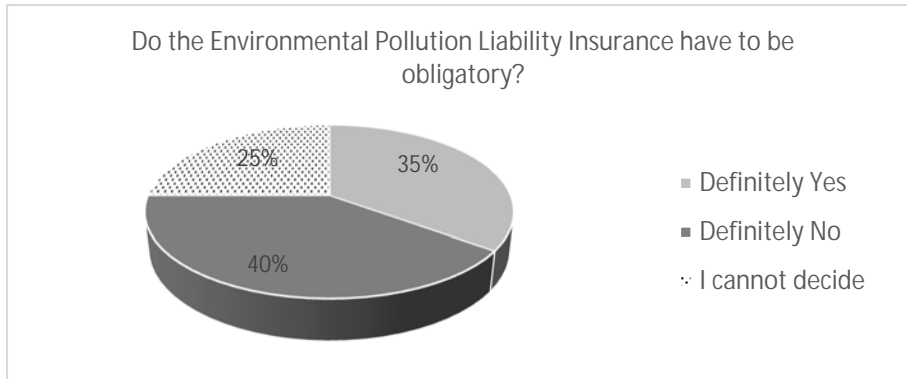
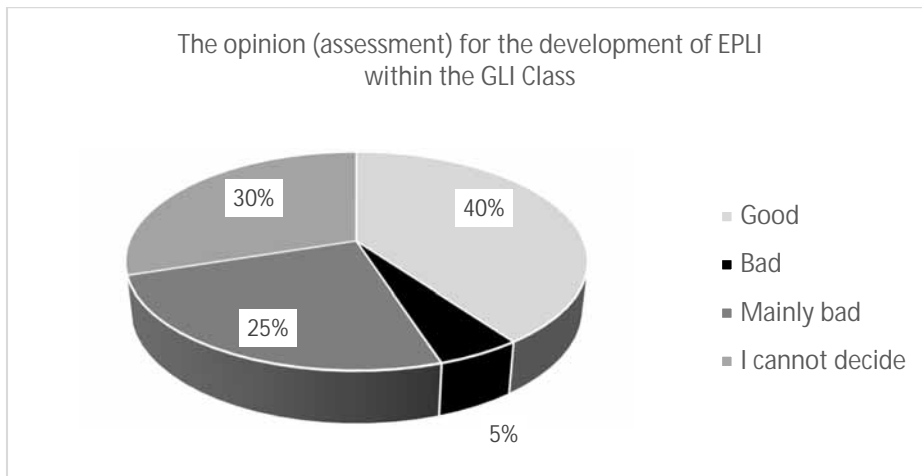


Figure 4

The distribution of the responses according to the opinion on the development of the EPLI within the General Liability Insurance Class



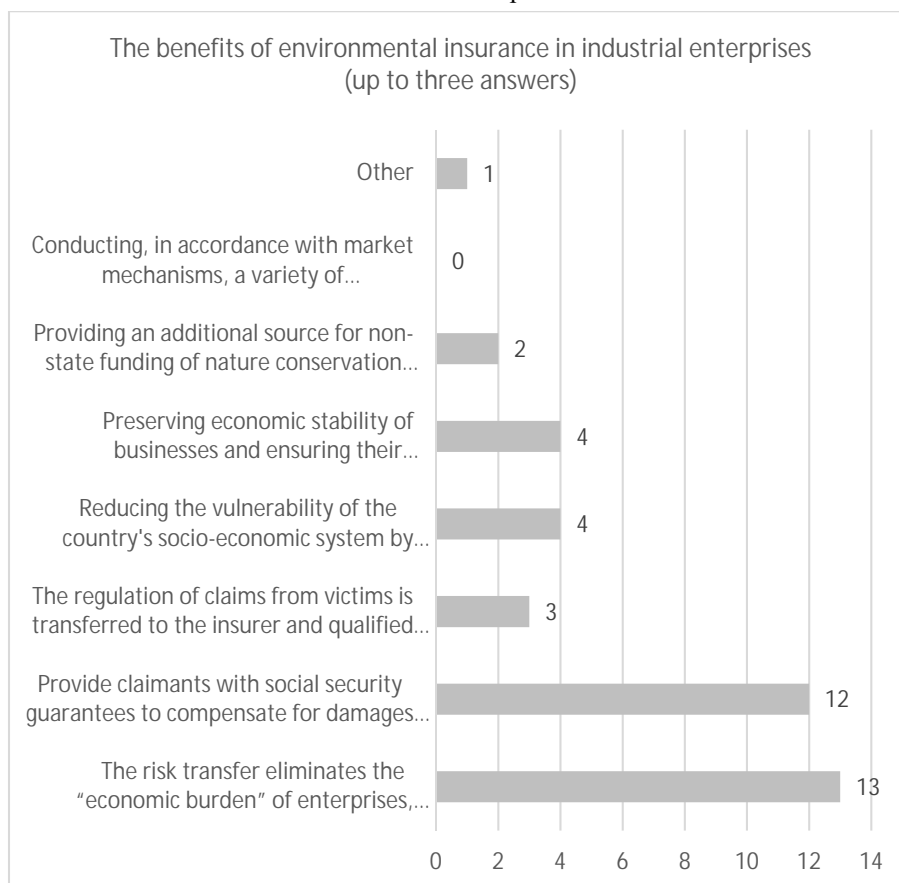
Respondents are adamant about the most significant benefits of environmental insurance, namely:

- Risk transfer removes the “economic burden” of companies paying a relatively low premium on possible large future damage.
- Providing the victims with social and legal guarantees for compensation of damages caused as a result of environmental pollution.

The distribution of respondents’ answers, regarding the benefits of environmental insurance, is presented in Figure 5.

Figure 5

Distribution of the respondents' answers on the benefits of environmental insurance in industrial enterprises



According to 40% of respondents, the development of environmental insurance on the national insurance market is predominantly bad, 25% cannot give an estimate, 25% respond "bad" and only 10% define it as good (Figure 6). The sceptic (negative) attitude towards the development of environmental insurance is impressive and this necessitates the need to look for the causes that have generated them and to influence on them.

According to the respondents, the main factors that hinder the sale of EPLI are: difficulties in risk assessment and they have the highest percentage (24.2%), lack of experience and traditions of insurance companies in such insurance (21%), the imperfections of the legislative base and the lack of insurance interest on the part of industrial enterprises. The distribution of the answers to this question is presented graphically in Figure 7.

Figure 6

The distribution of the respondents' answers about the development of environmental insurance on the national insurance market

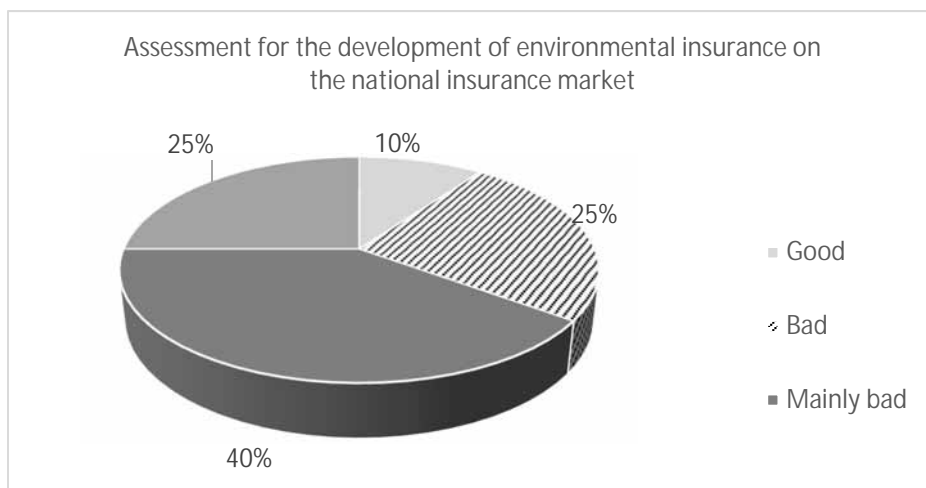
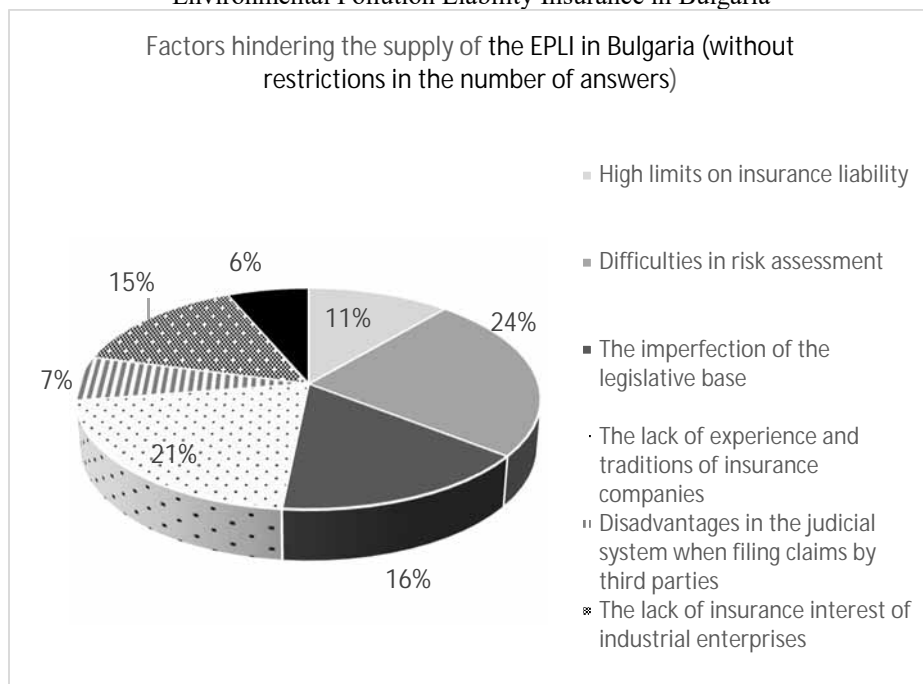


Figure 7

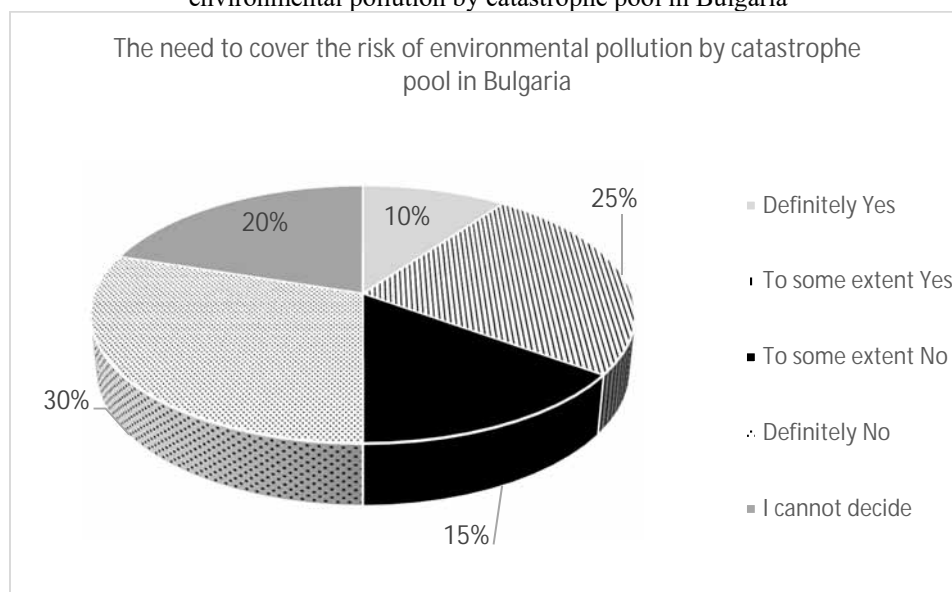
The distribution of the respondents' answers about factors hindering the supply of Environmental Pollution Liability Insurance in Bulgaria



On the issue of the need to create a catastrophic pool to cover the risk of environmental pollution, there is a difference and lack of certainty in the opinions – only 10% answered: “yes”, 25% “yes to some extent”, 15% indicated “to some extent no”, 30% did not consider it necessary and answered “definitely not”, and 20% of the respondents “cannot judge” (figure 8.).

Figure 8

The distribution of the respondents’ answers about the need to cover the risk of environmental pollution by catastrophe pool in Bulgaria



There is also a variety of opinions on the issue of the need for legislative changes in connection with the EPLI. In summary, it can be expressed the opinion that a part of the surveyed representatives of the insurance industry (about 1/3) believe that the EPLI needs legislative changes (figure 9).

When asked about the role of environmental insurance as a tool in corporate risk management of enterprises with hazardous production, 75% of surveyed insurers answered – positive, and only 5% had a negative opinion. 20% of the respondents have a neutral attitude towards the role of environmental insurance in the activities of industrial enterprises (Figure 10).

The answers of the insurers who practice EPLI show that the most insured enterprises are in the mining industry – 46%, followed by the processing industry – 39%, and the least in the energy industry – 15% (Figure11).

Figure 9
The distribution of the respondents' answers about the necessity of legislative changes concerning the EPLI

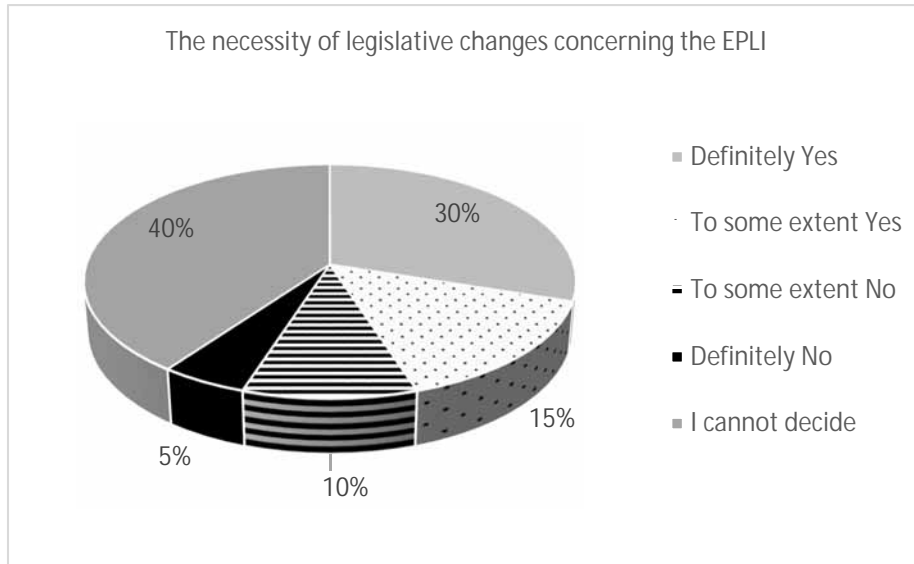


Figure 10
The distribution of the respondents' answers about their assessment of the role of environmental insurance as a tool in the corporate risk management of enterprises

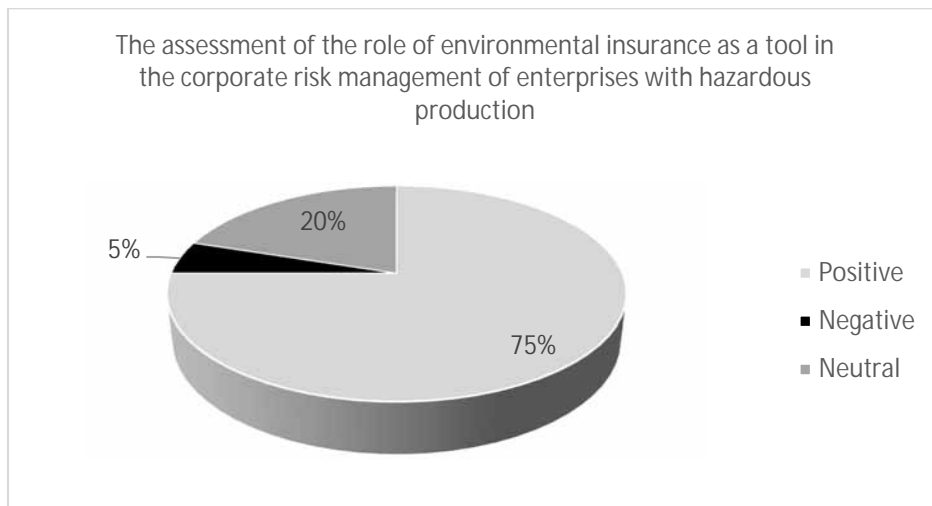
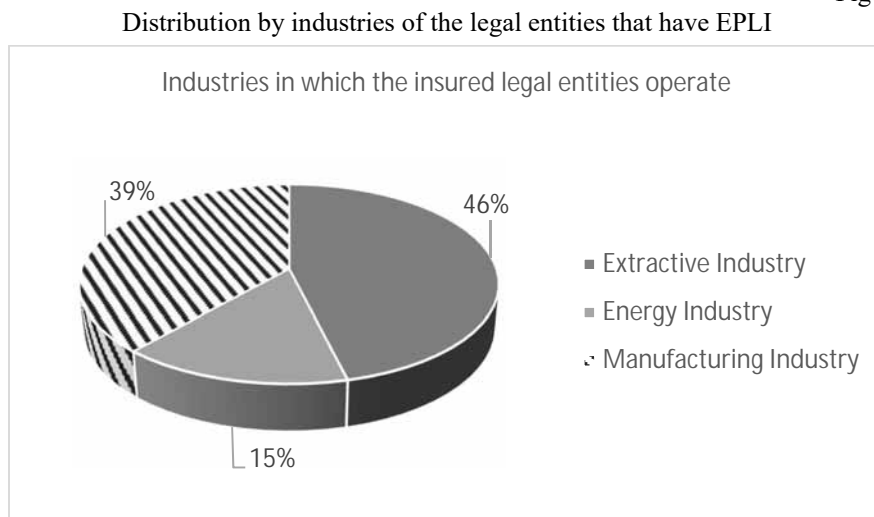


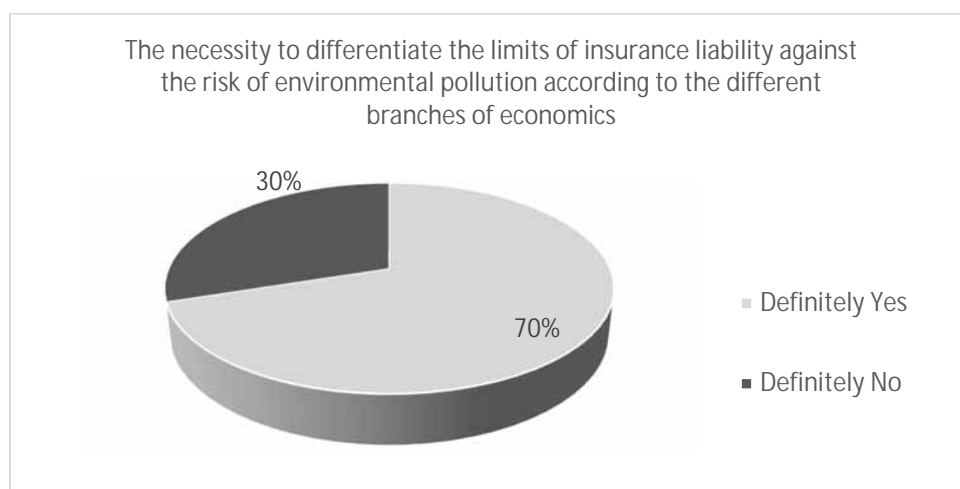
Figure 11



Regarding the EPLI, the majority of experts in insurance practice (70% of respondents) definitely believe that there should be a differentiation of the limits of insurance liability in the transfer of risk of “environmental pollution” in enterprises with hazardous production (Figure 12). This is related to making new mathematical calculations, legislative changes and application of new actuarial methods and techniques.

Figure 12

Distribution of respondents according to the necessity to differentiate the limits of insurance liability against the risk of environmental pollution according to the different branches of economics

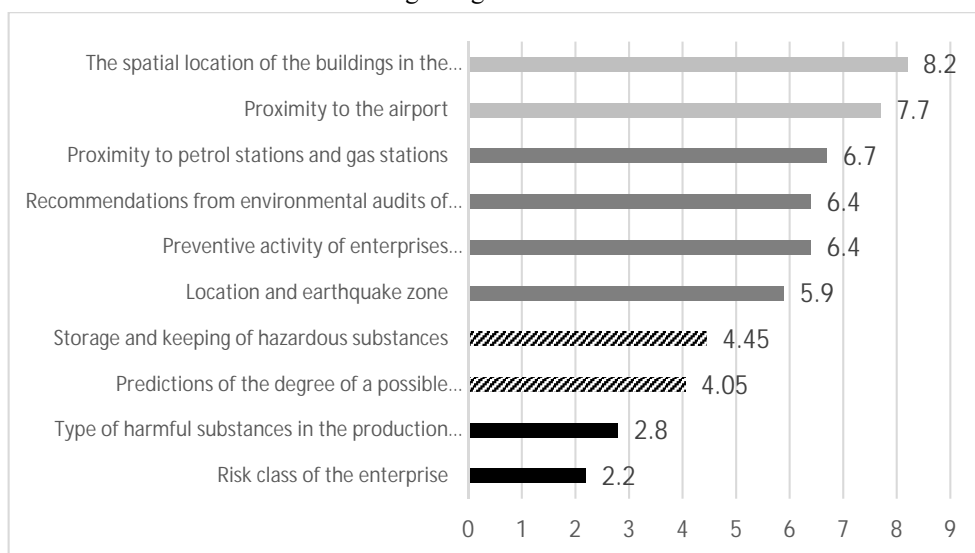


Regarding the factors determining the insurance premium of the EPLI, an arrangement and calculation of the weighted average rank has been performed for each of the price factors. Ranks from 1 to 10 were averaged, and the number of indicated ranks for the respective risk factor was used as weights. From the presented average ranks of risk factors, it is clear that the lowest average rank is the risk class of enterprises (2,2), which makes it decisive, followed by the type of harmful substances in the enterprise, forecasts for the level of possible environmental pollution, storage and storage of hazardous substances. These are the first four most important risk factors that must be taken into account when determining the net premium. In order to make a real risk assessment, it is necessary to use techniques that take into account all ten factors, but with different weights and the obtained average ranks could be used for this purpose. Figure 13 presents the average ranges of the risk factors and their division into four groups is done.

- **First group** which must be taken into account when determining the risk premium – **risk class of the enterprise and type of harmful substances in the production process;**
- **Second group** which consist of – predictions of the degree of a possible environmental pollution and storage and keeping of harmful substances;
- **Third group** – location and earthquake zone, preventive activity of enterprises, recommendations from environmental audits of enterprises and proximity to petrol stations and gas stations;
- **Fourth group** – proximity to the airport and the spatial location of the buildings in the enterprise.

Figure 13

The average ranges of the risk factors

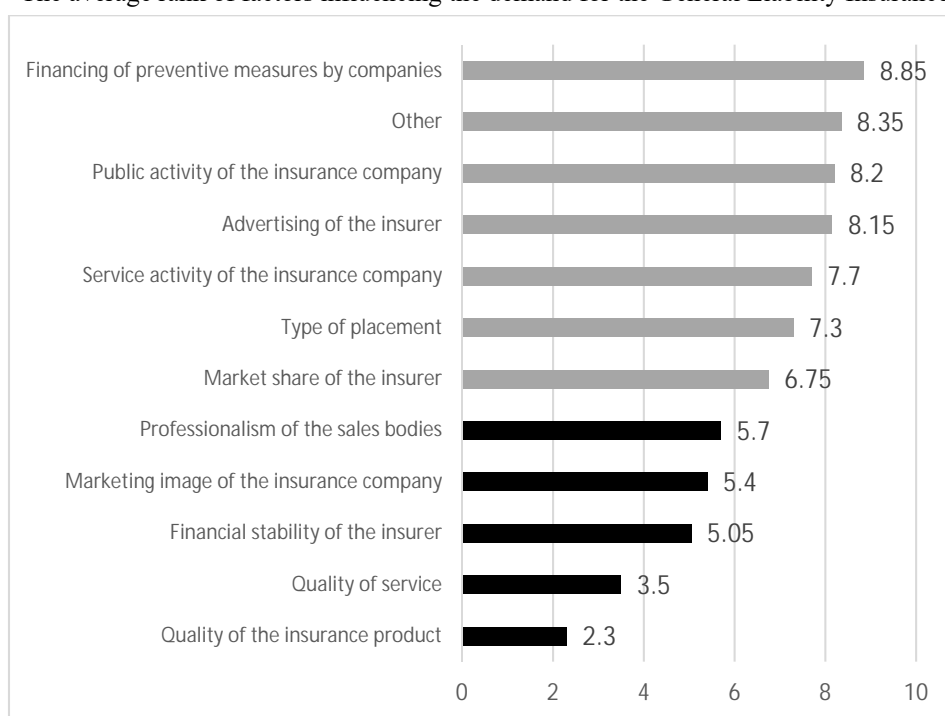


The same approach was used to rank the factors influencing the demand for General Liability insurance (GLI), and then a weighted average rank was calculated.

From the calculated average ranks of the factors influencing the demand for general liability insurance, it is clear that the lowest average rank is the quality of the insurance product, followed by the quality of service, financial stability of the insurer, market image of the insurance company and the professionalism of the marketing authorities. These are the first five most important of the 12 factors, determining the demand for GLI (Figure 14).

Figure 14

The average rank of factors influencing the demand for the General Liability Insurance



After grouping and summarising the results of the survey, there is a sufficient amount of information on the basis of which a number of connections and patterns between the studied phenomena and processes can be explored. In Appendix 2 of the study, compiled correlation tables to analyse the relationships and dependencies among questionnaire responses are presented. On this basis, the following dependencies are examined:

- **First**, the study of the dependence between the possession of a licence from the Financial Supervision Commission (FSC) for practising the GLI and performing insurance operations under the EPLI.

The indications among which the relationship is examined are alternative and are represented on the dichotomous scale – two possible responses that represent a simple alternative. Based

on the distribution of the respondents' answers, the coefficients of association, contingency and colligation, known as four-cell correlation coefficients, were calculated.

The presented distribution allows the calculation of the contingency and colligation coefficients, as the requirement that there are no zero values in the cells is less decisive than the association coefficient.

The association coefficient developed by Yule shows the full dependence between the possession of a licence from the FSC for practising the GLI and the performance of insurance operations under the EPLI. The coefficient is equal to 1, because one of the cells of the table is 0, which breaks one of the requirements for applying this coefficient. This problem is not so expressed when calculating the contingency and colligation coefficients.

Pearson's contingency coefficient $\varphi = 0.4804$ and it shows a moderate dependence between the possession of a licence from the FSC for practising the General Liability Insurance and the performance of insurance operations under the EPLI. This is quite logical as the fact that the licence is possessed does not mean that such type of insurance may be taken out automatically because other factors such as – conditions of the insurance and client's trust in the insurer etc., have an impact.

Yule's coefficient of colligation $\gamma = 0.1744$ and it shows little correlation between the possession of a licence from the FSC for practising the General Liability Insurance and the performance of insurance operations under the Environmental Pollution Liability Insurance.

The general conclusion is that it is not enough to possess a licence, but other factors must also be emphasised in order to conclude such an insurance contract.

- **Second**, study the dependence between the possession of a licence from the FSC for practising the GLI and the payment of an insurance sum or indemnity under the EPLI.

In this case, the studied variables are also alternative, but the four-cell correlation method cannot be applied because it is pointed out that both groups of insurers do not make payments under this insurance.

- **Third**, study the dependence between the possession of a licence from the FSC for practising the GLI and the need for obligatory EPLI.

In this case, the variable "the possession of a licence from the FSC for practising the GLI" is an alternative and is presented on a *dichotomous* scale and the variable "the necessity of obligatory EPLI" is presented by the nominal scale and has three definitions. To establish the narrowness of the relationship between them, the correlation coefficients of Chuprov, Pearson and Cramer are used. Due to the small number of units in the population, including licensed non-life insurers in the country, the percentage of *respondents* to the questionnaire, as well as the specifics of liability insurance against environmental pollution, it is necessary to analyse the cross-answers of the first and fourth question. Here again, there are several components, due to which the application of the method has certain conditions. However, due to the importance of the studied relationship, the correlation coefficients of interconnection are calculated and their interpretation is very careful and consistent with the specifics of the applied method.

The value of χ^2 for the studied relationship is 3.6735. The coefficient of Cramer is $V = 0.3622$. Based on the correlation coefficients, this value indicates the presence of a moderate correlation between the possession of a licence from the FSC for practising GLI and the necessity of obligatory EPLI. The interpretation of the results is in accordance with the fact that, in the case of a different number of factors and result determinations, this coefficient never reaches 1, which once again highlights the strength and significance of the studied relationship, exactly that the possession of a licence is crucial for the opinion of the obligatory nature of the EPLI. The coefficient of Chuprov $K = 0.3046$ also shows a moderate correlation dependence, which is also confirmed by the magnitude of the coefficient of Pearson $C = 0.3406$.

- **Fourth**, the study of the dependence between the possession of licence from the FSC for practising GLI and the assessment for the development of the EPLI within the GLI Branch.

From the available information, it can be seen that the analysis of the studied dependence can again be performed on the basis of the correlation coefficients of interconnectedness, as in this case, the value of the studied relationship is 2.5397, and the Kramer coefficient is $V = 0.3012$. There is a moderate correlation between the possession of a license by the FSC for the practice of GLI and the assessment of the development of the EPLI within the GLI Branch. As already mentioned, the coefficient again never reaches 1. The results obtained once again emphasise the strength and importance of the studied relationship, namely that the possession of a license is decisive for the assessment of the development of EPLI within GLI Branch. Chuprov's coefficient $K = 0,2532$ also shows a moderate correlation dependence, which is confirmed by the magnitude of Pearson's coefficient $C = 0,2884$.

- **Fifth**, the study of the dependence between the possession of a licence from the FSC for practising GLI and the assessment for the development of Environmental Insurance on the National Insurance Market.

Again, the studied dependence is burdened with additional conventions, but in order not to lose analytical information and to adequately reflect the relationships, the results are subjected to *analysis* and comment. For the studied dependence, the value of for the studied relationship is 0.4519, and the coefficients of Kramer, Chuprov and Pearson are respectively, $V = 0,1281$, $K = 0,1077$ and $C = 0,127$. They show a weak correlation between the possession of a license by the FSC for the practice of GLI and the assessment of the development of environmental insurance in the national insurance market. The obtained results are logical since the assessment for the development of the National Insurance Market does not depend only on the possession of a licence from the FSC for practising GLI, but also on many other factors.

- **Sixth**, the study of the dependence between the possession of a licence from the FSC for practising GLI and the necessity to cover the risk of environmental pollution by a catastrophe insurance pool in Bulgaria.

The analysis of the studied dependence can again be done on the basis of correlation coefficients of the interconnection of Cramer, Chuprov and Pearson. In order to comply with the requirements for *application* of the method and correctness of the analysis and interpretation of the results, the aggregation of closely related answers is performed. The following results were obtained: the value of the studied relationship is 5.6085. Kramer's coefficient are $V = 0,5295$ and shows the existence of a significant correlation between the possession of a license by the FSC for the practice of GLI and the assessment of the development of environmental insurance in the national insurance market. Chuprov's $K = 0,4453$ and Pearson's $C = 0,4680$ ratios also show moderate to significant correlations. The presented coefficients show well enough the strength and importance of the studied relationship, namely that the possession of a license is decisive for the assessment of the need to cover the risk of environmental pollution from a catastrophic pool in Bulgaria. The obtained results are logical since most insurers are aware that the covering of this risk by the catastrophe pool is necessary and it will have a positive impact on the Insurance Market.

- **Seventh**, the study of the dependence between the possession of a licence from the FSC for practising GLI and the necessity of legislative changes regarding the EPLI.

Here again, it is necessary to consolidate the answers into three groups – “yes”, “no” and “I can not judge”. The results of the analysis show that according to Kramer's $V = 0,725$, Chuprov's $K = 0,6097$ and Pearson's $C = 0,587$ coefficients, there is a significant, even strong correlation between the possession of a FSC license for general liability insurance and the view of the need for legislative changes in connection with EPLI.

- **Eighth**, the study of the dependence between the possession of a licence from the FSC for practising GLI and the necessity to differentiate the limits of liability of EPLI according to the different sectors of the economy.

The available information warrants the analysis to be based on the four-cell correlation coefficients – the association coefficient, contingency coefficient and colligation coefficient. The results of the analysis show that the association coefficient of Yule $Q = 0.4706$ estimates the dependence as moderate to significant. The contingency coefficient $\phi = 0.1905$ and colligation coefficient $\gamma = 0.1748$, show that there is low to moderate correlation dependence between the possession of a licence from the FSC for practising GLI and the necessity to differentiate the limits of liability of EPLI according to the different sectors of the economy. This relationship is not strong and the main reasons for this should be sought in the fact that this is a relatively new *risk* covered on the national insurance market.

- **Ninth**, the study of the dependence between the possession of a licence from the FSC for practising GLI and the assessment of the role of environmental insurance as a tool in the corporate risk management of enterprises with hazardous production.

The distribution of responses to these two questions, although with some conventions, allows the calculation of correlation coefficients of interconnectivity. The results of the analysis show that according to Cramer's coefficient $V = 0.3839$, Chuprov's coefficient $K = 0.3228$ and Pearson's coefficient $C = 0.3584$, there is a moderate to significant correlation between the possession of licence from the FSC for practising General Liability

Insurance and the assessment of the role of environmental insurance as a tool in the corporate risk management of enterprises with hazardous production. The results show that insurers licensed by the FSC to practise GLI considered this type of insurance as an important determining instrument, in corporate risk management, especially when it concerns enterprises with hazardous production.

In the analysis of the official statistical data presented to the FSC, it is generally found that the development of EPLI follows the dynamics in the development of GLI, due to the fact that the results are reported in this class of insurance, according to the Insurance Code. The information shows that in the period 2014-2019, there were no major fluctuations in the premium income of GLI, which averages about BGN 40 million on the national insurance market. A significant increase has been observed in the last two years (2020 – 2021), when the premium income exceeds BGN 50 million. The analysis of the data shows an increase in premium income in the last two years of the analysed period and increased demand for insurance protection, regardless of the impact of the COVID crisis in the country (Table 1.)

Table 1

Premium income in the General Liability Insurance class (in BGN)

Year	Premium income	Including active reinsurance
2014	34 646 294	5 976
2015	37 480 563	144 082
2016	40 225 973	41 180
2017	41 774 523	34 044
2018	37 984 978	70 485
2019	42 213 100	479 492
2020	50 466 871	322 801
2021	57 433 626	294 406

Source: FSC.

There is also no significant change in the relative share of the premium income of GLI Class in the structure of the premium income of the Non-life insurance branch, which amounts to only 2% on average for the analysed period (Table 2).

Table 2

Relative share of the premium income of the GLI class in the structure of the Non-life insurance branch (in %)

2014	2015	2016	2017	2018	2019	2020	2021
2	2	2,5	2,4	1,8	1,7	2,1	2,2

Source: FSC.

In this regard, however, it could be recommended to clarify the submission of statistical information by insurance companies of the GLI class to the FSC. The general reporting of the data in this class of insurance does not allow us to trace the dynamics of the premium income of specific insurance products, for example, of the different types of professional liability insurance, including EPLI.

Conclusion

On the basis of the author's research, as well as on the basis of the summarised and analysed information from the conducted marketing *research*, some **main conclusions** can be highlighted in the study:

First. With regard to *the first formulated hypothesis*, it is proved that business units still demonstrate reserved consumer behaviour in seeking security through environmental insurance. According to insurers, the difficulties in risk assessment and the lack of experience and traditions of companies in offering environmental insurance products, as well as imperfections in insurance legislation, are the main reasons for the insufficient use of the benefits and effects of environmental insurance by legal entities.

This hypothesis is confirmed by the opinion of experts from industrial enterprises in the chemical industry, according to which the factors complicating the offer of EPLI in Bulgaria (ranked first in importance) are the following: imperfections in the legal framework, lack of insurance interest on the part of industrial enterprises, high limits of insurance liability, difficulties in risk assessment.

Second. Regarding *the second hypothesis*, it is stated that environmental insurance at the present stage has not yet become widespread in Bulgaria, and as a reason, there are a number of complicating factors. The insurers themselves, who participated in the survey, share (65% of the respondents) that the state of environmental insurance on the national insurance market is "rather bad" and "bad". The uncertainties surrounding the creation of a national catastrophic pool to cover environmental risks, and the still lack of one, are forcing insurers to refrain from offering environmental insurance.

Regarding the demand for EPLI, the specialists from the chemical industry in Bulgaria indicate the main factors determining the conclusion of insurance contracts, namely: the financing of preventive measures by insurers, the financial stability of the insurer, the market share of the insurer and the qualities of the insurance product. An important complicating factor here is the adequate determination of the limits of the insurance liability. According to the respondents in the enterprises of the chemical industry, the need to differentiate the limits of liability against the risk of "environmental pollution" according to the sub-sectors in the sector is at the forefront.

Third. Regarding *the third hypothesis*, the positive role of environmental insurance on the effectiveness of corporate risk management is proved. This is the opinion of 75% of respondents. Experts in insurance practice are of the opinion that the transfer of risk through insurance removes the "economic burden" of companies whose insurance security costs are relatively small compared to possible major future damage caused by environmental risk. This is one of the main effects of insurance protection in the context of corporate security of the business unit.

Experts in the chemical industry answer in a similar way, as the opinion of the majority of respondents, is that the role of environmental insurance as a tool in corporate risk management of enterprises with hazardous production is positive. According to the respondents, the benefits of environmental insurance should be sought in maintaining the

economic stability of enterprises and ensuring their competitiveness, reducing the vulnerability of the socio-economic system of the country by covering the consequences of man-made disasters and industrial accidents, providing an additional source of non-state funding for environmental protection measures and providing victims with social and legal guarantees to compensate for damage caused by environmental pollution.

According to the conclusions made in the development, several basic **recommendations** can be outlined, which should be important for improving the relations between the entities in the conduct of environmental insurance and for its future development in the Bulgarian insurance market. They are the following:

First, there is a need to apply underwriting (Misheva, I., 2015, pp. 34-46) in the insurance of environmental risks with technogenic nature, taking in account the fact that the successfully applied underwriting business process in the environmental pollution liability insurance leads to increasing the competitiveness of the companies and increasing the demand on the national insurance market.

Secondly, there is a need for the implementation of a full-fledged legal framework and methodological framework at the national level for the introduction of environmental insurance in a mandatory form. For example, unlike a number of countries, where EPLI is mandatory, in Bulgaria, it is voluntary even for industrial enterprises with hazardous production. On the other hand, there are insufficient incentives for the development of voluntary environmental insurance to create more favourable conditions for industrial enterprises as consumers of insurance services.

Third, the consideration of environmental insurance as an element of the economic mechanism to insure environmental security and safety in industrial enterprises requires the development of accurate system approaches and principals for creating an effective system of insurance protection in order to guarantee the property interests of legal entities and individuals.

Fourth, a balanced combination of insurance and prevention in the context of corporate risk management will lead to the preservation of the favourable environmental state, the recovery of the ecological conditions in ecologically unfavourable areas and will guarantee the protection of the population from the negative influence of the anthropogenic and the technogenic impacts.

Fifth, the differentiation of the limits of liability of EPLI, according to the various sectors of the economy, can be a decisive incentive to increase the insurance interests of industrial enterprises in the country.

Sixth, the need for changes in insurance legislation can be justified by the manifestation of cross-border losses caused by environmental risks, which determines the need to create a catastrophic pool at a national and, if necessary, regional level.

Seventh, the results of the conducted marketing research prove that the still poor demand and supply of environmental insurance in Bulgaria are due to the fact that this insurance branch includes relatively new insurance products for the national insurance market. There is a need

to apply the “positioning” strategy by specialised companies for the purpose of imposing the EPLI in specific sectors of the economy.

Eighth, the implementation of marketing research in the environmental insurance market is an essential prerequisite for studying consumer demand, respectively, for undertaking marketing actions to form insurance needs and interests, as well as to increase the insurance and environmental culture of the population.

Based on the research, some findings can be made to solve **basic problems** and **aggravating factors** of conceptual and methodological nature in insuring environmental risks. These are:

- There is a need to improve the insurance protection of the companies, which could be achieved through the implementation of flexible marketing strategies aimed at differentiating, innovating and promoting insurance products of the Ecological Insurance Branch.
- The main focus in implementing the marketing policy of insurers specialising in the environmental insurance should be the conduct of marketing research to study consumer behaviour and consumer satisfaction in the national insurance market. Essential for the successful implementation of marketing research is its organisation. The achievement of the expected results from the study of a specific insurance market is based on the specific preparation for its implementation, taking into account the benefits and competitive advantages of the studied insurance, conditions and dynamics of the selected target insurance market and etc.
- Future marketing research should be carried out on the basis of gathering information and studying the behaviour of all subjects involved in the conduct of environmental insurance in the country. For instance, it is necessary to have specific information not only from insurers, but also about the case law related to claims of third parties affected by environmental technogenic risks, as well as by industrial enterprises as legal entities – consumers of insurance services. Interest in terms of marketing research would be the opinions and assessments of magistrates, lawmakers and experts from the FSC regarding the implementation of future legislative changes concerning the EPLI and the possibility of introducing the compulsory nature of this type of insurance.
- In the last few years, no changes have been made to the Insurance Code with regard to environmental insurance and the elimination of some inaccuracies in specific texts and the use of insurance terminology. There is still no clarity on the issue of creating a catastrophic pool for environmental risks in Bulgaria.
- Difficulties in the author’s analyses also stem from the fact that there is no official statistical information on specific indicators related to the dynamics of environmental insurance in the country. The author does not have statistics on the studied liability insurance against environmental pollution, due to the fact that the information provided by supervised entities to the FSC on their insurance contracts is systematised at the level of insurance classes according to Annex № 1 of the Insurance Code (IC), and not according to the insurance products offered by the insurers. In this sense, the studied insurance falls into the GLI class under item 3 of Section II of Annex N 1 and is reported together with the other insurance in this class.

- Another aspect of the research difficulties is the lack of official information on claims by victims of environmental pollution as a result of accidents in industrial enterprises, as well as the manifestation of environmental risks of anthropogenic nature in our country.

We hope that success in conducting the insurance of environmental risks can be achieved by applying the Solvency II Directive (DIRECTIVE, 2009), the implementation of the International Standard ISO 14001:2015 concerning the protection of the environment (ISO, 2015) and Directive 2012/18/EU on the control of major-accident hazards.

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