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FINANCING INSTRUMENT FOR RISKS MANAGING. POLISH EXPERIENCE

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Abstract. The study is the result of scientific research carried out in co-operation with the European Business Club. Tke issue presented in eariler study and it is a continuation of the research conducted among companies which use insurance as an instrument of financing ecological risks. The structure of the study has been subordinated to the thesis according to which insurance can be an important instrument for financing ecological risks, including risks in mining.
According to the subject of discussion, the following were applied: elemental analysis – if the object of study requires the distribution of the elements without looking for mutual dependence between them; casual analysis – when there was a need of looking for the cause–effect relationships between the elements of the object of the study; logical analysis – consisting of breaking down the object of study, taking into account the existing one in logical relations.

Keywords: environmental risk, environmental sustainability, damage, insurance, environmental policy.

JEL Classification: G22, G32, M31

Introduction

The article is the effect of a study carried out within the research program in co-operation with the European Business Club Association e.V., Schloss Oedheim in Germany. The issue was touched in an eariler study (Przybytniowski 2010, 2012) and this is a continuation of research conducted among companies which use insurance as a instrument of financing ecological risks. The structure of the study has been subordinated to the thesis according to which insurance can be an important instrument for financing ecological risks, including risks in mining. The empirical data come from the coal mining sector and refer to the examination of loss ratio in this sector. They were analysed by the author in terms of the economic factor which is the civil liability insurance (compulsory or voluntary) and other types of insurance against damage caused in the environment by its pollution or destruction.

Based on the assumption made, the author concluded that the surface reclamation bonding is a financial instrument which neutralizes the effects of ecological risks, but it may be of compulsory or voluntary character. The development of the insurance market should be stimulated not only by the increase of ecological awareness and the popularity of the principles of corporate social responsibility, as well as the development of compulsory insurance and other economical solutions connected with shaping and protecting the environment.

The methodological concept of the study is based on the functional perspective of insurance market. According to the subject of discussion, the following were applied: elemental analysis – if the object of study requires distribution of the elements without looking for mutual dependence between them (this analysis is descriptive); casual analysis – when there is a need for looking for the cause–effect relationships between the elements of the object of the study;

logical analysis – consisting of breaking down the object of study taking into account the existing logical relations.

Polish coal mining is characterized by difficult geological and tectonic conditions, causing the existence of many risks associated with the exploitation of deposits, and natural or social factors. Potential natural threats in mining are: subsidence, fire, explosion of coal dust, gas and rock ejection, water and climatic risks.

The objective of this article is to present and evaluate the problems connected with the specificity of environmental risks and their importance in mining. The design of the study was subordinated to the assumption according to which insurance can become an important instrument financing risk in mining, including ecological risk. The sample group examined included entities employing 10 or more people. In this article the author analysed and evaluated the data in terms of their readiness to conclude:

– insurance of examined companies;
– volutary insurance, including liability for environmental damage caused by pollution.

Analysing the trends in the risks of natural disasters and the losses arising from them, it is worth considering whether climate changes have an impact on the frequency and/or intensity of natural hazards. Most of the recent studies referred mainly to the assessment of losses in the economy (Piekle 2007; Vranes, Piekle 2009; Barredo 2009; Nordhaus 2010; Zhou, Wu, Wu 2010). Fewer studies referred to losses in the insurance sector and they were limited to selected hazards in a particular, analysed country (Crompton, McAneney 2008; Changnon 2009).

Taking into account the successively changing market and the hazards that accompany the customers of insurance companies, there are two reasons for treating ecological insurance as an economic and financial instrument (Przybytniowski, Stasch 2012b). With a view to hazards arising and losses accompanying them, an insurance company should be interested in whether these losses are caused by the natural changeability of the climate (Przybytniowski 2010), or are the effect of anthropogenic emissions of greenhouse gases (Bouwer 2011). Secondly, the losses in the insurance sector are estimated with greater precision compared to total economic losses. Economic losses are usually estimations and are treated as multiple losses in the insurance sector.

Studies of economic losses of particular world economies and compensation paid by insurance and reassurance companies did not show any growth tendency (see: Piekle 2010; Vranes, Piekle 2009; Barredo 2009). According to the scientists, in the recent years some "normalization" appeared in the amount of loss, compensation and benefit payments for damages connected with natural and unnatural disasters. It is dictated by the increased value of reserves held by insurance and reassurance institutions for this type of damage, which increases the economic security of both particular world economies and insurance companies, as well. The calculated value of reserves is based on the ratio of the number of disasters in the past and the inflation rate for the year, and the value of GDP per capita.

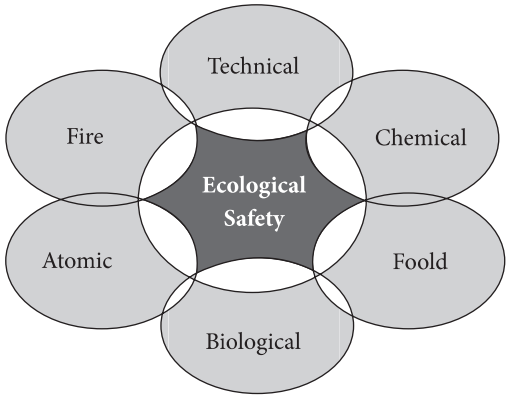


Fig. 1. Components of ecological safety
Source: based on own studies

1. Concept of ecological safety

Industrial gases released during production pollute the air and municipal and industrial waste, various chemical substances and household garbage pollute the soil. At the turn of the 20th and 21st centuries, apart from the existing natural hazards caused by nature and technical accidents caused by human activity, new threats appeared, particularly ecological ones.

In the author's opinion, the concept of ecological safety should be understood as:

– clean air, healthy water and healthy food, and
– the possibility to relax and rest, as well as continuous existence of all currently recorded wild species.

There is no explicit definition of ecological safety, so in this case there is total freedom of interpretation of this term. In consideration of the above, the concept of ecological (environmental) safety should be understood as such formation of natural and social relations in the Earth biosphere, which creates appropriate conditions of existence for the whole humanity, not impairing the fundamentals of life on our planet. As it seems, ecological safety is a process where, with the participation of many constituents, actions should be adapted to the sphere of international relations, development strategy for a given country and collective ecological awareness of its community (Fig. 1).

In practice, there are two trends resulting from different points of view on the problem of ecological safety (Derissen, Quaas, Baumgärtner 2011). The first, negative one, invokes sources of hazards and ways of avoiding them, preferring the philosophy of neocatastrophism manifested in the attitude "what must be – must be". It looks for the sources of

hazards in the natural environment and the activity of many economic objects. Such approach makes the prevention begin after the hazard has already appeared, and exactly after the damage which has already occurred. Such a position causes ecological safety to be treated as a legal pursuit for protection of one's own natural environment and people's health from anti-ecological operations of the other countries**,** not considering the opportunities for prevention.

The second approach came into being in the second half of the 20th century. and it is a creative trend in which ecological safety is treated as actions undertaken on international and national fora, aimed at shaping the desired state of the natural environment in order to preserve the risk-free state.

Whereas, ecological responsibility is the counteraction against the, so-called, public hazard, among others connected with catastrophes, including also natural catastrophes. Economical safety of the society and economy needs not only implementing definite instruments protecting against the negative impact of economic activity on the environment, but also protecting proper water resources which meet the needs in terms of quantity and quality, preserving the agricultural production space of the desired parameters, increasing forestation rate and increasing unprotected areas.

2. Causes of ecological catastrophes

Among many hazards which appeared in the 21st century, one must include ecological hazards, connected with the ongoing process of destruction of natural human environment. Thus, an ecological catastrophe must be understood as a change in the natural environment, species or population, in the way that it renders its subsistence impossible. This phenomenon has increased and become global since human harnessing nuclear energy and, particularly, after a series of great explosions conducted by nuclear powers in the sixties of the 20th century. It is when the threat appeared of the annihilation of nature in its present state, in case of total nuclear war and the, so-called, "nuclear winter" to follow, with great, climatic changes all over the globe. The 1986 catastrophe in Chernobyl alerted the world to the fact that, however peaceful the use of atom might be, it can cause disastrous effects across borders. Consequently, after this catastrophe a new term "Ecological Catastrophe" was coined. There are at least several causes which make it impossible to slow down the process of natural environment destruction, regardless of the efforts made so far. Above all, there are:

– economic,

– demographic,

– and social reasons.

At this point a question arises; who is there in the knowledge society and does the Internet actually decide on technological development and, consequently, on economic, environmental and social development? Generally, the market always wins, but for red, brown, pink or green, bureaucratic totalitarianism is a black market.

Scientists who study ecological catastrophes mention, among other causes:

– global warming (climate change),

– industrial development.

It might happen that human error or negligence is the cause of explosion or defect of such machinery as nuclear reactors or tankers transporting hazardous substances. The area where the degradation of the natural environment has happened, which leads to the breakdown of ecological balance, is the area of ecological hazard. Therefore, the growth in civilization and environmental hazards is observed, and the role of various appropriate, preventive measures is increasing. Hence, more and more often risk management should take into account both positive and negative aspects of potential damage, particularly ecological damage, caused in the natural environment.

3. Determinants of risks in mining

There are two characteristic approaches to insurance risk (Šlimák 2006; Coval, Jurek, Stafford 2009; Tapiero 2010). The first one, in accordance with the economic thought, treats risk through the prism of dangers perceived as a cause of real socio-economic events. The second approach, specific to the insurance law, treats risk from the point of view of the effects of danger occurrence. Risk may be dispersed or concentrated. It is important to take steps to eliminate the accumulation of risky situations. If the risk is concentrated and, therefore, the effects of the implementation of a single risk may cause painful damages threatening the future of business (such as mining), insurance is a factor decreasing their probability. It is just an indirect means of risk control; in other words, a way of dealing with the effects of risk. (Meier, Outreville 2006; Sheremet, Lucas 2008; Mayers, Smith 2010; Gollier 2012).

Damages incurred as a result of danger in mining may be direct (relating to particular people or property) or indirect (connected with, e.g. social damage). They can result from the appearance of phenomena caused by natural forces, mostly sudden, difficult to foresee and avoid (e.g. rock burst), or caused by human activity, (e.g. long-term negligence), in case of which the risk of defect is relatively easy to predict. Damage connected with risk appearance can be of personal character (loss of health or life) and property character (damaged infrastructure). Damage in which the affected party is an identifiable subject, as well as ecological damage, is the damage where it is difficult to indicate the aggrieved party (Gore 2006) (e.g. outdated machinery).

Polish underground mining is characterized by difficult geological and mining conditions, causing the existence of

numerous hazards associated with the exploitation of deposits, and natural or human factors. Natural risks (Ferguson 2006), are usually characterized by high dynamics of development. This is particularly true of threats of rock burst and methane risk. Their course is based on violence, high-intensity of development, substantial actions, and the occurrence of destructive factors causing loss of life or serious injury among employees, as well as leading to such events as disasters (Stinchcombe 2007).

Basic threats in underground mining should include: rock burst, infarcts, fire, methane, coal dust explosion, gas and rock outbursts, water threats.

Radiation threat also appears.

The current level of safety in coal mines is formed by:

1) The location of most mines within the Upper Silesian Coal Basin, resulting in the concentration of mining operations both locally and regionally,
2) long period of time often over 100 years or more, of mining activities by individual mines, which in many regions has led to a large volume of exploited deposits and damage to the structure of the rock mass,
3) occurrence of multi-deck deposits (problems with remains of pillars, edges, and their interaction),
4) large and growing operating depth (approximately 5–8 m/year). Currently the deepest mines conduct exploitation at the depths of 900–1150 m,
5) delays in the area of improving the techniques and technologies of mining and the lack of proper machinery and equipment,
6) application on an increasing scale of "sublevel" exploitation model. Sublevel exploitation and, connected with it, concentration of mining operations, with the depth of these works increasing, contributes to the intensification of existing hazards. In most exploited sublevel longwalls the primary rock temperature exceeds 30° C, causing an increase in climatic hazards.

Of the total number of 32 active coal mines in 2010[1]:

1) In 29 mines (91%) mining was carried out by 121 longwalls, including 23 mines (72%) where 40% of mining (48 longwalls) was carried out below the working level, of which:
   – 21% (25 longwalls) of Category III and IV of methane threat. To compare, in 2009 – 27% (32 of 120 longwalls),
   – 31% (38 longwalls) of Class "B" of coal dust explosion threat. In 2009 – 44% (53 of 123 longwallss),
   – 9% (11 longwalls) of the second and third degree of rock burst threat, while in 2009 – 13% (16 longwalls),
   – 3% (4 longwalls), in which mining was carried out at methane threat of Category III and IV, the third degree of rock burst threat and Class "B" coal dust explosion threat. 16% (19 longwalls) in 2009,
   – 11% (13 longwalls) with no methane threat. Compared to 2009, there are no changes.
2) In the longwalls where mining was carried out below the working level:
   – 3% (4 longwalls) was carried out at a depth of 500 m (in 2009 – 9 longwalls (8%)), 24% (29 longwalls) at the depth from 500 to 800 m (in 2009 – 35 longwalls (29%)), and 12% (15 longwalls) below 800 m (in 2009 – 28 longwalls (23%)) and 25% (30 longwalls) was carried out at the difference between the depth of provision and the depth of mining works carried out at more than 50 m, including 15 longwalls with a difference of more than 100 m, just like in 2009,
   – 10% (12 longwalls) where the temperatures measured by dry-bulb thermometer exceeded 280C (in 2009 15 longwalls (13%)), and 17% (20 longwalls), where this temperature was between 25 to 280C, and in 2009 – 23 longwalls (19%)),
   – extraction by longwalls carried out below the level of provision accounted for 44% of the total extraction, while in 2009 – 54%. In four mines 100% of production came by longwalls below the level of provision, as in the previous year[2].

In 2010, fatal accidents decreased to 21 accidents, and serious accidents by 25 incidents, compared to 2009. Overall, in 2010, there occurred 2,056 (79%) accidents of their own crew, from among 2,615 in total, while in 2009 there were 2,249 (80%) of 2,799 such accidents in total, giving a decrease in absolute numbers by 184. The lowest accident rate of their own crew was noted in 2005 – 1,792 (85%) of 2,117 in total. Incidence rate of fatal accidents per 1 million tons of coal extracted in coal mines for their own crew for the year 2010 was 0.17, and 0.45 for 2009. At the same time, the incidence rate of fatal accidents per 1 million tons of coal extracted in coal mines for their own crew was 0.12 and 0.30, consecutively.

The main causative groups of accidents in total in the mining industry in 2010:

1. Stumble, slip or fall of persons – 30.2%.
2. Fall, descent, subsidence of the masses or lumps of rock – 10.6%.
3. Fall, descent or subsidence of other objects – 8.5%.
4. Contact with transport equipment – 8.5%.

[1] In 2009, there were 31 active coal mines

[2] Calculations based on: *Stan bezpieczeństwa i higieny pracy w górnictwie w 2009 i 2010 roku [State of health and safety in the mining industry in 2009 and 2010],* Mining Authority, Katowice, March 2011.

5. Tearing off rocks from the roof – 5.9%.
6. Impact in, contact with a stationary object – 5.2%.
7. Impact, injury because of working tools – 4.8%.
8. Excessive effort or malicious traffic – 3.9%.
9. Other incident caused by technical hazards – 3.9%.
10. Tearing off rocks from hewn – 3.6% (Stan …, 2011).

The above statistical data do not include damage to property (relatively easy to estimate), and social harm caused by the effects of coal mining, which is more difficult to estimate. They include also ecological damages.

4. The essence of ecological risk

There is a principle that the culprit of environmental damage should bear the costs of preventing this damage or correcting their effects (Przybytniowski 2012). This principle applies clearly and strictly to individual acts. It is expressed by all kinds of taxes imposed on the polluter or sanctions imposed directly on environmentally harmful incidents. But what really is the damage to the environment (Liu 2006; Lou, Wu 2008). Damage to the environment is an unfavorable, measurable change in the state or function of natural elements (protected species, protected natural habitats, water, earth), assessed in relation to the initial state, caused directly or indirectly by the activities carried out by the user. However, the direct threat of damage to the environment is a high probability of damage to the environment in the foreseeable future (Table 1).

Table 1. Damage in the environment

In the protected species	In the protected species of natural	In the waters	In the surface of the earth
When it has a significant negative impact on reaching or maintaining the status of their protection	When it has a significant negative impact on reaching or maintaining the status of their protection	When it has a significant negative impact on ecological status, chemical or the quantitative of water	When it is a threat to human health or makes it necessary to change the existing method of using the Earth surface

Source: own studies based on environmental act

If the change of the state or function of natural elements has a measurable negative effect on human health, it is considered that the damage occurred in the environment. Damage in the environment is already an instance of yet another negative effect, characteristic for at least one type of environmental damage (Heink *et al*. 2012).

Environmental risks are associated with activities which cause adverse effects in the environment and differ significantly in scope and degree of influence, from sudden events such as breakdowns or accidents, long-term phenomena, such as destruction of infrastructure by landslides, to the adverse impact on health of the population (Fig. 2).

Fig. 2. The risks associated with threats in the system
Source: own studies based on PN-IEC 300-3-9 standard

Thus, ecological risk can be divided into an ecological risk in its strict sense (environmental hazards), the possibility of deterioration in environment quality, distorting the balance in nature, or a natural disaster; and the risk in its broad sense, including health, cultural, material and financial risks. Therefore, it is difficult to develop a uniform definition of environmental damage. Insurance companies, in their general insurance conditions (General Conditions), depending on the legal status of the country, variously define ecological damage, and thus the scope of their responsibilities. N. H. Stern (2007) believes that environmental damage means "the negative effects in the environment, caused by excessive pollution of environmental components: air, water and soil or changes in ecosystems, located within the area culprit's operations". Whereas, B. Fiedor (2007) defines environmental insurance as an ecological instrument of environmental protection, which means the transfer from the culprit to the insurance institution, in exchange for appropriate payment of insurance premium, civil liability for actual or potential environmental damage. For the purposes of this paper, the Author assumed that the surface reclamation bonding understood as the primary method of financing environmental damage means the transfer of financial commitment from the culprit to the insurance company, in exchange for the appropriate amount of insurance premium, civil liability insurance for actual and / or potential environmental damage, as well as changes in ecosystems caused by the culprit responsible for the damage.

Accordingly, the sources of environmental risk are: using the environment, making changes to it, actions of natural forces of nature and using legal and administrative instruments.

Analyzing the essence of environmental risk, it should be noted that the common element of these risks is the inability to compensate damages in relation not only to the individuals but also to the objects. For damages caused in the environment, the financial responsibility is borne by its perpetrator.

Table 2. Environmental Damage (caused by the impact on the environment)

Damage in the environment	Damage to the person or to property
Environmental costs – paid by the country or municipality	Environmental costs – paid by the unit
Loss of benefits associated with environmental pollution – incurred by the country or municipality	Loss of benefits associated with environmental pollution – paid by the unit
Defects or damage of the environment as: • the common good – paid by the state, or • the public good – paid by the country or municipality	• Damage to the body, • Death, • Damage to natural resources – used by the unit

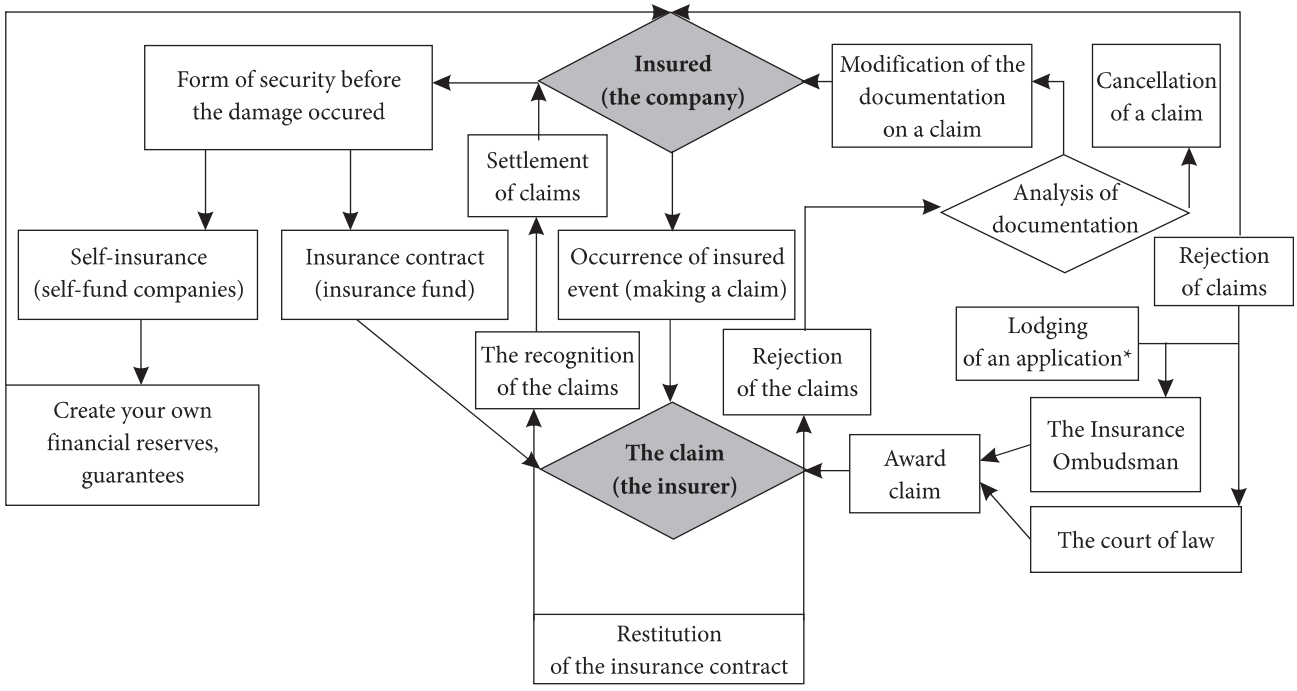
Source: based on own studies

Environmental damage (Table 2) may be treated as damage in the environment – the destruction or breach of natural resources which are the elements of the environment, personal injury – death, body injury, violation of health, damage to property – the destruction or damage to property, consumer property or production property, and the loss of benefits.

Thus, in environmental policy, environmental insurance is an important economic tool of economic and market mechanisms. One must keep in mind that the function and purpose of environmental insurance should be the environmental responsibility of a business. Therefore, insurers should take over its responsibility by offering appropriate insurance cover to companies. From the viewpoint of customers and their risks, it is reasonable to expect the protection of two types of liability – civil and administrative one (Przybytniowski 2010, 2012).

5. The essence of risks caused by coal mining operations

According to "The Report on Mining Waste Management" of 2006 the data show that the supervised mining establishments in 2009, produced 70.7 million tons of mining waste. The largest quantity of waste, up to 48.9%, was formed in coal mines. Another place in terms of share was occupied by the waste from mining copper (41.1% of waste), mining lead and zinc ores (3.6% of total waste). For example, in coal mines, methane is an



* A claim may be brought to arbitration by the Insurance Ombudsman without the court or directly to an ordinary court

Fig. 3. The place and functions in the system of insurance-claim compensation. Restitution of the insurance contract

Source: based on own studies

important contribution to the greenhouse effect because there is no possibility of reducing its emissions. The data of Mining Authority (WUG) show that in 2009 the area covered by mining operations has freed the 878 million m^3 of methane. With the utilization of methane gas installations which worked in 20 mines, energy developed 165 million m^3 of methane. For the rest of methane emissions in the mining sector, operators have to pay a fee for environmental pollution.

6. The essence and functions of environmental insurance in mining

In the insurance neutralizing ecological damages (see: Teng 2010) there are also interested entities causing such damages. Surface reclamation bonding refers to mitigating the effects of various risks associated with environmental pollution caused by the elements and forces of nature (fire, water, wind, earthquake, etc.), or by human activity (the effects of equipment failure, leaks, uncontrolled waste, etc.). In both cases the result of risk occurrence is its effect on the balance of the ecosystem in the environment. In the literature we can find a narrower approach to ecological insurance, represented by S. Labatt, R. White (2002) and the wider one, represented by (Przybytniowski, Stasch 2012). In narrower terms, surface reclamation bonding shall be understood as "(...) a legal instrument where ecological character of the field of mining, nature, functions and purpose are closely related to entities with responsibility for environmental damage". In wider terms, ecological insurance includes both entities' liability for environmental damage and the responsibility of insurance for the loss related to an experience in property insurance of the injured person. In case of surface reclamation bonding with a high level of advancement, the insurance coverage includes both the offender's civil liability, as well as the damage to property, or lost profits of a victim, resulting from a particular "ecological" event which is the source of loss, which is extremely important when you cannot assign the fault to particular individuals responsible for the damage. The main problem, in case of environmental damage, is the concept of insurance accident, which qualifies a relevant event for insurance coverage. This concept is understood as a random event, "sudden", and "unexpected". Ecological damage[3] is often characterized by "the lack of urgency," which excludes most of them from under the insurance coverage (Labatt, Rodney 2007; Handschke, Monkiewicz 2010; Weitzman 2012). Also, often such consequences can be expected – thus the lack of "unpredictability". This problem was eliminated by the United States, introducing changes in insurance legislation. The unpredictability and the need for accident insurance was not abandoned, considerably expanding the possibilities of insurance against environmental damage ("Commercial Land Insurance Policy" and "Pollution Legal Liability Site Guard Policy in the UK", whereas the United States introduced "Pollution Legal Liability" (Mudgal, Benito 2008). Assuming that surface reclamation bonding is closely linked to the source of risk, and not to the insurance cover, it can be understood as the broad definition of ecological insurance and include, in addition to liability insurance, property insurance or lost profits insurance (Zhou, Wu, Wu 2010; Pézier, Scheller 2013).

The development of environmental insurance in Poland is primarily related to the use of "all risk" clauses in insurance or liability, which mainly include damage caused by contaminants or pollutants entering the soil, earth, atmosphere, sewage and water reservoirs. Ecological risks are generally excluded from the insurance coverage in typical insurance contracts.

With the increase in environmental and legal awareness, the interest in insurance is growing, which is also stimulated by the right to pursue claims against those responsible for environmental pollution and the liability for ecological damages on the basis of risk. Particular importance in mining or quarrying has liability insurance for damage caused in the environment by pollution, which can be applied in case of potential damage caused by the exploitation of mines.

From among of the total number of insurance contracts, liability for environmental damage against pollution, mining industries has been entered into 204.5 thousand contracts, which represents 4.41% of entities operating in this sector. The data presented indicate a low propensity of entrepreneurs in Poland to make use of surface reclamation bonding. With that in mind, the question arises concerning the market absorption of surface reclamation bonding, understood as the intensity of the need to insure against the existing state of satisfaction.

Observing the level of feeling the lack of surface reclamation bonding policy for full protection of property among the surveyed enterprises by ownership sectors and sizes of companies, generally of the policyholders surveyed (46,322), the public sector accounted for 6.9%, and the private sector for 93.1%. The data indicate a low level of feeling the absence or insufficiency of surface reclamation bonding in the group of policyholders. It is evidenced by the fact that only 0.12% of entrepreneurs declared no liability insurance for damage caused by pollution of the environment as insufficient to provide full insurance coverage. In the group of large enterprises and the public sector, this ratio was more than twice as high.

[3] Irreversibility (of environmental damage) refers to the permanent loss of environmental assets or environmental quality, requiring preventive action rather than restoration or cleanup

7. Ecological insurance - market exeprrience

In the Polish legislation there are two types of environmental responsibility: the responsibility for potential environmental threats, and "proven guilty" (liability arising from the Civil Code). The current Polish Act of 23 May 2003 on insurance activity, is the primary legal act on business insurance, which creates the potential for compensation for environmental damages as a result of insurance.

1) risk of injury suffered by the insurance holder: property and personal insurance;
2) risk of liability (civil), in connection with economic activity or possession of property for damages incurred (by others): financial (liability insurance) and personal (liability insurance) (Przybytniowski 2010, 2012).

In the Polish insurance system there is a possibility of liability insurance for environmental damage caused by economic activity.

They are:

1) insurance against civil liability for environmental damage resulting from emergencies;
2) liability insurance for potential environmental threats;
3) voluntary and mandatory liability insurance for any actual or potential environmental damage that may occur as a result of prolonged exposure to the operator, and that this interaction in determining the causal links is difficult or impossible.

In addition conditions for environmental insurance can be found in the Polish legislation in other legal acts:

1) Act on Geological and Mining (Journal of Laws of 5 August 2011 No 163, item 981).
2) Environment Protection Act (Journal of Laws of 19 October 2011 No 224, item 1341).
3) Waste Act (Journal of Laws of 2010 No 185, item 1243).
4) The Act on Genetically Modified Organisms (Journal of Laws of 24 July 2003 No 130, item 1187).

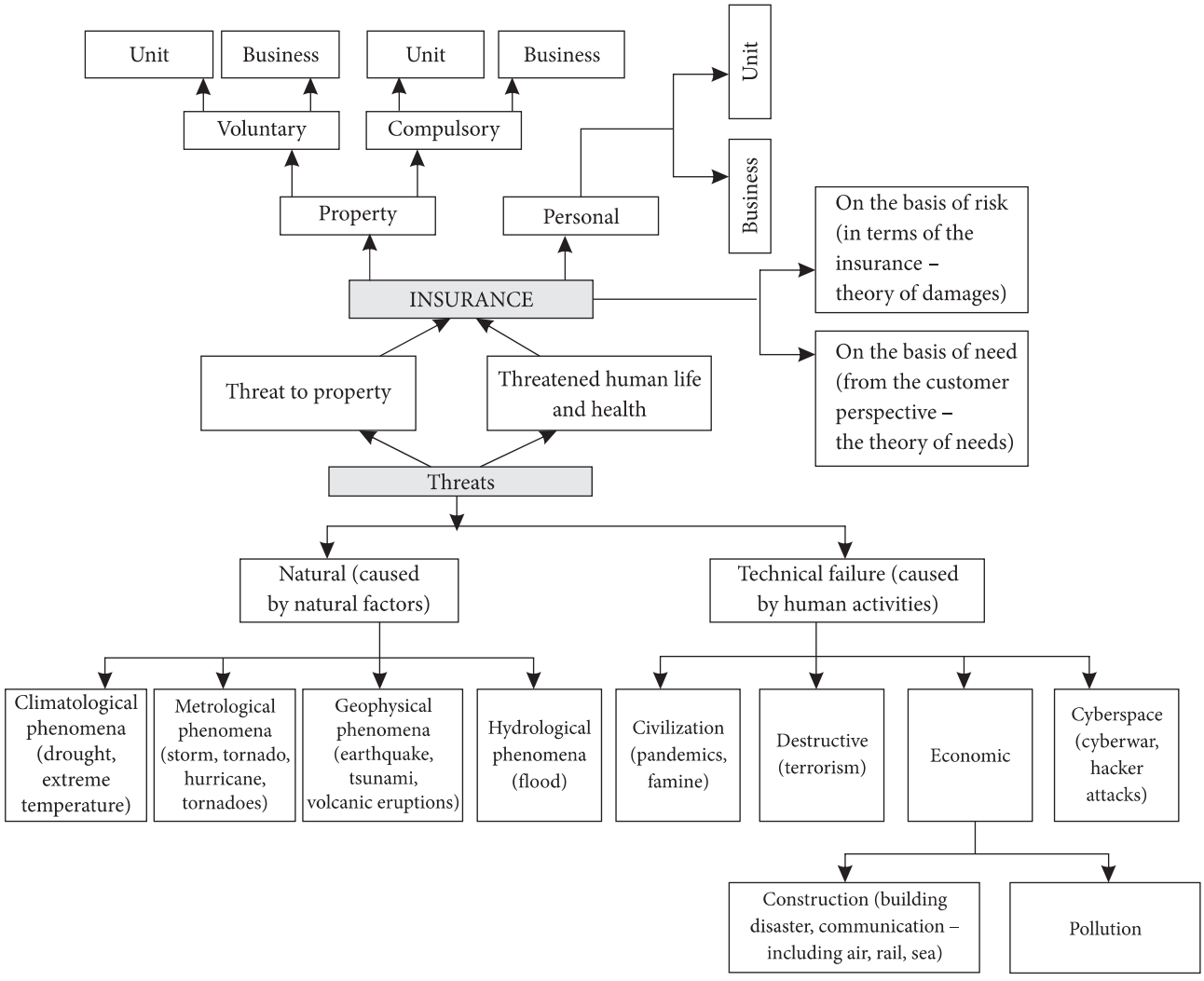


Fig. 4. Insurance and the risk of disasters

Source: based on own studies

There are two possibilities of environmental responsibility: the responsibility for the proven guilt and the liability for breach of the environment on the basis of potential threat (Przybytniowski 2010, 2012). In line with this reasoning, liability insurance for damage caused to the environment should distinguish three types of damage:

1) loss and damage which arise in the environment as a result of catastrophic risk – a natural one;
2) loss and damage which arise in the environment as a result of catastrophic risk associated with the human factor;
3) loss and damage which arise in the environment despite proper exploitation and maintenance of the equipment used in the environment.

On the basis of the previously mentioned acts, there have been mandatory financial security claims made for: adverse consequences in the environment and potential environmental damage, which is included in the authorization to use the environment given to the operator. These safeguards can take form of an insurance policy (see: Przybytniowski 2012).

A financial instrument, which is an insurance contract does not always guarantee full compensation to victims for damage and injury they have suffered.

Compensation of claims must fulfill a number of important conditions:

1) correctly assess the damage (which is the hardest thing);
2) determine the causal link between pollution and the damage;
3) determine the polluter and the victim;
4) simple and transparent procedures to execute compensation.

However, this instrument allows increasing the pressure of responsibility by the polluters, as well – it has a function of a stimulus for pollution abatement by the polluter (for example, the application of safer technologies).

Responsibility for the environment resulting from the legal function applies to most "sudden" events and is related to the principle of proven guilt. Environmental responsibility in the economic function is to encourage companies which are potentially environmentally harmful to make decisions related to preventive measures, that is, environmental responsibility, as an economic instrument for environmental protection. In the selection of planned investment projects, including insurance, related to environmental protection, they should be guided by the principle of economic efficiency, bearing in mind ecological effectiveness. This principle is used to minimize the effort per unit of gained effect. This economization of action is reduced to implementing environmental objectives at minimal cost through appropriate economic tools.

8. The importance of ecological insurance

The principal value of the environmental policy is a human being. The new National Environmental Policy is intended to satisfy the growing human needs, both material and relating to the quality of the surrounding environment.

A Man and his activity is closely linked with the natural system. Maintaining balance in this system requires a consistent and overall management of both: access to resources and the environment and liquidation of and prevention from forming negative environmental impacts of economic activity, as well as rational use of natural resources (Przybytniowski 2010; Paterson 2010). It should be reflected in the relevant management structures at the national, provincial and local governmental level, with the appropriate distribution of competences. It is also important that among the companies benefiting from environmental resources, and introducing changes to the environment, actions should be taken to develop, promote and create conditions for pro-environmental management systems, focused on systematic elimination and, if it is not possible, to minimize negative environmental impact and its sources. Ecological safety of society and economy requires not only introducing the instruments hedging against adverse environmental impacts of economic activity, but also securing adequate disposable water resources that meet the quantitative and qualitative needs of the society, maintaining the agricultural production area with the desired parameters, increasing forest cover and increasing protected areas.

Environmental responsibility is prevention from the, so-called, public risk associated with disasters, including natural disasters.

What should ecological insurance serve for? Firstly, to protect natural resources in terms of their production utility; secondly, to support the companies which realise pro-ecological investment projects.

There are two possibilities of ecological responsibility: liability for proven guilt and civil liability for violating the state of the environment in terms of potential threat.

In line with this course of thinking, civil liability insurance for damage done to the environment should differentiate three types of damage:

1) loss and damage to the environment which arise from catastrophic - natural hazards,
2) loss and damage to the environment which arise from catastrophic risks connected with the human factor,
3) loss and damage to the environment which arise despite proper maintenance and use of the equipment used in the environment.

Moreover, it must be pointed out that, as of today, there are no quantitative models, but only qualitative ones. Insurance or reassurance companies do not assess the "human capital quantitatively". However, according to the Author, the calculations should be made according to the formula below, which makes the amount of damage paid by insurance and reassurance institutions more adequate to the amount of damage which actually occurred (see: Przybytniowski, Stasch 2012).

Conclusions

1. Specific governments and insurance market representatives should together initiate and create a disaster risk management program to limit the amount of loss arising from such damage. These operations should be conducted under the supervision of the governmental administration.
2. The level of insurance of enterprises is relatively low, there is large potential in non-insurance companies which see the need for insurance as a financing instrument for environmental risks, including the coal mining industry.
3. It can be concluded that environmental insurance is a financial instrument created in order to neutralize the effects of environmental risk, but it may be of compulsory or voluntary character.
4. In order to increase the safety of their citizens, governments should have an influence on the process of disaster risk management, as well as on the range of risks that insurance programs cover (more: Przybytniowski 2010, 2012). Such contracts should be of unlimited duration.

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