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PERCEPTION OF ENVIRONMENTAL INSURANCE RISK VS. IMPLEMENTATION OF CONTROL MEASURES IN ORGANIZATIONS MANAGED ACCORDING TO ISO 14001:2015 IN POLAND**

I. INTRODUCTION

Risk perception can be understood as the individual or collective evaluation of an objective risk.[1] Such a definition generates two essential courses of study: firstly, application of scientific methods for the estimation of measurable risk parameters, such as risk occurrence probability or its severity (in its objective or financial meaning); secondly, studies of risk perception in terms of its subjects, focused what it is determined by, as well as studies of the consequences of particular approaches to risk. The following article contributes to the latter research area.

The practical relevance of studies pertaining to risk perception primarily arises from the juxtaposition of risk perception against the expert evaluation of risk (benchmark). The identification of factors determining risk perception makes it possible to take action concerning these factors which is aimed at the reduction of the 'perception gap'. The perception gap can be defined as the difference between, on the one hand, the expert evaluation of the qualities describing the risk and, on the other, the perception of these qualities presented by the risk subject.[2]

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[1] Aven and Renn (2010): 10–11.

[2] Slovic, Fischhoff, Lichtenstein (1980): 208.

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The description of a perception gap becomes complex when it is endogenous factors that mainly determine the volume of risk. The benchmark for the individual risk perception is set on each occasion by the expert evaluation of risk for a particular subject of risk. An example of risk where the above difficulty can be seen is environmental insurance risk.[3]

Breaking through the barriers to research is possible by confronting environmental insurance risk perception and the ISO14001 environmental management system (EMS ISO 14001), and shifting the focus of research interest from perception determinants to the consequences of a particular perception, because systemic solutions reflect the organisational perception of environmental insurance risk.

The purpose of the present study is to evaluate the interrelation between environmental insurance risk perception and the frequency of implementation of measures to control this risk within EMS ISO 14001 (henceforth referred to as relevant systemic solutions (RSS)) The research problem is presented in the form of a question: is the high evaluation of measures regarding environmental insurance risk perception connected with the implementation of relevant systemic solutions? Such a research concept will make it possible to determine whether EMS ISO 14001 is a tool for managing environmental insurance risk.

The former research results regarding the impact of risk perception on control operations justify the hypothesis that the higher the assessment of environmental insurance risk perception measures, the more frequent the implementation in the ISO 14001 EMS of the relevant – from the insurance point of view – systemic solutions (RSSs), that is the means to control this risk. It is possible, though, that ISO 14001 EMSs constitute a tool for only managing other types of environmental risk (connected with, e.g., the level of natural resources consumption or the volume of generated waste, etc.).

II. OVERVIEW OF THE SUBJECT LITERATURE

Subjectivity of evaluation is a regular element which links the scientific risk concepts suggested by scholars;[4] it has determined a broad spectrum of research problems.

The first research thread is aimed at answering the question why people perceive risk in different ways.[5] An array of concepts has been developed concerning the determinants of risk perception. Amongst them one can find the techno-scientific approach, the psychometric model, the comprehensive

[3] Environmental insurance risk refers to such types of environmental risk for the potential polluter, the financial implications of which may be transferred onto an insurance company, up to a degree allowed by the present insurance coverage. Lemkowska (2020): 25.

[4] Aven, Renn (2010): 10; Anantho (2008): 3; Sandman (2012): 6–12; Altonoğlu, Atav, Sönmez (2017): 436.

[5] Chauvin, Hermand, Mullet (2007): 171.

personality model, and the value-belief-norm theory.[6] They differ in terms of the importance assigned to various factors which determine the perception process. The concepts have been classified by Janmaimool and Watanabe,[7] who propose dividing them into four groups. The first, denoted as cultural concept group, assigns essential importance to the social factors which determine risk. The individual (not social) dimension of determining risk perception is, in turn, emphasized by the paradigm of axiomatic measurement (the second group). A broader scope of determination is included within the concepts which belong in the psychometric paradigm (the third group). The particular risk perception in this paradigm is derived from both the physical attributes of risk (i.e. its potential catastrophic impact) as well as psychological and cognitive factors. Finally, the last group of concepts, characterized by their highly interdisciplinary nature, is the so-called Social Amplification of Risk Framework (SARF), which encompasses two stages of developing a particular risk perception: external factors determination and individual or collective interpretation.

The risk evaluation system which leads to a particular perception of risk is immensely diverse. Janmaimool and Watanabe[8] proved that perception-moulding factors differ depending on respondents' residence and exposure to exogeneous risk. Other analyses point to the dependence of risk perception on race and ethnic group, subsequently relating it to the level of education, income or political views.[9] In turn, Shengxiang, Qiang, Chaoqun[10] looked at the impact of time and space distance. The large amount of research, however, did not always result in consistent outcomes.[11]

Another thread of research aims at making recommendations for the process of risk communication.[12] Each and every time, communication should be adapted to the risk profile and its perception by a given subject (groups of subjects).[13] It is essential to take into consideration the evolution of the subject's surroundings, which always carries with it the need for a dynamic change in communication principles.[14]

Slovic and others'[15] research findings were, in turn, clear about pointing to the explicit link between risk perception and the importance attributed to its control measures. Risk perception is situated within the bundle of decision-related motives, along with such factors as awareness of problems, past experiences, access to information, etc. Analyses of the causative importance of risk perception have been conducted in the context of its many types (e.g. health

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[6] General overview of concepts: Altonoğlu, Atav, Sönmez (2017): 437.

[7] Janmaimool, Watanabe (2014): 6294. See also Kaczała (2017): 282.

[8] Janmaimool, Watanabe (2014): 6307.

[9] Macias (2016): 124126.

[10] Shengxiang, Qiang, Chaoqun (2012): 224.

[11] e.g. Alhakami, Slovic (1994): 1085–1096; Gregory, Mendelsohn (1993): 259–264; Janmaimool, Watanabe (2014): 6307.

[12] Cf., e.g., Seeger (2006): 232–244; Allen et al. (2017): 422–440.

[13] Janmaimool, Watanabe (2014): 6308.

[14] Kasperson (2014): 1233–1239; Renn (2014): 1277–1281.

[15] Slovic, Fischhoff, Lichtenstein (1980): 202.

risk,[16] natural disaster risk[17]), at the intersection of various types of activities (e.g. nature-related risk in agricultural operations[18]).

In the area of risk perception studies, the realm of environmental risk has taken an important position since the beginning of the twenty-first century.[19] The research has not led, however, to the identification of a statistical relationship between the measurements of risk perception and a particular catalogue of actions to be taken as part of environmental risk management.

The uniqueness of the approach presented here results from the assumed scope of the term environmental risk (objective scope) and the catalogue of subjects whose perceptions are studied (subjective scope). While the previous studies cover an ample catalogue of broadly understood environmental risks, including, for example, the risk of natural disasters, the present analyses focus on environmental insurance risk. They are also aimed at completing the evident research gap in the area of the relation of environmental risk perception to the control operations conducted with regard to this perception, especially at the organisational level. Hence, the research covers organizations in Poland which have implemented ISO 14001 EMS.

III. METHOD

Testing the research hypothesis generates two methodological issues. Firstly, it creates the necessity of operationalizing the notion of 'risk perception'. Secondly, it is indispensable to distinguish the RSSs whose implementation in organizations will be subjected to research.

The construct of perceived risk is not directly observable.[20] It is not clear what the 'subjective assessment' mentioned in the definition refers to, which originates from the lack of a uniform definition of risk.[21] Slovic suggested measuring risk perception by evaluating the level of perilousness of risk (lack of control or its catastrophic potential), the level of knowledge about risk (non-observability, novelty status and a delay in occurrence of its impact) as well as the number of persons exposed to the risk occurrence.[22] O'Connor, Bord and Fisher[23] connected perception with three measures: expectation concerning the occurrence of a perilous event; expectation concerning the negative consequences of the above for oneself (the studied subject) and others, and

[16] Brewer et al. (2007): 136–145.

[17] Kaczała (2019): 113–120.

[18] Toma, Mathijs (2007): 145–157.

[19] e.g. Bamberg, Möser (2007): 14–25; Xu et al. (2017): 35–50; Janmaimool, Watanabe (2014): 6292–6293; Altonoğlu, Atav, Sönmez (2017): 437; Rowe, Frewer (2004): 513.

[20] Xu, Feng, Li, Chen, Jia (2017): 40.

[21] Overview of definitions; cf. in. al. Otway, Thomas (1982): 69–82; Lash, Wynne (1992): 4; Crawford-Brown (1999): 6293; Michalak (2004): 3.

[22] Slovic, Fischhoff, Lichtenstein (1980): 201; Slovic (1987): 282.

[23] O'Connor, Bord, Fisher (1999): 462.

knowledge about the causes of the problem. Kaczała,[24] in turn, points out that risk perception may be referred either to an event (action) which is the cause of the negative impact felt by the subject of risk (in the literature such an event is called a peril, a risk occurrence determinant, the risk affecting the object, a risk agent) or to the impact of such an event.

Most researchers, however, analyse risk perceptions through the prism of two indicators: the probability of the event occurrence and the violation of particular values (impact), assuming that these violations can be defined differently, for example in natural units (loss of crop) or as pecuniary ones (loss of income).[25] Xu et al.[26] point to the lack of contradiction between Slovic's approach quoted above[27] and the most commonly mentioned in the literature bi-indicator operationalization of risk perception. They claim that the impact (violation of values) covers all three of Slovic's aforementioned categories. A few scholars[28] divided the likelihood category into two dimensions (probability of event occurrence and susceptibility to risk materialization). As a result, Brewer et al.[29] proposed three measures of risk perception: likelihood, susceptibility and severity.

In the present analysis of the relationship between risk perception and control operations conducted with regard to environmental insurance risk within ISO 14001 EMS, a three-category measurement of environmental risk perception has been adopted (see Table 1).

Table 1

Measures of environmental insurance risk perception (A variables)

Abbr.	Description	Measurement method/ categories
OL	Subjective evaluation of the likelihood of damage occurrence Loss catalogue: **Group A** – in surface waters, – in groundwater – in land – in protected species [...] **Group B** – emissions of substances into the air – energy emissions [...]	Six ranked variables, in the scale 1–7, where: 1 – causing this damage is very unlikely 4 – it is hard to say 7 – causing this damage is extremely likely

[24] Kaczała (2019): 16.

[25] Shengxiang, Qiang, Chaoqun (2012): 224; Kaczała (2019): 84 and the literature cited therein.

[26] Xu, Feng, Li, Chen, Jia (2017): 39.

[27] Slovic (1987): 462.

[28] Brewer et al. (2007): 137.

[29] Brewer et al. (2007): 137.

Table 1 (*cont.*)

CL	Subjective evaluation of the likelihood of bearing the particular consequences resulting from damage occurrence Catalogue of consequences: a) Claims due to damage to property caused by emissions b) Claims due to damage to person caused by emissions c) Environmental organisations claiming infringement of the environment as a common good d) Obligation to remedy environmental damage to water e) Obligation to remedy land damage f) Obligation to remedy environmental damage to protected species and habitats	Ranked variables, in the scale 1–7, where: 1 – entirely unlikely 4 – it is hard to say 7 – extremely likely
CS	Subjective evaluation of the severity of the particular consequences resulting from damage occurrence Catalogue of consequences: a) Cost of conducting remediation (cr) in water b) Costs of cr in land c) Costs of cr in protected species [...] d) Volume of compensations paid on account of property damaged due to emissions e) Volume of compensations paid on account of damage done to persons due to emissions f) Volume of compensations paid in response to environmental organisations' claims g) Loss of revenue due to breaks in operations h) Loss of reputation i) Legal costs j) Loss of permissions to conduct operations k) Loss of competitive advantage l) Loss of customers	Ranked variables, in the scale 1–7, where: 1 – Minor and entirely not severe 4 – it is hard to say 7 – Major and extremely severe

[*] According to the adopted definition, environmental insurance risk refers solely to the types of risk which may be covered by insurance. Although points h), j), k), l) of the CS measure are not directly reflected in the current offer of insurance companies in Poland, signing an insurance contract may indirectly affect the ultimate perception of the burden of the aforementioned consequences.

Source: author's own compilation.

The study encompasses the analysis of relationship between risk perception (evaluated according to the three measures listed above) and taking controlling actions with regard to environmental insurance risk within the framework of ISO 14001 EMSs. They have been identified on the basis of the analysis of the ISO 14001:2015 standard, as well as the overall terms and conditions of specialized environmental insurance available on the Polish market (cf. Table 2).

Table 2

Relevant Systemic Solutions (B variables)

Variables		Description	Measurement method/ categories
Personal integration variables	1	Respondent's competencies (the respondent is responsible both for insurance and ISO 14001)	Binary variable (1 – yes, 0 – no)
	2	Respondent knows who in the organization is responsible for insurance cover concerning environmental risk	Binary variable (1 – yes, 0 – no)
	3	Respondent's knowledge of insurance (the respondent knows if any insurance contracts have been signed for environmental risk)	Binary variable (1 – yes, 0 – no)
Project variables	4	Treating the insurance sector as an interested party (in the process of context analysis during ISO 14001 implementation its needs and expectations were analysed)	Binary variable (1 – yes, 0 – no)
	5	Criteria for the selection of the parties interested in the process of context analysis (criteria relevant to insurance sector were taken into account)	Binary variable 1 – criteria relevant to insurance sector were taken into account, 0 – they were not taken into account
	6	Criteria for the selection of environmental aspects (criteria relevant to insurance sector were taken into account [30])	Binary variable 1 – criteria relevant to insurance sector were taken into account 0 – they were not taken into account

[30] The scope of damage caused to the environment or other adverse impact on the environment in the past; the value of compensations and other benefits paid out to third parties in the past; the costs of remediation activities carried out with reference to elements of the environment incurred in the past, regulations referring to third party liability for damage or other adverse impact caused to the environment resulting from the organization's operations, regulations urging to remediate environmental damage, the likelihood of causing environmental damage or another adverse impact upon the environment in the future, possible dangerous substance leak, the impact of waste on the environment, the impact of waste oil emulsions on the environment.

Table 2 (*cont.*)

Informative potential variables	7	a	Estimation of the likelihood of environmental damage/another adverse impact on the environment according to the loss catalogue Loss catalogue: cf. Table 1	Two methods of measurement 1) Binary variable (1 – the organization estimates the likelihood of environmental damage/another adverse impact on the environment in connection with at least one type of loss from group A (B), 0 – the organization does not estimate the likelihood for this group of losses); 2) Quantitative variable – the number of types of losses for which the likelihood is estimated
		b		
		c		
		d		
		e		
		f		
	8	A	Estimation of probable maximum cost necessary to be incurred in the event that damage does occur Separately for Group A and Group B of loss catalogue	Two methods of measurement 1) Binary variable (1 – the organization estimates the amount of costs incurred in connection with at least one type of loss from group A (B), 0 – the organization does not estimate the costs for this group of losses) 2) Quantitative variable – the number of types of losses for which the costs are estimated
		B		
	9	A	Claims register (A claims register is kept for the Group A and Group B of the loss catalogue)	Two methods of measurement 1) Binary variable (1 – the claims register is kept at least for one type of loss from Group A (B), 0 – no register is kept) 2) quantitative variable – the number of registers that is kept for Group A (B) of loss catalogue
		B		
	10	a	Monitoring environmental aspects A catalogue of aspects a) Volume of substances emitted into the air b) Volume of noise emitted into the air c) Volume of emissions into surface waters d) Condition of groundwater	Nine binary variables: 1 – the given aspect is regularly monitored 0 – it is not monitored
		b		
		c		
		d		

Volume of risk variables		e	e) Volume of fluorinated greenhouse gasses emissions f) Volume of waste g) Condition of technical means of emissions prevention h) Condition of technical means of limiting the adverse environmental impact i) Installation parameters influencing the level of environmental impact	
		f		
		g		
		h		
		i		
	11	A	Preventive actions taken in connection with likely damage	Two methods of measurement 1) Binary variable (1 – preventive actions are taken at least for one type of loss from group A (B), 0 – no preventive action is taken 2) quantitative variable – the number of types of losses from group A(B) that preventive actions taken against
		B	Separately for Group A and Group B of the loss catalogue	
	12	A	Repressive actions planned or taken in connection with a type of damage	Two methods of measurement 1) Binary variable (1 – repressive actions are planned or taken at least for one type of loss from group A (B), 0 – no repressive actions are planned or taken) 2) quantitative variable – the number of types of losses from group A(B) against which repressive actions are
		B	Separately for Group A and Group B of the loss catalogue	
	13	A	Introduction of response procedures to potential emergency situations in the case of loss occurrence	Two methods of measurement a) Binary variable (1 – a procedure was introduced at least for one type of loss from group A (B); 0 – no procedure was introduced b) Quantitative variable – how many procedures were introduced for Group A (B)
		B	Separately for Group A and Group B of the loss catalogue	
	14	A	Remediation indispensable in order to restore the original condition of the environment in response procedures to potential emergency situations	In group A two methods of measurement a) Binary variable (1 – such action is included in the procedure for at least one type of loss from group A, 0 - it is not included) b) Quantitative variable – the number of types of losses for which such action included In group B a binary variable was used
		B	Separately for Group A and Group B of the loss catalogue	

Table 2 (*cont.*)

	15	A	Environmental goals (establishment) (Goals were established with regard to reduction of the likelihood of damage occurrence and a reduction of damage scale)	Two methods of measurement a) Binary variable (1– a goal was established for at least one type of loss in group A(B), 0 – no goal was established) b) Quantitative variable – how many goals were established
		B	Separately for Group A and Group B of the loss catalogue	
	16	A	Environmental goals (accomplishment) (The degree to which environmental goals were accomplished in connection with a reduction of likelihood or scale of the damage – if they had been established)	Two quantitative variables were set a) Average accomplishment degree for the goals established in group A of the loss catalogue b) Average accomplishment degree for the goals established in group B of the loss catalogue Degree of accomplishment was determined on the scale 0–4, where 0 meant that the goal had not been accomplished at all, and 4 that it had been accomplished in full
		B	Separately for Group A and Group B of the loss catalogue	

Source: the author's own compilation.

The data describing the variables was obtained via an electronic survey (October 2018 – May 2019). The invitations to complete the questionnaire were sent to 1612 organizations which had implemented ISO 14001 EMSs in Poland. A total of 121 fully completed questionnaires were returned. The respondents were all in charge of ISO 14001 EMSs in their respective organizations.

In order to verify the research hypothesis, an analysis was carried out of the relationship between the risk perception measures (A variables) and the identified RSS (B variables). Depending on the type of statistical features (qualitative features – dichotomous; multi-variant; quantitative features) suitable measurement and inference methods were used with reference to the relationship:

a) when the B variable was qualitative, the preferred test was the independence chi-squared test, and the power of this correlation was evaluated by means of the V-Cramer coefficient and the contingency coefficient; additionally, in the case of the square 2x2 tables the Yates correction was used;

In the case of a distinct asymmetry of response distribution as well as the fact that it was impossible to conduct an independence chi-squared test because of the too small numbers predicted in some cells of the contingency table (crosstab), the U-Mann-Whitney test was used;

c) when the B variable was a quantitative one (e.g. the number of claims registers kept by a company), the significance of the correlation was concluded on the basis of the Spearman's rank correlation coefficient; this choice was determined by the rank character of the features and also by the distribution of responses.

IV. RESULTS

Table 3 presents the scope of the relevant statistical analysis. In all the cases, the relationship was considered significant when the p value of a given test did not exceed the statistical significance level of 0.05.

The research findings have shown a lack of relationship between the measures of environmental insurance risk with both project variables and personal integration variables. Regardless of the risk perception measures, it was uncommon to combine competencies regarding functions connected with ISO 14001 EMS and private insurance. The insurance sector was also (and without any significant relationship with risk perception measures) infrequently considered to be one of the interested parties (the initial stage of ISO 14001 EMS implementation involves the identification of such parties). The criteria for the selection of the interested parties were not, on the whole, connected with the perception of environmental insurance risk, either. The only exception turned out to be the relevant relationship between the values of risk perception measures (OL and CS) and the consideration of selection criteria for environmental aspects which were relevant to environmental insurance risk.

Table 3

The scope of statistically significant relationships between measures of environmental insurance risk perception (A variables – AV) and relevant systemic solutions (RSS) (B variables – BV)

	BV	1	2	3	4	5	6	7						8		9		10						10			11		12		13		14		15		16	
AV		A	A	A	A	A	A	a	b	c	d	e	f	A	B	A	B	a	b	c	d	e	f	g	h	i	A	B	A	B	A	B	A	B	A	B	A	B
OL	a						■	■	■	■	■			■		■		■	■	■		■		■			■		■	■	■	■					■	
	b						■	■	■	■	■			■						■	■	■	■	■		■			■		■		■					■
	c						■	■	■	■	■	■	■	■		■	■	■		■	■	■	■	■		■		■		■	■	■	■		■				
	d						■	■	■	■	■			■															■		■	■	■						
	e						■	■	■	■		■	■	■	■		■	■	■				■		■	■	■		■	■	■	■	■		■		■		
	f						■	■	■	■	■		■	■																						■		
CL	a							■	■	■								■	■	■						■			■	■	■							
	b							■		■				■																	■							
	c							■		■								■	■	■							■				■	■					■	■
	d							■	■	■	■			■		■								■						■			■	■				
	e						■	■	■	■						■		■									■											
	f					■		■	■	■	■		■									■					■			■				■				
CS	a							■	■	■	■									■	■			■			■		■								
	b						■	■	■	■	■		■			■		■						■	■		■		■								
	c							■	■	■	■			■								■		■	■		■		■								
	d							■	■	■	■		■								■	■		■	■	■	■		■		■						
	e							■	■	■	■		■					■						■	■	■	■		■		■						
	f							■	■	■	■									■	■	■		■	■	■	■		■		■						
	g						■	■	■	■		■	■										■	■		■			■		■						
	h						■	■	■	■		■	■										■	■		■			■		■						
	i						■	■	■	■								■						■	■	■	■		■		■						
	j						■	■	■	■			■							■				■	■	■	■		■		■						
	k						■	■	■	■			■											■					■		■						
	l						■	■	■	■			■											■					■		■						

Source: the author's compilation.

What is interesting is that in the case of the CS variable the recognized relationship was significant for its variants labelled g-l: the burden of consequences, a large majority of which are not insured.

Relationships in the area of risk perception measures and informative potential variables occurred much more frequently. The entities which ranked highly all the variants of risk perception measures also more frequently declared the estimation of likelihood of all the mentioned types of environmental damage or another adverse effect on the environment. With regard to the influence of perception measure values upon the remaining variables of informative potential (i.e. Assessment of probable maximum cost, Claims register, Monitoring environmental aspects (A-F)) fewer relationships were identified. The most frequent relationships were identified between the above variables and the OL one. A particularly interesting relationship was found between some categories of the CS variable (Loss of revenue due to breaks in operations, Loss of reputation, Legal costs, Loss of permissions to conduct operations, Loss of competitive advantage, Loss of customers) and the implementation of monitoring procedures for waste volume in organization. The high ranks of the aforementioned risk perception measures were connected with more frequent attempts to control waste volumes. Such dependencies are not visible with reference to monitoring of other environmental aspects (i.e. emissions into the enumerated areas of the environment). Hence, this is how organizations approach planning control operations: those which highly rank the severity of damage consequences manage it through the prism of the potential sources of the damage (waste) and not through the perspective of loss destination (water, ground surface, protected species, etc.).

Numerous relationships were observed with regard to certain variables in the category of volume of risk, namely: Monitoring environmental aspects (in the part directly affecting the volume of environmental insurance risk – 10, g-j), Preventive actions (11), Repressive actions (12), and Response procedures to potential emergency situations (13). Organizations which ranked risk perception measures more highly were more frequently engaged in monitoring environmental aspects (this conclusion can be mainly drawn on the basis of studies of relationships between OL and CS variables). The analysis shows that within the Group A of losses, the implementation of preventive actions (11), repressive actions (12), and response procedures to potential emergency situations (13) are significantly related with most categories of risk perception measures. The entities which ranked measures of environmental insurance risk perception more highly also implemented the control operations with reference to the volume of risk variables more frequently. This regularity was also noticed in the Group B of losses, but this was only in the case of the Repressive actions variable (12).

There were no statistically significant relationships between variables describing risk perception and the volume of risk variables 14, 15, 16. This suggests that the evaluation of risk perception measures does not affect the implementation of environmental remedying action in the response procedures concerning emergency situations. It does not translate into the estab-

lishment and accomplishment of the established environmental objectives. Very few exceptions regarding statistically significant relationships were only observed for selected sub-categories of the OL perception measure, as well as for the implementation of control operations (14-16), for one or both of the loss categories.

V. CONCLUSIONS

Risk perception measures present a statistically significant relationship only with the implementation of certain control operations undertaken within the ISO 14001 system, in particular in the area of informative potential variables and the volume of risk variables (except those which regard environmental objectives and planning environmental remedying actions in the response procedures for potential emergency situations). Therefore, it turns out that the perception of environmental insurance risk is not significantly statistically related to a way of organising EMS which would integrate private insurance and ISO 14001 EMSs as tools for managing the same kinds of risk. Simultaneously, environmental risk is nonetheless considered in the process of identifying environmental aspects by entities which highly rank risk perception measures (OL and CS). High indicators of risk perception affect the undertaking of direct control operations concerning risk, but they are not necessarily connected with insurance sector expectations.

Despite quite numerous relationships between risk perception measures and the volume of risk variables, the surprising fact is that there are no statistically significant relationships in the area of the variables related to environmental goals. High evaluation of risk perception measures is not reflected in establishing and achieving environmental objectives with reference to particular categories of environmental damage or other types of adverse impact on the environment. Similarly, despite frequent instances of designing response procedures to potential emergencies focused on particular categories of damage or impact, high evaluation of perception measures does not translate into including in these procedures remedial actions indispensable for restoring the original status of the environment. Hence, when it comes to both designing response procedures and establishing environmental objectives, the organizations which highly rank risk perception measures do not necessarily focus on directing the outcomes of their actions (areas of the environment which are reflected in the loss catalogue). In the course of creating the elements of EMSs, they may consider the source of emissions (e.g. waste) more frequently.

Not all highly ranked risk perception measure categories have equal relevance for the frequency of the implementation of risk control operations. The largest number of statistically significant relationships was identified for the OL variable, primarily for the category of ‘evaluation of likelihood of damage occurrence in ground’ and ‘evaluation of likelihood of substance emissions into

the air'.[31] The CS variable generated fewer statistically significant relationships; therein, the following categories: 'evaluation of costs of conducting remediation in land', 'evaluation of the volume of compensations paid on account of damage done to person or property due to emissions', 'evaluation of volume of compensations paid in response to claims from environmental organizations' and 'evaluation of volume of legal protection costs' were of the greatest importance to RSS implementation. Within the CL variable the number of identified statistically significant relationships was the smallest. This could have resulted from the relatively low number of past cases in Poland in which the material consequences were drawn and the polluter was held responsible.

Drawing conclusions on the basis of the present study is burdened with certain limitations. The respondents were the persons in charge of ISO 14001 EMS in their respective organizations. Parallel to that, a large majority of these systems have functioned in the organizations for many years. Hence, the evaluation of risk perception measures was prone to taking into account the already implemented systemic solutions. The resulting evaluation of OL, CL or CS variables might have been lower than it could have been, had the respondents adopted an approach based on so-called natural conditions, where the evaluation is conducted by answering a conditional question about a situation in which no precautions have been taken.[32] The use of this solution results from the experience of many years of environmental systemic management in the studied organizations. It would be exceptionally difficult for respondents to refer to natural conditions.

The empirical analyses were conducted on the basis of questionnaires, so they, too, could be flawed in a typical way for such studies, especially the flaws connected with direct respondents. However, the standard requires that organizations which implemented ISO 14001 EMSs are to nominate person in charge of the system. It is justified to assume that they are competent in the field under investigation.

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PERCEPTION OF ENVIRONMENTAL INSURANCE RISK VS. IMPLEMENTATION OF CONTROL MEASURES IN ORGANIZATIONS MANAGED ACCORDING TO ISO 14001:2015 IN POLAND

Summary

The numerous studies of risk perception to date have been focused on three different areas of the subject. Firstly, researchers have aimed at the identification of risk perception determinants, secondly, they have created recommendations on how to communicate the risk to society, and finally they have analysed the relationships between risk perception measures and the means of risk control implemented in organizations. The last indicated research area is complemented by the following paper. On the basis of data derived from online interviews it was concluded that the higher the assessment of the measures of environmental insurance risk perception, the more frequently organizations implemented selected means of risk control in the environmental management system according to ISO 14001 (EMS ISO 14001). The largest number of statistically significant dependencies were observed in the area of variables which describe the informative potential of EMS ISO 14001 (informative potential variables) and those which directly determine the volume of environmental insurance risk (the volume of risk variables). Simultaneously, not all categories of risk perception measures are equally related to the frequency of risk control means implementation. A particularly large number of statistically significant correlations were identified for the following variable: the evaluation of the likelihood of the occurrence of environmental damage.

Keywords: environmental risk; environmental insurance; environmental management system ISO 14001