Analyzing Strategic Factors Associated with Issuance of Environmental Liability Insurance Policy in Developing Countries using SWOT and QSPM

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Abstract—In recent years, environmental pollution is one of the most commonly discussed topic in international scene. Environmental pollution and its associated aspects are not limited to the location of occurrence, but inevitably influence other regions too; as it says: "There is one earth for all". In other hand Environmental pollution is one of the most commonly discussed topics in today's national and international political societies in which increasing efforts are being made. Environmental pollution and its associated aspects are not limited to location of accident but inevitably influence other regions. Emission of carbon dioxide into the atmosphere or transfer of nitrates, and other hazardous chemicals into the rivers, seas and ocean waters can suggest such claim. Due to the lack of associated rules, criteria and regulations for issuance of environmental liability insurance, QSPM (Quantitative Strategic Planning Matrix) technique was applied in this study to introduce strategic factors required for such analysis. There are ten integrated strategies. The essential strategy is using legal tools to assess environmental risks in different industries. Results show that we need raising awareness of environmental accidents outcomes, which is concerned by insurance companies at developing countries.

Index Terms—Environmental pollution, hazard, QSPM, Internal and external factors, SWOT.

I. INTRODUCTION

Until 1972, due to the lack of appropriate environmental legislation and rules, there were no insurance policies on environmental related issues. Passing acts associated with clean air, water, resource conservation and restoration, gave the way for introducing environmental liability insurance policies such as environmental response, compensation issues, liability, etc. Enactment of natural resources conservation and restoration rules paves the way for introducing insurance which can cover gradual pollution losses. Since 1986, insurance industries undertook essential environmental liabilities for their potential customers. Nowadays in Europe, experts and authorities focus on development of environmental rules for defective products [1]. Increasing knowledge of environmental risk management indicated that environmental liability insurance should cover financial resources for compensation of past environmental pollution losses, natural resources losses, and harmful effects of polluting industries, and emotional distress of people who were forced to leave their house because of chemical pollution, etc. In so many cases environmental

liability insurance has provided a safe and healthy work environment for industries. Regarding technological achievements and management developments, environmental liability insurance is a tool for reducing potential hazards of industrial units specially polluting industries [2].

TABLE I: INTERNAL AND EXTERNAL FACTORS OF ISSUING ENVIRONMENTAL LIABILITY INSURANCE POLICY

Weaknesses(internal)	Strengths(internal)
Lack of awareness about environmental damages	Existing of Domestic experts
Environmental issues are not a priority in industries	Existence of civil liability insurance in different existing insurance policies
Lack of experienced experts in order to issue environmental liability insurance	Different methods and techniques environmental risk assessment are available
Lack of environmental experts in insurance companies	Presence of different field in environmental universities
Occurrence of chain accidents and inevitability of its outcomes	
Uninsurable accidents (like natural disasters)	
Threats(external)	Opportunities(external)
No-obligation quote for issuance of environmental liability insurance policy exist	Availability of environmental rules and standards
Decision makers' focus on economic objectives	Presence of a government organization (DOE)
Tax policy does not motivate industries for new (environmental) insurance policy	Existing of Law of Environmental Crimes
Potential environmental pollution by industries supposing that insurance companies will cover the <i>cost</i> to remediate <i>pollution</i>	Availability of insurance agencies all over the country
lack of <i>experience</i> in dealing with <i>environmental liabilities</i> , especially in claim management, which may cause insurers financial loss	

II. METHOD

In this research, environmental factors (both internal and external factors) which affect issuance of environmental insurance policy, was analyzed and identified. In other words, one should be aware of existing internal and external factors which affect insurance policy. Thus, one should assess all the strategic factors in order to detect all important and

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non-significant factors, and prioritize them. IFE and EFE matrices are evaluated to determine internal and external strategic factors [3].

A. Identification of Internal and External Strategic Factors

Internal Factor Evaluation matrix (IFE) is used to analyses Organizational Internal Factors (OIF). In other words, IFE evaluates strengths and weaknesses of organizational units. External Factor Evaluation matrix (EFE) analyses external factors and can be utilized to evaluate company's

management performance in regards to identification of external opportunities and threats (Table I). As a result, after identifying internal and external factors, the strengths, weaknesses, opportunities, and threats of liability insurance policies can be identified, and a weight can be assigned to each factor, that ranges from 0.0 to 1.0, depending on its importance. Zero means least important and one indicates most important [4].

TABLE II: IFE MATRIX

Internal Strategic Factors	Rating	Normalized Weight Factor	Status quo Score	Final score	Description
Strengths:					
1. Existence of civil liability insurance in different existing insurance policies (Liability Insurance (LI))	18	0.12	2	0.24	20 years of liability insurance experience in Iran
2. Presence of domestic experts are available (Environmental Experts (EE))	15	0.07	3	0.21	Availability of experienced experts
3. Different methods and techniques environmental risk assessment are available. (Risk Assessment (RA))	18	0.1	2	0.2	Different methods and techniques of environmental risk assessment will help identifying associated risks and fair values of insurance
4. presence of different field of Environmental Universities (EU)	14	0.06	3	0.18	Graduate programs offer environmental bachelor, master and PHD degrees.
Weaknesses:					
1. Lack of awareness about environmental damages (Environmental Damages (ED))	19	0.15	1	0.15	Calculating environmental damages is not easy. Using different methods for environmental economic evaluation will be useful
2. Environmental issues are not a priority in industries (Environmental Priority (EP))	16	0.1	2	0.2	Managers' first priority is more production and more profits. Most of them look at environmental issues as an opportunity for fame or advertisement.
3. Lack of experienced experts in order to issue environmental liability insurance (Insurance Expert (IE))	15	0.08	2	0.16	Insurance companies suffer from lack of experienced experts in order to issue environmental liability insurance.
4. Lack of environmental experts in insurance companies (Environmental Experience (EX))	15	0.07	3	0.21	Environmental experts are not employed in insurance companies.
5. Occurrence of chain accidents and inevitability of its outcomes (Environmental Accidents (EA))	18	0.14	2	0.28	Some environmental accidents have inevitable outcomes.
6. Uninsurable accidents (Uninsurable (UI))	17	0.11	2	0.22	Most of environmental accidents which have catastrophic impacts are not covered by liability insurance policy.
Sum		1		2.05	

Status quo of each factor is rated from 1 to 5 (1=weak, 2=below average, 3=average, 4=higher than average, 5=well). These factors are called Existing Condition Score (ECM) [5]. Existing Status quo can help to manage weaknesses, strengths, threats, and opportunities in an organization. If the management wants to reduce weaknesses and threats, its assigned score will be high and vice versa. Thus each factor's

final score is calculated by multiplying score of each row of organizational internal and external factors to its normalized weight. These values are written in a new column. After identifying internal factors, the strengths and weaknesses of environmental liability policy issuance can be highlighted [6].

Since environmental risks transfer in developing countries

is a new topic, it is constantly being confronted with weaknesses and threats. On the other hand, opportunities, strengths and potential of these countries enable them to develop new insurance policies as well as environmental insurance policies [7].

B. Forming Internal and External Factors Evaluation Matrices

In order to form internal and external factor evaluation matrices, a score has been given to each item from zero to 20, using expert opinions that reveal how well an insurance company can perform that item. This is called "Rating". In order to normalize the "Rating", equation 1, 2 has been used to evaluate normalize weight factors [8].

$$l = \frac{d}{d_{max}} \quad (1)$$

$$d_n = \frac{d}{(\sum_{i=1}^n l_i) \times d_{max}} \quad (2)$$

where dn is the normalize factor and d_{max} is the maximum weight among strategic factors. It should be noted that the summation of normalize weight factors should be one.

To evaluate the existing condition, the experts' opinions (EXO) have been used to indicate the present situation by assigning the score from 1 to 5.

1=weak, 2=below average, 3=average, 4=higher than average, 5=well

The scores are called status quo.

TABLE III: EFE MATRIX

External Strategic Factors	Rating	Normalized Weight Factor	Status quo Score	Final score	Description
Opportunities:					
1. Availability of environmental rules and standards (Environmental Rules (ER))	18	0.12	2	0.24	Environmental rules and standards provide an opportunity for development of insurance industry in terms of environmental liabilities.
2 Department Of Environment (DOE)	17	0.10	4	0.4	Department of environment which is responsible for seeking penalties for non-compliance in order to meet environmental goals.
3. Environmental crime acts (Environmental crime (EC))	19	0.15	3	0.45	Environmental crime acts leads industries to environmental liability policies.
4. Availability of insurance agencies all over the country (Insurance Development (ID))	15	0.09	3	0.18	Availability of insurance agencies all over the country will help domestic employment and develop new insurance policies.
Threats:					
1. No-obligation quote for issuance of environmental liability insurance policy (Insurance Rules (IR))	19	0.17	3	0.51	Yet there is no-obligation quote for issuance of environmental liability insurance policy in Iran.
2. Decision makers' focus on economic objectives (Economic focus (EF))	17	0.12	2	0.24	Politicians and governors focus on economic objectives than environmental goals.
3 Tax policy does not motivate industries for new (environmental) insurance policy (Environmental Motivation (EM))	14	0.11	3	0.33	Financial motivations are needed for issuance of environmental insurance policy.
4 Potential environmental pollution by industries supposing that insurance companies will cover the cost to remediate pollution (Pollutant Industries (PI))	18	0.14	2	0.28	Sometimes issuance of an insurance policy will cause some industries not to focus on environmental issues.
5. Lack of experience in dealing with environmental liabilities, especially in claim management, which may cause insurers financial loss (Insurer's Experience (IX))	12	0.11	3	0.33	Small number of insurance policies issued, and potential risks of financial loss may discourage insurance companies and make them stop issuance of environmental liability insurance.
Sum		1		4.05	

The final score of each item can be evaluated by multiplying the normalize weight factor to present status. Tables II and III show the final score IFE and EFE matrices for all different defined items.

The summation of final scores for each matrix, can present the status of SWOT of insurance policy of environment. [9]

Since internal and external strategic factors evaluation matrices are used to identify importance of the factors and their prioritization, sum of their weighted scores have been calculated. The minimum is 1, the maximum is 5 and the average is 3. If the total IEF score is less than 3, it means that issuance of environmental liability insurance has weaknesses

due to internal factors [10]. Similarly, if the average of total EFE score is less than 3, it means that issuance of environmental liability insurance does not work as well in taking advantage of opportunities and dealing with threats. [11] The scores in Tables II and III were given in accordance

with one expert opinion. In order to take the advantage of all experts (7 experts), the average weighted score of each item was evaluated using the average of evaluated scores, as presented in Table IV.

TABLE IV: COMPARING SURVEY RESULTS OF STRATEGIC FACTORS

Internal Strategic Factors	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Average	SD ¹	X-SD	X+SD
Strengths:											
1. Existence of civil liability insurance in different existing insurance policies (Liability Insurance (LI))	0.24	0.19	0.22	0.18	0.15	0.26	0.22	0.2	0.037	0.163	0.237
2. Presence of domestic experts (Environmental Experts (EE))	0.21	0.17	0.12	0.24	0.17	0.23	0.20	0.19	0.041	0.149	0.231
3. Different methods and techniques of environmental risk assessment (Risk Assessment are available (RA))	0.2	0.19	0.11	0.17	0.21	0.22	0.17	0.18	0.036	0.144	0.216
4. Environmental courses in universities (Environmental Universities (EU)) are practiced	0.18	0.22	0.12	0.11	0.16	0.21	0.18	0.17	0.041	0.129	0.211
Weaknesses:											
1. Lack of awareness about environmental damages (Environmental Damages (ED))	0.15	0.19	0.21	0.12	0.18	0.12	0.10	0.18	0.041	0.139	0.221
2. Environmental issues are not a priority in industries (Environmental Priority (EP))	0.2	0.24	0.12	0.18	0.15	0.22	0.18	1.29	0.040	1.25	1.33
3. Lack of experienced experts in order to issue environmental liability insurance (Insurance Expert (IE))	0.16	0.21	0.11	0.20	0.18	0.25	0.12	0.17	0.049	0.121	0.219
4. Lack of environmental experts in insurance companies (Environmental Experience (EX))	0.21	0.16	0.19	0.11	0.21	0.20	0.15	0.17	0.037	0.133	0.207
5. Occurrence of chain accidents and inevitability of its outcomes (Environmental Accidents (EA))	0.28	0.18	0.19	0.19	0.22	0.19	0.21	0.208	0.034	0.174	0.242
6. Uninsurable accidents (Uninsurable (UI))	0.22	0.21	0.18	0.22	0.24	0.24	0.12	0.204	0.042	0.162	0.246
Sum	2.05	1.96	1.57	1.72	1.8	2.14	1.65	1.84	0.213	1.627	2.053
External Strategic Factors	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Average	SD ²	X-SD	X+SD
Opportunities:											
1. Availability of environmental rules and standards (Environmental Rules (ER))	0.24	0.22	0.14	0.18	0.20	0.19	0.12	0.18	0.042	0.138	0.222
2. Department of Environment (DE)	0.4	0.12	0.22	0.14	0.43	0.22	0.28	0.26	0.119	0.141	0.379
3. Environmental crime	0.45	0.43	0.25	0.22	0.40	0.29	0.34	0.34	0.09	0.25	0.43

¹ Standard Deviation² Standard Deviation

acts (Environmental crime (EC))

4. Availability of insurance agencies all over the country (Insurance Development (ID))	0.18	0.22	0.12	0.13	0.4	0.29	0.19	0.22	0.098	0.122	0.318
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Threats:

1. no-obligation quote for issuance of environmental liability insurance policy (Insurance Rules (IR))	0.51	0.32	0.6	0.23	0.55	0.32	0.42	0.42	0.13	0.29	0.55
2. Decision makers' focus on economic objectives (Economic focus (EF))	0.24	0.19	0.12	0.18	0.12	0.14	0.10	0.15	0.049	0.101	0.251
3. Tax policy does not motivate industries for new (environmental) insurance policy (Environmental Motivation (EM))	0.33	0.22	0.22	0.12	0.14	0.14	0.2	0.24	0.072	0.168	0.312
4. Potential environmental pollution by industries supposing that insurance companies will cover the cost to remediate pollution (Pollutant Industries (PI))	0.28	0.2	0.19	0.12	0.16	0.12	0.19	0.18	0.055	0.125	0.235
5. Lack of experience in dealing with environmental liabilities, especially in claim management, which may cause insurers financial loss (Insurer's Experience (IX))	0.33	0.23	0.22	0.19	0.16	0.22	0.21	0.22	0.052	0.158	0.272
Sum	4.05	2.92	2.08	1.51	6.16	1.93	2.27	2.98	1.62	1.36	4.6

TABLE V: COMPARISON OF STRENGTHS AND OPPORTUNITIES (SO)

Strengths		EU	RA	EE	LI
Opportunities					
ER					
DE					
EC					
ID					

TABLE VI: COMPARISON OF WEAKNESSES AND OPPORTUNITIES (WO)

Weaknesses		ED	EP	IX	EX	EA
Opportunities						
ER						
DE						
EC						
ID						

TABLE VII: COMPARISON OF WEAKNESSES AND STRENGTHS (WS)

Weaknesses		ED	EP	IX	EX	EA	UI
Strengths							
LI							
EE							
RA							
EU							

The results show that the average for internal factor is 1.84 and for external factor is 2.98; these results indicate that issuance of environmental insurance policy at present time is

not able to change threats to opportunities (2.98) and weakness to strengths (1.84). Therefore SWOT model is used to establish new strategies by using strengths, weaknesses, opportunities and threats in pairs to obtain the proper strategy.[12] (Table V to X).

TABLE VIII: COMPARISON OF STRENGTHS AND THREATS (ST)

Strengths		LI	EE	RA	EU
Threats					
IR					
EF					
EM					
PI					
IX					

TABLE IX: COMPARISON OF WEAKNESSES AND THREATS (WT)

Weaknesses		ED	EP	IX	EX	EA	UI
Threats							
IR							
EF							
EM							
PI							
IX							

Shaded cells in each table indicate the interface between strategic factors. [13]. by analyzing these interfaces and also consulting insurance experts, appropriate strategies were defined as given in Table XI.

TABLE X: COMPARISON OF OPPORTUNITIES AND THREATS (OT)

Opportunities		ER	DE	EC	ID
Threats					
IR					
EF					
EM					
PI					
IX					

TABLE XI: DEVELOPING INTEGRATED STRATEGIES

Combined strategies	Strategy Description
SO1	Using legal tools to assess environmental risks in different industries
SO2	Developing civil liability insurance according to the insurance industry's development
SO3	Improving supervisory structure of environmental department in order to be able to implement to environmental insurance policy
WO1	Raising awareness on environmental accidents outcomes
WO2	Insurance companies should higher environmental experts
WO3	Developing administrative infrastructure for issuance of environmental insurance policy
WS1	Giving priority to environmental issues in industries
ST1	Developing environmental protection culture through reconstruction of education system.
WT1	Providing obligatory rules in order to provide environmental liability insurance policy
OT1	Review of environmental crime law

In order to assess the attractiveness of each strategic factor and related strategy, the QSPM matrix is formed as given in Table XII.

In the first column of the QSPM matrix, list of organizational and strategic factors are given which include all the strengths, weaknesses, opportunities and threats, exactly in accordance with the IFE and EFE matrices. In the second column, the final score of each item is written using calculated figures given in IFE and EFE matrices. The rows of QSPM matrix are included a variety of different strategies such as SO, WT, ST, WO as defined earlier. [14]

Each column of the QSPM matrix is divided into two columns. One is called the Attractiveness Score (AS); and the second is called Total Attractiveness Score (TAS).

TAS can be calculated by multiplying each AS to its final score. The AS itself has valued from 1 to 4 that is depending on its effect and the importance within that strategy. Score 1 is given when there is no attraction and 4 if it is highly attractive.

By comparison of the results of the summation of TAS from each strategy, the higher score can indicate a more attractive strategy [15].

TABLE XII: COMPARING DIFFERENT STRATEGIES FOR PRIORITIZATION

Strategic factors	Final score	OT1		WT1		ST1		WS1		WO3		WO2		WO1		SO3		SO2		SO1	
		AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS
LI	0.056	2	0.11	3	0.16	1	0.05	1	0.05	3	0.16	3	0.16	2	0.11	1	0.05	4	0.22	2	0.11
EE	0.047	3	0.14	2	0.09	4	0.18	4	0.18	3	0.14	4	0.18	3	0.14	3	0.14	2	0.09	3	0.14
RA	0.056	1	0.05	2	0.11	2	0.11	2	0.11	3	0.16	1	0.05	4	0.22	1	0.05	3	0.16	4	0.22
EU	0.044	2	0.08	2	0.08	4	0.17	2	0.08	3	0.13	4	0.17	2	0.08	2	0.08	1	0.04	2	0.08
ED	0.059	2	0.11	2	0.11	2	0.11	2	0.11	3	0.17	4	0.23	4	0.23	2	0.11	2	0.11	4	0.23
EP	0.05	2	0.10	2	0.10	3	0.15	4	0.23	2	0.10	2	0.10	4	0.23	3	0.15	1	0.05	2	0.10
IX	0.047	2	0.09	4	0.18	2	0.09	2	0.09	3	0.14	4	0.18	3	0.14	2	0.18	1	0.04	1	0.04
EX	0.047	1	0.04	2	0.09	3	0.14	1	0.04	3	0.14	4	0.18	3	0.14	2	0.09	1	0.04	2	0.09
EA	0.056	1	0.05	2	0.11	3	0.16	2	0.11	2	0.11	3	0.16	4	0.22	2	0.11	2	0.09	4	0.22
UI	0.053	2	0.10	2	0.10	1	0.05	2	0.10	2	0.10	2	0.10	3	0.17	1	0.05	3	0.17	1	0.05
ER	0.056	4	0.22	2	0.11	2	0.10	3	0.16	3	0.16	2	0.11	2	0.11	2	0.11	2	0.11	2	0.11
DE	0.053	4	0.21	4	0.21	3	0.17	3	0.17	2	0.10	2	0.10	3	0.17	4	0.21	3	0.17	4	0.21
EC	0.059	4	0.23	4	0.23	2	0.11	3	0.17	2	0.11	2	0.11	3	0.17	4	0.23	1	0.05	4	0.23
ID	0.047	2	0.09	3	0.14	1	0.04	1	0.04	4	0.18	3	0.14	2	0.09	2	0.09	4	0.18	2	0.09
IR	0.059	3	0.17	4	0.23	3	0.17	2	0.11	3	0.17	4	0.23	2	0.11	4	0.23	3	0.17	4	0.23
EF	0.053	2	0.10	3	0.16	3	0.16	2	0.10	2	0.10	2	0.10	2	0.10	3	0.16	1	0.05	3	0.17
EM	0.044	2	0.08	2	0.08	2	0.08	2	0.08	3	0.13	1	0.04	2	0.08	2	0.08	2	0.08	2	0.08

PI	0.043	3	0.13	3	0.13	4	0.17	3	0.13	2	0.08	4	0.17	3	0.13	3	0.13	1	0.04	3	0.13
IX	0.059	2	0.11	2	0.11	2	0.11	3	0.17	4	0.23	2	0.11	2	0.11	2	0.11	3	0.17		0.11
SUM			2.21		2.53		2.32		2.23		2.57		2.62		2.57		2.36		2.03		2.64

III. CONCLUSION

Prioritization of TAS from different strategies show that we need set prioritized compound strategies at any area as SWOT as below:

- 1) Raising awareness of environmental accidents outcomes (WO1)
- 2) Using legal tools to evaluate environmental risks in different industries (SO1)
- 3) Insurance companies require environmental experts (WO2)
- 4) developing administrative infrastructure for issuance of environmental insurance policy (WO3)
- 5) Providing obligatory rules in order to provide environmental liability insurance policy (WT1)
- 6) Developing supervisory structure of environmental department in order to issue environmental insurance policy (SO3)

The insurance companies should provide the necessary tools and infrastructure in order to be able to execute these strategies. In order to do so, it is necessary to consider some specific issues such as laws, regulations, social and economic conditions of each society.

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