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THE STRATEGIES OF INTERNALIZING THE NEGATIVE EXTERNALITIES IN THE COMPANY'S SUSTAINABLE DEVELOPMENT

Dmytro Kozlov

Abstract. The study focuses on externalities which play the important role in sustainable development. They indicate the impact of the company's activity on the third persons. On the basis of findings, the externalities from the company's financial reports are monetarized. The externalities exerting influence on the profit or loss as well as on the total balance of the company are analysed. Positive and negative externalities are identified in order to internalize the negative externalities with the help of definite strategies of sustainable development. It is emphasized that the long-term action plans to ensure competitiveness, environmental protection and social legitimacy help to adapt to expected market, environmental and social developments. The study discusses current strategies: defensive (reactive), offensive that are viewed from the economic, environmental and social perspective. It is investigated that the defensive strategies are limited to the implementation of relevant laws or agreements in order to avoid negative consequences for the legislator. On the other hand, offensive, inward-looking strategies are aimed at aligning the company's structures (organizations) and systems (environmental management systems) with the requirements of sustainable development, motivation and qualification of employees for sustainable development. The environmental sustainable development strategies are focused on a variety of ecological aspects. The emergence of economic, environmental and social risks and opportunities in machine-building company with their potential solutions is underlined. As the matter of fact, using the right strategy, the company can easily go through the internalization of negative externality to exert more substantial impact on the society, environment and the economy.

Keywords: positive externality, negative externality, internalization of externalities, sustainable development, analysis of externality of the company, defensive strategies, offensive strategies

JEL Classification: M21, Q56

Author:

Dmytro Kozlov

Sumy State University, 2, Rimski-Korsakov St., Sumy, 40007, Ukraine

E-Mail: kozloff1976@gmail.com

https://orcid.org/0000-0003-3381-4265

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1. Introduction

The global economic crises of recent decades have become increasingly closely linked to global environmental problems. Scarcity of available natural resources, intensification of the climate change, an increase in the scale of natural disasters and the resulting losses determine the inevitability of society's transition to sustainable development, which ensures the harmonious coexistence of nature and humanity. The Global Sustainable Development Goals (United Nations, 2012) and the Paris Agreement (Paris, 2015) set new economic guidelines for states and companies in various economic activities.

At the same time, given the slow pace of achieving the sustainable development goals by national economies and businesses, the tools for managing the transition to a new type of management are imperfect and require further scientific justification. Particularly important in this context is the provision of "greening" of machine-building companies, which are mainly high-tech industries that provide diffusion of innovations, including environmental, to other areas of the economy.

One of the main problems of sustainable development management is the presence of externalities – external effects of economic activities which are perceived by third parties who are not direct participants in the company. Therefore, the internalization of externalities, especially negative ones, is of great importance for environmentally balanced regulation of machine-building companies.

2. Literature Review

The modern scientific idea of externalities, their importance for the economy and the possibility of regulation have been formed in the research by the representatives of various fields of economics. An attempt to study externalities was made for the first time within the framework of the neoclassical theory of well-being, the origin of which dates back to the beginning of the XX century and is connected with surnames of Pareto (Pareto, 1927) and Pigou (Pigou, 1952). The further development of externality theory takes place in the studies by Kaldor Nicholas (Kaldor, 1939), Hicks John (Hicks, 1939), R.A. Musgrave (Musgrave, 1959), Paul A. Samuelson (Samuelson, 1948), John R. Commons (Commons, 1959), J. M. Clark (Clark, 1917), D. North (North, 1983), John Kenneth Galbraith (Galbraith, 1973), Ronald Harry Coase (Coase, 1937). On the ground of their ideas, the direction of the externalities research has received a deeper scientific interpretation. In modern economic theory, a thorough research of externalities is represented in the works by W. Baumol and W. Oates (Baumol & Oates, 1993), A. A. Papandreou (Papandreou, 2003), H. R. Varian (Varian, 1992), K. Bithas (Bithas, 2011), M. Common (Common, 2011) and J.C.J.M. van den Bergh (van den Bergh, 2007), who examined the development of externalities in more practical modern field.

However, given the passive attitude of the vast majority of business entities towards "green" activities, today their motivation to form and implement strategies for sustainable development at the microeconomic level, taking into account the developed theoretical and methodological framework, is extremely weak. Isolated cases of companies' environmentally conscious behaviour do not provide large-scale changes, requiring the formation of adequate economic levers to manage environmentally oriented transformations. Thus, the need to improve the strategies of sustainable development of machine-building companies under modern economic conditions determined the relevance of the topic, its importance and practical significance, as well as the purpose and objectives of the research.

3. Methods

To analyse the impact of externalities, it is vital to identify at least one component that is not part of the interactions among economic entities, which either benefits in the case of positive externalities or, loses if the externalities are negative. Although most externalities are non-monetary in nature, the monetary equivalent of economic and social externalities can be found in the company's financial statements. This research takes the definite items of the consolidated balance sheet and statement of profit or loss of the company. The most important characteristic of the selected items is to have the externality principle inside.

The following selected items (with the sequence number in the financial report) should be defined depending on the recipients of externalities:

- Long-term financial investments: accounted under equity method (1030): interaction of the company with other companies. Recipients of externalities may be workers with additional jobs.
- Long-term accounts receivable (1040) and Trade accounts receivable (1125): interaction of the company with other companies. Recipients of externalities are employees of the company who do not receive a monetary reward from the products or services provided.
- Accounts receivable: due from budget (1135): interaction of the company with the state. The recipient of externalities is a society that could receive additional funds under expenditure budget items.
- Deferred pension liabilities (1505): interaction of the company with the workers. Recipients of externalities are families of workers who have not received the appropriate cash receipts.
- Accounts payable: trade accounts payable (1615): interaction of the company with other companies. Recipients of externalities are employees of other company who do not receive a monetary reward from the products or services provided.
- Accounts payable: due to budget (1620): interaction of the company with the state. The recipient of externalities is a society that has not received timely revenues under expenditure budget items.

- Accounts payable: salary payable (1630): interaction of the company with the workers. Recipients of externalities are families of workers who have not received enough money in the form of wages.
- Staff costs (2505): interaction of the company with the workers. The recipient of externalities is a society that has enough paid jobs, or vice versa.
- Social charges (2510): interaction of the company with the workers. Recipients of externalities are the families of workers and society in general, who have been involved in the funds funded in this way.
- Ecology Tax: paid by the company to the state.

Thus, there are three groups of indicators of economic externalities: through relations with the state; formed in interaction with employees; formed in interaction with other economic entities. Data that are freely available to the following companies were used: Sumy Machine-Building Research and Production Association Joint-Stock Company (hereinafter referred to as JSC SMNVO) (JST SMNVO, 2020), Sumy Pumping and Power Engineering Plant Joint-Stock Company Nasosenergomash (hereinafter JSC Nasosenergomash) (JSC Nasosenergomash, 2020), Private Joint Stock Company Scientific-Production Joint-Stock Company Vndikompressormash (hereinafter PJSC SPJSC Vndikompressormash) (PJSC SPJSC Vndikompressormash, 2020), Joint-Stock Company Sumy Plant Energomash (hereinafter JSC Energomash) (JSC Energomash, 2020; JSC Nasosenergomash, 2020). The data has been searched since 2016, i.e., the transition to international financial reporting standards.

Table 1. Estimated share of externality

No	The item line code	Externality type by essence		Estimated share q_e	Total estimated share q_e
		by essence	by type of influence		
1	line code 1030	economic	positive	0.055	0.055
2	line code 1040 and line code 1125	economic	negative	0.055	-0.055
3	line code 1135	economic	positive	0.055	0.055
4	line code 1505	social	negative	0.112	-0.112
5	line code 1615	economic	negative	0.055	-0.055
6	line code 1620	economic	negative	0.055	-0.055
7	line code 1630	economic	negative	0.055	-0.055
8	line code 2505	social	positive/ negative	0.112	±0.112
9	line code 2510	social	positive	0.112	0.112
10	ecology tax	ecological	positive	0.334	0.334
			Total	1.0	

Source: developed by the author.

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The profit (loss) of any company is the major indicator of company's existence. In order to calculate the effect of a separate externality to net profit (loss) it is necessary to determine the estimated share of each externality (q_e) depending on the nature of the impact to the economic activity of the company. The estimated share of each externality is illustrated in *Table 1.*

To indicate the impact of each externality, there should be determined the ratio (k_e) of expenses separate item that indicates the exact externality, depending on the total amount of the current balance according to the following formula. To understand the impact of externalities on net profit (or loss) for each year separately, it is necessary to determine the sum of the coefficients of externalities depending on the total estimated share ($\Sigma k_e q_e$) for each year separately by the formula on *Figure 1* with the sum by each company and the graphic image of two exampled companies.

The impact of externalities on net profit (or loss) for each year

$\Sigma k_e q_e = k_1 * q_1 + k_2 * q_2 + \ldots + k_{10} q_{10}$, (2)

where q_1 is an estimated share of each externality,

k_1 is a ratio (ke) of expenses for each year by the year:

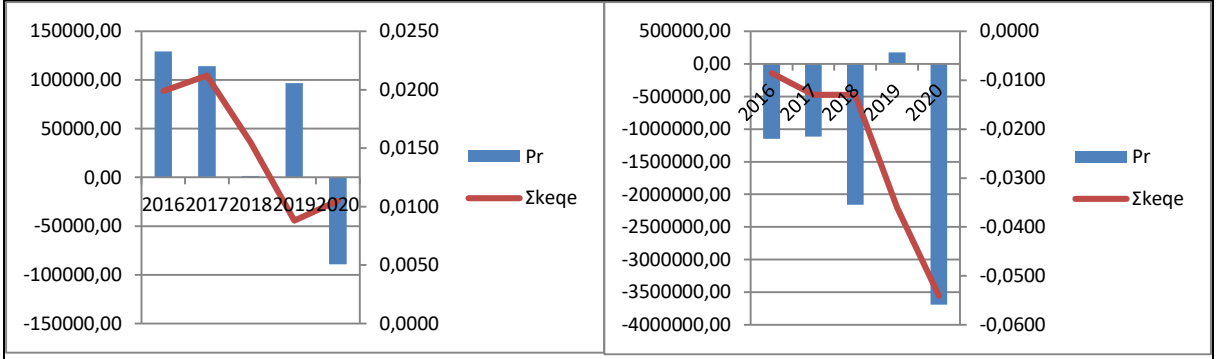
$k_e = B_s / B$, where (1)

B_s is the balance sheet item under the research;

B is the value of the balance for the specified year.

The sum of the coefficients of externalities, taking into account the share estimated

Company	The sum of the coefficients of externalities ($\Sigma k_e q_e$) by years				
	2016	2017	2018	2019	2020
JSC SMNVO	-0.0085	-0.0130	-0.0130	-0.0360	-0.0541
JSC Nasosenergomash	0.0199	0.0212	0.0155	0.0088	0.0105
PJSC SPJSC Vndikompressormash	-0.0036	-0.0053	-0.0067	0.0107	0.0320
JSC Energomash	0.1151	0.0718	0.1124	0.0660	0.1000



JSC SMNVO JSC Nasosenergomash

Figure 1. The impact of externalities on net profit (or loss) for each year of the company

Source: developed by the author.

The impact of externalities on net profit (or loss) can be calculated by the following formula on *Figure 2* with the amount by each company and the graphic image of two 11exemplified companies.

The influence of externalities on net profit (or loss) by modular value of sum of externalities coefficients

$Pr_e = Pr^* \Sigma k_e q_e$, when $Pr>0$ (3)

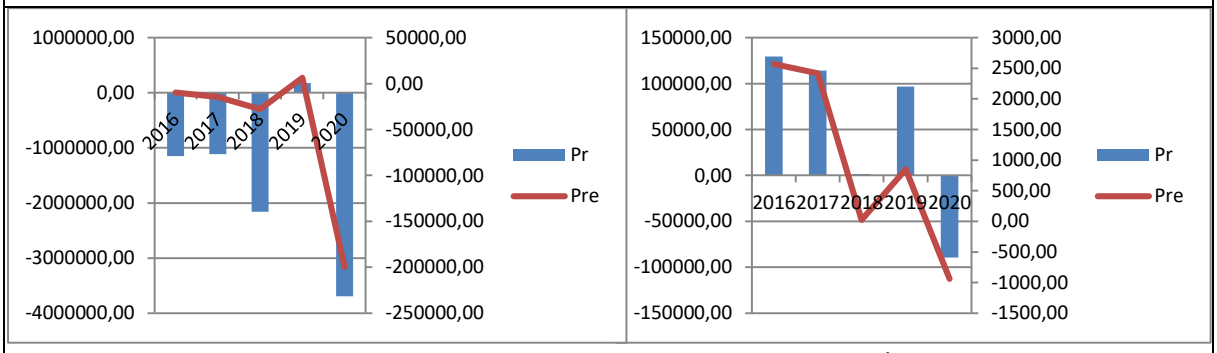
$Pr_e = Pr^* |\Sigma k_e q_e|$, when $Pr<0$, where (4)

Pr_e is net financial profit (loss) including externalities;

Pr is net financial profit (loss).

Net financial profit (loss) taking into account externalities by modular value of the sum of coefficients of externalities depending on the nature of the impact.

Company	Net financial profit (loss) including externalities (Pr_e) by years				
	2016	2016	2016	2016	2016
JSC SMNVO	-9797.21	-9797.21	-9797.21	-9797.21	-9797.21
JSC Nasosenergomash	2571.22	2571.22	2571.22	2571.22	2571.22
PJSC SPJSC Vndikompressormash	10.44	10.44	10.44	10.44	10.44
JSC Energomash	27.62	27.62	27.62	27.62	27.62



JSC SMNVO JSC Nasosenergomash

Figure 2. The influence of externalities on net profit (or loss) by modular value of sum of externalities' coefficients

Source: developed by the author.

According to these data, it is possible to determine the moments of transition from positive to negative externalities and vice versa in relation to profit or loss. The general picture emphasizes the emergence of negative externalities, especially with the company suffering damage. That is, if the machine-building company is unprofitable, there are also extremely dangerous negative externalities that need to be internalized.

To obtain a clear picture of the externalities' dynamics to the total balance of the company first, give the sum of the coefficients of externalities in percentage terms, then determine the average value of the sum of the modulus of externalities as a percentage of the balance for all years as in *Figure 3*.

The average value of the sum of the modulus of the externalities' coefficients as a percentage of the balance sheet total

$(\Sigma k_e q_e)_{mid} = (|\Sigma k_1 q_1| + |\Sigma k_2 q_2| + \ldots + |\Sigma k_5 q_5|):5,$ (5)

where $\Sigma k_e q_e = (k_1 * q_1 + k_2 * q_2 + \ldots + k_{10} * q_{10}) * 100.$ (6)

The sum of the modulus of the externalities' coefficients as a percentage of the amount of the balance

Company	The sum of the externalities' coefficients ($\Sigma k_e q_e$) by years in percent					($\Sigma k_e q_e$)$_{mid}$
	2016	2017	2018	2019	2020	
JSC SMNVO	-0.85	-1.30	-1.30	-3.60	-5.41	-2.49
JSC Nasosenergomash	1.99	2.12	1.55	0.88	1.05	1.52
PJSC SPJSC Vndikompressormash	-0.36	-0.67	1.07	3.20	1.58	0.96
JSC Energomash	11.51	7.18	11.24	6.60	10.00	9.31

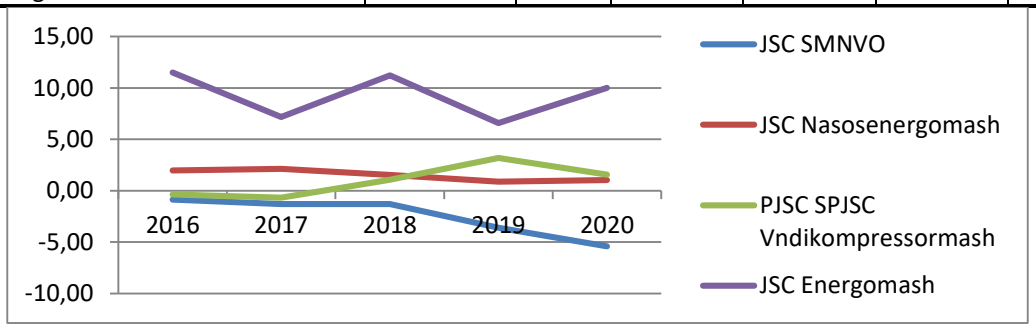


Figure 3. Determining the sum of the modulus of the externalities' coefficients as a percentage of the balance sheet total

Source: developed by the author.

Thus, the average value of the sum of the externalities' coefficients depending on the total estimated share as a percentage of the amount of the balance sheet $(\Sigma k_e q_e)_{mid}$ reflects the result of the company's economic activity in view of obtaining externalities. If this indicator is negative or less than 1.0, it emphasizes the urgent problems of the company in terms of impact on third parties, that is the increasing of the number of negative externalities over positive ones.

A very important indicator is the dynamics of the positive externalities' occurrence in relation to the occurrence of negative externalities. If there is a movement to reduce positive externalities, it also indicates a possible problem with the emergence of negative externalities that requires further internalization.

4. Results and Discussion

The internalization of negative externalities is inextricably linked with implementing strategies for the company' sustainable development. The need for action that arises as a result of a strategic analysis of sustainable development management in the company should be implemented by strategies that seem appropriate to achieve the goals of sustainable

development. Sustainable development strategies are medium-term and long-term fundamental decisions on implementing the principles of sustainable development in the company (for example, corporate social responsibility). These are long-term action plans to ensure competitiveness, environmental protection and social legitimacy, which adapt to expected market, environmental and social developments. As a link between goals and activities, strategies define the course of action for appropriate measures to be able to achieve economic, environmental and social corporate goals. With the help of compatibility between economic goals, on the one hand, and social and environmental goals, on the other hand, sustainable development strategies can be differentiated (Porter & Kramer, 2006). They are primarily focused on social and environmental goals (sensitive corporate social responsibility), but also aimed at improving the competitive position of the company (strategic corporate social responsibility).

Strategies of sustainable development in the company are differentiated in terms of strategy orientation (defensive/reactive, offensive and selective) and strategic considerations (market, society, environment and the company itself). As for the degree of the company's readiness to manage sustainable development, offensive and defensive strategies should be distinguished. Although defensive strategies of sustainable development observe management as a risk or a necessary evil, rather than business and social opportunity, offensive strategies of sustainable development focus on the opportunities and include initiatives to implement and accelerate the sustainable development model in business. Selective strategies for sustainable development are aimed at specific target groups, stakeholders and means of environmental protection, so, there is more an internalization of negative environmental externalities only.

The offensive strategy aims to create competitive advantage and social perception through sustainable development management (Costanza, 1991). Sustainable development is viewed as an innovative concept, as a social commitment, and as an opportunity to achieve competitive advantage (business case). The orientation of the defensive strategy attempts to avoid, circumvent or combat the negative consequences of unstable corporate management. The company can apply the following defensive strategies of sustainable development:

- response: sustainable development is assessed as an entrepreneurial risk and is realized in the company only when there is a risk of neglect, if it is not observed (for example, environmental responsibility, damage to image, risk of boycott);
- retreat: this strategy is aimed at the exit of the company from contradictory spheres of activity, which are socially and ecologically unstable (for example, leaving or relocation of environmentally harmful companies);
- resistance: strategies aim to counter the requirements of public protection and the protection of corporate social responsibility (against lobbying, for example).

There are strategies for sustainable development with an emphasis on markets, society, the environment and the company itself. Market-oriented strategies of sustainable development

include seizing opportunities or preventing risks through formulated sustainable development requirements in the markets. Defensive market strategies of sustainable development are focused on achieving competitive advantage through opportunistic behaviour (for example, deceiving consumers through questionable advertising with environmental arguments). On the other hand, offensive strategies aim to achieve competitive advantage through sustainable development management.

Strategies aimed at society fix the promotion (offensive) or limitation (defensive) of social requirements for sustainable corporate management and corporate social responsibility. Defensive strategies are aimed at protecting against social demands for sustainable development (defensive strategies, for example, through targeted lobbying) by "opposing companies" and should serve to support classical economic forms and the status quo (hedging strategies). Offensive strategies of the company, such as aggressive product promotion, PR-promotions, advertising, involve taking the initiative to promote sustainable development. They also create and intensify collaboration with relevant stakeholders in society and open dialogue, cooperation with environmental associations, strategies cooperation and so on. Moreover, such companies provide a deep insight into corporate activities, creating transparency and participating in the fight against corruption (transparency and anti-corruption strategies). In addition to improving relations with stakeholders in society, these strategies are aimed at improving the image and reputation of the company (win-win strategies). They may selectively address individual social stakeholders (for example, politicians, NGOs).

Environmental sustainable development strategies can focus on variety of ecological aspects (for example, climate, water), protect resources and avoid or reduce environmental risks through production activities (van den Bergh, 2007). Defensive strategies are aimed at such cases as the development of potential to reduce costs by saving energy, materials, production and disposal of waste (increasing the level of resources). This is achieved through environmentally efficient production and processing processes (that is energy management systems, cycle processes, design to increase efficiency, reduce assembly and disassembly costs). Offensive strategies pursue environmental measures that exceed the net potential for cost reduction and exceed the legal minimum, assuming corporate responsibility. This is applied to the establishment of energy and environmental management systems. Coordination and cooperation of manufacturers with suppliers and dealers in the value chain are also a strategic approach (cooperation strategies). In vertical value chains, sustainable development implies an access at the level of cooperative approaches (for example, in the procurement of raw materials and supplies and at the stages of further marketing, as well as in the disposal and redistribution of waste). According to the principle "from cradle to grave", the company’s responsibility extends to the entire life cycle of the product (product management model). The companies must be aware of the environmental risks of their activities and be prepared for any obstacles (depending on the risk of production).

Strategies of the companies' sustainable development, in fact, cover all areas with law compliance (corporate compliance), as well as with all other obligations undertaken by the corporate charter (corporate management). Defensive strategies are limited to the implementation of relevant laws or agreements (labour and co-determination laws, environmental laws) to avoid negative consequences for the legislator (closure of the company). Offensive, inward-looking strategies aimed at aligning the structures (organizations) and systems (environmental management systems) of the company with the requirements of sustainable development, motivation and qualification of employees for sustainable development (personnel management). Furthermore, the company should establish its own code of ethics, which is aimed at sustainable development and is mandatory for management. These strategies can be selectively targeted at individual parts of the company (for example, production) and at individual internal stakeholders (for example, shareholders, management).

Machine-building companies are places where economic, environmental and social risks and opportunities arise (Lukash et al., 2021). Sustainable risk management is a key aspect of strategic sustainable development management. Potential environmental, social and personal threats from the company's activities are often perceived as a risk that they want or do not want to take (depending on the risk itself). High attention to public health and the environment, as well as the great importance of the media in modern societies have led to the fact that the activities of machine-building companies are listed critically by social stakeholders and are often the cause of social and environmental dangers (Staehle, 1992) as a sign of externalities. Existing complaints in companies can quickly turn into noticeable scandals in the media due to accusations or excessive dramatization (Kepplinger, 2012). If stakeholders do not accept the behaviour of the company, if these requirements and expectations are not met by this company, it can lead to a loss of reputation and image and even deprivation of social perception (license to operate) for the company.

In recent years, the risk situation has changed significantly for humanity, as well as especially for the company. In its 2011 Global Risk Report (Global, 2011), the World Economic Forum identified five types of global risks: economic (including deteriorating assets, high volatility in energy prices), geopolitical (including corruption, terrorism), and technological (including online data security, threats from new technologies), environmental (including air pollution, climate change) and social risks (including demographic change, economic inequality). It could be interpreted into economic, environmental and social risks as risks of sustainable development of the company.

Social risks are associated, on the one hand, with the general danger to people and social communities that may arise from the mechanisms of the global economy (for example, economic and social inequality, poverty, exploitation and migration in parts of the world), and on the other hand, with such specific negative social dangers for people caused by non-compliance by companies with laws or international conventions (e.g., human rights).

Environmental risks (e.g., global warming) are often associated with social risks (e.g., poor harvests).

The management of machine-building companies must identify operational risks in a timely manner and correctly assess their dangerous potential (Mitroff, 1994). This requires basic individual qualities (risk awareness of the manager), corporate culture (sustainable development as a value of the company) and organizational skills (for example, the use of risk management system). For companies with a corporate culture focused on social responsibility and risk-oriented corporate governance, an important aspect is overall sustainable development management. Sustainable risk management includes the identification, analysis and assessment of potential hazards to people, nature and companies, the planning of strategies and measures to avoid or reduce these risks, and strategies for communicating and reporting potential risks (transparency strategies). The goal is to avoid or minimize risks to people, society and nature.

Environmental and social risks are those risks that have a direct impact on business activities (for example, government regulations to reduce greenhouse effects) or if the engineering company can be identified as the cause (for example, claims for compensation for prohibited waste removal, etc.). The risk of harm to people and nature through the company's operational activities is transferred to economic risk, which may result from the activities of damaged or affected stakeholder groups (e.g., compensation, closure of operations, unwillingness to buy or boycott purchases) (Wagner, 1994).

5. Conclusion

The results of the current research suggest the importance of externality for the company's sustainable development. When the externalities are difficult to calculate, it is possible to distinguish them from the selected items of balance sheet depending on the recipients of externalities. Using the right strategy (defensive or offensive) the company can easily go through the internalization of negative externality to exert more substantial impact on the society, environment and the economics.

Forming the strategies of sustainable development is medium-term and long-term fundamental solutions for implementing the principles of sustainable development in the machine-building company. The implementation of such strategies in long-term action plans will ensure competitiveness, environmental protection and social legitimacy, which are adapted to expected market, environmental and social events. It is recommended to timely detect the operational risks and correct assessment of their dangerous potential, such as the manager's awareness of risks, corporate culture (sustainable development as a value of the company), use of risk management system, etc.

6. Conflicts of Interest

The authors declare no conflict of interest.

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