

QUANTITATIVE HARMONIOUS MODEL OF SUSTAINABILITY FACTORS: MEASURING CONTRIBUTION OF FINANCIAL VIABILITY

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Abstract. The goal of the research is investigation of interrelationship and importance of factors impacting corporate sustainability, paying greater attention to financial viability of a company. For achievement of goal, authors have implemented the theoretical analysis of literature, applied the scientific induction and the analysis of primary and secondary data. Commercial organizations of Riga region (Latvia), which provide the services, are the subject of the research. The authors analyze and understand the essence of the category “sustainable development” and characterize factors impacting on company’s sustainable development, applying the methodology of “Golden section”. The authors evaluate the contribution of financial viability in sustainable development of Latvian companies, as well as define the sufficient level of indicators of financial viability. The results of research will enable commercial organizations to achieve the harmonious sustainable development, and to redefine their development strategy.

Keywords: sustainable development, financial viability, golden section, sufficient level.

1. Introduction

An enterprise is a basic element of the state economic system on whose capability for a long-term activity depends a sustainable development of the state or region. An entrepreneurial activity is a process which is orientated over a long period of time but under the influence of various circumstances a specific subject may experience failure and with the expansion of the time period the possibility of an encounter with such failure is increasing. The most popular form of commercial activity in Latvia among its subjects is a limited liability company (Ltd). Statistical data on the registration and liquidation of a specific form of commercial activity for the last 18 years reveal the issue of viability of the enterprises. For December 2009 25 % of the enterprises registered in 2002 as limited liability companies did not survive 7 years. More than 70 % of the companies registered earlier in 1992 and 1993 were liquidated.

The aim of the given article is to examine the interaction and significance of the factors which influence sustainable development of the enterprises paying special attention to the financial viability of the enterprises. The objects of the article are enterprises registered in Riga region (Latvia) and whose main activity is provision of services. In order to achieve the set aim the authors use the theoretical analysis of the literature, methods of scientific induction, and primary and secondary data analysis. The authors evaluate the concept of sustainable development of an enterprise, analyse the contribution of financial

viability to the provision of a sustainable development and define the sufficiency of the indicators of financial viability.

The long-term existence of the enterprise depends on its ability to rationally use resources and make profit taking into consideration the influence of the environmental factors. It becomes especially topical during the time of economic recession since preserving the business processes requires flexible actions, ability to identify the unimproved resources and finding rational decisions in a short period of time. The results of the research will enable sustainable harmonious development of the entrepreneurs making the process of redefining the strategy for the sustainable development easier for them.

2. Defining the Sustainability

The concept of sustainable development was defined in 1987 in the report «Our Common Future» of the United Nations World Commission on Environment and Development as «sustainable development means meeting the needs of the present generation without compromising the ability of future generations to meet their own needs» (WCED 1987). Initially the concept of sustainable development was connected with ecology but later the orientation on the countries’ and regions’ sustainable economic development appeared. In 2006 the review of the EU sustainable development strategy presents the explanation of the economic purpose of sustainability «a dynamic knowledge-based competitive economy showing

strong growth (3 % per year) and providing more and better jobs (70 % employment by 2010)» (EU SDS 2006). It means that a country's and region's economic development and sustainability are possible to reach if its structural elements – enterprises and organizations are sustainable. Approach to the enterprise's sustainability is based on the implementation of the ideas of a macroeconomic sustainability approach in the practical management of enterprises involving economic, social and ecological activity of enterprises in the short-term as well as in a long term period (Steuer *et al.* 2005).

Sustainability is about the ability to continue to deliver in the long-term given the demand on your current resources (Hale 2004). Thus it is crucial to provide the activity of the enterprise not losing its potential and not overloading its main resources which determine the existence of the system itself. An enterprise's sustainability relies on the reproduction function which is aimed at the efficient use of all types of resources reaching a long-term profitability which is transformed into economic growth and development simultaneously improving the quality of life and environment of an individual and society in general.

Summarising the definitions of the concept «sustainable development» given by the researchers (Hockerts 1999; Dunphy *et al.* 2000; Fiksel 2001; Marewijk 2003) the authors come to the conclusion that a goal oriented movement of the economic subject should be performed simultaneously in accordance with and systematically involving all three dimensions of sustainability: social, economic and ecological. The issue of the use of the human resource factor at the enterprise refers to a social dimension of sustainability. The economic dimension in its turn involves technological and financial systems, their relevance to the business ethics and ability to provide prospective long-term financial guarantees (Fetzer, Aaron 2009). The ecological dimension presupposes the optimisation of consumption of the natural resources used by the enterprise and the use of such technologies which would enable the balance between the business activity of the enterprise and limitations of the natural system and would prevent the degradation of natural ecosystems.

Sustainable development is a concept based on stable policies in investment, operations, and financing (Helfert 2001). Sustainable development is connected with the forms of progress which comprise all functional manifestations of the enterprise (commercial, industrial-technical, financial, organizational, managerial, innovative,

social) which are interdependent and interacted. Within the context of sustainable development a harmonious and balanced interaction of the enterprise's subsystems is emphasised.

3. Developing the System of Sustainability

The issues of sustainable development are a topical object of research. Sustainability is difficult to define and evaluate and even more difficult to achieve, that is why some authors examine dimensions, principles and models of sustainability. Many authors recognize three dimensions of sustainability (ecological, economic and social) where all the dimensions are interconnected (Dyllick 2002). There is an opinion that sustainability is a new paradigm of the enterprise's management, alternative to traditional models of development and profit maximization (Wilson 2003). One of the latest models (Fig. 1) taking into consideration factors of internal and external influence includes 4 dimensions: 1) finance; 2) social; 3) organizational; 4) environmental. Economic dimension of a three-dimensional model (Dyllick 2002) is replaced by organizational which includes innovations and potential of the compensation process and a finance dimension which is based on the assets return and the enterprise's acceptable risk.

Modern business environment dynamically changes, disharmonic situations and uncertainty in the enterprise's internal environment appear, and it becomes unstable and difficult to anticipate. It indicates the controversial impact of this factor on the provision of sustainable development.

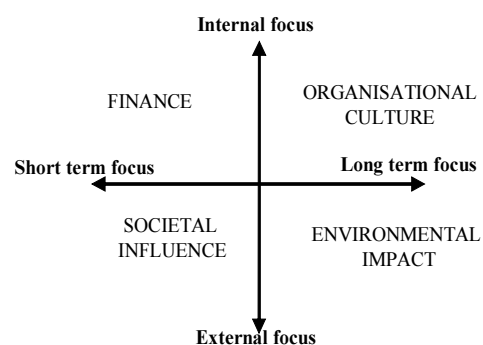


Fig. 1. Model of Corporate sustainability (Aras&Growther 2007)

Sustainable development virtually relies on the result which is achieved under the complex circumstances since in reality there are situations when not all factors are available in sufficient quality and it is necessary to compensate the missing factor for the other one. Besides that the

economic essence of the enterprise lies in observation of the shareholder's economic interests, which requires the specification of the sustainable development concept in its practical implementation at the enterprise.

The authors reckon that sustainability dimensions are important and processes undergoing at the enterprise from insignificant and everyday ones to strategic and complex ones determine the possibilities for sustainable development. They testify a certain balance of power and resources, which enables the system to sustain the influence of external forces and resist the internal ones. Sustainable development is based on the understanding of and ability to include and implement all structural elements of sustainability dimensions in all subsystems of the enterprise: the management system, and functional and resource systems. Thus the general efficiency of the system depends on a certain harmony between the system elements and the state of dynamic equilibrium.

The solution of the problem the authors see in the development of a quantitative harmonious model of sustainability factors. In order to evaluate the contribution of the finance dimension in the provision of sustainability the authors use the indicators (debt to equity ratio, profitability of assets; profitability of sales, interest coverage ratio) included into the methodology of evaluation of financial viability offered by the International Monetary Fund (IMF 2007). In their previous research the authors elicited that the given methodology is a good tool of controlling the level of a company's financial viability and the offered indicators objectively evaluate the company's financial condition (Koleda, Lace 2009).

The authors examined the concept of financial viability in the context of sustainable development, assuming that sustainable development is a kind of function of various elements (like environmental, social, finance, structural) (Fig. 1). Financial viability is defined within finance element. In the course of morphological analysis of definitions of financial viability and sustainable development the authors have studied the following concepts which are connected with this idea: balance; stability; development; financial viability; hold up (Beaver 1966; Bocharov 2001; Zhulega 2006; Altman, Heine 2007; Kulbaka 2009).

In the course of the research carried out by the authors they have come to the conclusion that financial viability presupposes such distribution and use of financial resources which allows to sustain the state of a company's equilibrium in a short-term period and to provide sustainable development of a

company in a long-term period (Koleda, Lace 2009).

3.1. Harmony Principles in a Business Sustainable Development

An enterprise is a complex system which possesses specific qualities: 1) variability and stochastic behaviour of individual characteristics of the system; 2) limited abilities which are determined by the resources available; 3) ability to resist entropic trends; 4) ability to adapt to changeable conditions. In the context of sustainability it is necessary to speak about the proportion of functional parts or harmonious relations of the enterprise as a system (as a whole), which in the result of specific activities becomes the basis for a long-term existence of the system.

A harmonious system is characterized by several features: 1) combination and unity of the system elements; 2) proportion since the number of elements is more than one; 3) a certain balance between the system elements which provides functionality; 4) simplicity, consistence and rationality; 5) conformity and compatibility with a superior system (Volkova, Jemlyanov 2006).

Harmonious combination of parts and the whole (0.62/0.38) has been known for a long time, and many researchers confirmed that the harmonization process is carried out in accordance with the «Golden section» rule. Generalized «Golden section» are invariants, which allow natural systems in the process of their self-organization to find a harmonious structure, stationary regime of their existence, and structural and functional stability (Soroko 1984). Solving the task of a harmonious combination of parts and the whole underlies in the stability of all world phenomena, from space to a human body, technical systems, politics, education etc.

The principles of the «Golden section» are also applied in business economics (Soroko 1984; Semiglazov 2009). At the turn of the 20th–21st century a new trend of modern management–harmonious management is emerging (Ivanus 2005). The operation of the «Golden section» law is revealed within the processes of profit structuring between the institutional sectors of economics, where each sector performs its own specific role in the GDP reproduction and creating the prerequisites for a stable economic growth (Kryuchkova 2008). Some authors envisage the distribution of the organization's resources according to hierarchical management levels using the principles of the «Golden section» (Pitelinsky 2009). The «Golden section» rule is also applied in

the process of buy–sell under the conditions of competitive balance where the existence of the «Golden section» proportions indicates the stability of the market (Haritonov 2003).

The authors think that using the «Golden section» principles (0.62/0.38) it is possible to acquire the understanding of such interrelation of parts in the whole which corresponds to a structural and functional integrity. Besides that, using the «Golden section» approach which is based on an adequate combination of constituent parts it is possible to obtain an optimum result which provides an economic effect. It can be considered a working tool which possesses consistency and quantitative assessment.

3.2. Hierarchical Analysis of the Elements of the Finance Dimension within the Frames of a Harmonious Sustainability Model

An enterprise’s sustainable development and preserving competitiveness for a long period of time are connected with the ability to manage resources. That is why the issue of the terms of the system existence and its usefulness evaluating these in the context of the resource binding and output is a topical one. Since the enterprise’s sustainable development is determined by external and internal factors and the results of the enterprise’s activity, the sustainability model is

formed from subordinate levels which include sustainability dimensions and their elements.

The authors presented the system of factors for provision of a sustainable development demonstrating the finance dimension in detail, in the Fig. 2. The system consists of 5 levels. Financial viability can be provided by efficient management of the assets and capital within the company. In accordance with this and using the harmony principles, the authors divided the indicators of financial viability (IMF 2007) into two groups. Assets profitability and sales profitability fall into the first group of indicators which characterize the efficiency of assets management. Debt to equity ratio, interest payment ratio fall into the second group of indicators which characterize the efficiency of capital management.

4. Main Principles of Evaluation of Contribution of Financial Viability to Sustainability

An investigation of financial viability in the concept of sustainability is based on the comparison of the system elements of sustainability provision and the distribution of values among them according to the harmony principle (the «Golden section» rule). The authors suggest to calculate not only theoretical relevance of financial viability according to the rule 0.62/0.38 and its role in providing

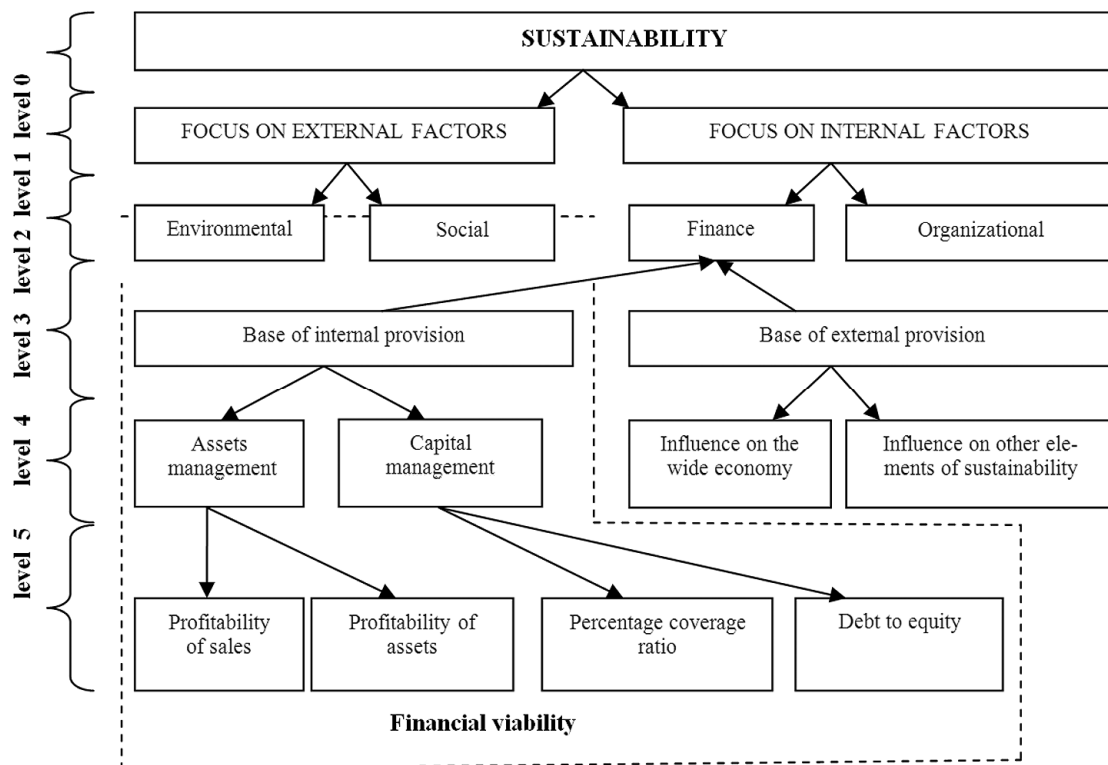


Fig. 2. Finance Dimension within the Frames of a Harmonious Sustainability Model using Four Dimension Model of Corporate Sustainability

sustainability, but to evaluate the actual contribution of financial viability to the provision of sustainability of the Latvian enterprises.

While creating a quantitative harmonious model of sustainability factors, the authors relied on the following assumptions and principles:

1) The role of internal factors is more relevant than the role of external ones because the enterprise can actively influence them adapting to the conditions of the external environment;

2) Financial viability is a necessary condition for the provision of the enterprise's organizational potential and other sustainability elements as well;

3) Use of the enterprise's internal capabilities for provision of financial viability is connected with a lesser risk especially in the period of the global finance crisis;

4) Assets management possesses a higher relevance in comparison to capital management since efficient assets management is able to compensate for the consequences of inefficient capital structure;

5) Interest coverage ratio is more relevant than debt to equity ratio, since it characterizes: a) a company's capability to pay for the use of debt capital b) the possibility to attract funds from the external sources even if the ratio of outside funds in the structure of the capital is relatively high;

6) Profitability of sales is an indicator of a company's pricing policy and also of its ability to control expenses. Its relevance is higher than the relevance of the indicator of assets turnover, which is reflected on the decrease of the relevance of the assets profitability indicator.

4.1. Quantitative Harmonious Model of Sustainability Factors

Applying the «Golden section» rule authors have developed original quantitative harmonious model of sustainability factors for evaluation of contribution of financial viability to sustainability of a company:

$$Ra_{ji} = (Wa_{ji} * Sa_{ji} / \sum_{i=1}^{2^j} Wa_{ji} * Sa_{ji}) * 100, \quad (1)$$

$$Wa_{ji} = \begin{cases} x * a_{j-1; (i+1)/2} & \text{if } i = \text{odd-numbered} \\ (1-x) * a_{j-1; i/2} & \text{if } i = \text{even-numbered} \end{cases} \quad (2)$$

Where:

$$\sum_{i=1}^{2^j} Wa_{ji} = 1,$$

$$\sum_{i=1}^{2^j} Ra_{ji} = 100\%,$$

x - constant, $x=0.38$,

Ra_{ji} – contribution of a_{ji} element of the harmonious model to the provision of sustainability,

Wa_{ji} – weight of i -th element of j -th level,

Sa_{ji} - a degree of sufficiency of indicator a_{ij} ,

j - level of the system, $j=(0, 1... 5)$,

i - index number of element of j -th level of system,

$i=(1, 2, 4... 2^j)$, a_{ji} – i -th element of j -th level.

A degree of sufficiency of indicator of the company is determined by the actual values of indicators to permissible values ratio. If the actual value of an indicator exceeds its permissible value, then the enterprise is sustainable. If the actual value of an indicator is equal to its permissible value, then the level of sustainability of the company is 100 % sufficient. In the case when the actual value of an indicator is lower than its permissible value, the enterprise runs the risk of loss of financial viability and bankruptcy (Koleda, Lace 2009).

In the result of calculating a theoretical contribution of financial viability to sustainability under the optimistic scenario, that is when the elements of the sustainability model are in a such state which provides the company with the possibility to perform its functions and preserve its characteristics despite the influence of external and internal forces ($Sa_{ji}=1$), the following values were obtained:

1) Theoretical contribution ($R_{th} a_{ji}$) of financial viability due to internal capabilities of the enterprise under the optimistic scenario is: $R_{th} a_{38}=24$ %;

2) Overall contribution of the finance dimension due to internal and external capabilities of the enterprise to the provision of sustainability comprises 38 %.

After distributing the model's elements relevancies according to the «Golden section» rule, the authors received the following results (Table1).

In the case where the actual contribution of financial viability exceeds a theoretical value ($R a_{ji} > R_{th} a_{ji}$), enterprises have a potential for preserving the state of balance and long-term development.

If actual contribution of financial viability is equal to a theoretical one ($R a_{ji} = R_{th} a_{ji}$), the company is able to preserve the state of balance and stability but it has no potential for development due to internal capabilities.

If the actual contribution of financial viability is lower than theoretical ($R a_{ji} < R_{th} a_{ji}$), the enterprise is not able to sustain the influence of external and internal forces and to develop due to its internal capabilities. In this situation the enterprise's potential growth and stability can be guaranteed only in case of an extremely favourable influence of external factors of financial viability, organizational, social and ecological potential of the company.

Table 1. Distribution of the Harmonious Model's Elements Weights according to the «Golden section» Rule

a_{0i}	Sustainability (a_{01}) (according to Fig.2)								
Wa_{0i}									
a_{1i}	Focus on external factors (a_{11})			Focus on internal factors (a_{12})					
Wa_{1i}	0.38			0.62					
a_{2i}	Social (a_{21})	Environmental (a_{22})	Organizational (a_{23})	Finance (a_{24})					
Wa_{2i}	0.14	0.24	0.24	0.38					
a_{3i}				Base of external provision (a_{37})		Base of internal provision (a_{38})			
Wa_{3i}				0.14		0.24			
a_{4i}				Influence on the wide economy (a_{413})	Influence on other elements of sustainability (a_{414})	Capital management (a_{415})		Asset management (a_{416})	
Wa_{4i}				0.05	0.09	0.08		0.16	
a_{5i}						Debt to equity ratio (a_{529})	Percentage coverage ratio (a_{530})	Profitability of assets (a_{531})	Profitability of sales (a_{532})
Wa_{5i}						0.03	0.05	0.06	0.10

5. Results of the Research

The Latvian medium and small size enterprises of Riga region which function in the service industry were chosen as the object of the research. Statistical sample for 2007 consists of 28380 micro and small enterprises, as well as 1059 medium sized enterprises.

The enterprises were selected on the basis of the largest business activity in the given region of Latvia (67 %) and their contribution to the gross

domestic product (42 %). Evaluation results of actual values of the indicators of financial viability as well as their maximum values and the level of sufficiency at the enterprises of the analyzed sphere are presented in the Table 2 (Koleda, Lace 2009) Calculation of the actual contribution of financial viability to provision of sustainable development of the Latvian enterprises in the service industry in Riga region according to the golden section rule is presented in the Table 3 and Fig. 3.

Table 2. Indicators of Financial Viability (2007)

Indicator (i)	Actual value of indicator	Description of permissible values	Permissible values of indicator	Actual sufficiency (S_{ji})
Profitability of assets (a_{531})	0,05	Interests/liabilities	0.03	1,66
Profitability of sales (a_{532})	0,06	(Interests+Short term liabilities)/ expenditures	0.397506	0,15
Debt to equity ratio (a_{529})	3,40	Sufficiency level of liabilities /sufficiency level of own capital	4.99	1,47
Interest coverage ratio (a_{530})	4,05	1	1	4,05

Table 3. Actual Contribution of Financial Viability to Sustainability (2007)

Elements of the system	a_{01}									
	a_{11}			a_{12}						
	a_{21}	a_{22}	a_{23}	a_{24}						
				a_{37}		a_{38}				
	a_{413}	a_{414}	a_{415}		a_{416}			Total		
Wa_{ji}	0.14	0.24	0.24	0.05	0.09	0.03	0.05	0.06	0.10	1
S_{ji}	1	1	1	1	1	1.47	4.05	1.66	0.15	12,33
$Wa_{ji} * S_{ji}$	0.14	0.24	0.24	0.05	0.09	0.04	0.20	0.10	0.02	1,12
$Ra_{ji}, \%$	12,5	21,43	21,43	4,46	8,04	3,57	17,85	8,93	1,79	100

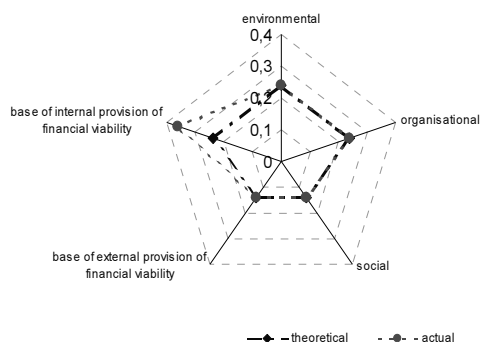


Fig. 3. Contribution of Factors of Sustainability

Actual contribution of financial viability due to the company's internal resources under the optimistic scenario comprises $R_{a38}=32.14\%$, which is 34% (Fig. 3) higher than theoretical, consequently, companies in 2007 had: 1) potential for not only the state of equilibrium but for sustainable development too; 2) reserve of financial viability to compensate the insufficiency in other elements of sustainability, in order to preserve the state of equilibrium and provide a sustainable development.

Evaluation of the actual level of other elements of sustainability was not the aim of the given research. The authors of the article think that the actual contribution of other elements to the provision of sustainability is less than their theoretically sufficient level. The given assumption is based on the results of other research which testify a low level of innovation, ecological and social trends in the management of Latvian companies (World Bank 2005; EIS 2006). That is why the management team of the company should control the level of contribution of financial viability due to the company's internal capabilities; it should not be lower than the theoretical level that is 24%. This constituent plays the most significant role in the company's sustainable development since it is subject to control and is the tool for compensation the insufficiency of other elements.

6. Conclusions

An enterprise's sustainable development does not happen itself, it is based on the company's worked-out strategy for sustainable development and coordinated practical activities. Finance indicators provide information which is possible to integrate into a model of sustainable development in this way comprehensively and harmoniously combining the enterprise's financial, social, ecological and organizational parameters. This approach requires understanding of sensitivity and relation of all dimensions involved.

The authors have evaluated the contribution of financial viability to sustainable development of Latvian companies by developed original quantitative harmonious model applying the «Golden section» rule.

In the conditions of the global economic crisis the sufficiency of the sustainability elements which equals 1 is impossible, which is why the enterprise should control the situation when the actual level of contribution of financial viability in sustainability would not be lower than the theoretical and could compensate for the insufficiency of other elements.

The suggested approach to defining the contribution of different factors to sustainability will enable commercial organizations to control trends in its development towards sustainability.

The authors would seize the opportunity in the future to continue the present research by adding more detailed analysis of all elements of sustainability. Besides, the comparative analysis of other approaches to assessment models of sustainability factors should be done.

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