

THE EFFECT OF SERVICE CLUSTERS ON THE SUSTAINABLE ECONOMIC DEVELOPMENT

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Abstract. Clusterization has been named as one of the priorities of the development strategy of many European Union countries. Clusterization experts have already hypothesized that clusters of various economic activities are important not only in the formation of regional policy, but they also in a complex way stimulate the whole country's economic growth from job creation to the development of intellectual property to new innovative industries. These realities show that cluster activity and its results are important not only for cluster participants, but also for the economy of the country in which clusters operate. However, there are currently no reliable and effective tools to validate this hypothesis. In the analysis of the problem and in order to deepen the theoretical knowledge of the object under study, this paper analyses and summarizes systematic, logical and comparative scientific literature, scientific studies, strategic documents and legal acts. Therefore, the purpose of this paper is to provide a theoretical overview of the currently available knowledge on service clusterization and sustainable economic development, to demonstrate the acute absence of relevant theoretical foundations and linkages that would allow to analyse these phenomena, and propose a methodological approach that would allow to expand this field of study.

Keywords: Clusterization, sustainable economy, development

JEL Classification: C38

Introduction

Service clusterization as a phenomenon has been developing steadily in the wake of many industries' tendencies to consolidate themselves in order to reduce proximity between companies as a means of attaining greater operating (and other) benefits. One of the more well-known examples of clusterization would be the Silicon Valley – the home and hub of the world's greatest technology companies. Service orientated organizations, those whose main operations and business practices are concerned with the production and distribution of intangible goods (as opposed to physical products) also have been striving to capitalize on the benefits of clusterization and seek to consolidate (be it geographically or virtually). Service clusterization and self-sustaining business clustering initiatives are becoming more and more prevalent. Some of these clusters are purposefully developed and aimed at achieving long-term economic goals, while others are still in the formation process and are at the embryonic stage. Clusterization has been named as one of the priorities of the development strategy of many European Union countries.

On the other hand, in today's world economy, it is not enough to evaluate purely economic indicators in order to determine the impact of clusters on the national economy. In terms of both academic studies and country's practice, the term 'sustainable economy' or its synonyms, such as 'sustainable development', 'smart economy' and so on, are used in terms of the level of development of a country. The essence of a sustainable economy lies in the assessment and development of three unambiguously important dimensions (economic, social and environmental).

The above-mentioned statements suggest that clusters and related processes are extremely relevant for the implementation of priorities for a modern sustainable economy. However, there is practically no research on the complex impact of clustering on a sustainable national economy. Many contemporary scholars have extensively studied the process of cluster formation, their forms, their benefits to cluster participants and so on.

Research on the topic of sustainable economy has been published by both Lithuanian (Juknys, 2010, Čiegis and Zeleniūtė, 2008, Čiegis and Šimanskienė, 2010, etc.) and foreign authors (Ness, 2007, Mauerhofer, 2008).

However, there were also no scientific discussions that included a sustainable economic assessment in relation to clustering. Meanwhile, clusterization experts have already hypothesized that clusters of various economic activities are important not only in the formation of regional policies, but also in a complex way stimulate the whole country's economic growth from job creation to the development of intellectual property to new innovative industries. However, there are currently no reliable and effective tools to validate this hypothesis.

Formulation of the scientific problem. Clusterization and sustainable national economy have been widely debated over the past decade in scientific circles and various economic and policy levels. Both of these phenomena are usually analysed individually, their apparent benefits and interconnectedness are presented in a fragmented way. The analysis of scientific literature revealed that the problem of identification and assessment of the impact of clusterization on a sustainable economy is not particularly emphasized. It has been observed that in the works of scientists, there is a lack of a complex and integrated approach, and a clear research methodology to address this issue. Therefore, this **scientific problem** emerges: Which research methods should be applied that would allow to determine the impact of clusterization on a sustainable country's economy?

Methodology

In order to empirically investigate the formulated scientific problem and achieve the goal of the study, the research will follow the logical progress framework that has been created and is presented in Figure 1 below.

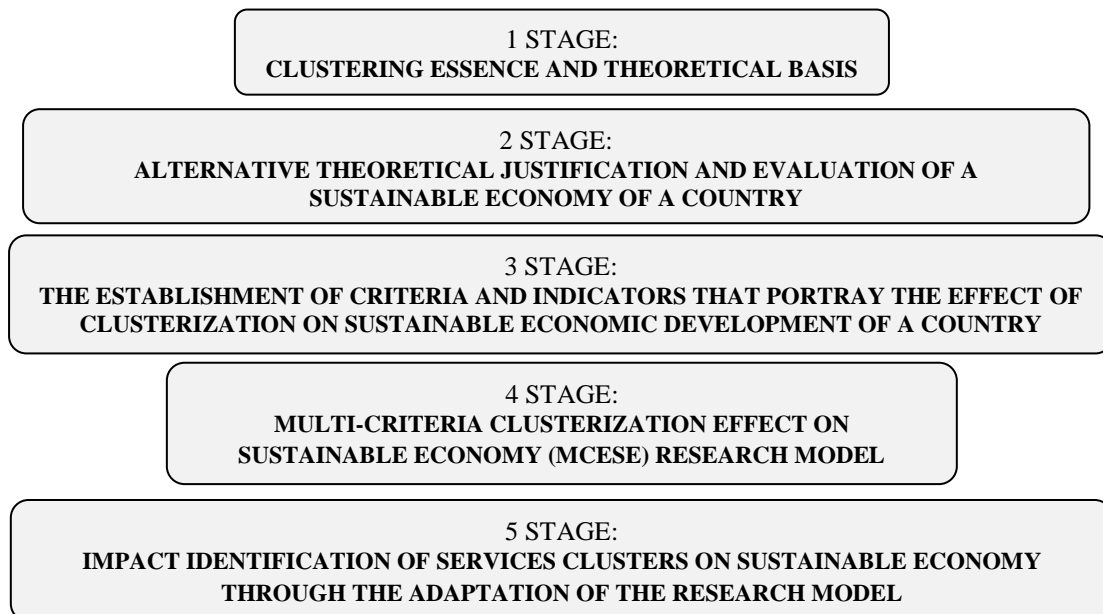


Fig. 1. Research logical frame (Source: Created by the authors)

In order to analyse the problem and to deepen the theoretical knowledge, the theoretical part carries out systematic, logical and comparative analysis of scientific literature, strategic documents and legal acts. Based on scientific literature and studies, and based on the methods of logical induction and deduction, a compact multi-criterion model of the impact of clusterization on the sustainable economy of the country is envisioned to be created that would interlink and integrate the dimensions of sustainability with service clusterization effect. Thereafter, it is necessary to empirically verify the created research methodology based on theoretical knowledge. To this end, the hypothetical MCESE model that is proposed should at least apply these research methods:

- 1) Systematic, logical and comparative analysis and synthesis of scientific literature and scientific studies
- 2) Analysis and synthesis of the content of strategic documents and legal acts
- 3) Analysis of primary and secondary statistical data
- 4) The mean comparison method
- 5) Expert evaluation
- 6) Questionnaire survey

- 7) Mathematical and statistical processing methods using statistical data processing programs: SPSS and Microsoft Excel
- 8) Calculation and evaluation of integrated indicators

Following the empirical application of the MCESE study model in practice, appropriate conclusions can be drawn and, if necessary, the hypothetical model can be adjusted.

Literature Review

Clusters and related phenomena have been studied and shaped for almost two decades. Interest in them and their benefits can be seen both in Lithuania and in Europe. According to R. Jucevičius (2009), a cluster as a form of economic activity reflects many challenges of the contemporary environment – both in developed and developing countries, such as Lithuania.

In 2014, the Government of the Republic of Lithuania (Resolution No. 298 of the Government of the Republic of Lithuania of 25 March, 2015) highlighted 2 important phenomena in this regard:

- 1) In order to promote business and scientific cooperation, the concept of the development of clusters in Lithuania was approved, where the objectives and tasks of cluster development have been established, the directions of development of clusterization processes were determined, the optimal number of cluster members, the level of cluster development, the mechanisms (financial instruments), which promote the creation of clusters, development, innovation activities and connection to international networks.
- 2) According to the state of cluster development, Lithuania from the 109th position among 144 countries in 2013 rose by 20 positions, and in 2014, it was at the 89th position (the strategic goal was set to reach the 70th place by 2020 according to the cluster development level).

The listed topicalities oblige to get acquainted with the theory of clusters in detail and to clear up the most important aspects related to the scientific problem of this research.

Global clusters and clusterization problems are discussed in various scientific sources (Bekar, Lipsey, 2001, European Commission, 2003, Frerot, 2008, Roelandt et al., 2000, etc.). R. Jucevicius (2008) states that so far, there is still no consensus agreed on regarding what should be the most precise definition of a cluster. This situation is conditioned by the fact that clusters were historically formed around the world, in different cultures, linguistic groups, various economic conditions, and thus, they acquired specific characteristics in various countries. The concept of a cluster is multifaceted and encompasses geographical distribution, type of communication, sense of dependency, technological level, life cycle and so on. It is also used for local economic development and regional analysis (employment, economic growth and productivity) (Frerot, 2008).

Most researchers in their cluster definitions particularly distinguish the geographical concentration (Porter, 2000, Silvestre, Dalcol, 2010, Pearl, 2010, Jucevicius, 2009, etc.). Other authors (Brito, Costa, 2009, Felzensztein, 2008), Jucevicius, Puidokas, 2007) identify the essential element of the cluster definition as the relationship between cluster members. Still other scientists (Montresor, Marzetti [2008], Hatani [2009], Williams, Claiborne [2009]) devoted a great deal of attention to the role of the final products and research institutions in defining clusters. The most common cluster definitions are shown in Table 1.

Table 1. ‘Cluster’ definitions in literature (Source: created by the authors)

No.	Year	Author	Definition
1.	2000	M. Porter	The geographical concentration of interconnected firms, specialized suppliers, service providers, related industries and associated institutions (i.e., universities, agencies, trade associations), which both compete and cooperate in a particular area.
2.	2000	TH. J. A. Roelandt, V. A. Gilsing, J. Sinderen	Strongly interconnected affiliated company (including specialized suppliers) networks based on value-generating production chains.
3.	2001	C. Bekar, R. G. Lipsey	A large regional group of geographically close proxies, whose members not only cooperate with each other, but also maintain strong links with local research and research organizations, national laboratories, financial institutions and other business infrastructure elements.

4.	2003	Commission Of The European Communities	Geographically interconnected, complementary and even competing companies, specialized suppliers, service providers and associated institutions (such as universities, standard and trade associations).
5.	2008	A. Kamarulzaman, N. Mariati	Significant geographic concentration of entities that are similarly and complementarily (at least one industrial sector, agency, institution) causing the directness of actors and their formal and informal interaction, agglomeration economies, and high social capital, that promote dissemination and all of which have a significant impact on the region or national economy.
6.	2008	Europe Innova	A common place for partners, service providers, education and research institutions with a wide range of interactions.
7.	2009	R. Jucevičius	Geographically close groups of interconnected enterprises and other organizations in a certain area, linked by common technologies and competencies
8.	2012	'Klasterių studija'	Interconnected companies, suppliers, academia, related institutions and other actors, whose participants collaborate in a wide range of economic activities and initiatives, in order to increase economic efficiency, knowledge sharing, technology transfer and the development of new products.
9.	2008	www.klasteriai.lt	Geographically close groups of companies and associated institutions merged in certain fields related to common technologies and knowledge

As can be seen from Table 1, numerous authors provide cluster definitions, but according to D. Kulikauskas and D. Viselgaitė (2012), they are usually only modifications to the definition of M. Porter (2000). Each author focuses on certain elements that describe clusters, according to the object of their research and point to it as the most important one. Therefore, it can be argued that the theory of clusters is relativistic and still being developed: in each case of a scientific study, it is possible to find different criteria that define the concept of clusters. However, in the scientific literature, the basic concept of cluster formulated by M. Porter (2000) is commonly used – the geographical concentration of interconnected enterprises, specialized suppliers, service providers, related industries and associated institutions (i.e., universities, agencies, trade associations) that both compete and cooperate in a certain area.

Summarizing the concepts from Table 1, it can be seen that clusters are related to the activity of a defined field (business), geographic concentration and complementary cooperation. Therefore, R. Jucevičius (2008) suggests understanding clusters in two possible senses:

- 1) In the narrow sense, a cluster is an economic agglomeration; the cluster is a combination of companies that interact with each other in related and supporting activities (i.e., specializing in a particular stage of the product value chain and benefiting from cooperation with suppliers and customers).
- 2) In the broad sense, a cluster is a regional/sectoral social production and innovation system; the cluster is a combination of companies that interact with each other in related and supporting activities (i.e., specializing in a particular stage of the product value chain and benefiting from cooperation with suppliers and customers).

Thus, a brief analysis of the scientific literature shows that the cluster as a phenomenon is multidimensional and ambiguous. However, it is possible to distinguish the most common features that characterize them (Stalgienė, 2010):

- Critical mass
- Businesses are concentrated in a limited area
- Companies/organizations must be close enough to avoid unnecessarily high levels of cooperation/meeting costs
- Relationships between organizations are sustained consistently, ensuring the achievement of common goals
- Mutual interaction
- Specialization
- Competition and cooperation
- Uniqueness

- Clusters can increase innovation, production competitiveness and support or promote economic growth in the region and/or the country
- Clusters are self-organizing

The scientific justification of cluster concepts and their characteristics suggests that this phenomenon can take shape both in the production (industry) and in the service sector.

According to Porter (2000), the government's economic policies that promote clustering processes can become a factor integrating different areas of economic activity that are regulated by public authorities (see Figure 2).

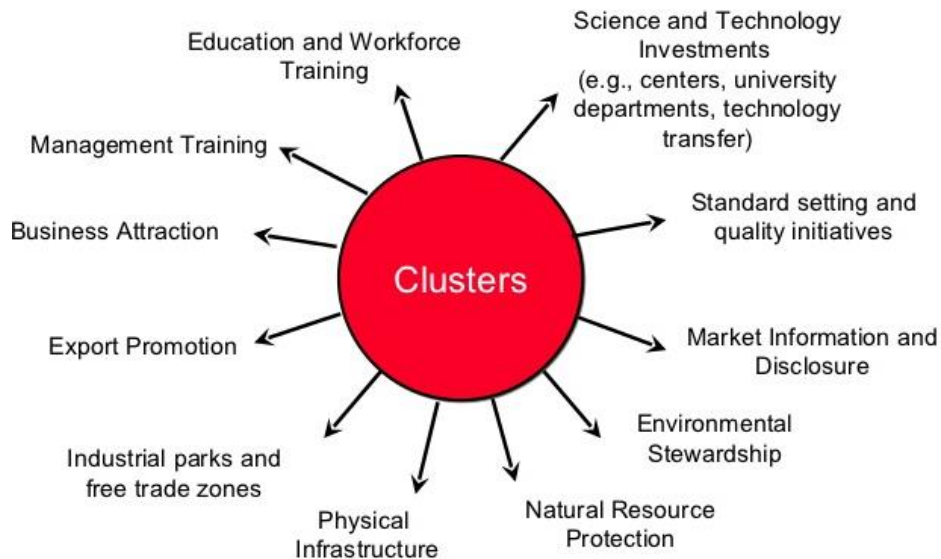


Fig. 2. Relationship between clusters and general macroeconomic policies (Source: Porter, 2000)

As Figure 2 shows, clusters are closely linked to essential directions of modern economics, especially with regard to direct investment, research and innovation. The policy of clustering as an area of autonomous economic policy began to intensify only in the last decade, but many elements of clustering are already reflected in the country's innovation and technology policies. All the countries developing clustering policies use it as a means of strengthening national competitive advantage. The policy that promotes the development of the country's (or region's) exclusive competitive properties is based precisely on cluster-based approaches. With such wide range of cluster effects, cluster development creates prerequisites for increasing productivity – one of the key sources of enterprise competitiveness.

V. Navickas and A. Malakauskaitė (2008) argue that cluster building and formation is becoming a significant task for governments and companies, while clustering initiatives outline new guidelines for economic policies that are based on macroeconomic stabilization, privatization and market liberalization in advanced economies. In many countries, modern economic and industrial policies are based on the cluster concept. In implementing such a policy, the state develops and implements measures to promote the interconnection of enterprises belonging to the cluster and the development of the strategic communication cluster in the external environment. Similarly, Skarzauskiene, Gudelytė and Lančinskienė (2014) state that in the context of a globalized economy to stimulate the emergence of innovation and their implementation in the country, clusterization and clustering of individual sector provide additional opportunities for promoting competitiveness, innovation development and stimulation of economic growth.

Many authors evaluate the process of clustering and its benefits positively, distinguishing one or the other aspects of their creation or performance. Most commonly, the following aspects of the purpose behind clustering are distinguished (Jucevičius et al., 2012):

- Encourages the country's economic growth and labour force employment
- Attracts new technologies, skilled workers and investment in research
- Commercialize innovation
- Increases economies of scale

- Helps to reduce the length of new products or processes entering the market
- In general, cluster companies have more opportunities to increase productivity
- Help to increase the competitiveness of the whole sector (not just individual enterprise)
- In addition to the perception of overprinting, more attractive conditions for innovations are created

Alternatives for assessing sustainability of a national economy in scientific discussions.

Historically, the industrial development of the world was primarily aimed at production, but from a societal point of view, the paradigm of development was directed at the growth of justice, where social factors were important, and then environmental protection was taken into consideration, which became the third most important development goal. Consequently, the development of the concept of sustainability has three main points: economic, social and environmental. Therefore, the concept of ‘sustainable development’ was ushered, which means that sustainable development must ensure not only economic growth but also the compatibility of economic activity with environmental, social and technical constraints. Many authors emphasize that it is not possible to achieve the desired level of economic, ecological or social sustainability at the same time without at least ensuring the minimum level of sustainability in each of these sustainability forms.

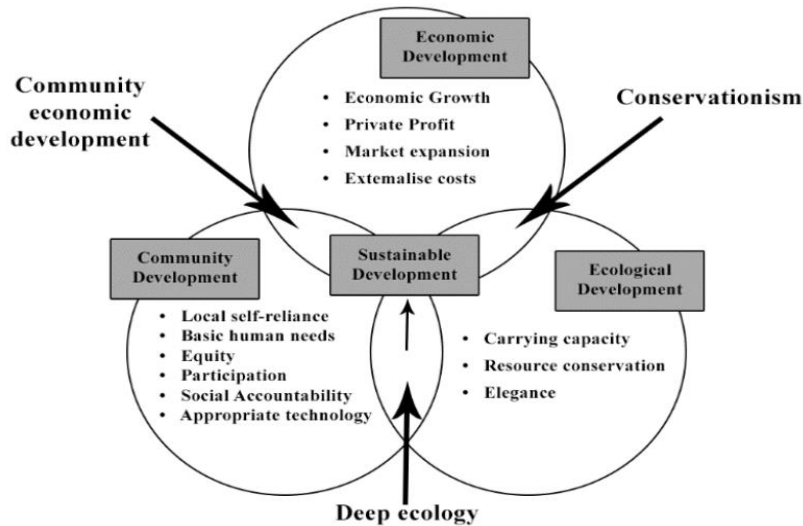


Fig. 3. The traditional perception of sustainability dimensions (Source: Mieszajkina, 2016)

Figure 3 represents the most often presented reflection of sustainable development concept and its dimensions in the work of many researchers. However, more recent studies reveal some new trends. Sustainable development, in the works of some authors (Čiegis et al., 2005, Mauerhofer, 2008), is to be considered as a derivative that has more than three dimensions, and the four dimensions are economic, social, ecological and institutional. This broader perception of sustainability is presented in the Mauerhofer (2008) analysis. He suggests using the 3D Sustainability Model to measure performance. By introducing an institutional dimension, it more reflects the idea of sustainability (see Figure 4).

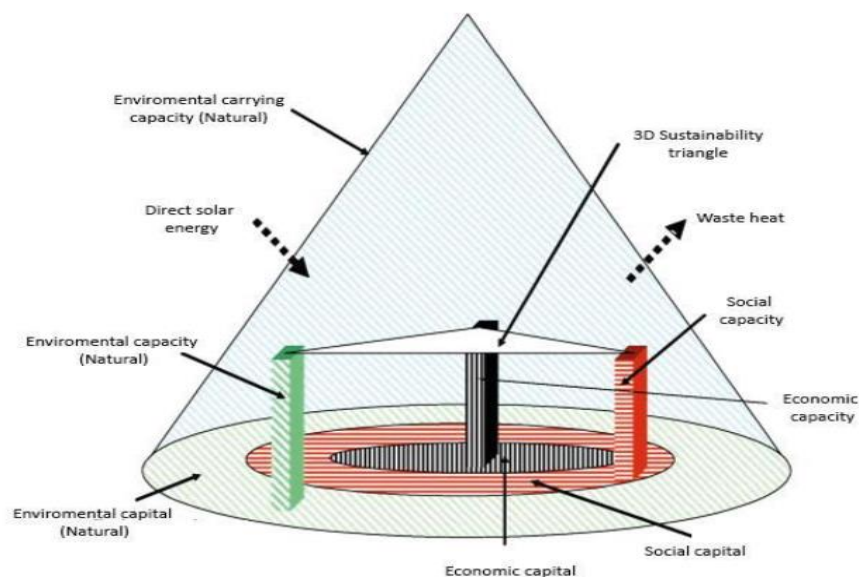


Fig. 4. Sustainable development in 3D model (Source: Mauerhofer, 2008)

According to this model (see Fig. 4), the economic aspect is integrated into the social (public) aspect, and both of them – into the environmental aspect. The model is limited by a cone symbolizing environmental constraints. The economic aspect at the middle of the circle indicates that it is created from human labour and environmental resources. Columns symbolize social (population, lifestyle, education, as well as institutional factors [political and governance system], property rights, etc.), environmental (ability to provide resources, space and other services) and economy (profit, productivity, unemployment level) capacity.

Yuknys (2012) presents another interesting 4-dimensional understanding of a sustainable economy. Yuknys has argued that the processes of quantitative growth inevitably prevail in the lower stages of development, but the gradual increase in the contribution of qualitative changes is evolving. The more we approach the boundaries of the Earth or some territorial unit, the slower is the quantitative growth and the greater is the contribution of qualitative changes to the overall development process. Under this notion, upon reaching Earth's capacity limit, further development, in keeping with the principles of sustainable development, should be based solely on qualitative changes (development) and a phase of zero growth should start there.

However, Mikalauskienė (2014) states that it is not really possible to compare all four types of capital (human, developed, natural and social). The sustainability criterion foresees that the same indicators should be applied when defining the coherence of all four dimensions. Unfortunately, there is no single indicator that is suitable for social cohesion, human satisfaction and ecosystem integrity. These criteria, just as monetary value, must be monitored and measured in their own dimensions. To this extent, the economic theory with its need for strong and reliable comparability measures makes it challenging to contemplate how ecological and social processes are economically important. Therefore, the conception of a sustainable economy of the 4 dimensions remains outside the bounds of economic theory that is concerned with strong comparability or at least a high degree of comparability measures.

Based on the above conclusion, this work assumes that the basis of a sustainable economy of a country consists of three dimensions: economic, social and environmental.

Analysing scientific literature and strategic documents, it was observed that many authors (Juknys, 2010, Ciegis and Zeleniūtė, 2008, Čiegis and Šimanskienė, 2010) emphasize the territory (city and/or state) when talking about sustainable development. Griesienė (2013) emphasizes that the development of the theory of sustainable development is important for the analysis of the states, since this area is paying great attention not only nationally but also globally, thus solving problems prevailing worldwide. It is therefore important for countries to develop national strategies for sustainable development that contribute to the implementation of the concept at the country level and contribute to addressing the global challenges of environmental protection, consumption and resource depletion. Main goals of Lithuania's sustainable development:

- in terms of economic and social development, resource efficiency indicators by the year 2020 to achieve the average EU Member States in 2003

- on the basis of environmental indicators – to comply with the EU's permissible standards, to comply with international conventions that limit environmental pollution and impact on the global climate. All indicators in the Lithuanian sustainable development strategy are presented in Figure 5.



Fig. 5. Priorities of Lithuania's Sustainable Development Strategy (Source: prepared by the author based on the National Strategy for Sustainable Development, 2018)

Lithuania's strategic priorities for sustainable development (see Chart 5) are set in accordance with the national interests of Lithuania, peculiarities, priorities of the EU Sustainable Development Strategy, provisions of other program documents. This strategy includes six sectors of the economy, four environmental sectors, four key social aspects and regional development issues. All these economic, social, environmental and regional development aspects must be presented and formulated through their integration.

The need to follow and analyse strategic documents is justified by the fact that it would not be possible to determine the impact of clusterization on sustainable national economy without knowing what priorities were set and what goals the country was seeking.

Having identified the concept of a sustainable country's economy and its relationship with the country's strategy papers, it is necessary to review its alternatives. Cough and Kozlovskiy (2011) state that in recent years, the development of an effective system for the progression of sustainable development has focused not only on sustainable development theorists, but also on the various national and international institutions responsible for the practical implementation of the ideas of sustainable development.

Ness (2007) argues that the methods for assessing sustainable development can be divided into the following categories:

- **Indices**, which are further broken down into both integrated and non-integrated ones
- **Product-related assessment** that emphasizes product and/or service materials and/or energy flows in terms of life-cycle
- **Integrated assessment methods**, the set of which is intended for strategic change or implementation of projects

Analysing scientific literature, it has been observed that scientists or responsible institutions have derived a number of integrated indicators and indices, most often used in Table 2.

Table 2. The most commonly used integrated sustainability assessment indicators (Source: prepared by authorbased on Čiegj, Kozlovskij, 2011)

Indicator name	Short name	The essence of the indicator
<i>Index of Sustainable Economic Welfare</i>	ISEW	It, like GDP, shows only the activity of economic activity over a certain period of time. And while the estimates include income distribution indicators that help internal consistency, these economic indicators do not say anything about sustainable economic development over time. This indicator completely eliminates the social indicator.
<i>Genuine progress indicator</i>	GPI	GPI is an advanced tool for ISEW, because it combines more indicators (both economic and environmental). Thus, it better reflects economic well-being and ecological sustainability. On the other hand, this index does not touch on social components, although one of the most important features of sustainable development is the harmonization of all three aspects of human life (economic, social and ecological). Hence, GPI as a tool for assessing sustainable development is not completely satisfactory.
<i>Welfare index</i>	WI	The welfare index is integrated. On the other hand, the economic and social components of sustainable development are considered together in this case (HWI sub-index), while the ecological component is separate (EWI sub-index). In addition, since both sub-indices have the same weight (Welfare index is the arithmetic mean of HWI and EWI), it eventually results in the environment being considered to be twice as important as the economic or social. The welfare index also analyses social sustainability. The internal social sustainability in this case is strongly portrayed – more than 10 social indicators are used for this purpose.
<i>Human Development Index</i>	HDI	The HDI consists of an equivalent sum of three components: (a) Lifecycle index (b) Education index consisting of 2/3 literacy index + 1/3 higher education index (c) Generic product index Such HDI calculation has received much criticism. Most of this critique is related to calculations, the correctness of data selection and so on.
<i>United Nations Indicators of Sustainable Development</i>	UNCS D58	Since 2001, UNCS D58 consists of four groups of sustainable development indicators: 1) Economics, which consists of subgroups of 2 indicators: economic structure (4 indicators) and consumption / production (9 indicators) 2) Society, consisting of subgroups of 6 indicators: equality (4 indicators), health (8 indicators), education (3 indicators), housing (indicator 1), security (indicator 1) and population (2 indicators) 3) Environment, consisting of subgroups of 4 indicators: atmosphere (3 indicators), land (6 indicators), oceans / seas / coasts (3 indicators) and fresh water (3 indicators) 4) Institutions, consisting of groups of 2 indicators: institutional framework (2 indicators) and institutional capacity (4 indicators) (UNCS D, 2001; 2007; Čiegj, 2010)

Table 2 contains a number of indicators for sustainable development, however, none of them are adequately sufficient on their own. On the basis of the study of scientific literature, it was concluded that to date, there is no single method or system to measure the development and change of a sustainable economy. Therefore, it is necessary to very precisely identify the object of the investigation and then to select and/or modify the most appropriate existing methods that allow the optimal results of the evaluation to be achieved.

The lack of scientific substantiation in regard to establishing criteria and indicators portraying the impact of clusterization on individual national economic sustainability dimensions

Analysis of the scientific literature and the content of strategic documents revealed that the Lithuanian cluster formation environment is highly related to the implementation of the strategic vision of Lithuania 2030, in particular, the priority area of the smart economy and the economic priority of integrating the national economy into global networks. The priorities and goals of the National Progress Program of Lithuania (2012) should strongly stimulate clusterization and integration processes. Thus, it can be stated that the environment formed

at the highest strategic level is very favourable for the development of clusters, and the envisaged financing for this area allows real development of the clustering policy. However, there remains a high risk that companies are most interested in not total economic benefits and participation in the overall value chain, but state support (Clust Studio [Klasterių studija], 2012).

However, after analysing the scientific literature on clusters and the theory of sustainable national economics, it has been observed that the focus is on the development of clusterization (especially in the manufacturing [industrial] sector). However, the impact on the economy, and even more so on the sustainable development, is not substantially investigated or occurs only in isolation and lack an integrated and unified approach (the process of clusterization itself, its possibilities and disadvantages, impact on cluster participants, impact on the region, etc. are considered). Nevertheless, it is necessary to mention such a research as it is a great start for the further solution of the problem formulated in this dissertation.

The very first research project for clusters in Lithuania appeared in 2001, which was conducted by the KTU Business Strategy Institute together with the Centre for Economic Research in 2001. This research work, similar to the Lithuanian cluster software study (2003), was dedicated to clusters as an important aspect of improving the competitiveness of the national industry and business and to demonstrate to the heads of enterprises and organizations of the country, to explain to all interested parties the essence of clusters, their advantages, showing the experience of other countries to promote clustering of enterprises. It can be argued that these studies were more descriptive than evaluative and only justified the existence of the clusters themselves and their application in practice.

Another research work was carried out in 2007 – the Feasibility Study of the ‘Kurortology’ Research Cluster in Druskininkai (State Tourism Development Institute). However, it was intended for a specific purpose and covered only the formation of the Druskininkai tourism and health cluster model.

In 2011, a scientific feasibility study the ‘Analysis of the Development Opportunities of the Creative Industry Cluster in Kaunas Region’ was carried out (Tulušienė, 2011). However, like the previous study it was focused particularly to analyse the models of the functioning of creative industries clusters in the centre of Kaunas (Kaunas Old Town and Laisvės alėja) and to evaluate their developmental possibilities.

One of the most comprehensive studies of Lithuanian cluster researchers was prepared in 2012 – ‘Cluster Studio2’, in which:

- Analysis of the cluster concept has been performed
- An analysis of the effectiveness and impact of Lithuanian innovation policy on clusterization processes
- An analysis of the legal acts regulating or affecting cluster activities
- Review of Lithuanian cluster ecosystem
- An analysis of clusterization processes in foreign countries (Finland, Sweden, Norway)
- An analysis of essential strengths, weaknesses, opportunities and threats of Lithuania's cluster activities
- In order to increase the efficiency of cluster activities, the study offers suggestions on the external environment and internal processes
- Suggestions are presented on the efficiency of cluster efficiency and the establishment of indicators for the assessment and monitoring of the efficiency of clusters
- A certain measure was proposed to increase cluster awareness and prestige
- Three trends in the development of clusterization processes in Lithuania were presented (high-tech sector clusters, clusters as regional development engines and large clusters of traditional industry sectors)

Although this studio is very valuable, it is mostly focused on analysing the development of clusters themselves. The analysis of the manufacturing sector in this study in terms of clusterization was based on M. Porter's ‘Diamond’ model (2000) (see Figure 6).

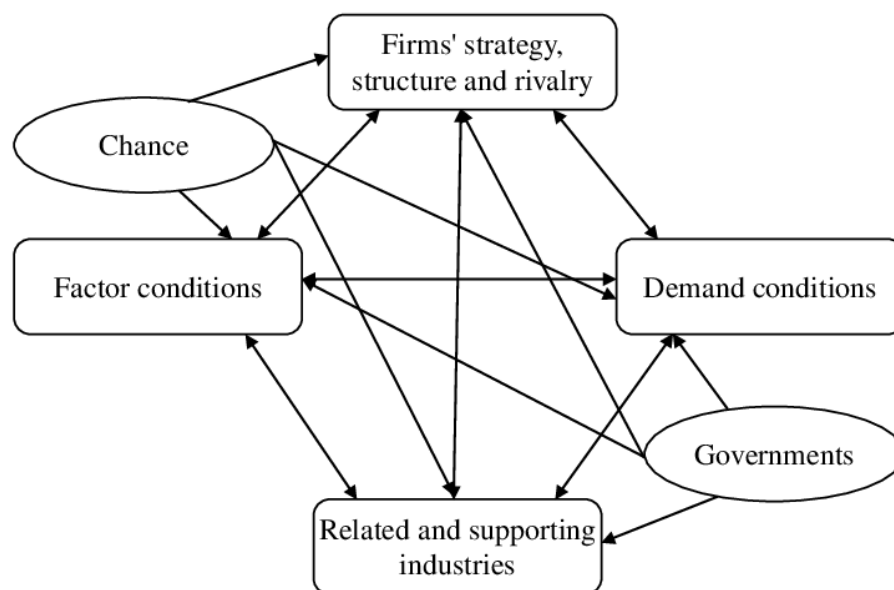


Fig. 6. M. Porter 'Diamond' model (Source: Porter, 2000)

The principle of the exclusion of criteria and criteria proposed by the authors is acceptable in addressing the scientific problem of this work, but several significant deficiencies of the proposed assessment system are observed:

1. the study actually focuses on the analysis of the sector's competitiveness, integrating just a few indicators of clusterization process
2. there are no concrete, measurable indices of the estimates justifying the objectivity of the research
3. the criteria and indicators apply to only one systemic unit, the industrial sector, without integrating the context of a country's economy, region, or the enterprises themselves
4. does not completely reflect the environmental dimension of the sustainable economy of the country and its criteria and indicators
5. only partially reflects the equivalent social dimension of a sustainable national economy (through human resources)
6. the survey largely covers the manufacturing sector (only the tourism sector was analysed from the services sector)

Another significant scientific work is found in the article by D. Štreimikienė and A. Mikalauskienė (2009) in determining the criteria and indicators indicating the impact of clusterization on individual dimensions of sustainable national economy. They used the methodology for calculating integrated indicators for monitoring the national energy strategy and for calculating the effectiveness of energy policy measures. The advantages of the assessment methodology they provide are:

1. clearly defined criteria and indicators indicating the impact of the analysed phenomenon on the individual dimensions of sustainable national economy (economic, social and environmental)
2. identify specific and measurable indicators that can be calculated on the basis of official statistics or other official and objective information
3. the criteria and indicator sets are analysed in a complex economic system, separately assessing their impact on the country, region and company itself
4. the established criteria and indicators can be supplemented, modified and withdrawn according to the needs depending on the subject matter

The study noted the following deficiencies in the system of evaluation of integrated indicators:

1. the subsystems of the economic system (the country, the region's economy and the results of the company) do not correlate with each other
2. there is a lack of further economic analysis of the subsystems of the chosen sector.
3. the research methodology has been applied to only one sector.

Nevertheless, a national energy sector research based on the integrated indicators method has been empirically verified and the results obtained have been found to be appropriate. (Štreimikienė, Baležentis, 2013). This allows us to formulate an opinion that the methodology of multi-criteria and integrated indicators is suitable for creating a methodology for research for this dissertation.

Ramanauskas, Gargasas (2011) have applied similar assessment methodology in their scientific research. They assessed the activities of rural tourism homesteads in the aspect of sustainable development. The study highlighted the key criteria for each dimension of sustainable development; with the help of experts, identified their relevance and importance (weighting factor) for the study and calculated the integrated indicator of sustainable development according to 1 formula:

$$DV = 0,33 \sum_{n=1}^n (1/B_s) * S_s + 0,33 \sum_{p=1}^p (1/B_e) * S_e + 0,33 \sum_{m=1}^m (1/B_a) * S_a , \quad (1)$$

where: 0.33 - DV coefficients weight of social, economic and environmental;

S_s, S_e and S_a respectively the assessment of social, economic and environmental DV evaluation and the total number of criteria set.

B_s, B_e and B_a - the number of corresponding social, economic and environmental criteria in a particular research object (compliance with specific criteria is determined by experts), respectively.

This formula was also found in works by other authors with larger or smaller modifications. Therefore, it is to be understood that the methodology for the study of the impact of clusterization of a sustainable national economy should be expressed as an integrated indicator covering:

1. clusterization criteria that are consistent with the specifics of the sector (industry or service) and sustainable economic dimensions
2. the integration of all economic subsystems (country, sector, region, cluster, cluster participant)

In addition, depending on the research network, correlation between selected criteria and subsystems should be determined. These assumptions will serve as the basis for the study.

Conclusions

On the basis of scientific literature, the cluster conceptualization was systematized and it was concluded that despite their abundance, all of them are modifications to the definition of M. Porter (2000). The basic notion formulated by M. Porter (2000) states that the cluster is the geographical concentration of interconnected enterprises, specialized suppliers, service providers, related industries and associated institutions (e.g., universities, agencies, trade associations, etc.), which in a certain area compete with each other and cooperate with each other. In the works of all other authors, the basic thought of M. Porter remains, only focusing on those elements that are relevant to their research objects. In this regard, it is concluded that the theory of clusters is relative and still being developed: in each case of a scientific study, it is possible to find different criteria that define the concept of clusters and the process of clusterization itself. However, the inclusion of clustering in Country Strategy Papers shows that the purpose and the benefits of this phenomenon are important at the state level, not to mention the economic policy of the regions.

The analysis of scientific literature revealed that the phenomenon of sustainable national economy, as well as the phenomenon of clustering, is relatively young. Therefore, it is still accompanied by an active scientific discussion both on terminology and on the alternatives to assessing the phenomenon itself. The abundant list of scientific literature has shown that scientists have even developed 4 different rating systems (by category) for the assessment of sustainable (sustainable) economics. The most popular and most commonly used is the calculation of the integrated indicator. However, the analysis of scientific literature revealed that there is not one commonly accepted method of evaluation.

In order to identify the criteria and indicators indicating the impact of clusterization on individual dimensions of sustainable national economy, an overview of research studies was done. Their analysis showed that there is almost no research on clustering assessment: all the studies actually focus on analysing the problems of development of clusters (especially of the industrial sector), rather than assessing the results achieved. However, the inclusion of clustering issues in country strategy papers makes it necessary to look for an answer whether this process

contributes to the implementation of strategic goals and objectives. The answer should be evaluated by quantitative and qualitative methods, and the resulting estimate should be expressed as an integrated indicator.

References

- Andriani, P., Jones, C., Perkmann, M., De Propris, L., Sena, V., Delbridge, R., Möslin, K., Neely, A. (2005). Challenging Clusters. The Prospects and Pitfalls of Clustering for Innovation and Economic Development. *Advanced Institute of Management Research*.
- Bekar, C., Lipsey, R. G. (2001). Clusters and Economic Policy. *Policies for the New Economy, Montreal*.
- Bruneckienė, J. (2010). Šalies regionų konkurencingumo vertinimas įvairiais metodais: rezultatų analizė ir vertinimas. *Ekonomika ir vadyba*, vol. 15, 2010, ISSN 1822-6515. p. 26-31
- Činčikaitė, J., Belazarienė, G. (2001). Klasteriai ir regionų konkurencingumas. *Tarptautinė konferencija „Regionų plėtra-2001“*, Kaunas: Lithuanian regional research institute, p. 23–24.
- Felzensztein, Ch. (2008). Innovation and marketing externalities in natural resources clusters: The importance of collaborative networks in Chile and Scotland. *Academia: Revista Latinoamericana de Administración*, Vol. 40, p. 1–12.
- Jucevičius, R. (2008) *Klasterių ABC. Vilnius: Klasterių kompetencijos tinklas*; [Accessed 2015-06-20]. Available from Internet: <http://www.verslilietuva.lt/files/files/PDF/klasteriuabc.pdf>
- Montesor, S., Marzetti, G.V. (2008). Innovation clusters in technological systems: A network analysis of 15 OECD Countries for the mid-1990s. *Industry & Innovation*, Vol. 15, No. 3, p. 321–346.
- Navickas, V., Malakauskaitė, A. (2008). Nauji makroekonominės politikos svertai: klasterių fenomenas. *Verslas: teorija ir praktika*, p. 245-252.
- Ness, B. (2007). Categorising tools for sustainable assessment. *Ecological economics*, Vol. 60. No. 3, 2007.
- Pearl, M. (2010). Strategic clusters: a vehicle for global growth, *Manufacturing Today*, p. 8–10.
- Porter, M. E., Stern, S., Delgado, M. (2014) *Clusters, Convergence, and Economic Performance*;, *Research Policy*, 43 (10), p. 1785–1799; [Accessed 2015-06-12]. Available from Internet: <http://www.clustermapping.us/sites/default/files/files/resource/Delgado,%20Porter%20and%20Stern%20-%20Clusters,%20Convergence,%20and%20Economic%20Performance.pdf>
- Roelandt, Th. J. A., Gilsing, V. A., Sinderen, J. (2000). Cluster - Based Innovation Policy: International Experiences. *Erasmus University Rotterdam*, Research Memorandum 0012.