

Theoretical Reasoning of the Use of Indicators and Indices for Sustainable Development Assessment

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The problem of the use of indicators and indexes for the assessment of sustainable development is analyzed in the work. As the objectives, for this the concept of sustainability indicators and indices is analyzed. Then the analysis of the concept of sustainable development is given. After this the analysis of the methodological principles of sustainability indicators and indices development is provided. The methods of systematic scientific literature analysis, general and logical analysis, comparison and generalization were used in the article.

Sustainability assessment currently arises as comprehensive, integrated, and provident decision-making approach. Ignorance of sustainability turns our future into more risky one. Thus sustainability indicators and indices, which have to measure features and processes of human and environmental systems that should guarantee continuity and functionality, might be discussed.

In order to manage sustainability, society has to formulate clear and measurable goals of sustainability that should be continuously revised and corrected. The level, at which these goals are implemented, might be measured using sustainable development indicators, i.e. definable and measurable parameters, which show values and trends of development of ecologic, economic, and social stability of a particular region.

Speaking about sustainability indicators, we should take into consideration the fact that any separate aggregated indicator does not foresee interchange among three main dimensions analysed in environmental economics: effectiveness, justice and sustainability.

Perfect indicators are uncommon; therefore, their development in a general case involves methodological compromise among technical feasibility, public availability to use, and systemic consistency. The effectiveness of sustainability indicators can be characterised by three attributes: credibility, legitimacy, and salience.

Sustainable development is a multi-dimensional issue involving huge amounts of complex information. There is some need to systematically reduce this information to a more concentrated form while constructing the pyramid of information aggregation, at the base of which are raw data and at the top there are indexes.

The new primary classification suggested by Bell and Morse (2001) is based on who has set the indicators and

how they have been set, with an additional dimension related to whether the sustainability indicator is quantitative or qualitative.

When choosing particular sustainability indicators, following principles of sustainable development should be taken into account: a) social justice; b) local government, public participation, democracy; c) sustainable balance between local and imported resources consumption; d) use of local economic potential; e) environmental protection; f) protection of cultural heritage, protection and regeneration of a new environmental quality, increase in functionality and attraction of area and buildings maintained.

Economic effectiveness itself does not guarantee ecologic and social sustainability because economic indicators used do not reflect it. Therefore, assessment of sustainable development needs integrated approach, a set of multi-dimensional indicators, which evaluate both separate parts of the system and their relationships.

Keywords: sustainable development, assessment, indicators, indexes.

Introduction

The Problem. Changes, development, interaction and sustainability are the keywords that characterize processes, which are taking place in our society (Katane, Baltusite, 2007). Sustainable development is regarded as a new paradigm of development in many scientific, political and legal documents that are in force in Europe, and in the world (Kryk, Zielinska, 2007). Global sustainability might be achieved by *fair redistribution* of the use of natural resources. In order to solve an unavoidable contradiction between the necessity to reduce excess consumption of Western countries (unsustainable consumption characteristic to developed countries might be designated as one of the factors that compounds seeking for sustainability in these countries (Spangenberg, Lorek, 2002) and a wish of both Northern and Southern countries not to reduce such consumption, it is necessary to guarantee the balance among what is *ecologically urgent, socially desired* and *politically achievable*. While looking for the fundamental decisions how to change models of consumption and life styles so that they would fit the requirements of sustainable development, sustainability

assessment models might be used which will be discussed in the article putting stress on indicators and indexes.

The efforts to move the concept of sustainable development from a theoretical level to a decision-making level and to link the economic development to environment are followed by a number of problems (Burinskiene, Rudzkiene, 2009). One of them – the objective to ensure the efficiency of the concept of sustainable development implies the problem of its measurement. Sustainable development strategies without indicators or qualitative reasoning would be lacking a solid scientific foundation. Meanwhile indicators are in general a quite simple instrument allowing to evaluate economic, social and ecological objectives of state's development.

The main research *problem* in this article is that circle of indicators and indexes suitable for assessment of sustainable development is not well-defined.

The research object is the contents of sustainability assessment indicators and the problems that are caused by the use of indicators for the qualitative and quantitative assessment of sustainability.

The aim of this research is to disclose the main problems caused by the application of indicators and indices for sustainability assessment and to suggest methodological solutions.

The Tasks. In order to fulfill these objectives, the following research tasks had to be accomplished:

- To discuss the concept of indicators and indices of sustainable development assessment.
- To present methodological principles of sustainability indicators and indices development.

The method of the research was logic abstraction that encompasses generalizations on theoretical systems analysis of the environmental and ecological economics; this was based on the conclusions and reasoning of scientists from other countries. The main scientific studies related to the problem have been reviewed and thoroughly analyzed.

The concept of sustainability indicators and indices

Sustainable development is a certain compromise among environmental, economic, and social goals of community, allowing for wellbeing for the present and future generations (Ciegis et al., 2009). Sustainability assessment currently arises as transparent, comprehensive, integrated, and provident decision-making approach (Gibson, 2005). Ignorance of sustainability turns our future into more risky one. On the contrary, understanding ecological limitations and clarifying possible risks allow making informative decisions. This reduces threatening uncertainties and opens up new possibilities. The integration between economics and thermodynamics at the substantive level is of crucial importance too, because economic processes obey thermodynamic laws and therefore a sound economic theory must be coherent with thermodynamics (Ciegis, Ciegis, 2008). From a merely entropic perspective, the principle of sustainable development looks rather contradictory, as under the entropy law none of the systems on Earth may be sustainable. It should be noted that the latest criticism of

neoclassical model of economy is mostly based on the principles of the thermodynamic laws (Rudzkiene, Burinskiene, 2007). For example, *Daly* (1991, 1990, 1987), on the basis of the second law of thermodynamics, argues that in the ordinary economic process, energy of the low entropy provides the possibility to convert material through transformation of energy into high entropy useless energy.

Thus, when the concept of sustainable development is clarified, *sustainability indicators and indices*, which have to measure features and processes of human and environmental systems that should guarantee continuity and functionality, might be discussed. Sustainability indicators are developed as a simplified tool of communication, which helps to make political decisions for seeking sustainability. In order to achieve this goal, it is necessary to set a limited number of easy understandable indicators (Spangenberg, 2002). According to the World Bank, fundamental factor of good indicator is the estimation of relationships between measurement of environmental conditions and practical political possibilities (World Bank, 1997). Optimal sustainability indicators are those that include essential features of a system and show scientifically sound trajectory of maintenance or improvement of this system (Moldan, Dahl, 2007). However, these indicators should not necessarily include all aspects of sustainability because, as *Huetting and Reijnders* (2004) argue, in that case they often become very subjective and meaningless.

Indicators are a useful tool used to simplify, determine in quantitative terms and summarize enormous flows of information, develop useful mechanism of feedback, which highlights spheres where we act properly and where major attention is needed. Actually, indicators are used in order to reduce the amount of complex interrelationships by converting them into simple formulation, which makes assessments easier (Ciegis, 2004).

In general terms, an *indicator* is a quantitative or a qualitative measure derived from a series of observed facts that can reveal relative positions (*e.g.*, of a country) in a given area. When evaluated at regular intervals, an indicator can point out the direction of change across different units and through time. Therefore, indicators are quantitative information, which helps to explain how specific concerns (phenomena) change over time. Many years limited number of the main economic constraints was used to assess economic activities (production, rate of employment, rate of inflation, balance of payment, state debt, etc.). Such statistics presents a general situation but it does not explain causes of specific trends and does not necessarily reflect the situation of particular sector of industry, community or territory.

In order to manage sustainability, society has to formulate clear and measurable goals of sustainability that should be continuously revised and corrected. The level, at which these goals are implemented, might be measured using sustainable development indicators, *i.e.* definable and measurable parameters, the values and trends of which show development of a ecologic, economic, and social stability of particular region (Subalansuotoji plėtra, 2001). Such information derived from indicators is very useful in order to assess tools such as taxes, regulation or voluntary agreements, considering their validity (one of the essential

requirements imposed on indicators) and effectiveness to secure sustainability (Ciegis, 2009). As *Parris and Kates* (2003) emphasise, indicator developers demonstrate political naivety, which is proved by a gap between politically formulated goals and weak efforts for guaranteeing that designed indicators would be turned to implementation of these goals.

Sustainable development is quite a new area; therefore, design of indicators has an important role in defining sustainability itself. Indicators suggested in many other political spheres might be analyzed only if clear and comprehensive understanding of this sphere and its issues exists. As clear criteria do not exist (in an insufficiently theoretically studied field of sustainable development), wrong set of sustainability indicators could be developed, which would not allow both specialists and society understand the essence of sustainable development. Disability of indicators to meet a function of communication would make them worthless (Moldan, Dahl, 2007).

Measurements (their systems) are needed for the implementation of the main goals of sustainable development, i.e. to contribute to the protection and use of resources within the limits of the Earth's regenerative capacities. Thus, the significance of *indicators* as important instruments of sustainability implementation process is based on the need to measure and assess the progress of reaching goals.

Making the concept of sustainable development operational raises important challenges in terms of measurement. Without indicators or a quantitative framework, sustainable development policies lack a solid foundation on which to advance. Indicators are rather simple tools, which allow evaluating economic, social, and environmental goals of national development. If environmental, social, and economic indicators are integrated into one, they form an *index*.

Indicators should be characterized by the following features: simplicity, wide coverage, possibility of qualitative assessment that allows for setting trends. Integrated sustainability assessment itself is the most important and difficult sphere of potential indicator use because such an assessment should include wide spectrum of different problems and issues (Dahl, 2007).

There is no *single* measure of sustainable development that could involve everything the concept "sustainability" means. On the contrary, there are alternative indicators, each of which reflects different understanding of what is important for sustainable development. Any separate aggregated indicator does not foresee interchange among three main dimensions analyzed by environmental economics: *effectiveness*, *justice* and *sustainability*. As *Victor* (1994) emphasizes, aggregated indicators are useful only when we believe in a high degree of substitution among produced, human, and natural capital. When limits of the substitution among these types of capital are confronted, then every of them should be expressed by a specific indicator.

When measuring sustainable development, it is common to choose and combine a particular number of indicators for each of the three (or more) dimensions: economic, ecological, social, etc. On a global level there

are over 500 sustainability indicator efforts, which were developed by governmental and non-governmental organizations. Of this number, about 70 are global in scope, over 100 national in scope, more than 70 are state or provincial in scope, and about 300 are local or metropolitan in scope (Parris and Kates, 2003). The affluence of sustainable development indicators has multiple motivations, which include decision making and management, regional advocacy, and research and analysis. (For example, *Kaklauskas et al*, 2009 presents an analytical model of the rational sustainable development of Vilnius by undertaking a complex analysis of micro-, meso- and macro-environment factors affecting it). Nevertheless, every indicator has its own advantages and disadvantages, thus, it is impossible to find a single indicator for all cases.

Sustainability indicators are multi-dimensional, multidisciplinary indices with sub-themes developed with care to evaluate and measure the status of an area in terms of progress towards sustainability (Ghosh et al., 2006). Scientific literature often analyses issue, to what extent a different indicator sets contributes to sustainable development assessment. We conclude that there are no indicator sets that are universally accepted, backed in compelling theory, rigorous data collection and analysis, and influential in policy. This is due to the ambiguity of sustainable development; the plurality of purpose in characterizing and measuring sustainable development; and the confusion of terminology, data, and methods of measurement.

In order to improve existing system of sustainability indicators, competing trends and their methodological requirements, indicators have to be important, correspond policy goals, they have to be informative (well-defining a problem), easy to understand and compute, logical, effective (information provided should pay-off), practical, reliable, summarizing (they should cut variety and abundance of indicators not losing essential information at the same time), based on accessible data and should be taken into account. It is not an easy task to define an indicator set inherent to sustainable development.

Perfect indicators are uncommon, therefore, their development in general case involves methodological compromise among technical feasibility, public availability to use, and systemic consistency (Moldan, Dahl, 2007).

It is obvious that indicator sets intended to be applied cannot describe everything, therefore, it is important to design a typical set, which presents comprehensive characteristics but not wider than that needed for bringing the essence. Systemic method of choosing indicators should be based on sound scientific methodology, which involves multidimensional components and estimates uncertainty if there is a need for this. Such method should be flexible so it allows to broaden and reducing the number of indicators striving for better assessment in a given context (Ciegis, 2002).

While discussing sustainability assessment tools, on the one hand, there is the demand for approaches that have more *specific* assessment performance (meaning more case- and site-specific). At the same time there exists the demand for tools that are *broader* in order to be accessible to a wider user group for differing case circumstances.

There is also the need for more *standardised* tools that give more transparent results. Like the many facets of the concept of sustainability itself, proper tool development can only happen when all parameters are considered simultaneously.

The effectiveness of sustainability indicators can be characterized by three attributes: credibility, legitimacy, and salience (Cash et al., 2002; Parris and Kates, 2003); where *credibility* refers to the scientific and technical adequacy of the measurement system, *legitimacy* refers to the perception that the production of the measurement system is respectful (fair) of the stakeholders' divergent values and beliefs, and *salience* refers to relevance of the indicator to decision makers (this is emphasized in Funtowitz et al., 1999).

According to the North West Regional Assembly (2003), an effective indicator framework needs to take into account the following basic criteria: a) policy relevance and utility for users, b) analytical soundness, and c) measurability.

It is quite challenging to produce indicators which meet all these requirements – which are technically sound, understandable to non-experts, relevant to the policy process, and for which data is available. Therefore, in practice many indicators are partial, compromised, with patchy data and debatable definitions. There are also general features which make a rational framework structure more challenging (NWRA, 2003).

Indicators should be *scientifically sound* as well. Every indicator needs a specific technique, which includes conception of indicator, its significance, measuring units, data sources, methods of data collection and analysis, evaluation criteria, etc.

Planning the schemes for the construction of integrated indicators, the validity is verified applying statistical methods. These methods are applied in analyzing relations of basic indicators and selecting indicators that exert major influence. The study includes the methods for the improvement of reliability of variables measurement scale, the ground for construction of reliable scales, optimization of a questionnaire and examples of its application (Rudzkiene, Burinskiene, 2007).

Lists of *technical criteria* are common in the sustainable development literature. Based on literature review good indicators should be (Olsson et al., 2004; PASTILLE, 2002):

- exact, transparent and explainable,
- relevant, cost-effective and sensitive,
- instructive and usable,
- scientifically reliable or analytically sound, including response to change,
- measurable according to standardised methods and based on accessible data,
- comparable, not ambiguous and robust or independent of assumptions,
- limited in number,
- related to a reasonable time horizon and to relevant spatial area,
- capable of relating to other indicators and aggregation.

Juknys (2008) indicates the following characteristics of sustainability indicators: a) usefulness, b) simplicity, c) versatility, d) representativeness, e) sensitivity, f) consistency,

g) qualitative form of indicators, and h) sufficiency of data time series.

According to Rudzkiene and Burinskiene (2007), indicators of sustainable development are characterized by: a) relationship with policy, b) versatility, c) accessibility, d) understandability, e) qualitative assessment, f) scientific soundness and efficiency, and g) sensibility to changes.

Sustainable development is a multi-dimensional issue involving huge amounts of complex information. There is the need to systematically reduce this information to a more concentrated form while constructing increasingly aggregated sustainability indicators (in order to make effective decisions and as such indicators and indicator sets play a vital role). Such information system could be seen as *pyramid of information aggregation* (PASTILLE, 2002), at the base of which are raw *data* and *indexes* are at the top.

The index often simplifies complex systems to often just one number. This can be useful for decision-makers, but if important pieces of information are missing or improperly represented in an index, it can give false signals to decision-makers. As Ebert and Welsch (2004) argue, indicators usually aggregate information in such a way, which does not allow producing useful indicators from a social wellbeing or environmental sustainability perspective.

Moldan and Dahl (2007) also analyse methods of sustainability indicators development and their aggregation levels. They determine: a) indicators, b) aggregated indicators, c) combined (composite) indicators, d) indexes.

Sustainability indicators can take a number of related forms:

- monitoring indicators,
- aggregate sustainable development indices,
- target (or goal) indicators,
- sustainability assessment criteria.

Solid analysis and measurement provide the basis for implementing sustainable development policies. Understanding sustainable development linkages and achieving the required policy trade-offs across the environmental, economic, and social spheres requires novel methodologies based on new types of statistical approaches. The challenge in measuring sustainable development lies in *developing new indicators and combining these* through (OECD, 2002; 2005):

- *accounting frameworks* that contain physical flow accounts for four types of resources: natural resources, ecosystem inputs, products, and residuals,
- *decoupling methods* are useful in helping policy makers understand the interface between developments in two different spheres: in most cases, they compare the relative growth rates of environmental and economic variables,
- *global approaches* because more sophisticated measures of global flows of capital, human and natural resources are essential for arriving at true indicators of sustainable development,
- *composite indices* are synthetic indices of groups of individual indicators which are used to compare and rank countries in the areas such as environmental performance and sustainable development.

Composite indicators are much like mathematical or computational models. As such, their construction owes more to the craftsmanship of the modeler than to universally accepted scientific rules for encoding. As for models, the justification for a composite indicator lays in its fitness to the intended purpose and the acceptance of peers' acceptance (Rosen, 1991).

Methodological principles of Sustainability Indicators and Indices Development

The new primary classification suggested by *Bell and Morse* (2001) is based on who has set the indicators and how they have been set, with an additional dimension related to whether the sustainability indicator is quantitative (numerical) or qualitative (non-numerical).

Attempts to highlight the relationships between sustainability indicators – with multiple causes and effects and perspectives being something to consider and explore – became quite difficult. It is tribute to the dominance of the standard classification that mechanically shoe horning sustainability indicators into a table with two columns became an overriding priority. In this manner it imposes worldview that in turn dominates the discourse of sustainability indicators and restricts other perspectives. Thinking through cause and effect relationships can be revealing and vital if one is actually going to use sustainability indicators as management and policy tools. However, the cause and effect classification makes little concession to the perspective of the use of sustainability indicators, in that it is primarily based on a technical mindset rather than on the aspirations of those who may ultimately want to use them.

While the traditional classification emphasizes technical driving force–state relationships, *Bell and Morse* (2001) wish to consider the usage of sustainability indicators at a primary level. Cause and effect then becomes a secondary concern.

An underlying complication has been the association between a parameter judged to be important to sustainability, and the form and method behind which it is to be expressed and understood. In practice we settle for simpler (and cheaper) methods of measurement that inevitably make compromises. Yet all of this, results in multiple levels of assumption that almost always end up with an “indicator of an indicator” that has human value judgment bound within it. *Bell and Morse* (2001) argue that multiple perspectives of the same thing are inevitable as long as people are involved, and if people are not inside then it does not make sense to talk of sustainability. Therefore, in contrast to many writers, authors quoted here suggest that all people understand, value, and care about indicators.

The experience analyzed by *Bell and Morse* (2001) indicates that it is possible to combine both qualitative and quantitative sustainability indicators, but this requires an exercise in engagement at both policy and local level. The result could be called *multiple perspective sustainability indicators*. Such indicators would allow combining different visions but at the same time providing an internalized reminder about the centrality of people in all of this.

Bell and Morse (2001) emphasized two related issues that are of particular interest in terms of sustainability and its indicators:

- 1) the institutional and personal maelstrom within which sustainability and its indicators have to operate;
- 2) imposed limitations on resources, especially time, for generating indicators.

In both of these the complication is that the promotion of sustainability is but one concern among many that individuals have. Hence, sustainability and its indicators have to operate within an institutional maelstrom of limited resources and ever-changing set of concerns and agendas. According to the authors, mentioned above, before a single sustainability indicator is created, the starting point of the whole process needs to be a series of simple questions: Who needs sustainability indicators and why? Do they also want participation from local people? If local participation is required then whose mindset counts?

When choosing particular sustainability indicators, following principles of sustainable development should be taken into account: a) social justice; b) local government, public participation, democracy (there is a common consensus that stable and democratic political system is necessary for sustainable development, which might be understood as a combination of economic, social, and ecological ideas in a democratic environment (World Bank, 2006; Rodgers et al., 2006, Lane, 2006)); c) sustainable balance between local and imported resources consumption; d) use of local economic potential; e) environmental protection; f) protection of cultural heritage, protection and regeneration of a new environmental quality, increase in functionality and attraction of area and buildings maintained.

Literature proposes that *process of sustainability indicator development* should incorporate the following:

$$\text{A Process of Indicator Development} = \text{Intended Purpose} + \text{Desired Audience} + \text{Appropriate Design} + \text{Relevant Consultation / Participation}$$

The early literature on development of sustainability indicator systems was heavily focused on how to design and develop indicators. It presented indicator development as a relatively technical task even if the intended purposes of the indicators were to communicate and engage with community groups. Alongside this has gone work that has surveyed the extent of local sustainability indicators initiatives. Some of this has probed into the issue of how effective indicators are but this has raised a real problem for the “indicator industry” (Rydin et al., 2003). Research has often found it difficult to discern clear links between the development of an indicator programme and actual changes in decision-making and policy outcomes. In consequence, there is often a reliance on less tangible impacts, such as capacity building or information sharing. This has highlighted the need for a new research agenda on sustainability indicators, one that examines this linkage between indicators development and policy action.

Many authors have used *social construction* to argue that it is possible to adequately reflect the subjectivity of sustainable development through sustainability indicators. Rather than placing emphasis upon the actual indicators

themselves, social construction is used to place emphasis upon the actual process of developing indicators. The creation of successful sustainability indicators relies far more on how they are integrated into the processes of regional governance and far less on devising, designing, and modifying particular indicator sets. By using social construction many authors have built upon the function of sustainability indicators, devising a number of different roles carried out by them. These roles create a vision of purpose for sustainability indicators far beyond the traditional view of objective measurement (McAlpine, Birnie, 2005).

The most important purposes of indicator use might be explored as follows (PASTILLE, 2002):

- *understanding sustainability* (indicators can help to identify relevant elements of sustainable development, promote understanding, and indicate the state of local sustainability),
- *supporting decisions* (indicators can make sustainability measurable and therefore manageable),
- *involving stakeholders* (sustainable development itself for many stakeholders is too abstract concept to relate directly to action. Indicators enable this link to be made and can motivate action),
- *directing* (during the implementation stage relevant aspects of sustainable development are identified, indicators are developed and used to provide feedback on progress),
- *solving conflict and building consensus* (indicators can show the advantages and disadvantages of different alternatives and help to find win-win situations).

Each purpose discussed above has its own goal, stakeholders, target group for use and many more of its own characteristics. A single indicator is often not able to serve all purposes (for instance, an indicator designed for scientific analysis will not be effective in raising public awareness and motivating public participation).

Sustainable development is continuous objective, therefore methods are needed to measure how it is approaching, what progress is being done. Economic effectiveness itself does not guarantee ecologic and social sustainability because economic indicators used do not reflect it. Therefore, assessment of sustainable development needs *integrated* approach, a set of multi-dimensional indicators, which evaluate both separate parts of the system and their relationships. One aggregated indicator is not enough to reflect all important aspects of development although such indicators are quite popular. Besides, the very concept of sustainable development involves not only *quantitative* (economic) parameters of growth, but also *qualitative* (social, environmental) elements as well.

During the last two decades efforts have been laid to develop indicators for practical assessment of how sustainable development of states is. In order to measure effectiveness of national sustainable development strategy and environmental policy from the viewpoint of ecologisation of individual sectoral policies, *indicators* involving the following aspects should be used (Ciegis, 2009):

- social and economic indicators (including indicators of corporate social responsibility, as the overall idea of

sustainable development soon touched the world of the enterprise through a new concept: Corporate Social Responsibility, which now is developing as a response to changing society needs and global problems solving (Juscus, Snieska, 2008; Ruzevicius, Serafinas, 2007; Relano, 2008);

- indicators of changes in environmental quality and pressures (including indicators of eco-labelling (Ruzevicius, Waginger, 2007));
- indicators of national and public activity (including indicators of cooperation in environmental governance (Zickiene, 2007) and public participation (Ciegis, Gineitiene, 2008)).

Grybaite and Tvaronaviciene (2008) presented estimation of sustainable development on institutional level. They investigated approaches of 10 measurements of sustainable development adopted by international organizations, or institutions and founded to review progress at the international, regional and national levels in the implementation of sustainable development policy. Platje (2008) stressed “Institutional capital” as a factor of sustainable development too.

Conclusions

1. Society has to formulate clear and measurable goals of sustainability that should be continuously revised and corrected. The level, at which these goals are implemented, might be measured using *sustainability indicators* because there is no *single* measure of sustainable development that could involve everything the concept “sustainability” means.
2. *Sustainability indicators* themselves are multi-dimensional, multidisciplinary indices with sub-themes developed with care to evaluate and measure the status of an area in terms of progress towards sustainability.
3. When choosing particular sustainability indicators, following principles of sustainable development should be taken into account: a) social justice; b) local government, public participation, democracy; c) sustainable balance between local and imported resources consumption; d) use of local economic potential; e) environmental protection; f) protection of cultural heritage, protection and regeneration of a new environmental quality, increase in functionality and attraction of area and buildings maintained.
4. In order to measure effectiveness of national sustainable development strategy and environmental policy from the viewpoint of ecologisation of individual sectoral policies, *indicators* involving the following should be used:
 - social and economic indicators;
 - indicators of changes in environmental quality and pressures;
 - indicators of national and public activity.

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Rodiklių ir indeksų naudojimo įvertinti darnų vystymąsi teorinis pagrindimas

Santrauka

Šiame darbe nagrinėjama rodiklių ir indeksų naudojimo įvertinti darnų vystymąsi teorinė problema. Šiam tikslui pasiekti išsamiai išanalizuota darnumo rodiklių ir indeksų samprata.

Po šios analizės pateikti darnaus vystymosi rodiklių ir indeksų kūrimo metodologiniai principai. Darbe naudojama sisteminė mokslinė literatūros analizė, bendroji ir loginė analizė, taikomi lyginimo ir apibendrinimo metodai.

Šiuo metu darnumo vertinimas yra išsamus, integruotas ir įžvalgus sprendimų priėmimo požiūris. Nežinant, kas yra darnumas, kur mes esame ar kur einame, mūsų ateitis tampa rizikingesnė. Todėl reikia aptarti *darnumo rodiklius ir indikatorius*, kurie turi išmatuoti žmogaus ir aplinkos sistemų bruožus, taip pat procesus, užtikrinančius jų tęstinumą ir funkcionalumą ateityje.

Norint valdyti darnumą, visuomenei tenka suformuluoti aiškius ir išmatuojamus darnumo tikslus, kurie turi būti nuolat iš naujo svarstomi bei patikslinami. Laipsnis, kuriuo šie tikslai yra įgyvendinti, gali būti išmatuotas naudojant darnaus vystymosi indikatorius – apibrėžiamus ir išmatuojamus parametrus, kurių vertė ir kaitos kryptis rodo konkretaus regiono ekologinio, ekonominio ir socialinio stabilumo raidą.

Bendruoju atveju rodikliai yra pakankamai paprasta priemonė, leidžianti įvertinti ekonominius, socialinius ir aplinkosauginius šalies plėtos tikslus. Jeigu aplinkosauginiai, socialiniai ir ekonominiai rodikliai yra integruoti į vieną rodiklį, tai jie sudaro *indeksą*.

Kalbant apie darnumo rodiklius, reikia įvertinti tai, kad bet kuris atskiras ir agreguotas rodiklis nenumato mainų tarp trijų svarbiausių aplinkos ekonominėje teorijoje įvertinamų dydžių: *efektyvumo, teisingumo ir darnumo*.

Darnaus vystymosi matavimui įprasta parinkti ir suderinti kiekvienos iš trijų (ar daugiau) dimensijų – ekonominės, ekologinės, socialinės ir t. t. tam tikrą rodiklių skaičių. Pačių darnaus vystymosi rodiklių gausą lemia tai, kad jie yra reikalingi sprendimams priimti ir valdyti, regionams propaguoti, tirti ir analizuoti. Be to, pasirenkant rodiklius, teko įvertinti tai, kad kiekvienas indikatorius turi savo pranašumus, ir trukumus puses, ir kad, kaip jau minėta, yra neįmanoma surasti vieno indikatoriaus, tinkančio visiems atvejams.

Kadangi retai egzistuoja toboli indikatoriai, jų kūrymas bendruoju atveju apima tam tikrą metodologinį kompromisą tarp techninio galimumo, visuomeninio tinkamumo naudoti ir sisteminio neprieštaringumo. Norint apibūdinti darnaus vystymosi indikatorių efektyvumą, reikia remtis trimis kriterijais: patikimumu, pagrįstumu ir iškilumu.

Darnus vystymasis yra daugiamatis reiškinys, apimantis labai daug sudėtingos informacijos. Todėl, šią informaciją reikalinga pateikti labiau koncentruotą, sudarant *Informacijos koncentravimo piramidę*, kurios pagrindą sudaro pirminiai labai detalizuoti *duomenys*, o viršūnėje yra *indeksai*.

Norint suprasti darnaus vystymosi ryšius ir pasiekti reikalingą ekologinės, ekonominės ir socialinės sferų politikos suderinimą reikalingos novatoriškos metodologijos, pagrįstos naujais statistiniais požiūriais. Toks iššūkis matuojant darnų vystymąsi yra *naujų rodiklių kūrimas ir jų derinimas, pasinaudojant: a) apskaitos struktūras; b) atsiėjimo metodus; c) globalius požiūrius; d) kompleksinius indeksus*.

Metodologiškai unikali yra S. Bell ir S. Morse (2001) pasiūlyta bazinė darnaus vystymosi rodiklių klasifikacija pagal tai, kas ir kaip konstruoja rodiklius, papildyta dimensija, priklausoma nuo to, ar rodikliai kiekybiniai, ar kokybiniai.

Įmanoma sujungti kokybinius ir kiekybinius darnumo rodiklius, bet tam reikia įtraukti strateginius ir vietinius lygmenis. Rezultatas galėtų būti vadinamas *daugialypio požiūrio darnumo rodikliais*.

Pasirenkant konkrečius darnumo indikatorius, taip pat reikėtų vadovautis šiais darnaus vystymosi principais: a) socialiniu teisingumu; b) vietine savivalda, visuomenės įtraukimu, demokratija; c) darnia pusiausvyra tarp vietinių ir įvežtinių išteklių naudojimo; d) vietinio ekonomikos potencialo panaudojimo; e) aplinkos apsauga; f) kultūros paveldo saugojimu, naujos aplinkos kokybės apsauga ir atkūrimu, eksploatuojamos erdvės bei pastatų funkcionalumo bei patrauklumo didinimu.

Galima išskirti tokius svarbiausius rodiklių naudojimo tikslus: a) darnaus vystymosi supratimą; b) sprendimų paramą; c) suinteresuotųjų šalių įtraukimą; d) nukreipimą; e) konfliktų sprendimą ir susitarimo siekimą.

Ekonominis efektyvumas dar negarantuoja ekologinio ir socialinio darnumo, nes naudojami ekonominiai rodikliai neatspindi ekologinės ir socialinės darnos. Todėl darniam vystymuisi vertinti reikalingas *integruotas požiūris* į pasaulį, kelių dimensijų indikatorių, kurie įvertina ir atskiras tiriamos sistemos dalis, ir ryšius tarp jų visumą.

Raktažodžiai: *darnus vystymasis, vertinimas, indikatoriai, indeksai*.

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