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MANAGEMENT PRINCIPLES OF SOCIETY'S SUSTAINABLE DEVELOPMENT AND TRANSFORMATION OF ECONOMY

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ABSTRACT. ***The article deals with some theoretical aspects of identification and implementation of the sustainable economic development management concepts in societies' development strategies. The main management system requirements for sustainable economic development were formed using the theoretical approach. The article evaluates the content and issues related to the environmental indicators, including the environmental space and the ecological footprint concepts, applied in sustainability measurement, as well.***

KEYWORDS sustainable development, management, economic growth, environment, indicators

Introduction

Today, when economic powers are governing biggest part of our lives, the most important question arises, at what level sustainable development can be adequately analysed and implemented, applying contemporary economic theories. Economic development orientations and concepts, valid in the previous century, cannot satisfy the humanity's needs and they have only a limited application spectrum in environmental protection studies. The situation supposes the necessity to propose new approaches and to define the essence of economic theory, its potential role and tasks, in solving issues related to critical human existence and civilisation survival in the future.

At the very beginning of 1990s, after the Soviet block collapsed, a big group of countries with very specific features of their development was formed alongside two traditional distinguished groups of developed and developing countries. Though, these countries of so-called transitional economies occupy a huge area from the Pacific Ocean, too little attention is being paid to analysis of specific features of their development alongside with transitional decline in economy, not only the production in different economy sectors but the consumption of natural resources and environmental pollution decreased several times. *Transition to market economy*, which is based on private initiative and private investments, inevitably is followed by restructuring of post communist countries economies and modification of its activities. Fast transition to market economy, restructuring of Lithuanian economy, increased prices of energy and other resources, caused many serious problems during the last decade, but increased consumption of renewable resources caused positive, from point of sustainability, changes in Lithuania's development.

Though, the essence of the sustainable development concept is clear enough, the exact interpretation and definition of sustainable development has caused strong discussions leading to suggestions of proposing new models of society sustainable development and its management. If the existing concepts of sustainable development were enriched by new principles, new methodological presumptions, it would be easier to comprehend the essence of sustainability and to accommodate the new definition of sustainable development and the new meaning of its management.

The main **objective of the article is two-fold**: *firstly*, to disclose the content of management of socially and ecologically oriented economic development and, *secondly*, to ensure theoretical principles of its realisation. The content of environmental indicators, including concepts of *ecological space* and *ecological footprint*, and the problems from the perspective of their suitability for decision-making in economic development sustainability issues are critically investigated in the article as well.

The research tasks. In order to fulfil this objective, the following research tasks had to be accomplished:

- to analyse the principles of sustainable management;
- to analyse the need of the indicators in the management of the sustainable development;
- to review environmental indicators, used in economic development sustainability decisions;
- to discuss the ecological footprint and the environmental space concepts from the viewpoint of their sustainability evaluation potential;
- to formulate theoretical principles for calculating the environmental space for certain resources.

The basic **methods of the scientific research**, that were employed in the article, were a *logic abstraction*, which encompasses *generalisations* on economic and management theories and thoughts, *theoretical systems analysis* of the problems of management of society sustainable development, according to the *conclusions and reasoning* of scientists from other countries, *comparison and research the processes* of economic systems development.

1. Principles and Decision-Making Mechanism of the Management of Society Sustainable Development

Historically, the concept of sustainability as primarily used in economics and ecology as well as in the interdisciplinary context. Further, the concept of sustainability has dispersed over many aspects of global and micro processes, including more and more different sustainability drivers and possibilities of their interactions.

Though, the *essence* of the ***sustainable development*** concept is clear enough, the exact interpretation and definition of *sustainable development* has caused strong discussions. It is possible that the terminology problem occurs in the *dual* nature of the *sustainable development* concept, covering ***development*** as well as ***sustainability***. Economic and environmental literature offers over 70 definitions on *ecologically sustainable development*, representing the **variety** of terminology on sustainable development. It is thought appropriate to use the definition provided in *Brundtland Commission Report*, which discloses the idea of *sustainable development* best. It postulates that

> *"sustainable development is the kind of development, which satisfies the present-day needs without undermining the opportunities of future generations to satisfy their needs. The sustainable development concept determines boundaries – not absolute limitations, but restrains, applied to resources of the existing technological and social organisational environment and capabilities of absorbing the effects of human activity"*
> (Our Common Future, 1987).

But the problems of precise definition of sustainable development term and content in the economics, in the management theory can be considered as advantage, because in all levels leaved ***the space for the discussions, the variety of the possible models of development***.

In the analysis of consequences of society development it is possible to distinguish three dimensions:

a) *ecological* dimension,
b) *economic* dimension,
c) *social* dimension.

Thus, according to the current understanding of sustainable development, three pillars of an equal significance – environmental protection, economic development and social development – form its basis. Also it is possible to distinguish three society sustainable development ***management approaches***: a) *economic*, b) *ecological*, c) *social*.

1) **The economic** *sustainability* management approach is based upon *R. Solow's* (1986) amplified *theory on capital substitutability* and *Hicks-Lindahl concept of maximum income, which can be acquired by saving essential wealth (capital) resources for the benefit of future generations,* (implementing the principle of fair distribution among generations). This approach is very apparent in the literature, analysing the *sustainable utilisation of renewable natural resources*, in fact, it is the basic theory of optimum and economic effectiveness, applied to utilisation of scarce resources (Munasinghe, 1993). But here we face some issues, related to *capital*, which should be preserved, *identification* types and its *substitutability*, as well as problems of *evaluation* of *types of wealth*, including ecological resources.

2) **The ecological** approach to management of *sustainable development* pays most attention to *stability of biological* and *physical systems* and refers to *C. Holling's* (1973) scientific works. According to this approach *the primary task of economic development is to determine the natural systems limits for various economic activities*. In this case, the vitality of sub-systems becomes essential in the critical view of global stability of the total ecosystem. Thus, the significance of *preserving biological diversity* is emphasised here in order to secure balanced nature. Referring to biological diversity, it is worth noticing that it cannot be replaced by anything else. This fact gives us a strong argument *against discount application in determining the value of biological diversity.*

Speaking about *ecological* approach to management of sustainable development, it must be mentioned, that until now, the attention was drawn only to those environmental problems *the technical nature and cause of which had been earlier established and clearly identified.* In those cases, when the *causes of* ecological problems *were very dispersed, with no clear boundaries in space and similar to "hidden time bombs"*, the environmental protection progress is very minimal and slow. Here the important role was played by the contemporary economic development, which encouraged an *increasing segmentation of environmental management*. Instead of the *segmented* approach to environmental management a new environmental economic policy is needed, oriented towards *integrated environmental management*, which allows formulating ecological principle of management of *society sustainable development (environmental protection integration principle)*. This approach would incorporate and evaluate the following:

a) *the relationship between all levels of environmental. economic, social and cultural factors, making impact on the ways the humanity exploits the environment and natural resources*, emphasising renewable resources and sustainable development;
b) *the guarantee of resource protection and their potential to be renewed in the long run.* This calls for additional attention towards the negative ecological effects, which have been slowly accumulating during a long run and expanding to cause disastrous outcomes. The samples of such *irreversible* damage can be illustrated as follows – "the greenhouse effect", reduction of the ozone layer, lost of biological diversity with some species of fauna and flora getting extinct, erosion of soil, contamination of underground water. It vital to comprehend these *global* environmental problems require *global solutions*;
c) *the opportunity to preserve and apply alternative methods for rational employing environment and resources for future generations.* This issue seems to get very little attention and valuable discussion in modern market.

3) Sustainability forces limitations upon the society's ability to exchange with the surrounding natural systems and upon the society's structure as well. People-oriented the **social-cultural** sustainability concept *reflects the interface between development and dominating social norms and strives to maintain the stability of social systems, considering equality among different generations and securing survival of cultural variety as well as remising the possibility of destructive conflicts.* For those who pursued social justice sustainable development envisaged the long-hoped alternative for economic orthodox doctrine and neo-liberalism.

The responsibility for planet demand *global solidarity and cultural basis*. It relates with *local development*. Practically, without strong consensus on local level to set priority for sustainable development, it is impossible to connect economic, environmental and social (communal) systems. Therefore we can to formulate basic **principle of management** of *society sustainable development* ***(community principle):*** *for socially stable development we must to further to incite wider participation of people in the decision making*.

Taking into consideration these three society sustainable development management approaches, it is possible to formulate generalised **principle of management** of *sustainable development* ***(complexity principle)***, which require to analyse *sustainable development* as the interface of *three systems – ecological, economic and social*. ***In this case, the common goal of society sustainable development would be to maximise goals from the viewpoint of all systems concerned by utilising the exchange process, exchange made among various goals of economic, social and ecological systems, and by evaluating them through the optimising process applied to individual space in individual time limit***.

Sustainable development is a compromise between environmental, economic and social objectives allowing to commonwealth of the society for itself and future generations without exceeding allowable limits of environmental impact.

Thus, the *sustainable development* concept merges two urgent *goals*: a) *to ensure appropriate, secure, wealth life for all people* – its is the goal of ***development***, and b) *to live and labour in accordance with bio-physical limits of the environment* – it is the goal of ***sustainability***. These goals might seem contradictory but, despite that, they have to be achieved in unison.

In the ***policy*** of sustainable development important place will be given to three basic matters: a) to the proper social – economic *theory* of development, b) to the exhaustive, reliable, and renewable economic, ecological, and social information *data bases*, c) to *moral values*, which predominate in the society (*Figure 1*).

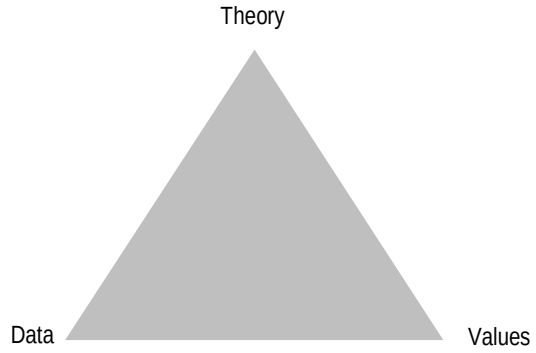


Figure 1. **The policy of sustainable development**

Sustainable development, as elaborated in Agenda 21, has three explicit dimensions, the *social*, the *economic* and the *environmental* one, and implicitly a fourth, the ***institutional*** one. (The ignorance of this *dimension* is one of the biggest shortages of management of implementation of society sustainable development). This can be visualized by the "***prism of sustainability***" (*Figure 2*).

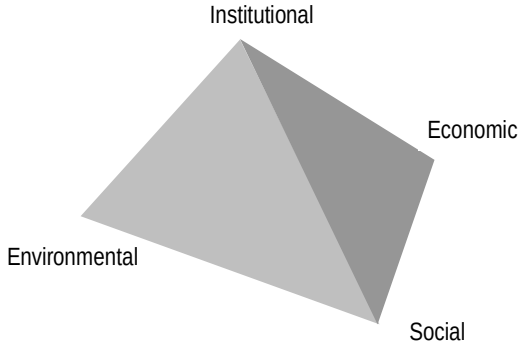


Figure 2. **The four dimensions of sustainability** (Spangenberg et al, 1999)

For all dimensions of *management* of the sustainable development priorities should be identified: for *environmental* – safeguarding the environment; for *social* – strengthening social coherence/justice; for *economic* – satisfying material needs; for *institutional* – participation/co-decision. It is, however, not enough to define targets for the four dimensions of sustainability. They are only expressing some of the necessary preconditions to maintain the self-reproduction cycles of the four related subsystems, without giving any information on the character and effect of the correlations. Therefore, and also because these relationships often turn out to be closely linked to the most important fields of policy making, we have to pay attention to the proper definition of ***targets for the relationships*** as well:

- the relationship between the *social* and *environmental* dimensions – sustainable mobility;
- the relationship between *economic* and *environmental* dimensions – preventive economic policy;
- the relationship between *social* and *economic* dimensions – fair distribution of the material wealth;
- the relationship between *environmental* and *institutional* dimensions – co-decision in environmentally significant processes;
- the relationship between *social* and *institutional* dimensions – existence of suitable conditions for social self-organization;
- the relationship between *economic* and *institutional* dimensions – participation in decisions on production and consumption.

2. The Need of the Indicators in Management of Society Sustainable Development

If we cannot *measure* society's targets, it is impossible to *govern*. Therefore, if we want to manage sustainability, the society is in charge of formulating sustainability objectives, which should be constantly reviewed and assessed. It is clearly known that no intelligent decisions on sustainable development implementation can be made without using a set of reliable sustainability indicators. Indicators play a basic role in any strategy reporting and implementation audit. The *sustainable development* ***indicators*** can successfully measure the degree of objective implementation. But the definition of sustainable development does not give an indication on how to measure sustainability in practice.

Indicator development is always a *two-way* process. It is preferable to set certain indicators not only for policy aims, but they should assist in determining and formulating the policy itself. Thus, developing indicators is not a purely technical or scientific process: rather, it should be an open communication and policy process.

Indicators must be linked to concrete and – where useful and feasible – to quantified goals. Current international sustainable development reporting consists mainly of bringing together some key indicators developed for each one of the three sustainable development „pillars", i.e. combining environmental indicators, social indicators, and economic indicators. Sustainable development will, however, not be achieved simply by adding the three different sets of policy objectives, as this would result in a weak compromise. Better integration of policy objectives is needed, so that we could benefit optimally from their synergistic effects, taking trade-offs into account. By using a set of well-defined indicators, it becomes easier to communicate sustainable development, and in particular, the Local Agenda 21 implementation process. For assessing the efficiency of sustainable development strategies the following ***indicators*** can be used:

- *social and economic indicators*;
- *indicators of environmental condition and indicators of environmental pressure*;

- *indicators of social activities*.

Using the *Prism of Sustainable Development* model (*Figure 2*), prioritisation should be encouraged in this process by reducing the number of indicators down to 12 – 15 (each connected with targets), while at the same time supporting a broad and balanced coverage of environmental, social, economic and institutional issues.

Having formulated the principles of sustainable development and main presumptions of environmental utilisation, *"environmental indicators"* can be further discussed. ***Indicator*** – is the measure, differentiating from other values with its specific objectives, outreaching everything what could be directly measured. Indictors, in fact, can be used in order to reduce quantities of complex correlation, bringing them to a simple formula and, thus, facilitating evaluation.

The OECD "*Pressure – State – Response*" and "*Driving forces – Pressure – State – Impact – Response*" indicator model is usually applied for creating environmental indicators, where ***three levels of indicator formation*** are distinguished:

a) *indicators of environmental pressure*, as a potential impact criteria of human activity on environment;
b) *indicators of environmental state*, as the criterion of environmental quality;
c) *response indicators*, demonstrating the social reaction to changes of environmental state.

Thus, an optimal quantity of environmental indicators should be selected in order to improve the current indicator system and to assess competitive tendencies and system requirements.

The study of the sustainable development assumes an application of large, complex set of variables, describing different aspects of the development. To create this set, we need to select and/or aggregate these variables, but also analyse the correlation among them. The systemic method of indicator selection should follow the adequate scientific methodology, incorporating multi-dimensional components and assessing uncertainty. (Uncertainties occur in all stages of the decision making process and are the major reason for the difficulty of decision making). Such method should be flexible, i.e. capable of supplementing or reducing the number of indicators in order to achieve a better evaluation results in the given case. Eventually, in order to promote the progress of sustainable development, strong streamline indicators should be identified and properly applied. Indicators of sustainable development should concentrate the attention on the *start of the development cycle*, such as energy, natural resources, chemicals and other development sources and measures.

The use of sustainability indicators has been instrumental to modern attempts to promote environmental protection in different contexts across the Baltic Region too. The next step for examination of countries' progress along a path of sustainable development is to use *indices*. S. Žičkienė and Z. Tamašauskienė (2003) determined that a sustainable development index as a composite index, which incorporates eighteen indicators, six from each of three sectors – *economic, social* and *environmental*. Their findings showed that Lithuania is making progress along the path of sustainable development.

Hence, sustainability can be achieved only by the mutual integration of the four dimensions, an extremely ambitious, although necessary and urgent economic, environmental and social policy task. The **principle of management** of *sustainable development* ***(integration principle)*** is paramount, as it requires incorporating social and institutional interests in the environmental policy (economic interests are automatically included, and often dominate). This principle must follow the **institutional principle of management** of *sustainable development* ***(subsidiarity principle)***, which require, that *institutional decisions must be made on the possible lowest level*.

We can distinguish four economic levels in the policy of society's sustainable development (Hinterberger *et al*, 1997):

- the micro-level (enterprises and consumers),
- the meso-level (institutions and networks),
- the macro-level (fiscal, monetary and distributional conditions), and
- meta-level (societal goals).

The targets have to be defined for all economic levels of decision-making in a coherent manner. The resulting policy target matrices can be used to derive sustainability scenarios that include all four dimensions (economic, social, environmental and institutional) and economic levels (meta-, macro-, meso- and micro-level) in a coherent manner. A number of modelling approaches, using different simulation tools, have shown that such scenarios can be constructed in a coherent and workable manner (Spangenberg *et al*, 2000).

It is recommended to start the sustainable development process in all levels at the same time:

- global (international Agenda 21),
- state (national Agenda 21),
- regional (regional Agenda 21, for example, Baltic 21, which includes Region's sustainable development goals agreed by eleven Governments of the Baltic Sea Region and other Members of Baltic 21) and
- local (Local Agenda 21).

Redirecting our societies and economies towards sustainability is a task that cannot be attributed to any subgroup of society but one that needs to involve society at large if it is to be managed. The involvement of *all major groups of society* is one of the main institutional innovation that the sustainability discourse and Agenda 21 have brought about, and the success of implementation of Agenda 21 is possible only if they *work together*.

The World Summit on Sustainable Development (WSSD), which took place in Johannesburg 26 August - 4 September, 2002, reaffirmed sustainable development as one of the most important elements of the international agenda and gave new impetus for a global action to fight poverty and protect the environment. The understanding of sustainable development was broadened and strengthened, particularly the correlation of poverty, the environment and the consumption of natural resources. Governments agreed to a wide range of concrete commitments, in particular the Millennium Development Goals, as well as targets for action to achieve more effective implementation of sustainable development goals. Countries increasingly identify their national security interests with resource availability. Policies and programs for achieving sustainable development are essential for survival. It is necessary to try new approaches and to put in place new mechanisms that can provide a more sustainable model of development.

What Lithuania is concerned, the development of the National Sustainable Development Strategy started in July 2002, and has already been completed and recently approved by the Government. The Strategy is essential for further methodical and more co-ordinated implementation of national sustainable policy. Sustainable economic development based on the harmonised interaction between sectors and country's regions becomes a top priority of sustainable development in Lithuania. The main objective of sustainable development in Lithuania is to achieve the present average of the EU countries by 2020 in accordance with the indicators of economic and social development as well as the efficiency in consumption of resources, not exceeding the permitted EU standards according to the indicators of environmental pollution, to meet the requirements of international conventions in the field of minimisation of environmental pollution and impact on the global climate change.

In the context of sustainable development, industrial companies can not be viewed as an isolated unit. Industry should be viewed as an element of a broader dynamic system. Application of systems approach is crucial to understand complex interactions between different segments of such a system and enable application of most effective strategies and tools that will drive industrial development in a sustainable way. Analysing the implementation of sustainable development on the micro-level of *companies* and *economic organisations*, it is possible to formulate an important **principle of management** of *society's sustainable development* ***(profitability principle)***. *Companies* and *economic organisations* finally should realise that:

1) businesses and environment must assist each other, but not limit or disturb;
2) it is ***profitable*** for organisations to participate in the society's sustainable development.

In order to support industry's initiative in coping with environmental and sustainable development challenges and in utilising opportunities of sustainable industrial development, *National Program on Sustainable Industrial Development in Lithuania* was developed.

It is possible to distinguish these **principles of management** in the management of society's sustainable development:

a) *inter-sectoral view*,
b) *participation of society*,
c) *view to the future*,
d) *effective use of the natural resources*,
e) *local, regional and global activity impact assessment*,
f) *programming*,
g) *holistic thinking*.

If we consider the *decision-making mechanism* of sustainable development, considerable attention in the planning process should be given to the preparation of strategies of sustainable communities. When a *strategy of sustainable communities* for a particular community will be prepared and successfully implemented, the ***law of multiplication*** should start to operate: other sustainable communities will start to develop next to the established sustainable community, and, therefore, these sustainable communities will create the sustainable *regional* society, which, consequently, will unite regional societies into one sustainable *global* society. In fact, this step-by-step development will grow from the *local* (sustainability) to the *global* (sustainability).

The conclusion can be made that socially- and ecologically-oriented economic and management theories seek *to encourage (to stimulate) and to ease transformation of today's economy to healthy, humane and ecologically safe (sustainable) system*. These theories widely discuss:

- environmental functions and welfare in general, which is created using four forms of capital,
- suitable (appropriate) and well functioning social institutions,
- effective monitoring systems of implementation tasks of sustainable development,
- social equity, which leads to growth of *human welfare*.

3. The Use of Concepts of the *Environmental Space* and the *Ecological Footprint*

In order to find a feasible answer of how to evaluate sustainability goals of economic development, two concepts of "the ***environmental space***" and "the ***ecological footprint***" can be applied. Their background is identical, namely *a deep concern in surplus production and consumption in the North and development perspectives in the South*. The *"environmental*

space" is a more complex approach, where various important resource sectors are being analysed on the national level. Thus, the *"environmental space"* faces application difficulties in practice, comparing it to the *"ecological footprint" concept,* where resources are brought together into a single indicator at the desirable aggregated level. Besides, the *ecological footprint* makes the sustainability challenge more transparent, reflecting upon "***the plots of productive land and water ecosystems, necessary for resource supply and later utilised by the world's population, and the waste absorption, produced by the population, despite the location of water and land of the Earth***" (Rees, 2000).

It is known that those current projects, which applied the *environmental space* and *ecological footprint* concepts, have not presented a thorough developed scenario for securing sustainability, but have only produced a presumptive framework of directives and major implementation principles. In the future, this evaluation should be supplemented by actual figures, assuming the quantity of resources the world could utilise in a sustainable way.

The basic idea of the *ecological footprint* concept, proposed by *W. Rees* (1992) and later developed together with *M. Wackernagel* (Rees, Wackernagel, 1994), predisposes every individual process, activity and region as influencing the utilisation of the Earth's resources, waste accumulation and consumption of nature's services. This complex impact caused by utilisation of resources and the environment can be converted into a one-dimensional measure (that is where the substantiality of the method comes into force), namely into a biologically active land plot which should be presented in a calculated form.

Six land categories are identified for calculation procedures: utilised/ damaged land, gardens, landed properties, pastures and meadows, productive forests, energetic land and productive sea space. Therefore, ecological footprint indicates, how much the nations use nature. In reality, this footprint is not a solid land plot.

Applying this method to land distribution per person demonstrates that the average ecological footprint in the world would amount to about 1.8 hectare per capita. The ecological footprint in most developed countries reaches 3-5 hectares per capita, while in underdeveloped countries, like India, this figure reduces to 0.4 hectare per capita. Bearing in mind the fact that most developed regions exceed the ecological footprint limits of local ecological capacities, this inevitably leads to claiming extra ecological capacity from the global fund.

Attempts were made to calculate the ***potential ecological space***, i.e. the actual productive land plot of a region (Wackernagel, Rees, 1996). During the century, this land plot has shrunk from 6 hectares to 1.5 hectares on the global scale. It is also possible to compare the *ecological footprint* with the *potential ecological space*. Using the above-stated figures, it can be assumed that, at present, the humanity is exceeding the Earth's ecological capacity by 0.3 (= 1.8-1.5) hectares per capita, i.e. we face the *"ecological deficit"*, which could serve as the quantitative indicator for non-sustainability – the parasitical way of human life (*Figure 3*).

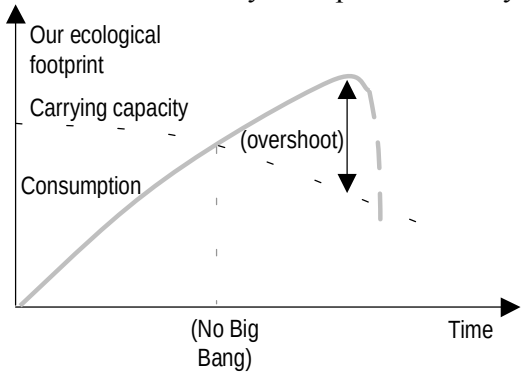


Figure 3. **The "ecological deficit" – economic growth exceeding the ecological capacity**

Some critique can also be found towards the *ecological footprint* concept.

Firstly, the ecological footprint presents a *one-dimensional indicator,* summing up the total ecological impact, directly or indirectly related to consumption, which assumes the shape of utilised land plot. In order to perform this calculation, different consumption categories should be transformed into the land plot category. It is obvious that this ***transformation*** might never be complete as some local characteristics of land types and land utilisation might be ignored.

Secondly, the ecological footprint refers to a *hypothetical* land plot, thus, there is some danger that it would be interpreted as *actual* or at least realistic utilisation of land. Besides, the ecological footprint does not differentiate between sustainable and non-sustainable utilisation of land, according to its definition.

Thirdly, issues, related to exercised *procedure of measurement and aggregation*, deal with the evaluation of environmental impact on *energy consumption*. This component of the ecological footprint approximately consists of rough calculations on productive land (forest) plot, which is necessary to assimilate CO_2 emissions, produced by burning extracted fuel. But CO_2 assimilation by forests is only one possibility of compensating CO_2 emissions, and, besides, it requires huge land plots.

Fourthly, the calculation of the ecological footprint does not incorporate the component of *fresh water*, the aspect, which is very crucial for droughty regions.

Fifthly, the ecological footprint does not reflect *environmental pollution*, exceptionally concentrating upon CO_2.

Sixthly, from the environmental point of view, the arbitrary selection of *spatial dimensions* (global, regional, and local) is exercised for calculating the ecological footprint. Especially, when national boundaries are determined by geo-political and cultural nature rather than environmental aspects.

Seventhly, the ecological footprint is characteristic of *anti-trade tendencies*. Thus, it cannot be interpreted as an objective indicator. The ecological footprint method totally ignores comparative advantages of countries and regions, related to the individual contribution of environmental and ecological resources.

Eighthly, the ecological footprint is a *static* indicator. It does not provide information on the recovery rate of natural systems and their marginal capacities in time and space.

How could the calculation of the ecological footprint be improved? Some suggestions could follow:

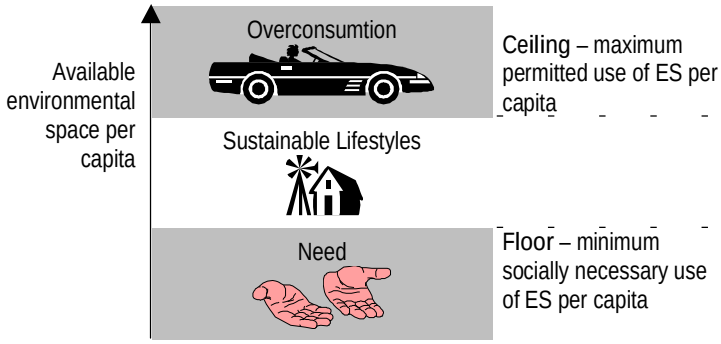
1. *Actual* figures, not *hypothetical* should be used in comparing two types of ecological footprint, which would reflect actual sustainable and non-sustainable land utilisation per person.
2. More flexibility should be allowed in the ecological footprint calculations.
3. One should be very responsible in proposing unique and absolute value of the ecological footprint.
4. Probably it would be the best to use the *scenario method*, which permits to research complex processes under the circumstances of big changes. The modelling method, not the accounting one, should be selected to realise economically valid conclusions.

According to *H. Opschoor's* concept, the term *ecological space* is defined as

the total amount of absorption capacity of environmental pollution, non-renewable resources, energy, landed property (land), water and forests, permissible to the humanity to serve and create without reducing nature's capacities for future generations to be able to use the same amount of aforementioned resources

(Netherlands Journal, 1994).

As demonstrated in *Figure 4,* this concept constitutes that at any time there are limits to the degree of environmental pressure, the Earth's ecological systems could cope without irreversible damage to these systems.



Abbreviation: ES – environmental space

Figure 4. **Living with our environmental space**

Mechanisms of progressive resource taxation based on the environmental space as a "threshold concept" should be considered as a necessary instrument for the enforcement of sustainable development.

Making the concept of environmental space *operational*, it requires a three-stage approach (Sips *et al,* 1994/5):

1) determining the human demands for environmental functions;
2) determining the sustainable supply of environmental functions;
3) matching supply and demand.

It is beyond any doubt that it will not be possible to prepare further strategies of effective environmental protection without clarifying, how much ecological space we have globally. The starting point for calculating the ecological space could be the following presumptions:

- renewable resources should be utilised at the rate without causing any serious damage to the environment;
- non-renewable resources should be utilised in a closed system;
- the pollution rate caused by people should not exceed the potential of environmental assimilation.

Thus, the amount of the ecological space is *limited* in its nature and at least it can be measured *quantitatively* up to some degree. In addition, the *environmental space* concept offers an opportunity to determine, how much environmental space of one country is used by inhabitants of the other one, by comparing the *global* utilisation of an individual resource, expressed as the average per person in *national* consumption.

It must be evaluated that the environmental space cannot be equalled to consumption. Rich countries should radically decrease their claims to the allocated environmental space, partially or totally compensating this loss by markedly increasing economic effectiveness.

4. The Theoretical Principles of Calculating the Environmental Space for Individual Resources

Local divisions of the International Environmental Organisation "*Friends of the Earth*" mutually implemented a project "*Campaign for Sustainable Development of the Europe*" in thirty countries of the EU, EFTA and Central and Eastern Europe Region in 1995-1997. The aim of this campaign was to envision European production and consumption till

the year 2010, evaluating the environmental space (Towards Sustainable Europe, 1995). By personally participating in the project, it was a unique opportunity together with foreign economists to create and improve theoretical principles of calculating the environmental space for individual resources.

The calculations of the environmental space in the project initiated by "*Friends of the Earth*" were mostly based not on resources accessibility but on the resources utilisation impact on the environment. During the course of scientific discussion, many environmental indicators were proposed, evaluating resource depletion as well as levels of contamination. The article is dedicated to the analysis of *a group of indicators, which constitute around 90% of all material flow in industrial process and resource utilisation taken together*.

Energy. When calculating the energy supply for the environmental space, it was presumed that ***"the greenhouse effect" is the major problem related to modern energy sector, which serves as a foundation for calculating the environmental space for energy considered a global value***. Trying to maximally restrict negative consequences of the "greenhouse effect", scientists agree that the permissible temperature increase per decade is $0.1^{o}C$ and no more than maximum increase of $2^{o}C$ in comparison with pre-industrial level. It means that the amount of CO_2 in atmosphere cannot exceed 550 ppm. Thus, the current situation should be transformed into the annual reduction of CO_2 emissions at least by 1-2% on the global level. Actually, it sounds unreal that by the year 2010 the desirable level of CO_2 emissions can be reached (1.7 tonnes per capita), transitional goals are needed as well. Besides, the most important element of the long-term scenario should be converting the current sources of energy to renewable (*sustainable ones*), as sustainable development cannot be guaranteed without transforming the global energy system into the sustainable one.

Fresh water. Only 2.5% of total water supply is *fresh* water, nearly 85% of which being accumulated in glaciers and permanent snow cover. The man has no power or knowledge how to use it. In fact, no more than 14,000 cubic kilometres of fresh water can be used, but the greater part of this water should be left for the maintenance of natural-ecological systems (Prust, 1995).

In some countries ***the index of water consumption, which is the ratio between the water consumed and the potential of fresh water in the territory,*** is quite high, sometimes equals to 1 or over. Here the environmental space is exceeded. For example, non-sustainable consumption of water, i.e. the situation when water extraction from underground water resources is faster than they can restore themselves over time, is characteristic of approximately 60% of major European cities with the total population of 140 million.

The fresh water space should *be calculated for each region individually,* which is very complicated and complex: it is conditioned by the local climate, hydro-geology of water system, the flora of the region, capacities of over-ground and underground water flows.

Non-renewable natural resources. Extraction of non-renewable resources *means a constant depletion of resource supplies in their nature*. So, the use of non-renewable resources cannot, strictly speaking, be sustainable. However, sustainable policy of non-renewable resources does not imply prohibiting its utilisation, but encompasses an intelligent, economical consumption to ensure their sufficient supplies for the future generations. The current situation faces the dilemma that the today's exploitation of non-renewable resources is destructive to the nature. The potential of ***the scope of the environmental space for non-renewable natural resources, for instance for metals, is fixed and determined by their rarity and environmental costs, originating from their extraction and utilisation (for example, energy consumption, level of toxins and discharge into the environment)***.

Calculations show that the global flow of such materials should be reduced by 50% during the next 30-50 years (Hinterberger, Schmitd-Bleek, 1999). Bearing in mind that the principle of justice demands the quantities of saved potential materials to be equally

distributed among countries, industrial countries will have to reduce the utilisation of various resources by 80-90%, i.e. by 10 times. A key concept in the use of non-renewable (but also renewable) resources is an increase in the dematerialisation of material flows in the technosphere – a reduction in resource use and an increase in the ecological efficiency of the production of goods, eventually leading to the well-being of society (Hoffren, 1988).

Agricultural resources. Land should be treated as a limited resource, because about 78% of the planet's landscape is either too damp, or too dry, stony, too steep or too shallow for cultivation of agriculture (Cleveland, 1994). Nowadays, nearly all arable land in the world is being used – approximately 1475.43 million hectares of arable land (Biswas, 1994). It comprises approximately 0.24 hectares per capita.

Contemporary and very intensive methods of agrarian production are non-sustainable by reducing the arable land potential by around 16 million hectares per year. Thus, by the year 2010, only 0.22 hectares will be accessible per capita. If the same decreasing tendencies persist till the year 2025, the land suitable for agricultural activities will be reduced to 0.17 hectares per capita with the total Earth's population of 8.4 billion (The Concept, 1998).

In order to calculate ***the environmental space, accessible for agricultural production, the following presumptions were taken into consideration***:

- environmental space is defined as a land plot, required to supply country's population with food and it is calculated on the level of different continents;
- as the problem of feeding people becomes global, one of the most significant dilemmas of the civilisation appears to be the provision of food, which should become the highest priority;
- the whole agriculture should become sustainable, which means, in a way, that no more arable land could be lost or wasted;
- as land considered to be a continental resource, it should be pursued that each continent provides its own food supplies, which would significantly reduce the transport energy, people's uncertainty and tension;
- it is presumed that 10% of currently employed land should be released from the circulation of agriculture and forestry and "returned to the nature" for the purpose of environmental protection.

Timber resources. According to specialist calculations of the World Nature Fund, forest plots have been reduced by ⅔ since the beginning of agricultural era (Mather, Chapman, 1995), thus, today forests cover only ¼ of the Earth's surface, i.e. approximately 3604 million hectares. Rainforests take nearly half of this figure but, comparing them with other biomes, they are being extinguished at a faster rate: since 1950 about half of the global rainforest have been exterminated.

Having considered that forests are vital in preserving life on the Earth, scientists have calculated that 1 hectare of forest brings benefit to the humanity, valued in 969 US dollars per annum (Costanza, et al, 1997). Thus, we should first improve *the sustainable forest management*, oriented towards forest protective functions and the value of environment formation and general social benefit.

"***Timber space***" calculations on the global level demonstrate that we have no right to cut the forests in the remaining 2173 million hectares of the *primeval forest*. Deforestation of the remaining 1431 million hectares of the *secondary forest should be sustainable*: the biological variety should not be disturbed and their potential to restore should be preserved. This implies that approximately 2 cubic metres of timber can be cut from each forested hectare.

Conclusions

1. According to theoretical presumptions of various theoreticians, three major types of sustainable development management approaches can be identified, which allows sustainable development to be analysed as the interface of ecological, economic and social systems, taking into consideration ethical aspects as well:
   - *Approach of economic sustainability management*. It is based upon capital convertibility theory and the concept of Hicks-Lindahl maximum income, which can be acquired by saving necessary reserves of equity, by creating benefit for future generations.
   - *Approach of ecologically sustainable development management*. It is presumed that the primary task of economic development is to determine the limits of natural systems for various economic activities and to emphasise the need for preserving biological diversity in ensuring balanced nature.
   - *Approach of social sustainability management*. It reflects the interface between development and dominating social norms, while it also strives to maintain the stability of social systems.
2. Sustainable development, as elaborated in Agenda 21, has three explicit dimensions, the *social*, the *economic* and the *environmental* one, and implicitly a fourth, the *institutional* one. The *"prism of sustainability"* can visualize this. In *managing* the sustainable development certain *goals* must be presented in the following dimensions:
   - for *environmental* – safeguarding the environment;
   - for *social* – strengthening social coherence / justice;
   - for *economic* – satisfying material needs;
   - for *institutional* – participation / co-decision.

Because the relationships often turn out to be closely linked to the most important fields of policy making, we have to pay attention to the proper definition of *targets for these relationships* of the sustainability prism as well.

3. The management of society's sustainable development should be based on the corresponding principles:
   - *complexity principle,* which require to analyse *sustainable development* as the interface of four systems – ecological, economic, social and institutional;
   - *community principle*, which states that for socially stable development we must further incite wider participation of people in the decision making;
   - *prevention principle*;
   - *principle of holistic thinking*;
   - *subsidiarity principle,* which requires institutional decisions should be made in the possible lowest level;
   - *planning principle*;
   - *profitability principle* demonstrates that companies and economic organizations should finally understand that businesses and environment must support each other but not limit or disturb, that it is *profitable* for them to participate in the society's sustainable development.
4. To have a better comprehension and knowledge of society's sustainable development and management, it is necessary to develop suitable indicators, which capture different dimensions of sustainability.
5. In search for solutions of adequately evaluating the achievements of sustainability in economic development, the concepts of "the *environmental space*" and "the *ecological footprint*" can be applied. Their background is identical, namely a deep concern in surplus production and consumption in the North and development perspectives in the

South. They envisage the human material dependency upon nature and demonstrate, how much land is needed to satisfy a certain way of life.

6. These concepts also face differences, which are described below:
   - ***The ecological footprint concept***. The ecological footprint, where resources are accumulated in one aggregated indicator, expressed as a hypothetical and plot for human activity is further defined as *the plots of productive land and water ecosystems, necessary for resource supply and later utilised by the world's population, and the waste absorption, produced by the population, despite the location of water and land of the Earth.* This makes the sustainability challenge more transparent, where decision-makers intuitively have a clear, digitally-determined criterion in evaluating the potential of politics, projects or technologies related to ecological issues.
   - ***The environmental space concept***. The environmental space can be denied as *total amount of absorption capacity of environmental pollution, non-renewable resources, energy, landed property (land), water and forests, permissible to the humanity to serve and create without reducing nature's capacities for future generations to be able to use the same amount of aforementioned resources*. It is difficult to apply this concept in practice, as resources are not aggregated into a single indicator, compared with the ecological footprint concept.

7. The application of existing concepts of *environmental space* and *ecological footprint* in scientific projects has not reached a feasible scenario for sustainability. They only demonstrated the main framework and implementation principles, thus, are not finalised yet. Therefore, intensive discussions are foreseen in methodological aspects determining the amount of environmental space. The cornerstone of calculating the environmental space can acquire the following forms:
   - renewable resources (agricultural land, forests, fish) should be utilised at the rate without causing any serious damage to the environment;
   - non-renewable resources should be utilised in a closed system;
   - the pollution rate caused by people should not exceed the potential of environmental assimilation.

8. Indicators, determining the environmental space, should take account of its dynamics – the fact that human needs (demand) and their impact on the environment and its functioning change in a long run. The project, initiated by the International environmental protection organisation "Friends of the Earth", presented the environmental space calculations, which were based not on resources accessibility but on resources utilisation impact on the environment.

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TVARIOS VISUOMENĖS PLĖTROS VALDYMO PRINCIPAI IR EKONOMIKOS TRANSFORMACIJOS

Remigijus Čiegis

SANTRAUKA

Straipsnis skirtas visuomenės subalansuotos plėtros valdymo problemoms nagrinėti, ypač gilinantis į keturis sąlygiškai atskirus aspektus: *ekonominį, ekologinį, socialinį* ir *institucinį*, analizuojant socialiai ir ekologiškai orientuotas ekonominės plėtros teorijas. Ypatingas dėmesys skiriamas visuomenės subalansuotos plėtros valdymo svarbos ekonominių teorijų raidoje klausimams. Siekiant atskleisti socialiai orientuotų ekonominių teorijų potencialą, plačiau charakterizuotas vienas iš ekologiškai subalansuoto tolesnės visuomenės plėtros galimų scenarijų, besiremiant *aplinkos naudojimo erdvės* koncepcija.

Straipsnyje konstatuojama, jog ekonominėje ir aplinkosauginėje literatūroje dabar pateikiama daugiau kaip 70 ekologiškai subalansuotos plėtros apibrėžimų, tačiau tinkamiausiais būtų Brundtland komisijos pateikta sąvoka: *„subalansuota plėtra – tai tokia plėtra, kuri patenkina dabartinio laikmečio poreikius, nesudarydama pavojaus būsimoms kartoms patenkinti savuosius. Subalansuotos plėtros koncepcija numano ribas – be*

absoliučius limitus, bet ribojimus, uždedamus esamos technologijų bei socialinio organizavimo būklės aplinkos ištekliams ir galimybės absorbuoti žmonių veiklos efektus“.

Visuomenės raidos (plėtros) pasekmių analizėje galima išskirti:

a) ekologinį matmenį;
b) ekonominį matmenį;
c) socialinį matmenį.

Tuo pačiu galima išskirti ir visuomenės subalansuotos plėtros ***valdymo metmenis***:

1) ekologinį – užtikrinti aplinkos saugumą;
2) socialinį – stiprinti socialinį darnumą ir teisingumą;
3) ekonominį – patenkinti materialinius poreikius;
4) institucinį – užtikrinti visuomenės dalyvavimą sprendimų priėmime.

Straipsnyje išskiriami ***visuomenės subalansuotos plėtros valdymo principai***:

- *kompleksiškumo principas*: jis reikalauja subalansuotą plėtrą nagrinėti kaip keturių sistemų – *ekologinės, ekonominės, socialinės ir institucinės* – sąveiką;
- *bendruomeniškumo principas*: norint užtikrinti socialiai stabilią plėtrą būtina šiuolaikinėje visuomenėje ir toliau skatinti kuo platesnį visų žmonių dalyvavimą priimant sprendimus;
- *prevencijos principas*: jis reikalauja šiuo metu skirti išteklius norint garantuotai apsisaugoti nuo dabartinės veiklos potencialių katastrofiškų efektų ateityje;
- *holistinio mąstymo principas*: sprendžiant sudėtingą subalansuotos plėtros problemą, reikia, kad būtų atsižvelgta į kiekvieną problemą sąlygojantį veiksnį;
- *subordinacijos principas* teigia, kad instituciniai sprendimai turi būti priimami galimai žemiausiame lygmenyje;
- *planavimo principas*: visuomenės subalansuotos plėtros įgyvendinimo procesas turi būti planuojamas, panaudojant „Vietos darbotvarkę 21“ (Local Agenda 21) kaip vieną iš galimų planavimo stadijų;
- *pelningumo principas*: įmonės ir ūkinės organizacijos galiausiai turi suprasti, kad verslas ir aplinka turi padėti vienas kitam, o ne riboti ir trukdyti, kad joms yra pelninga dalyvauti visuomenės subalansuotos plėtros įgyvendinimo procese.

Ieškant sprendimų, kaip būtų galima įvertinti ekonominės plėtros subalansuotumo tikslų pasiekimą, straipsnyje nagrinėjamos „***aplinkos naudojimo erdvės***“ ir „***ekologinės pėdos***“ koncepcijos. Aplinkos naudojimo erdvės apskaičiavimus galima išreikšti konkrečiais ištekliais, pvz., energija, gėlu vandeniu, neatsinaujinančiais gamtos ištekliais, žemės ūkio ištekliais bei medienos ištekliais.

Šiame straipsnyje atlikti tyrimai ir gauti rezultatai atveria geras perspektyvas ir padeda, autoriaus nuomone, tvirtus pagrindus naujam visuomenės subalansuotos plėtros valdymo dėsningumų pažinimui.

REIKŠMINIAI ŽODŽIAI: tvari plėtra, valdymas, ekonominis augimas, aplinka, rodikliai.