University doctoral (PhD) dissertation abstract

How is sustainability measured?
Evaluation of indicator sets in the national sustainable development strategies of EU countries

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INTRODUCTION

The most serious and urgent task for mankind is to avert the global ecological crisis. Several other gloomy dangers also lurk on humans: the war of civilizations, the expansion of poverty, mass famine, but the overturn of the dynamic balance of the planetary, life-support regulatory systems of nature might result in the devastation of life on earth, or at any rate that of mankind. The topic of sustainability is the current, global survival problem of our days.

This should be highlighted and stated in a definite, firm and explicit way, since many – most certainly ignorant, uninformed and/or short-sighted, selfish politicians, dominant opinion-makers, greedy, money-hungry, power-thirsty business people fail to recognize the danger; they hush it up, deny it or play it down.

Moreover, there are misbeliefs that environmental and sustainability policies formed in the past forty years represented a significant step in the direction of sustainability. It should be clearly seen that despite certain local results and few global success stories, in summary the past decades resulted in catastrophic transformations, so I regard the following statement only a cautious one: *"we have good reasons to think that globally we have not got closer to sustainability whatsoeve*r" (WILSON et al., 2007, p. 300.). In fact, we have moved away from it in a dangerous way. The threat has become greater than ever.

My thesis focuses on the most significant task that mankind faces, i.e. how to guarantee sustainability, including a primary sub-category, the measurement of sustainable development. Sustainability, sustainable development (SD), the interpretation of the notion of sustainable development, the clarification of these concepts mean difficult problems in themselves; furthermore, they include theoretical and practical challenges.

My starting point is the widely-accepted epistemological concept of natural sciences, which claims that *concept-formation* and *measurement* are parallel theoretical and practical activities for the description and understanding of reality and for driving processes in the favourable direction. The definition of the set of specific indicators and indices is by no means a secondary technical issue, but one of the focal points to solve the fundamental problem.

Moreover, this is the concrete representation of a research issue which should be raised on a much higher level of abstraction. The identification of a set of measurements which is suitable for quantitative description, sufficiently comprehensive but nevertheless the simplest possible one represents a challenging, significant and unsolved scientific task.

The analysis and the evaluation of the set of national sustainable development strategy systems (NSDS) is a meaningful, timely task for both science and social practice. Highly influential developed countries of our days, which set "examples" for others, more or less recognized the unsustainability of currently applied solutions of technical-social civilization in the past thirty years and started to develop and apply social mechanisms which might result in the conscious realization of the required changes. One of the key parts of these mechanisms is the emergence of sustainable development strategies (SDS). Unfortunately, national sustainable development strategies are weightless and ineffective from a political viewpoint. A root cause for this is that the notion of sustainability and the indicators of sustainability in close correlation with it have not yet been clarified and the notion of sustainability is usually interpreted incorrectly, wordily, superficially and in a misleading way.

A set of indicators selected on the grounds of a conception which is verbally drawn up and specified, can strengthen and further modify, clarify and at the same time operationalize the notion. However, it stiffens it to some extent and delimits it as well, as after the development of a set of indicators, the focus point is firstly the one that emerges out of the indicators. Once the statement is accepted that "the operational definitions and indicators are the pre-requisites for the realization of sustainability through practical political steps" (RENNINGS – WIGGERING, 1997, p. 25.), sustainability is fundamentally reinterpreted by the selection and application of sustainable development indicators. If only or at least measurable political goals are to be achieved which lend themselves to characterization by indicators, such as the majority of sustainable strategies, sustainability will basically mean what we actually measure.

Therefore, the selection and the practical application of sustainable development indicators is an outstandingly significant task, of which realization has already been started widely, and the process has been going on dynamically for more than twenty years. The Stiglitz report also claims that "*statistical indicators are significant in the development and evaluation of policies for boosting social development and in assessing and influencing the operation of economic markets. Their roles have become essentially more significant.*" (STIGLITZ et al., 2008, p. 7.).

Since the beginning of the 2000s, the development of sustainability indicators has become an area for both scientific research and political activity which induces great interest (VAN CAUWENBERGH, 2007). Activities to develop sustainability indicators have spread so intensively that today we can refer to a so-called "indicator industry" (HERZI – NORDIN HASAN, 2004).

However, further research is needed as the sets of currently applied indicators are far from perfect. Martin Ahbe, the Secretary-General of the European Commission claims that although complex sets of indicators are often used on European level, "*the current practice is chaotic in a sense*" (AHBE, 2007, p. 3.). This statement is true of all the levels where indicators are used. Wilson et. al state that "*although sustainability indicators fulfil their roles both in a political and organizational sense from small communities to global applications, it is questionable how effectively they can convert sustainability into actions. Moreover, there is no consensus about the best practice of planning and using sustainable development indicators* (WILSON et al., 2007, p. 300.).

As regards indicators, mention should be made that "*while living in an era of «primitive indicator accumulation», as a criticism of widespread, occasionally extreme experiments to produce indicators for making social-economic phenomenon measurable in western-European countries, a so-called post-autistic movement began in the Sorbonne, France which had followers in the United Kingdom as well* (HAVASI, 2007, p. 678.).

This intellectual trend rejects the obsession of losing ourselves in numbers and regards it as an experiment to "de-enchant" the world. It is "*directed against the dogmatic teachings of neo-classical economics and the «uncontrolled use of mathematics» (ibid)*", raising the probability that "*this might mean the beginning of the end for the culture of measurements and statistics, target numbers and indicators, which have become the fundamental characteristics of modern life (ibid)*". Although such an alteration of processes might seem to be unimaginable, my dissertation focused on the noteworthy warnings of this intellectual trend as well.

The above mentioned are to demonstrate that the subject of my thesis, the study of sustainability indicator systems, is a research area which includes extremely significant, timely and unsolved problems.

1. SUBJECT AND OBJECTIVES OF RESEARCH

My research explores the set of indicators for national sustainable development strategies which are currently in force in the EU member states. My goal is to answer the question: *To what extent do the current sets of indicators meet the requirements of sustainable development?*

Such a brief question needs careful interpretation. First of all, it should be clearly stated that the sets of sustainable development indicators in the 27 member states differ in various aspects. The number of indicators included in SDI sets ranges from 12 and 200 in the member states. The selected indicators also reveal high diversity, which is difficult to grasp; undoubtedly, approaches, suppositions and primarily the conception of sustainable development behind the development of SDI sets differ more or less, so there is no uniform set, not even a basic one. However, European sets of sustainable development indicators do have common features, and the *subject matter of my research focuses on the exploration of these common characteristics and differences, the introduction of presumable convergence and the identification of major trends.* The expression "*the sets of sustainability indicators*" in the above brief question is discussed in this sense.

The adjective "*current*" also needs to be explained. The sets of indicators for sustainable development were identified all over the world in the past 15-20 years, mostly by developed countries and international organizations. This process started in the mid-1990s and has continued since then. The occasional renewal of the sets of sustainability indicators means "shooting at a moving target", aggravating the identification of the subject of the research. On one hand, my dissertation seeks to describe the historical development; on the other hand, to explore the latest sets of indicators in each member state.

My analysis covers the SDI sets in all the 27 member states. However, certain states emerge more frequently and circumstantially in the research, with good reason.

Whereas several countries have abundant and full English documentation, merely few and oftentimes abridged sustainability documents are available for some other countries; moreover, the documents are not accessible on the Internet even in the language of the related country. I also presume that some countries may exert higher influences on certain processes than others, so it is expedient to study them foremost. The summary tables include all data in the 27 countries, but for the above mentioned reasons, they are sometimes insufficient.

The last part of my dissertation elucidates two coherent elements of the research question, which are not easy to interpret. I strive to sum up what I mean by "*to what extent do they meet*" and "*the requirements of sustainable development*". The research question may be formulated in several ways. What does a good set of indicators look like? Does an optimal set of SDI exist at all? What are the fundamental characteristics of a suitable set of indicators? What are the requirements for SDI sets? The answers to these questions depend on the objectives, functions of SDI sets and on users' demands. Three functions will be highlighted from among the listed ones in the dissertation, but not in order of importance. A good set of SDI serves the demands of political decision-makers, society and science as well. However, different sets of indicators are best suitable for support on decision-making, information and scientific analysis. This highlights the significance of the grammatical object in the research question, i.e. what and whose interests SDI sets need to serve. If one out of several partial users were singled out, it would raise another question and focus on a lower-level, more specific problem.

However, the research question approaches the topic on a higher level of generality and refers to the issue what *fundamental* purpose is to be served by the set of indicators. The above wording of the question presupposes that the condition of driving development in a sustainable direction is constituted by a suitable set of indicators and the quality of the DSI set should be best characterized by the extent it facilitates this shift. Therefore, the sets of indicators need to satisfy the demands of sustainability, i.e. the expectations of future generations and to provide for their *living conditions.*

The short form of the research question, even following the explanation of its certain elements, raises further questions which determine the structure of my dissertation, providing an explanation of the logical structure of my work and the sequence of the chapters.

1.1. Structure and logical construction

The key question, which is determinant in relation to national sustainable development strategies and their sets of indicators, is *how to approach the notion of sustainability and sustainable development.* The conceptual grasp of this notion determines the type, the composition and inner proportions of SDI sets fundamentally.

The chapter describing the theoretical bases sums up the major variants of the conceptional approaches of SD.

The beginning of the chapter briefly claims that sustainability should be interpreted as a specific representation of long-term, dynamic stability in energetically open, general, complex systems. This is significant, since abstract discussion will hopefully allow the positivist investigation of sustainability, in contrast with today's dominantly normative approaches.

The following part of the chapter first discusses *how the interpretation and the quantitative analysis of the notion, i.e. the measurement of sustainability are related,* followed by the critical analysis of the four approaches: the model built on the Brundtland definition, the three-dimensional one, the theory on capital and the social approach, enhancing their correlations with indicators.

The *third* sub-chapter describes the general introduction of notions in connection to indicators and sets of indicators. The significance of stock-type indices, the correlation of material stocks and sustainable development are included under separate points. The research sub-question of this part should be the following: *what are the criteria of good indicator sets, in what logical structure should SDI sets be arranged and what is the best guideline in the case of various requirements.*

The *third* chapter reveals what is meant by *sustainable development strategy in general and what the most essential features of national sustainable development strategies in EU member states are.* I give an overview of the approximately one and a half decades during which all the 27 member states drew up their NDSI. It presents the characteristics, modifications, and the historical development of these strategies with the indicator sets in the focal point, thus answering questions such as: *how do objectives specified by strategies and indicators correlate; how do the sets of indicators advance or hinder the development and realization of the strategy and the follow-up of results or the communication of the whole process.*

The *fourth* chapter explores the factual subject, describes and analyzes the sets of indicators in the member states. First I summarize the history of the development of the sets of sustainability indicators then it is followed by the examination of SDI sets in the EU, highlighting those essential elements which influence the sets of DSI in certain member states.

I find the historical analysis especially significant as it provides a good insight *where we are on the way towards a fully-developed set of DSI.* The examination of EU DSI seeks to answer the question of how the EU DSI set fulfils its functions; who use it for what purposes how effectively; what national DSI sets can take over from it.

The third part of the chapter directly discusses the sets of indicators in EU countries and, among others, seeks to answer questions such as *how SDI sets are circulated in the member*

states, how the concept of sustainability affects the indicator sets of NSDI, what new type of monetary and non-monetary complex indicators are used.

The *fifth* chapter investigates *the image of SD strategies formed by Hungarian experts of sustainable policies, the indicators of sustainability indicators and the roles of these indicators in the strategy of sustainability.* The chapter sums up the findings of an empirical research carried out by the method of structured in-depth interviews, outlines the professional opinion of Hungarian experts, which might provide an interesting addition to the state of SDI sets, their significance and roles in sustainability policies.

The summary includes not only the findings of research questions, but also the *current state of sustainability policies and strategies in the member states of the European Union.*

1.2. Some restrictive comments

1. My dissertation interprets sustainability as a problem of the global economic system. Clearly, the majority of the researchers of this area approach the question in broader terms and their investigations focus on human needs and well-being. Most of them take one of the loosened (Brundtland-type, three-dimensional, of weak criterion) approaches of sustainability as their starting point. The viewpoint of political practice, including national sustainable development strategies especially equals with the above mentioned opinion.

Therefore, I am well aware of the fact that my analysis is based on a minority standpoint and I wish to emphasize that this is my well thought-out and conscious decision.

2. My study does not wish to examine certain indicators. Its scope does not even cover the most essential, most often emerging indicators as they do not belong to its direct subject.

3. The subject of my study includes the sets of *national* sustainable development strategies; therefore the investigation does not cover the indicator sets of other geographical units and indicator sets related to certain thematic areas or sectors.

4. My dissertation also does not cover the description of an ideal set of indicators. All over the world significant organizations, statistical offices and research teams worked to compile some lists of indicators. For example, UNO EGB, OECD and Eurostat (90 experts from 48 countries) spent almost three years' work (2006-2008) to draw up a list of 30 indicators based on the capital theory and they do not regard their own work to be the final version.

5. I discuss current processes from a certain distance. My objectives are much more general and I discuss the problems on a higher level of abstraction, so the exploration of the impact of specific processes is beyond the scope of my thesis. However, I regard the influence of the government change in every four years a long-term partial problem, as it can overwrite strategic thinking and can result in modified avenues.

6. My study does not investigate the conception of *green growth* as well, as it does not exert a considerable influence on NSDI yet.

2. MATERIAL AND METHODS

1. I scoured the national and international professional literature on the topic. I processed approximately 80 *theoretical* studies on various levels of abstraction, closely related to the area (I refer to 123 theoretical sources in total) and included in my study, without adding the political documents (in number 168; they will come up in the following point).

I consciously selected the method of presenting the findings of current research not in a separate chapter, but included in the discussion of certain topics and I confront them with various viewpoints, highlighting the sometimes minute, sometimes definite differences. Where it is viable, I outlined the development of the concept related to the given issue. Every time I strived to represent my own standpoint clearly and characteristically. I find this methodological solution, the introduction and critical analysis of the literature in the discussion parts, expedient as it allows the expression of my own views set against the various approaches of the given issue and I do not refer back to a chapter on the literature review.

2. I performed a critical comparative analysis on the examination of NSDS in EU countries. I carried out an in-depth study on the documentation of NSDS of almost all members states (the strategies themselves, progress reports, monitoring reports and indicator reports etc.), and I compared them with their indicators and the requirements for indicators, aspects of indicator selection, their grouping, the types of indicators; I analyzed the structure of SDI sets and their logical guidelines.

I sought to give a complete picture; therefore my analysis covers the SDI sets of all the 27 countries in the EU. One of the biggest stumbling blocks of my analysis was that several large documents from the 27 member states comprised more or less different sets of indicators almost without exception.

(A single report prepared for the Eurostat mentioned more than 100 documents and up to 5000 indicators (EUROSTAT, 2007, p. 136.).

The following table shows the number of strategic documents in the member states which I processed.

Table 1. – Number of processed strategic documents

Country	Number of documents	Country	Number of documents
Austria	7	Poland	2
Belgium	5	Lithuania	4
Bulgaria	1	Latvia	4
Cyprus	2	Luxemburg	3
Czek Republic	6	Hungary	5
Denmark	3	Malta	5
United Kingdom	20	Germany	10
Estonia	4	Italy	2
European Union	25	Portugal	4
Finland	5	Romania	2
France	8	Spain	5
Greece	4	Sveden	5
The Netherlands	6	Slovekia	1
Íreland	14	Slovenia	3

Source: own calculation

3. As well as the sustainability strategy documents of certain members states and the EU; I also used the publications of several international organizations. I found the working materials of the UN especially useful, mostly the publications of the Division for Sustainable Development, United Nations Department of Social Affairs (UN DESA DSD), the publications of the United Nations Economic Commission for Europe (UN ECE) and the OECD.

4. The excellent homepage of the European Sustainable Development Network (ESDN) proved to be of great help for my work, providing the informal network of sustainable development officials and experts. It contains a regularly updated, detailed national profile for all European countries and introduces the given nation's activity related to SDS in a single structure, and also the Internet accessibility of concerned international organizations and the locations of key international documents.

5. My dissertation does not discuss other measurement issues and indicators of sustainability in a direct way either on enterprise or on settlement level, but I have scoured several such types of materials, gaining expedient, diverse information. In total I studied 70 company reports (these are not listed in the bibliography).

6. I supplemented the information obtained from the examination of theoretical literature, from national and EU documents with empirical studies by semi-structured in-depth interviews with Hungarian experts of environmental economics and other renowned professionals.

I interviewed altogether 28 experts of environmental issues, sustainable development or environmental accounts. My standpoint in choosing the respondents was to gain answers from the researchers and educators of the two most renowned departments of environmental management looking back on rich traditions in Hungarian tertiary education. These two institutes with a great past are the Institute of Environmental Sciences, Faculty of Economics, established by Professor Sándor Kerekes and the Department of Environmental Economics, Institute of Economic Sciences, BME, founded by Professor János Szlávik. Twelve out of the respondents work in these institutes; five are engaged in agricultural research, others are the experts of transport, environmental accounts and strategy development or have worked in the interest of environmental development in international organizations for years.

My selected method aimed at gaining a large amount of in-depth information on the causes of the problems raised in my dissertation and finding an answer for the probable direction of future development. In accordance with this, I compiled a list of questions arranged in a loose construction, including a sequence of mostly open questions. The other reason to choose this method was that the structure allowed the better comparison and occasional quantification of answers. The duration of the interviews varied between 22 and 95 minutes.

7. Especially noteworthy is one of the methodological solutions of my dissertation, which I find to be a fruitful and highly promising one for the future. I have come to realize that an analysis on the analogies between social-economic systems and *living organisms* offers a number of advantages for the SD researchers. I sought to find those actual analogies which might provide assistance for the selection of sustainability indicators.

The application of analogies has yielded exciting results in several areas of science. In economics, François Quesnay drew a comparison between blood circulation and economic life in his most significant work entitled Economic Table, which inspired the development of input-output tables. Alfred Marshall, in the foreword of his most essential work, *The Fundamentals of Economics* reveals that biology bears a stronger resemblance to economics than mechanics, as it studies complex biological systems whereas physics studies much simpler ones. (MARSHALL, 1890) Marshall returns to the analogy of economics and living organisms several times in his work, emphasizing the similarity arising from complexity. He

parallels economy with the highly developed vertebrates in biological systems, claiming that "the *modern economic organism belongs to the vertebrates"* (MARSHALL, 1890, App. B, p. 46.), characterizing merely the high level of development with his remark. János Kornai, who also analyzes an analogy in one of his essays claims that "*there are similarities between medical science fighting for human health and economics aiming to boost the operation of economic systems"* (KORNAI, 1983, p. 262.), and states that "*several economists have realized the significance of biological analogies already, among others Marshall, Boulding, Georgescu-Roegen" (ibid, p. 298).* Although Kornai investigates the analogies of two *sciences*, he relates to the analogy of the human body and economy as well.

James Lovelock, the founder of Gaia-hypothesis prefers drawing parallels with living organisms in all his books. The titles of two of his books indicate this method (*Gaia*: *The Practical Science of Planetary Medicine (*2001); *Gaia*: *Medicine for an Ailing Planet* (2005). He sums up the essence of his hypothesis in the first book as follows: "*the living material of the Earth and the atmosphere, the oceans and the surface can be regarded as a complex, common organism, which is capable of maintaining adequate living conditions for life on the planet",* adding that *"occasionally it was difficult not to mention Gaia as a living creature."* (LOVELOCK, 1990, p. 15.).

Lovelock makes several thought-provoking comments on sustainability on the grounds of the analogy between humans and nature-technosphere.

The above mentioned sought to highlight that the analogies are research methods which are not unprecedented at all. They are especially expedient to explore the subject of my dissertation as the problem of sustainability originates in the complexity of the global ecological system, allowing the comparison with other complex systems. Nevertheless, I am aware of the dangers of analogies. The key restriction of analogies between living organisms and the nature-technosphere system in my study is that while the structure of the above mentioned is essentially given (by structured information stored in genetic codes), the structure of the nature-technosphere system changes continuously and with unprecedented speed in our age. Konrad Lorenz writes that "*The ecology of humans change must faster than that of all living beings. The pace is dictated by the development of their own technology, which is accelerating constantly according to geometrical progression. Therefore, humans threaten the biocenosis in which and from which they live while causing unnecessary, profound and overfrequent changes."* (LORENZ, 1988, p. 24.). My dissertation uses the analogies carefully, mostly as intuitive methods and primarily to demonstrate my message.

3. MAIN FINDINGS

1. Starting from the accepted epistemological notion in natural sciences that *concept-formulation* and *measurement* are parallel theoretical and practical activities to describe and understand reality and to modify processes in a favourable direction, I regarded the selection of the set of sustainable development indicators as one of the focal questions for the solution of the basic problem. I presented that *the identification of sustainable development and its indicators are in close correlation. Our concept of sustainable development essentially determines what indicators are used and vice versa; the selection of indicators exerts a considerable influence on our vision and approach of sustainable development.* The selection and application of SDI re-interprets sustainability and basically *sustainability will mean what we measure.*

2. I gave a comprehensive introduction on the development of SDI sets in the EU and the member states, its key characteristics and types which are on significantly different levels of maturity. Most of them feature the thematic structure of political priorities and merely some countries on the cutting edge use the model-based approach, which is more systematic, coherent, transparent and which returns to some form of the DPSIR framework, adopting a capital-approach. This is the direction of further development.

3. Problems emerging during the development of an optimal system of SDI primarily derive from the wrong conceptual grasp of SD. The weakness of SDI sets origins in the approach and the three-dimensional model of SD based on the Brundtland model and their almost general adoption. The focal role of well-being as well as social and economic issues exert a great pressure on the set of indicators, obstructing the fulfilment of their functions. The enhancement of the ecological approach may improve the effectiveness of indicator sets.

4. Detailed analysis on NSDS of EU member states unveiled *that strategy-makers have not yet come fully aware of the significance of discussing the sets independently and separately.* NSDS set several essential but general objectives in relation to the development of natural environment, society and economy, but they render indicators only rather incidentally, ignoring their targeted values.

The general theory of indicator sets highlighted that the methodological identification, description and quantification of material stocks in nature, society and economy, the exploration of their relations with material flows and their inclusion in models might be a significant step towards the thorough understanding of metabolism in nature and technosphere.

5. The application of non-monetary complex indicators is merely sporadic and rhapsodic in the SDI sets of EU member states. The use of complex, non-monetary indicators complies rather with the ecological view, resulting in a better understanding of the correlation of natural and man-made systems, clarifying the criteria of long-term stability in the common system, i.e. sustainability, making it possible to outline and set the targets.

6. The present form of SDI sets fails to meet the requirements, as they do not give a clear and definite answer to the question, whether a country has approximated sustainability in a given period or not. They fail to provide decision makers and society with sufficient information and to give the expected assistance for the move towards sustainability. To further explore the possible directions of how to best identify indicator sets, I used the research findings of my dissertation.

4. NEW RESULTS

1. I have re-interpreted the relation between the conceptual grasp of sustainable development and the identification of the set of sustainability indicators, shedding new light on the role of sustainable development indicators.

2. I have described the development of the set of sustainable development indicators in the EU and its member states, their historical development, characteristic features and types. I have analyzed their weaknesses; I have drawn up the most significant trends of their development.

3. In several respects I have confirmed that the deficiencies in the set of sustainable development indicators are rooted in the wrong conceptual grasp of sustainable development. I have demonstrated that if sustainability is regarded a global ecological problem, the set of indicators may fulfil their functions more effectively.

4. I have highlighted the significance of the role of stock type indicators in the description of sustainable development.

5. I have pointed out the outstanding role of non-monetary complex indicators.

6. I have constructed 10 recommendations in relation to the directions of desirable further development for the sets of sustainable development indicators in EU member states.

5. THE PRACTICAL USEFULNESS OF THE RESULTS

The following part of my dissertation will sum up the ideas elaborated in my dissertation from general to specific and draw up my recommendations related to the desirable direction of development for SDI sets in EU member states. In reflection of my findings I assert they hold true of the SDI set of new Hungarian sustainable development strategy under preparation.

1. The the greatest weakness of sustainable development strategies is that they want to solve almost everything at the same time. As a result of the false interpretation of the three-dimensional model, economic, social and environmental areas have similar importance, although they are in a strictly hierarchical relationship: once a given technical level is achieved, the probabilities of social and economic processes are indicated by constraints specified by the laws of nature and economy.

Sustainability strategies should include the system of purposes and means for the adjustment of these constraints. Therefore, the fundamental question remains: how should society, the basic values (more exactly, lifestyle and *one* of its elements, consumption) of the relationship with nature and economy (coordination mechanisms, fundamental institutions and basic structures) be restructured to comply with constraints determined by nature.

If sustainability strategies are continuously burdened with irrelevant problems, modern societies will sustain a defeat practically in all areas, as the maintenance and assurance of the proper operation of life conditions, global ecological systems is the fundamental prerequisite of boosting well-being, creating stable societies and a prosperous economy.

Recommendation 1.: *Sustainable development strategies should be based on ecological bases, including only those social and economic issues which are directly related to ecological problems. Separate social and economic problems should be developed, which adjust to the priorities of sustainability strategies (and economic strategies to the priorities of social strategies as well).*

2. The highly restricted success of national sustainable development strategies is basically caused by the false approach of strategies and SDI sets related to sustainable development. Openly or not and in different degrees, they are all built on the Brundtland definition and the three dimensional model in close connection with it and focus on needs, welfare or well-being, considering non-ecological economic and social problems equally important with ecological problems.

The conceptual grasp of sustainable development, even if it is direct and textual, is merely superficial in NSDS and in some indicator reports, not to mention the more serious, above mentioned false approach. The remains of this approach can also be identified in some strategies and SDI reports which investigate sustainable development with a model constructed from some kind of mixture of various capital elements and the DPSIR framework.

Recommendation 2.: *The widely accepted conception of sustainable development based on the Brundtland definition and the three-dimensional model should be repealed. NSDS and indicator reports should start with the introduction of a new, scientifically founded model (built on the capital approach and the DPSIR framework) and consistently adhere to it.*

3. The greatest, common deficiency of sustainable development indicator sets for NSDS is that indicators are not established on the theoretical model of sustainability, but they are selected and structured according to political preferences, dominantly influenced by the two approaches mentioned under the previous point and their interest-motivated interpretations. As a consequence, SDI sets mostly contain irrelevant elements; moreover, in various proportions, they mix with indicators describing economic and social phenomena and processes which are not in the least connected to sustainability, aggravating potentials for the separation of problems in terms of time and significance. Indicators do not constitute a coherent system, therefore they are not suitable to support communication or decision making on the required level.

Recommendation 3.: *The selection of sustainability indicators according to political topics should be terminated. SDI sets should be based on the scientifically established model of sustainability. The indicator sets of sustainability, social and economic strategies should be separated where the order is hierarchical, with regard to the coherence of the three sets.*

4. The loose conception of sustainability, which ignores the massive dangers of ecological crisis in the present and in the future, which is blinded by excessive technological optimism, can be partly attributed to the fact that SDI sets compiled according to politically preferred issues fail to leave scope for stock-based approaches and stock type indicators. However, global ecological problems surfaced because *mankind considerably altered the material structure of the physical world* during its couple of thousand year old history, but especially in the past two hundred years.

Technosphere, emerging in the earthly system of existence in quasi equilibrium expanded in the past up to ten thousand years in an increasing pace, at the expense of the previous one. From this aspect sustainability should be interpreted as the long-term dynamic equilibrium of

stocks and flows in the nature-technoshpere system created by technical-social development. This equilibrium can only be described by stock and flow indicators included in SDI sets in a proportionate, systematic way.

Recommendation 4.: *SDI sets should include stock and flow variables in the adequate proportion, with especial regard to the adequate demonstration of correlations between the material stocks and flows of the nature-technosphere system, describing the material structure, processes and objective mechanisms of the related system with special regard to constraints imposed by nature.*

5. A further weakness of most SDI sets is that for lack of a clear structure, they blur the indicators of various roles, for example the objective qualitative and quantitative chatacteristics of the complex material system to be presented and also the indicators presenting the answers of the problematic sub-system (the technosphere). During the short, one decade development of SDI sets efforts have surfaced these days to eliminate this deficiency, and some SDI sets return to the application of the DPSIR framework. This is a model to be followed, as this solution clarifies in which areas progress has been made, and to what extent we lag behind our set objectives.

Recommendation 5.: *SDI sets should return to the application of some of the directives of the DPSIR framework.*

6. In the analysis of sustainability interpreted as the problem of ecological balance in the system of nature-technosphere indicators on several lower levels (individuals, households, organizations, settlements, regions, countries) indicators should be selected to reflect to what extent the given unit contributes to global sustainability and to demonstrate the specific conditions of the related unit.

This requirement should be achieved, among others, by the inclusion of indicators comparable with the ones used by the same types of units. In the case of countries, it means comparison in international terms.

Recommendation 6.: *The comparability of SDI sets is a fundamental requirement, in addition to maintaining country-specific indicators.*

7. For the support of communication and decision-making, increasingly higher amount of SDI sets apply key indicators to give an overall picture of sustainability. This is the right direction; however, it has several obstacles and stumbling blocks. Key indicators should be included in

systems, they should describe the investigated subject synthetically, and therefore the application of carefully selected indicators is recommended.

Recommendation 7.: *The application of key indicators is expedient and primarily the selection of complex indicators may increase their effectiveness.*

8. The application of non-monetary complex indicators emerges merely sporadically and rhapsodically in the SDI sets of EU member states, and there is no available explanation as to why exactly the given countries apply them. Nevertheless, the use of non-monetary complex indicators (mostly the indicators of MFA, the ecological footprint and biocapacity) will become one of the prominent avenues in the future, especially in stocks related to enhanced ecological awareness.

Recommendation 8.: *The use of non-monetary complex indicators proves to be expedient in SDI sets. Once adjusted to the inner logic of these systems, they might be given a more significant role; therefore their application as key indicators is recommended.*

9. The majority of SDI reports do not render target values to the indicators. However, in the SDI sets of some top-ranking countries target values are not merely indicated, but they are also compared with global and European objectives; moreover, the conditions of reaching the goals are also methodically analysed. This solution, with especial regard to the potentials of improvement, might considerably improve the efficiency of indicators.

Recommendation 9.: *Where possible, the strategy should define target values for as many indicators as possible. Trends in the development of indicators with target values should be regularly analyzed.*

10. In the past couple of years increasingly more member states undertook the obligation of publishing statistical data and analyses related to SDI sets at fixed intervals. There are indications that these will take the form of progress and follow-up reports of statistical publications. In most countries, a two-year report period is adopted, but annual reports are likely to become regular in the near future.

Recommendation 10.: *SDI reports should be prepared regularly. The goal is the publication of annual reports.*

6. PUBLICATIONS RELATED TO SUBJECT MATTER OF THE THESIS

Articles published in journals and foreign periodicals:
 1. **Karcagi-Kováts** Andrea (2009): *Az MFA mutatók alkalmazásának lehetőségei a települési fenntarthatóság jellemzésében*, „A jövő tudósai, a vidék jövője" doktoranduszok konferenciája, Debreceni egyetem AMTC, Debrecen, 2008. november 20., Agrártudományi Közlemények 34., Acta Agraria Debreceniensis 2009. Különszám, pp. 107-116.
 2. **Karcagi-Kováts,** Andrea – Odor, Kinga – Kuti, István (2009): *Rural population decline in the Visegrad-4 countries and Romania*. In: Sielski, Dariusz (Content editor and proof-reader): Certain aspects of structural change in rural areas. The experience of selected countries. Report n° 165.1, Institute of Agricultural and Food Economics – National Research Institute, Warszawa, 2009, 86 p. (pp. 57-72) (ISBN 978-83-7658-038-8)
 3. **Karcagi-Kováts, Andrea** – Kuti, István (2011): *A készletek általános elmélete és a fenntartható fejlődés*, Magyar Tudomány, 9 p. (to be published)
 4. **Karcagi-Kováts**, Andrea – Katonáné Kovács, Judit (2011): *Factors of population decline in rural areas and answers given to them identified in strategies*, Studies in Agricultural Economics, 17 p. (to be published)
 5. **Karcagi-Kováts**, Andrea (2011): *Performance Indicators in CSR and Sustainability Reports in Hungary*, Apstract, 9 p. (to be published)
 6. **Karcagi-Kováts**, Andrea (2011): *Útban egy új nemzeti fenntartható fejlődési stratégia felé — egy mélyinterjús felmérés tapasztalatai*, Agrártudományi Közlemények 3X., Acta Agraria Debreceniensis 2011. Különszám, 7 p. (to be published)
 7. Dombi Mihály – **Karcagi-Kováts** Andrea (2010): *A jövő gazdaságának anyagi alapjai*, ECO-Matrix (az LCA Center, a Magyar Életciklus Elemzők Szakmai Egyesületének elektronikus folyóirata), 20 p. (to be published)

Published foreign conference papers:
 8. Dombi Mihály – Bauerné Gáthy Andrea – **Karcagi-Kováts Andrea** – Kuti István (2011): *Influential factors of economies' material requirement*, 11th International Academic Conference "State, Economy, Society", 12-14 June, 2011, Andrzej Frycz Modrzewski Krakow University, Krakow, Poland, 17 p. (to be published)
 9. **Karcagi-Kováts**, Andrea – Kuti, István (2011): *The role of aggregate non-monetary indicators in the national sustainable development strategies of the EU Member States*, 2nd International Exergy, Life Cycle Assessment, and Sustainability Workshop & Symposium (ELCAS2) 19-21 June, 2011, Nysiros, Greece, pp. 436-443. (ISBN 978-960-243-679-0)
 10. Kuti, István – **Karcagi-Kováts**, Andrea (2011): *Stock type indicators, general theory of stocks, and sustainable development*, 2nd International Exergy, Life Cycle Assessment, and Sustainability Workshop & Symposium (ELCAS2) 19-21 June, 2011, Nysiros, Greece, pp. 444-451. (ISBN 978-960-243-679-0)
 11. **Karcagi-Kováts**, Andrea – Kuti, István (2010): *Diversity of Sustainability Performance Indicators and Corporate Reporting in Hungary*, Corporate Responsibility Research Conference 2010, Euromed Management School, Marseille, 15-17 September 2010, 8 p. (electronic publication)

12. **Karcagi-Kováts** Andrea – Odor Kinga – Kuti István (2009): *The Problem of Rural Exodus int the National Sustainable Development Strategies and National Rural Development Plans of EU Members*, Proceedings of the Fourth International Scientific Conference „Rural Development 2009 – transition towards sustainability", 15-17 October, 2009, Lithuanian University of Agriculture, Akademija, Kaunas region, Lithuania, pp. 208-213. (ISSN 1822-3230)

13. **Karcagi** Andrea – Kuti István (2007): *Economy-wide material flow indicators and their applications in national sustainable development strategies and agricultural strategies in the EU*, „AGRARIAN PERSPECTIVES XVI." Collection of Papers of International Scientific Conference, Prague, 18-19 September, 2007, pp. 705-713. (ISBN 978-80-213-1675-1)

14. **Karcagi** Andrea – Kuti István (2006): *Review and assessment of sustainability indicators of national sustainable development strategies of the ten new member states of the EU*, „AGRARIAN PERSPECTIVES XV." Collection of Papers of International Scientific Conference, Prague, 20-21 September, 2006, pp. 1005-1011. (ISBN 80-213-1531-8)

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15. **Karcagi-Kováts** Andrea – Kuti István (2010): *A készletek általános elmélete, fenntartható fejlődés és a készlet jellegű indikátorok jelentősége*, „HITEL, VILÁG, STÁDIUM" nemzetközi tudományos konferencia Nyugat-magyarországi Egyetem Közgazdaságtudományi Kar Sopron, 2010. november 3., 20 p. (CD: ISBN 978-963-9883-73-4),

16. Dombi Mihály – **Karcagi-Kováts** Andrea (2010): *A jövő gazdaságának anyagi alapjai*, „HITEL, VILÁG, STÁDIUM" nemzetközi tudományos konferencia Nyugat-magyarországi Egyetem Közgazdaságtudományi Kar Sopron, 2010. november 3., 20 p. (CD: ISBN 978-963-9883-73-4)

17. **Karcagi-Kováts** Andrea (2010): *Messze még a félidő ― Nemzeti fenntartható fejlődési stratégiák, 2010*, „Félidőben (a 2007-2013-as tervezési időszak közepén, az új tervezési időszak előkészítésének a kezdetén)" Nemzetközi Konferencia, Pécs, 2010. október 7-9., Pécsi Tudományegyetem Közgazdaságtudományi Kara Regionális Politika és Gazdaságtan Doktori Iskola, Évkönyv 2010, 3. Kötet, 160-170. p. (ISSN: 1588-5348)

18. **Karcagi-Kováts** Andrea – Kuti István (2010): *Az aggregált nem-monetáris indikátorok lehetőségei a fenntarthatóság figyelembevétele során a makroszintű tervezésben*, „Félidőben (a 2007-2013-as tervezési időszak közepén, az új tervezési időszak előkészítésének a kezdetén)" Nemzetközi Konferencia, Pécs, 2010. október 7-9., Pécsi Tudományegyetem Közgazdaságtudományi Kara Regionális Politika és Gazdaságtan Doktori Iskola, Évkönyv 2010, 2. Kötet, pp. 189-200. (ISSN: 1588-5348)

19. **Karcagi-Kováts** Andrea (2008): *A vidékfejlesztésre vonatkozó célkitűzések és indikátorok az EU tagországok nemzeti fenntartható fejlődési stratégiáiban*, 50. JUBILEUMI GEORGIKON NAPOK Nemzetközi Tudományos Konferencia, Pannon Egyetem Georgikon Mezőgazdaságtudományi Kar, Keszthely, 2008. szeptember 25-26., CD-kiadvány, 6 p. (ISBN 978-963-9639-32-4)

20. **Karcagi-Kováts** Andrea – Kuti István (2008): *Az anyagáram elemzés indikátorai és alkalmazásuk lehetőségei az agrár- és fenntarthatósági stratégiákban*, 50. JUBILEUMI GEORGIKON NAPOK Nemzetközi Tudományos Konferencia, Pannon Egyetem Georgikon Mezőgazdaságtudományi Kar, Keszthely, 2008. szeptember 25-26., CD-kiadvány, 7 p. (ISBN 978-963-9639-32-4)

21. Gáthy Andrea – **Karcagi** Andrea – Kuti István (2006): *Az alternatív energiaforrásokra vonatkozó célkitűzések és jelzőszámok az EU tagországok nemzeti fenntartható fejlődési stratégiáiban*. „Az alternatív energiaforrások hasznosításának gazdasági kérdései" nemzetközi tudományos konferencia, Sopron, 2006. november 8-9. Nyugat-Magyarországi Egyetem Közgazdaságtudományi Kar, CD-kiadvány, 8 p. (ISBN 978 963 9364 82 0)

Abstracts, conference presentations:

22. Odor Kinga – **Karcagi-Kováts** Andrea – Kuti István (2009): *Rural areas under the pressure of population decrease*, „AGRARIAN PERSPECTIVES XVIII. – Strategies for the Future", Collection of Papers of International Scientific Conference, Prague, Czech University of Life Sciences, September 15th - 16th, 2009 (Abstract) (ISBN 978-80-213-1965-3)

23. **Karcagi-Kováts,** Andrea – Kuti, István (2010): *Disponibilité en ressources et développement d'une économie biosourcée : le cas Hongrois*, „*Les dimensions socio-économiques de la transition vers l'usage des ressources renouvelables"* worksop international, Université de Reims Champagne Ardenne, ppt, 21 p. (conference presentation)

24. **Karcagi-Kováts** Andrea – Kuti István (2010): *MFA + MSA = MA ― A fenntarthatóság és az anyagi készletek*, „A fenntarthatóság professzionális megoldásai" a Magyar Ipari Ökológiai Társaság szimpóziuma, Debreceni Egyetem AGTC Gazdálkodástudományi és Vidékfejlsztési Kar, Debrecen, 2010. november 18-19., ppt, 20 p. (conference presentation)

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