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INDICATORS OF SUSTAINABLE DEVELOPMENT IN FRAMEWORK OF ENVIRONMENTAL POLICY: EXPERIENCE OF EASTERN NEIGHBORS

Definitions and signs

The term “indicator” is taken to determine the “specific mark”, which illustrates certain properties of the object, modification of the controlled process’s parameters, in simply (understandable and countable) form. Indicators that characterize social processes are based on statistical data and are used in assessment of efficiency of any activity, identification of causal relationships in the decision-making process. The implementation of the state policy on sustainable development causes the need for a system of indicators in areas that reflect different aspects of life: economic, environmental and social.

The *sustainable development indicators* (SDI) are quantified information, which helps to explain how the economic, environmental and social factors interact over time and how they affect society in the long run. *Environmental indicators* are essential element of SDI’s system. According to the European Environment Agency, an environmental indicator is a measure, generally quantitative, that can be used to illustrate and communicate complex of environmental phenomena simply, including trends and progress over time. Hence, it helps to provide insight into the state of the environment (Digest EEA 2014). Simultaneously, according to Organization for Economic Co-operation and Development (OECD) environmental indicator defines as a parameter, or a value derived from parameters, which points out, provides information and describes the state of a phenomenon/environment/area with significance, extending beyond that directly associated with a parameter value (OECD 2001).

Thus, indicator, as a measure, must meet the criteria of clarity, availability; be quantifiable, clear and straightforward to interpret. An important criterion is that the sustainable development indicator should be constructed from well-established data sources; it must be in line with the quality standards of official statistics. Indicators are statistics, directed specifically towards policy concerns and, which point towards successful outcomes and conclusions for policy (Adam Mannis 2002). Creation of a measuring system for the quantitative and qualitative assessment is one of the key challenges in implementation of the sustainable development concept.

Paragraph 75 “Transforming our World” states that goals and targets will be followed up and reviewed using a set of global indicators. They will be elaborated by member states, in addition to the outcomes of work, undertaken for the development of the baselines for targets, where national and global baseline data does not exist yet (The 2030 Agenda 2015). Moreover, goals and targets will be complemented by indicators at the regional and national levels.

Evolution and application experience. The beginning of sustainability measuring practice started in 1971 by the appeal of the United Nations Conference on the Human Environment, which requested to prepare periodic international, regional, and sub-regional reports on “the state of, and outlook for, the environment” (UNEP 1972). The main trends in state-of-the-environment reported in 1970-1990 were: showing the interconnections among environmental, economic, social, and institutional issues; reducing comprehensive lists of indicators into core sets for better communication; measuring progress towards achieving targets and objectives; including environmental reporting into government decision-making, business and industry plans (UNEP 2006).

The United Nations Conference on Environment and Development in 1992 pioneered the development of indicators that could help countries to make well-founded decisions concerning sustainable development. At the international level, the Commission on Sustainable Development (CSD) developed the first two sets of Indicators of Sustainable Development between 1994 and 2001. They have been extensively tested, applied and used in many countries as the basis for the development of national indicators of sustainable development.

The measurement of sustainable development since the mid-1990s has progressed in two alternative directions: using composite (aggregate) indicators and forming indicator sets (Conference 2014). At present, nearly all international organizations and national statistical offices use indicator sets. Thus, a joint United Nations Economic Commission for Europe

(UNECE) proposes three sets of sustainable development indicators: a large set based on the conceptual categorization (60 indicators), a large set based on the thematic categorization (90 indicators), and a small set, based on the thematic categorization (24 indicators) (Conference 2014). European Environment Agency’s Indicator Management System (IMS) currently contains 127 indicators, covering 22 environmental topics (EEA 2015). In this approach, broad ranges of indicators that provide information on various aspects of sustainable development encompass different dimensions of an issue without losing information through aggregation.

Milestones of indicators’ set for Sustainable development progress evaluation, initiated by the UN, have been presented in table 1. In order to identify a global indicator framework for the goals and targets, the United Nations Statistical Commission gathered at its 46th Session and established an Inter-Agency Expert Group (IAEG) on SDG Indicators, which composition reflects equitable regional representation. The proposal for Global Indicator Framework whose be submitted for consideration by the Statistical Commission at its 47th Session will be adopted thereafter by the Economic and Social Council and the General Assembly in line with existing mandates.

Table 1. Milestones of the indicators’ set development (based on *Platform 2015*)

Chapter 40 of Agenda 21 called on countries and the international community to develop indicators of sustainable development.	1992 <i>Agenda 21 (Chapter 40)</i>
The UN Commission, recognizing that any indicators developed under its work programme are intended only for use by countries at the national level on a voluntary basis, suited to country-specific conditions, and shall not lead to any type of conditionality, including financial, technical and commercial	2001 <i>CSD-9 (Decision 9/4)</i>
The Commission on Sustainable Development (CSD) at its 11th session encouraged further work on indicators for sustainable development by countries, in line with their specific conditions and priorities. SD-11 adopted the CSD’s multi-year programme work for the period 2004-2017 and decided to organize the upcoming CSD sessions as a series of two-year action-oriented Implementation	2003 <i>CSD-11 (Chapter 1 A 13)</i>

Cycles, with a Review Session of the first year and a Policy Session of the second year.	
The Commission on Sustainable Development (CSD) at its 13th session encouraged further work on indicators for sustainable development by countries, in line with their specific conditions and priorities. CSD-13 invited the international community to support efforts of developing countries in this regard	<p style="text-align: center;">2005 <i>CSD-13 (Chapter 1 C-Res 13/1)</i></p>
This third set of Indicators on Sustainable Development represents a follow-up to the two earlier sets published in 1996 and 2001 respectively, prepared under the work programme on indicators of sustainable development and was approved by the Commission on Sustainable Development in 1995. This publication in particular identifies some strategies on how to adapt this third set to national conditions and priorities.	<p style="text-align: center;">2007 <i>Indicators of Sustainable Development: Guidelines and Methodologies, 3rd Edition</i></p>
<p>On 6 March 2015, at its forty-sixth session, the United Nations Statistical Commission created an Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs), composed of Member States and including regional and international agencies as observers.</p> <p>The SDGs and targets are integrated and indivisible, global in nature and universally applicable, taking into account different national realities, capacities and levels of development and respecting national policies and priorities.</p>	<p style="text-align: center;">2015 <i>Inter-agency Expert Group on SDG Indicators 2030</i></p> <p style="text-align: center;"><i>Agenda: Indicators (Follow-up and Review, paragraph 75)</i></p>
The global indicator framework should be developed by the Inter Agency and Expert Group on SDG Indicators, will be agreed by the UN Statistical Commission and will be adopted thereafter by the Economic and Social Council and the General Assembly in line with existing mandates.	<p style="text-align: center;">2016 <i>Proposal Global Indicator Framework</i></p>

Indicators are representing the wider interpretation of statistical data lying underneath. For instance, an average life expectancy of an infant is usually taken to indicate the public health of a population. The purpose of selecting one or more indicators for describing a broader subject is to reduce information overload for data users. The strength and weakness of

indicators lie in their selection, which not only facilitates decision-making but also opens the door to data manipulation.

The alternative is aggregation of statistics and indicators into compound indices. Aggregation methods include the calculation of weighted or unweighted averages, summation in accounts and balances and mathematical reduction of correlated indicators by factor analysis (Bartelmus 2013) and data availability (fig. 1)

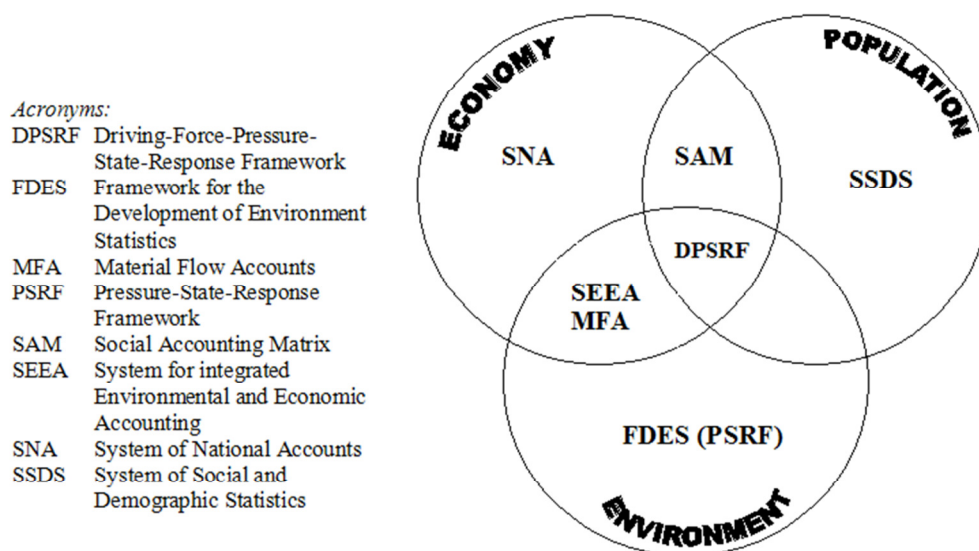


Figure 1. International statistical systems. (based on (Bartelmus 1997))

A composite indicator (CIs) is formed by aggregating individual indicators into a single index, taking the averages or applying a more complex mathematical approach. Such an indicator should ideally measure multidimensional concepts, which cannot be captured by a single indicator, e.g. competitiveness, industrialization, sustainability, single market integration, knowledge-based society, etc. (OECD 2008) For instance, the World Bank uses composite monetary indicators (genuine savings/comprehensive wealth) in its research on sustainable development (World Bank 2011). An example of positive practice of composite indicator's use is the U.S. Environmental Protection Agency's Air Quality Index (AQI) (USEPA 2009). The AQI aggregates hundreds of hourly measurements for four pollutants and ranks the air in a particular region as Good (AQI Scores of less than 50) through Hazardous (AQI Scores of greater than 500). Each of the six AQI levels is assigned a color code so that an interested party can make a quick visual assessment, e.g. a television broadcaster. The AQI meets all of the communication criteria for an effective environmental indicator: it is scientifically sound, meaningful, and simple to understand (Robert P. Blauvelt 2014). CIs have the advantage of giving a more concise picture of complex phenomena in a simple

way. At the same time, if they are poorly constructed or misinterpreted, if the construction process is not transparent, composite indicators can trigger erroneous political decisions or may be misused.

Nevertheless, the sustainability measuring practice shows the impossibility of utter rejection of CIs and indicates the growing demand for them. This has been reflected in several political initiatives, as GDP and beyond (EC 2009) and the Stiglitz-Fitoussi-Sen Commission (CMEPSP 2009), which have supported the trialing of composite and aggregate indicators that might be considered alongside GDP.

Nowadays the more commonly used frameworks for evaluating sustainability of human development are:

- pressure-state-response (PSR) and its variations, limited mostly to the environmental pillar;
- human well-being/ecosystem well-being;
- issue- or theme-based frameworks; and
- capital accounting based frameworks, centered on the economic and environmental pillar of sustainable development).

The latest trends. SDI performs an essential function of incorporating knowledge about the development of human society into decision-making at all stages: from planning and application to evaluation of the policy impacts. In the process of adjustment of the policy to the sustainable development goals three trends of indicators' using can be noted during the last decade. These trends form the arranging indicator sets under different represent frameworks; integrating environmental, social and economic indicators, developing models for the new aggregated indicators; globalization of indicator-based policy making.

Structured thinking about the interplay between the environment and socio-economic activities Statistics Canada developed in late 1970s an "ecosystem" approach that evolved into the pressure-state-response (PSR) model. The pressure-state-response reporting framework was implemented by the OECD and in 1980s was derived from this approach. On the basis of this model, EEA developed the DPSIR (driving force, pressure, state, impact, and response) framework, which is coherent with those, used by other organizations.

More complex, systemic challenges have created demands for more integrated indicators across the DPSIR chain. In the context of EU environmental policy targets 2010-2050, the revision of the EEA CSI was provided. In the scope of this process, there were elaborated new indicators such as emissions of main air pollutant (based on merging

indicators “emissions of acidifying substances”, “emissions of ozone precursors” and “emissions of primary particulate matter and secondary particulate matter precursors”); passenger and freight transport demand (based on merging indicators 'passenger transport demand' and 'freight transport demand'); EU and national total greenhouse gas emission trends and projections development (based on merging indicators 'greenhouse gas emission trends' and 'progress to greenhouse gas emission targets') (Digest EEA 2014). The Eurostat has also developed a model for the aggregated EU-27 to estimate raw material consumption, in order to provide an additional perspective for resource efficiency indicators. As mentioned earlier, in recent years, the EU in response to considerable political demand, has focused on supporting experimenting with composite and aggregate indicators that might be considered alongside GDP.

Indicators are mostly developed in the bottom-up direction in the most countries, i.e. using data sets drawn from the national monitoring systems which are established by legislation. Globalization of indicator-based policy making could be understood as the expansion of the SDI system of indicators in the regions where indicators are little used or not used at all. Thus, the project “Towards a Shared Environmental Information System (SEIS) in the European Neighbourhood” is being implemented over the period from 2010 to 2014. The overall objective is to help protect the environment in the European Neighborhood region by improving capacities of relevant authorities in environmental monitoring, data collection and management, assessment and indicator-based reporting on the environment. In 2012, the Statistical Division of the United Nations Economic Commission for Europe (UNECE) launched a project “Strengthening statistical capacity of countries with economies in transition to assess progress in achieving the UN Millennium Development Goal (MDG) on Environmental Sustainability and provide data on environmental vulnerabilities”. The target countries were the twelve countries of Eastern Europe, Caucasus and Central Asia (EECCA): Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, the Republic of Moldova, the Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. The desk study under the project revealed that there are data for two-thirds of indicators proposed as an example of the UNECE questionnaire in the statistical systems of eight of the EECCA countries, while 11 countries have the data available for at least half of the indicators. The international comparison in terms of whether the countries are on sustainable path is currently not possible due to the lack of common approach to measurement: existing SDIs differ in terms of metadata, methods of calculation, frequency of measurement, units, etc.

This is also true for the composite SDIs: it is not possible to compare them as their content varies from country to country (Desk study 2014).

Conclusions. The current state of sustainable development indicators reflects the evolution of policy concerns over the last decades. The variety of conceptual and organizational frameworks used by the different countries and organizations demonstrate the lack of harmonization. The main reasons for that are diverse policy priorities, variant academic approaches and data availability, cultural, religious and philosophical viewpoints. The lack of harmonization can be overcome by streamlining of SDI system. Modernization can be carried out in the following areas: identifying a universal small set of indicators that reflect the crucial points and transboundary aspects of sustainable development; elaboration the unified approaches of measuring; identifying indicators that are available for a large number of countries and enable international comparison. Based on this approach can be developed official uniform SDIs Metadata Catalogues and international guidelines that will serve for national indicator sets. National set of SDIs should be developed taking into account the data availability as an important criterion for indicator selection and should reflect the specificity of the countries situation. Such set needs to be complemented with a set of indicators for international comparison.

Most indicators are developed for the use at the national level. Nevertheless, the wide range of approaches to measuring sustainable development at different levels (local, regional, enterprise and household) is needed nowadays. There exists a challenge of finding meaningful indicators to represent conditions within the various sub-regions of a country.

Important challenges relate to the division of responsibilities of national authorities managing environmental data, data quality and data accessibility. The main task in this area is further institutional arrangements to support data flows.

An additional challenge for more established policy areas is provision of better analysis of cross-linkages between indicators, so as to help identify synergies and trade-offs between policy options and their management, and contribute to enhanced policy coherence.

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Abstract. *The sustainable development indicators perform an essential function of incorporating knowledge about the development of human society into decision making at all stages from planning and implementation to evaluation of the policy impacts. This paper provides an overview of evolution and application experience of sustainability measuring practice. Researchers analyze the directions of measurement approach progress. Modern trends of indicators' using are explored. From assessment of current status of sustainable development indicators authors reveal the main challenges in defining an appropriate set of them. The ways of overcoming the lack of harmonization in variety of conceptual and organizational frameworks used by the different countries are reviewed. Authors consider the direction of modernization of SDI system. The importance of measuring sustainable development at different scale levels: local, regional, enterprise and household levels is stressed. Researchers reveal the main task in division of responsibilities of national authorities, managing data quality and data accessibility. An additional challenge of providing better analysis of cross linkages between indicators is pointed out.*

Keywords: *sustainable development indicator, indicator sets, composite (aggregate) indicator, organizing framework, core set of indicators; pressure-state-response model; driving force, pressure, state, impact, and response framework, data availability, data quality, data accessibility*