

THE ROLE OF MONITORING IN SUSTAINABLE DEVELOPMENT

Vladyslav SMILKA

Kyiv National University of Construction and Architecture, Kyiv, Ukraine

Corresponding author's e-mail: vlsmilka@gmail.com

Abstract. The field of sustainable development has global goals focused on the repletion of wants of natural resources for present-day generations in terms of sustainable consumption so that future generations can meet their needs. Sustainable development can be achieved by substantially transforming national agency systems. The aim of the research is to determine role of monitoring and evaluation in the system of sustainable development of the territory. The methods used in this study are general scientific techniques and methods – analysis, logical access method, monographic and other methods. Some international standards for sustainable development have been adopted today. Monitoring and targeted indicator ratings are measures that promote sustainable development. The following conceptual approaches to monitoring can be distinguished for the purpose of monitoring: 1) monitoring as information and analytical support for the management decision support system; 2) monitoring aimed at generating new knowledge; 3) monitoring as a system for tracking quantitative and qualitative changes; 4) monitoring as sequential activity algorithm; 5) object state on-line monitoring; 6) proactive monitoring. Aims should be set to manage the sustainable development process and evaluate the effectiveness of the tools used to achieve it. Sustainable development indicators are necessary to establish the degree of responsibility of their values to the criteria for sustainable development.

Keywords: *Monitoring, Evaluation, Methods, Sustainable development, System, Principles.*

INTRODUCTION

Sustainable development is the development of a society in which repletion of wants of natural resources for present-day generations does not put in jeopardy the ability of future generations to meet their demand when the agreed environmental, economic and social components of development, man-made load do not exceed the capacity of the natural environment to self-renewal, and society is aware of the superiority of environmental priorities over others (National Academy of Sciences of Ukraine, 2007).

Sustainable development has global goals, one of which is “urban and community sustainable development” (Global Sustainable Development Goals 2015–2030) (UNDP in Ukraine, 2015). In the world, more than half the population lives in cities. It is expected the urban population will be about two-thirds of all humanity by 2050. Sustainable development can be achieved by substantially transforming the land management system. Achieving the security and sustainable development of population, including the provision of safe and affordable housing

for them, service and reconstruction of inefficiently used territories, is one of the problems of these goals. The above-mentioned measures include the attraction of investment in public transport, development of education, the creation of green public areas, as well as the improvement of the territorial planning system and land management (Global Sustainable Development Goals 2015–2030) (UNDP in Ukraine, 2015).

The issue of security of populated locality is on the agenda of the world community. The Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework) (UNDRR, 2015) was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDDR) in Sendai (Japan) on 18 March 2015. It is the outcome of stakeholder consultations initiated in March 2012 and inter-governmental negotiations held from July 2014 to March 2015, which were supported by the UNISDR upon the request of the UN General Assembly.

1. METHODS AND PROCEDURES

Promoting sustainable territories, methods for studying and valuation of environmental considerations is the overarching objective of the research. The aim of the publication is to determine the place and role of monitoring and evaluation in the system of sustainable development of the territory.

General scientific techniques and methods refer to the methods used in the present research. General scientific methods reflect the interdisciplinary knowledge integration and are practiced on a wide scale in many prospects. However, these methods are not universal in scope, they may not apply to all tasks and all objects of study. Specific character in the application of these methods is inherent in each prospect. Such general scientific methods include system analysis, abstraction, concrete definition, induction, deduction, analysis, synthesis, monographic method, analogy and modelling.

The principles of the system approach are as follows (Soroka, 2004):

1. The interconnection principle – the system is studied as part of a particular macrosystem. It connects a variety of compounds to another system, interacts and subsists in solidarity;
2. The versatility principle – the system as a single unit is studied from different sides with its characteristics;
3. The multidimensionality principle consists of studying different characteristics of systems that cluster – an object is described as a collection of some characteristics and the relationships between them;
4. The hierarchy principle – the system is considered a complex structure with different levels between which certain connections are made;
5. The multi-ordinal principle – different hierarchical levels of the system give rise to the regularities of a different order. Definite regularities are inherent only to all elements or some group of elements, while others are unique to only elements;
6. The dynamism principle – the system is considered in the movement and development.

System analysis contains a set of sound methods, techniques, recommendations aimed at achieving a detailed eventual result. System analysis as a scientific direction has theoretical and practical aspects (Gorban & Bakhrushin, 2011; Kovalska et al., 2019).

The first of them in the context of this study is manifested in the systematisation of the theoretical foundations of the functioning of monitoring systems related to sustainable development at the international and national levels, the identification of identical processes and patterns. An application aspect of the systematic analysis of this study relates to issues such as the decomposition of monitoring activities into components, the determination of the relationships between observation and evaluation systems, the environmental impact, and the unification (aggregation) of individual parts while maintaining their properties.

2. INTERNATIONAL STANDARD PROTECTION OF SUSTAINABLE DEVELOPMENT

Approaches to sustainable development and human security are generated globally and implemented in international standards. The non-governmental international organisation for ISO standardisation brings together experts from different industries through national standardisation bodies. The development of new international standards and their updating are underway at industry technical committees. National standardisation bodies may be part of relevant committees as needed. ISO/TS 268 Technical Committee has been established to standardise sustainable cities and communities, which develops requirements, guidelines and tools to help achieve sustainable development in cities and communities, including in rural areas.

For today, the following international standards have been adopted: ISO 37120:2014 Sustainable Development of Communities – Indicators for City Services and Quality of Life (ISO, 2014), ISO 37101:2016 Sustainable Development in Communities – Management System for Sustainable Development – Requirements with Guidance for Use (ISO, 2016), ISO 37106:2018 Sustainable Cities and Communities – Guidance on Establishing Smart City Operating Models for Sustainable Communities (ISO, 2018), ISO 37104:2019 Sustainable Cities and Communities – Transforming our Cities – Guidance for Practical Local Implementation of ISO 37101 (ISO, 2019a), ISO 37122:2019 Sustainable Cities and Communities – Indicators for Smart Cities (ISO, 2019b).

In Ukraine, the process of implementing sustainable development standards is at an early stage, which can be characterised as goal setting. In particular, the Sustainable Development Strategy and the Concept of Sustainable Development of Settlements were approved. International standards for sustainable development have not been implemented in Ukraine's national standards (Kovalska & Smilka, 2019).

The provisions of the Concept of Sustainable Development of Settlements are in line with the principles proclaimed in the Agenda for the 21st Century (NGO Committee on Education, 1992) adopted at the United Nations Conference on Earth Summit in Rio de Janeiro in 1992, in the final documents of the United Nations

Conference on Human Settlements (HABITAT-II) held in 1996 in Istanbul, Turkey, and recommendations of the United Nations Economic Commission for Europe.

Sustainable development is taking place in many fields, including ecology, urban planning, land management, economics, cultural heritage protection, transport, agriculture, tourism and others. Methodological support for the stages of sustainable development can have national and sector-specific features. The level of sustainable development must be defined by quantitative measurement. For substantive evaluation of sustainable development, scientists and experts have developed systems of indices, indicators and marks that are systematically calculated globally to respond appropriately in the event of negative trends. The choice of measures to be taken to achieve the Sustainable Development Goals depends on the specificities of national governance systems, so Sustainable Development Strategies may differ in content and context in different countries and regions. The Sustainable Urban Development Planning: Global Population Report 2009 identified that monitoring and evaluation should be part of the urban planning system as a permanent function (Planning Sustainable Cities: Global Report on Human Settlements, 2009), (United Nations Human Settlements Programme, 2009).

3. MONITORING CONCEPTS OF SUSTAINABLE DEVELOPMENT FOR NATIONAL LEVELS

The term “monitoring” (from the Latin *monitor* – to watch and check a situation carefully for some time to discover something about it) appeared before the Stockholm United Nations Conference on the Environment (Stockholm, 5–6 June 1972). Organisational experience for implementing such a system was developed by the experts of the SCOPE Special Commission in 1971. The basic principles of monitoring as a system were first outlined in R. Mann’s writings (Mann, 1980). Papers of Academician I. P. Gerasimov (Gerasimov, 1976) and Professor Y. A. Israel (Israel, 1984) are devoted to the formation of fundamental scientific foundations of environmental monitoring during the Soviet Union, which elaborate the main principles of the environmental monitoring system, as well as partially consider international aspects of the global system of environmental monitoring.

The problem of integrated global monitoring of environmental pollution was discussed in detail for the first time at the International Symposium on December 1978, Riga (Rovinsky, 1982).

Professor Y. A. Israel considered the term “monitoring” as the opposite to the term “control”, which included not only the observation and receipt of information but also the elements of activity, i.e., control forms. The term “control” in turn implies only the reception and information analysis without further action (Bogolyubov et al., 2010).

The object and aim of the monitoring may be various. Environmental, social and economic factors influence sustainable development. Each group of factors is investigated by specific methods and particularised entities, but globally the indicators should be generalised for further mathematical elaboration and comprehensive evaluation. According to the analysis results of scientific and

methodological literature (Kobryanov, 2015; Kondratiev, 2012; Kosimova, 2017; Kharitonova, 2016; Samoilin, 2015), it is determined that monitoring and evaluation of sustainable development are key elements of the system of state, regional and local government. For the aim and monitoring role, which can be implemented at all hierarchical levels of sustainable development management, the following conceptual approaches of monitoring can be distinguished:

- 1) monitoring as information and analytical support for the management decision-making system (aimed at providing reliable and up-to-date information to officials before making management decisions about the probable consequences of such decisions, the results of the evaluation of alternative decisions and recommended measures for eliminating the consequences of negative effects) (Kondratiev, 2012; Kosimova, 2017; Kharitonova, 2016; Samoilin, 2015);
- 2) monitoring aimed at obtaining new knowledge (discovering new information, new dependencies between objects of observation, between objects of observation and natural phenomena, between objects of observation and processes of human activity) (UNESCO Institute for Statistics, 2003);
- 3) monitoring as a system for tracking quantitative and qualitative changes (aimed at monitoring specific marks and indicators, informing about critical deviations of values of indicators and indicators from normative ones) (Kondratiev, 2012; Kosimova, 2017);
- 4) monitoring as a sequential algorithm (provides a software package of sequential actions to monitor the situation and processes aimed at controlling the environment, compliance with regulations and regulations) (Kondratiev, 2012; Kosimova, 2017);
- 5) on-line monitoring of the object state (provides non-stop (or at minimum intervals) observation of the object and recording the indicators of the state of the object) (Kondratiev, 2012; Kosimova, 2017);
- 6) advanced monitoring (aimed at environmental forecasting, its individual constituents, or the index level of object observation) (Kharitonova, 2016; Samoilin, 2015).

4. DISCUSSION AND ANALYSIS

Sustainable development monitoring is a system of observing, analysing and predicting changes in sustainable development indicators about the impact of human activities on the environment and the social sphere to prevent adverse effects on the life of the population, substantiate and make management decisions (The Programming Period 2014–2020).

Despite the variations in the concept of monitoring, its main purpose is to provide management bodies with complete, reliable and timely information on changes in social, environmental and economic spheres.

Monitoring and evaluation schematic diagram for ensuring the sustainable development of the territory (The Programming Period 2014–2020) (European Commission, 2013) is shown in Fig. 1.

Monitoring identifies changes in sustainable development outcomes. Tracking these values allows judging whether the indicators are moving in the right direction. If the indicators do not approach the set values, corrective measures should be put in place to provide the required level of sustainable development indicators. The values of basic sustainability indicators can be obtained from national or regional statistics (Smilka, 2018).

The sustainable development management system is organised in such a way that it considers the retrospective, existing and forecast data generated by the analytical monitoring systems. Depending on the dynamics of the achievement level of the projected indicators, the management system can adjust many measures aimed at achieving the ultimate goal of sustainable development. Thus, monitoring is a reflexive function of a sustainable development system that organises its behavior, considering not only experience but also the possible operation of other systems with which it interacts, such as the construction industry, education, medicine, services, etc. This property is aimed at the predictability of other adjacent systems (Yaakup et al., 2005).

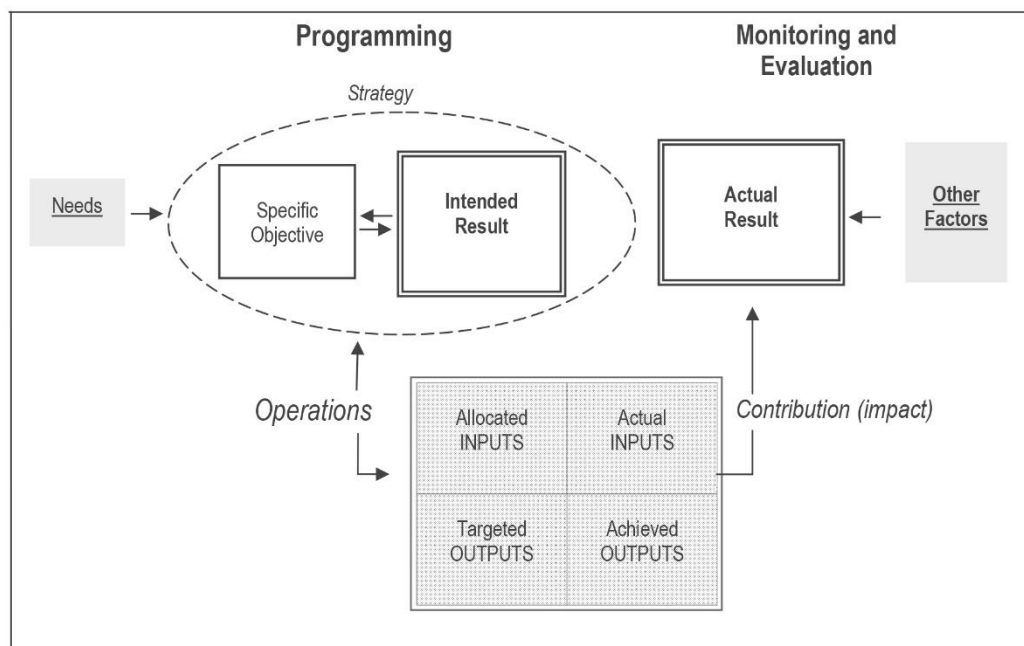


Fig. 1. Impact in relation to programming, monitoring and evaluation (The Programming Period 2014–2020), (European Commission, 2013).

On this basis, the aims of monitoring of the sustainable development of the territory may be as follows:

- identification of short-, medium- and long-term trends in the development of the territory;
- determination of changes in indicators of sustainable development of the territory;
- analysis of the causes that led to the negative trends in the indicators of sustainable development of the territory;

- improvement of data collection, processing and information evaluation procedures;
- improvement of monitoring procedures.

The main tasks of monitoring of the sustainable development of the territory are as follows:

- monitoring structuring;
- system-oriented analysis of the received information, its assessment and identification of the factors that determine the nature of the social and economic process;
- providing information on monitoring to the authorities and the population;
- territory development forecasting;
- substantiation and drafting of recommendations aimed at supporting the positive trends and overcoming the negative ones in the environment, economy and social sphere (Samoilin, 2015).

To ensure the evaluation of indices and indicators of sustainable development, it is necessary to have an effective mechanism for collecting, updating, processing and storing primary environmental indicators.

Structured data and results of environmental assessment, characteristics of individual factors are the result of monitoring activities.

During the monitoring the following types of evaluation can be carried out:

1. The differential estimate is an estimate of the influence of an individual factor on the level of sustainable development of the territory, region, country;
2. The comprehensive assessment is an assessment of the influence of a group of factors on the level of sustainable development of the territory, region, country;
3. The target-oriented differential estimate is an estimate of the impact of an individual factor on a particular settlement, which has a defined functional direction;
4. The target-oriented comprehensive assessment is an assessment of the impact of a group of factors on a particular settlement, which has a defined functional direction.

Estimation techniques:

1. The computational method is a method of quality assessment based on the calculation of the intensity of influence of factors in the territory, region, and the country;
2. The comparative method is a method that establishes the ratio of the actual indicators of the state of the territory, region, and the country to the normatively determined one;
3. The expert method is a method of determining the quality of the environment based on the opinion of professional experts.

To manage the process of sustainable development and evaluate the effectiveness of the means used, it is necessary to set benchmarks to ensure that they are achieved through monitoring and control procedures. Performance benchmarks can be defined by comprehensive indicators that characterise (National Academy of Sciences of Ukraine, 2007):

- quality of the social development (living standards) within a certain territory;
- the quality of the environment;
- ecological and economic efficiency of production, consumption of services.

Sustainable development indicators are necessary to establish the degree of compliance of their values with the criteria of sustainable development.

In the global dimension, the following organisations are engaged in the development of systems of indicators of sustainable development (Zgurovsky & Statukha, 2007; UNDESA; 2007):

- Commission for Sustainable Development;
- Food and Agriculture Organisation;
- Food Standards Agency;
- International Institute for Environment and Development;
- International Institute for Sustainable Development;
- Organisation for Economic Co-operation and Development;
- World Bank.

In large measure, the indicator systems of sustainable development intersect and take into account the following areas of human life support: economy, transport, leisure and tourism, land access, water resources, forestry, the atmosphere, waste, climate change.

CONCLUSION

Monitoring is a complex system, the organisational form of which is subject to the theory of systems. Monitoring, as a process, plays an important role in ensuring sustainable development in terms of assessing the level of consideration of the social, environmental and economic impacts of regional development.

Sustainable development monitoring will provide adequate information support to public authorities and local self-government bodies with reasonable, objective and reliable data on socio-economic and environmental status. The monitoring will also ensure quality management of activities in the socio-economic and environmental spheres, in terms of environmental protection, rational use of nature and land access on an objective information and science basis, following the principles of sustainable development.

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AUTHOR'S SHORT BIOGRAPHY

Vladyslav Smilka graduated from Kyiv National University of Building and Architecture, majoring in Cadastre in 2001. In 2008, he defended his Doctoral Thesis for the degree of Candidate of Technical Sciences in the specialty “Urban Planning and Spacial Planning”. He is the author of more than 55 scientific papers in the field of town-planning cadastre, town-planning monitoring, and regulation of land relations in human settlements.

Email: vlsmilka@gmail.com

ORCID iD: <https://orcid.org/0000-0002-7025-9398>