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**Vadym A. Tkachuk**
*National University of Life and Environmental Sciences of Ukraine*

## MONITORING OF SUSTAINABLE DEVELOPMENT OF RURAL AREAS AS OPEN SOCIOECONOMIC ECOSYSTEMS

*The paper grounds the need to develop a framework to assess the state of sustainable development of rural areas as open socioeconomic ecosystems at macro-, meso- and microlevels, employing both single and integrated indices. A methodology and an algorithm for monitoring social and economic subsystems are provided on the example of Kharkiv region. For the analysis purposes the following indicators were used: gross regional product (GRP) per capita, investment in fixed capital, the coefficient of renewal of fixed assets, financial potential, energy intensity of GRP, the share of innovative products in total volume of industrial production, Human Development Index, pollutant emissions into the atmosphere, discharge of polluted water, quantity of raw waste production and consumption, the renewal of forest resources, the area of specially protected natural areas, investments in fixed capital aimed at environmental protection and rational use of natural resources.*

***Keywords:*** *rural areas, sustainable development, taxonomy method, open socioeconomic ecosystems.*

**Вадим А. Ткачук**
***Національний університет біоресурсів і природокористування України***

## МОНІТОРИНГ СТАЛОГО РОЗВИТКУ СІЛЬСЬКИХ ТЕРИТОРІЙ ЯК ВІДКРИТИХ СОЦІАЛЬНО-ЕКОНОМІЧНИХ ЕКОСИСТЕМ

*У статті доведено доцільність розробки системи оцінки як одиночних, так і комплексних показників рівня сталого розвитку сільських територій як відкритих соціально-економічних систем на макро-, мезо - і мікрорівнях. Розроблено методологію та алгоритм моніторингу соціальної та економічної підсистем на прикладі Харківського регіону. Для аналізу використано такі показники: валовий регіональний продукт (ВРП) на душу населення, інвестиції в основний капітал, коефіцієнт оновлення основних фондів, фінансовий потенціал, енергоємність ВРП, частка інноваційних продуктів у загальному обсязі промислового виробництва, індекс розвитку людського потенціалу, викиди забруднюючих речовин в атмосферу, скидання забруднених вод, кількість непереробленних відходів виробництва і споживання, відновлення лісового фонду, неплоща особливо охоронюваних природних територій, інвестиції в основний капітал, спрямовані на охорону навколишнього середовища і раціональне використання природних ресурсів.*

***Ключові слова:*** *сільські території, сталий розвиток, таксонометрический метод, відкриті екосистеми.*

**Вадим А. Ткачук**
***Национальный университет биоресурсов и природопользования Украины***

## МОНИТОРИНГ УСТОЙЧИВОГО РАЗВИТИЯ СЕЛЬСКИХ ТЕРРИТОРИЙ КАК ОТКРЫТЫХ СОЦИАЛЬНО-ЭКОНОМИЧЕСКИХ ЭКОСИСТЕМ

*В статье доказана целесообразность разработки системы оценки как одиночных, так и комплексных показателей уровня устойчивого развития сельских территорий как открытых социально-экономических экосистем на макро-, мезо- и микроуровнях. Разработаны методология и алгоритм мониторинга социальной и экономической подсистем на примере Харьковского региона. Для анализа использованы такие показатели: валовой региональный продукт (ВРП) на душу населения, инвестиции в основной капитал, коэффициент обновления основных фондов, финансовый потенциал, энергоемкость ВРП, доля инновационных продуктов в общем объеме промышленного производства, индекс*

*развития человеческого потенциала, выбросы загрязняющих веществ в атмосферу, сброс загрязненных вод, количество непереработанных отходов производства и потребления, возобновление лесного фонда, площадь особо охраняемых природных территорий, инвестиции в основной капитал, направленные на охрану окружающей среды и рациональное использование природных ресурсов.*

***Ключевые слова:*** *сельские территории, устойчивое развитие, таксонометрический метод, открытые экосистемы.*

**Formulation of the problem.** It is generally accepted that globalization and regionalization are the dominant tendencies of the world development. They reveal not only new opportunities for economic growth, but also lead to an increase in imbalances and instability of the socio-economic systems, strengthening the asymmetry in the socio-economic development and investment attractiveness of the region, causing social inequalities and deep violations of wildlife organizations.

Achieving sustainability of socio-economic systems to balance the triad of social and economic development (nature - population - economy). Despite the practical importance, economic science has not yet formed a universally recognized system of scientific views on the mechanism of sustainable development, particularly regional socio-economic systems.

The least studied is the environmental dimension of sustainable development of regional socio-economic systems. Weak integration of environmental considerations in the development of concepts, strategies and programs for socio-economic development of regions, territorial planning schemes led to a substantial aggravation of ecological trouble in many parts of the country even in industrial and agricultural production, reduction in the efficiency of use of natural resources.

The underestimation of environmental factors and environmental constraints in the preparation of spatial development documents not only leads to numerous negative consequences in environmental management, but also a profound long-term imbalances between economic, social and environmental development of the socio-economic systems at different levels, affects the quality and efficiency of the developed environmental management mechanisms.

In this regard, comes an increasing need for regional management practices in sustainable development and social and economic systems in the conditions of globalization and regionalization.

**Analysis of recent research and publications.** The most remarkable scientists in the study of rural development is P. Hayduts'kyy [5], P. Sabluk [5], Yu. Lutsenko [5] and other scientists-economists. Recent issues associated with the review of certain aspects of the problem is reflected in the works of M. Orlatyy [7], E. Libanova [6], I. Prokopa [8], V. Yurchyshyn [10] and others. Recently, most researchers dealing with rural areas, almost pay no attention to differentiation of their development from a purely geographical dimension to industrial-commercial, social, economic, environmental, self-governing and ecological.

**The purpose of the article -** improving the methodology and mechanism for monitoring the organization and a comprehensive assessment of the socio-economic potential of the region to control the position of sustainable development of the territory.

**Research results.** Sustainable development of the territory - this is firstly: a process of continuous progressive development of socio-economic systems, which are based on the ability of a balanced use of the available resources for present and future generations, aiming to create a high standard of living, and secondly: well balanced development strategy for territories, leading to innovative breakthrough and a new era of civilization, and available at present time planet resources, won't be in demand.

Copyright vision of the modern definition of the socio-economic potential, lies in breaking of a certain degree of established perception of this category, as a set of economic instruments, sources and reserves of the company for specific purposes, for a maximum consideration of human

capital, implementing their intellectual potential through excellence and educational level. Here, we have in mind, modern and essential vector of economic development - innovation, which should be based on the efficient use of human capital, involving scientific and technological breakthrough, very necessary for our country in the era of post-industrial development of the world economy. From this perspective, the socio-economic potential, we have defined as the concentration of labor, material and technical, financial, natural, investment, organizational, managerial, informational, scientific and technical resources in the territory to ensure stable functioning of the socio-economic system and high quality life in a changing external environment.

Figure 1 shows the basic elements of a stable relationship between them and the existence of unity of purpose allows us to consider the socio-economic potential of the area and the country as a whole system and thus determine the direction of its development.

| **SOCIO-ECONOMIC DEVELOPMENT OF RURAL TERRITORIES** | | | | | |
|---|---|---|---|---|---|
| | COMPLEX | ECONOMIC | SOCIAL | ECOLOGICAL | INSTITUTIONAL |
| Goal | Ensuring an economically and ecologically grounded, socially oriented expanded reproduction, improving quality of life | Ensuring the sustainability of reproductive processes and achieve financial self-development | Ensuring a high level and improve quality of life for rural area | Ensuring environmental safety and environmental protection | Ensuring effective cooperation of all levels of government and monitoring of territory |
| Tasks | Ensuring economic potential of the area sufficient to support and develop life and natural potential of rural areas | Creating conditions to improve production efficiency, promotion of diversity and increase revenue | Promote demographic growth, increased employment and incomes, developing and providing the population with basic social services | Reducing the negative impact of economic and other activities in accordance with the standards of environmental protection | The combination of state regulation of rural areas and of local government |
| Factors | Competitiveness, innovation and investment activity, fiscal stability and security | The variety of forms and types of economic activity, competition, industrial infrastructure, the potential of the territory | The demographic situation, human resources, population, living standards, social and engineering infrastructure | The environmental situation, the financing of environmental protection, the availability of environmentally friendly technologies | The institutional structure of the territory, its planning, administration and appeal |
| Mechanism | Methods, forms to interact organizational, economic, social and environmental components of the territory | Small and medium businesses, cooperation and integration, diversification of activity | The development of social partnership between government, business, public, provide targeted protection of the most vulnerable rural population | Ecological and economic incentives for environmental protection, legal and organizational support of environmental activities | The development of local government and monitoring the diversity of civic participation, development and implementation of programs and projects |

*Author's development*

**Figure 1. Conceptual framework of socio-economic development of rural areas**

Each structural element, shown in Figure 1, is a self-organizing complex system, as well as an integral part of the socio-economic space of Ukraine. Given the categorical isolation of each element of the socio-economic potential, their development must be coordinated in accordance with the development of all the others. Thus, production capacity cannot develop without the growth of infrastructure, investment, etc. The development, in our vision must be based on innovation and in

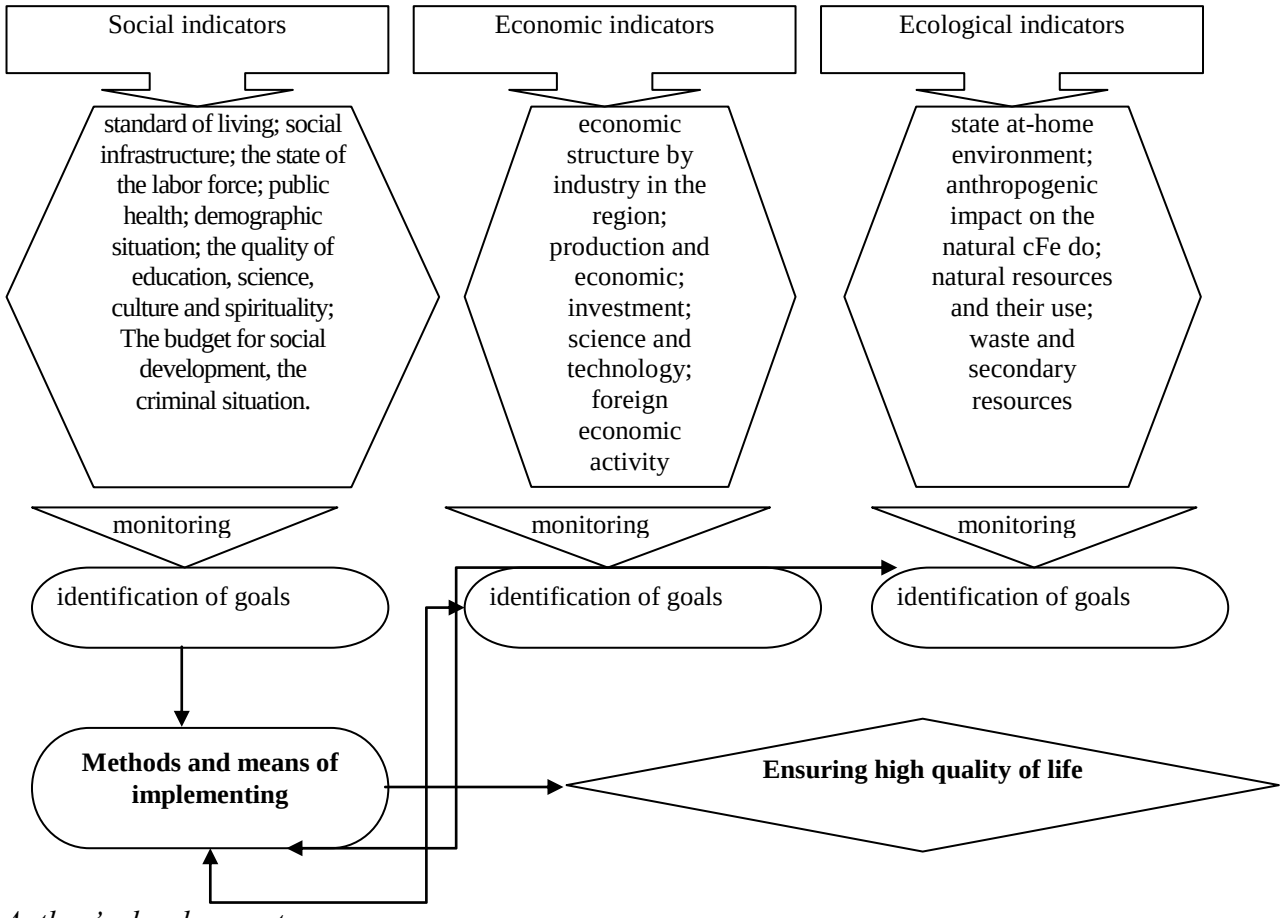
the interaction with the processes of formation of institutional and informational component. In describing the socio-economic potential must also take into account the complexity of the economic, environmental and social development; community nature management and environmental protection issues.

Comprehensive analysis of the socio-economic potential of the area as cited above is about the monotonous structure of evaluation and indicators. However, in our opinion, the assessment of the socio-economic potential of the territory should be carried out, not on the classical principle of construction, consisting of: labor, material and technical resources, natural resources, institutional resources, organizational and managerial resources, information resources.

The approaches to the assessment of the socio-economic potential, complementary, it is proposed to integrate the performance of three subsystems: social, economic, environmental. Such an approach to the estimation of socio-economic potential, takes into consideration the conceptual aspects of sustainable development of territories. Assessment of the socio-economic potential of the region is associated with the identification of its hierarchy, structured into three comprehensive in its content subsystems: social, economic, environmental.

The main strategic goal of socio-economic development of the region is to improve the quality of life and sustainable development of the economy. Accordingly to the objectives of regional development is built system of criteria (characteristics of development) and the development of indicators that allow you to implement these criteria. In rural areas there is a significant differentiation in terms of socio-economic development.

Based on the above formed hierarchical system suitable for monitoring the socio-economic development of the region (Figure 2).




*Author's development*

**Figure 2. Monitoring system for sustainable socio-economic development of rural areas**

Key indicators of the level of development of rural areas can be divided into 4 groups: 1) areas with high socio-economic potential and its effective use; 2) areas with high socio-economic potential, and its inefficient use; 3) areas having a low level of socio-economic potential, with sustainable, small rate of economic growth; 4) problem areas with an unstable economic growth.

An analysis of the dynamics of indicators of sustainable development in the Kharkov region showed that 8 of the 17 indicators of the trend deterioration in indicators 6 - improving and 3 - dynamics is not seen. Particularly important factors are the intensity of air pollution and the share of environmental investments (both figures were in the group with a negative trend) (Table 1).

*Table 1*

**Dynamics of indicators of sustainable development of rural areas of the Kharkiv region**

| Sustainable Development Indicators | Years | | |
|---|---|---|---|
| | 2005 | 2010 | 2015 |
| Environmental and economic indicators | | | |
| The release of pollutants into the atmosphere, thous. Tons | 2,0 | 1,8 | 2,0 |
| The intensity of the pollution of the atmosphere, t / thousand. UAH. GRP | 0,006 | 0,005 | 0,0055 |
| Polluted wastewater mln. $м^3$ | 45,3 | 46,5 | 47 |
| The intensity of the water pollution, t / thousand. UAH. GRP | 0,10 | 0,08 | 0,07 |
| The proportion of recyclable waste production and consumption,% | 34,1 | 36,2 | 33 |
| The intensity of waste production and consumption, t / thousand. UAH. GRP | 0,07 | 0,056 | 0,043 |
| Energy intensity, unit of fuel / thousand. UAH. GRP | 0,15 | 0,17 | 0,16 |
| Depreciation of fixed assets ratio,% | 50,6 | 59,1 | 60,0 |
| Emissions of carbon dioxide, t | 126,9 | 125,2 | 125,1 |
| Investments in environmental protection activities,% of investment in fixed assets | 2,0 | 1,0 | 3,0 |
| Ecological indicators | | | |
| The percentage of area covered by forest | 42,0 | 43,0 | 43,0 |
| Reforestation in the forests, thous. Ha | 0,6 | 0,6 | 0,5 |
| Percentage of protected area to maintain biodiversity of terrestrial environment | 12,4 | 12,4 | 12,4 |
| Socio-environmental indicators | | | |
| Number of people living in the cities, thou. Pers. | 510 | 510 | 510 |
| The share of housing, water supplies,% | 86,0 | 85,9 | 86,5 |
| Proportion of population with access to improved sanitation,% | 74,2 | 74,9 | 77,4 |

*The calculations are performed according to the statistics of annual "Kharkiv region in 2015 rotsi". Data access: http://kh.ukrstat.gov.ua/index.php/statystychnyi-shchorichnyk-kharkivska-oblast-u-2015-rotsi*

Comparative analysis can show the existing environmental problems in the context of lagging behind other regions, counties and the whole country, to identify associated with these indicators of social, economic and environmental problems (Table 2).

*Table 2*

**Key indicators of sustainable development for the rural areas of the Kharkiv region**

| № | Indicator | Dynamics 2010-2015 |
|---|---|---|
| 1 | The intensity of atmospheric pollution | ▲ |
| 2 | The intensity of the water pollution | ■ |
| 3 | The intensity of waste production and consumption | ▲ |
| 4 | Energy intensity | ♦ |
| 5 | Fixed capital depreciation ratio | ▲ |
| 6 | Reforestation in the forest fund | ♦ |
| 7 | Investments in environmental protection activities,% of investment in fixed assets | ▲ |
| 8 | Number of people living in especially polluted cities | ♦ |

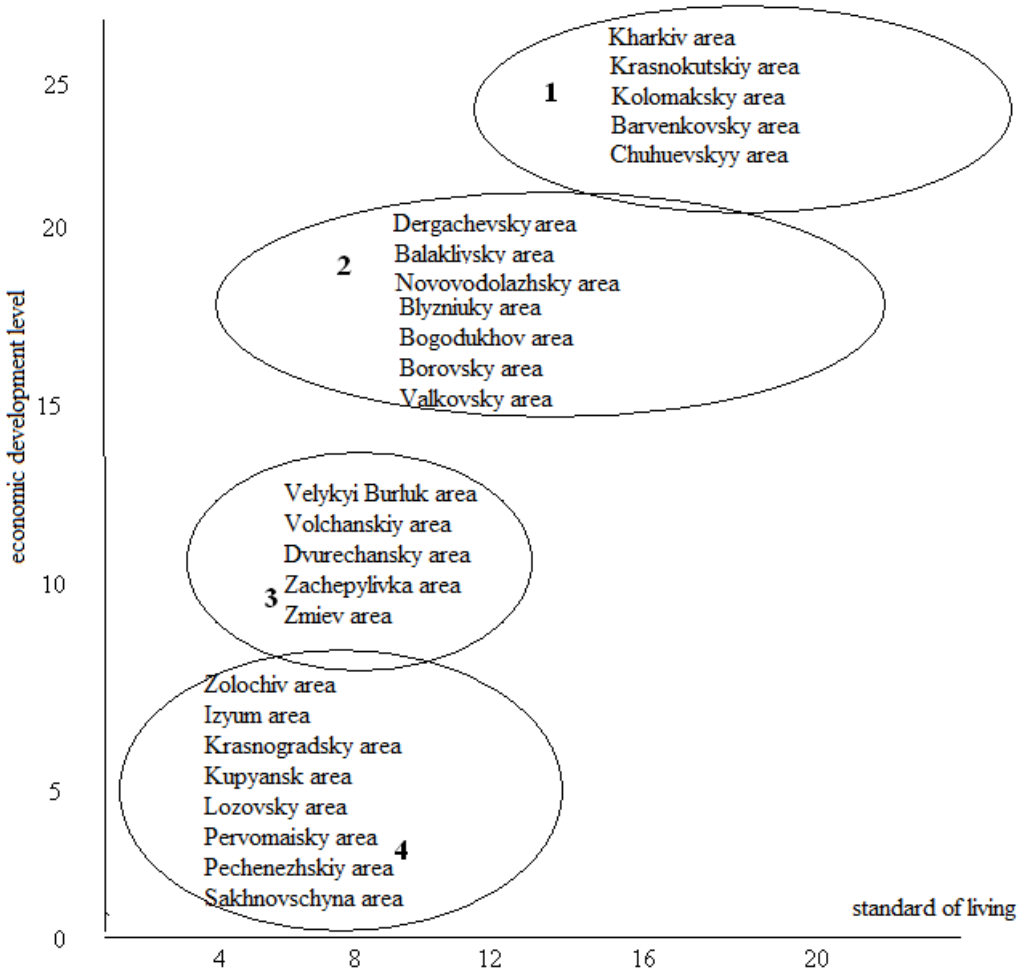
*Symbols:*

■ - *positive changes in the implementation of sustainable development goals;*

▲ - *adverse changes in the implementation of sustainable development goals;*

♦ - *uncertain changes in the implementation of sustainable development goals.*

The calculations were based on the integration of partial indicators of Kharkiv region: the standard of living (x-axis) was estimated by aggregating private indicators of ecological component of the territory, health, housing, security, education; level of economic development (y-axis) is characterized on the basis of aggregate GDP per capita, unemployment rate, the share of subsidies in the budget, GRP growth rates (2010-2015.). Calculations were performed using the method of multidimensional spaces (taxonomy method). According to calculations of the first group are Kharkiv, Krasnokutsky, Kolomak, Barvenkovsky, Chuguev districts. The second group includes Dergachëvsky, Balakleyskiy, Novovodolazhskogo, Bliznyukovsky, Bogodukhov, Borovsky, Valkovsky areas. The third group includes Velikoburluksky, Volchanskiy, Dvurechansky, Zachepilovsky, Zmiev district. The fourth group includes the remaining 8 districts of Kharkiv region (see. Figure 3).




*Calculated by author*

**Figure 3. Distribution of rural areas of the Kharkiv region in terms of development and use of socio-economic potential**

The studies revealed a significant number of inaccuracies in the information available on environmental management and the environment, as well as its absence on certain aspects of sustainable development, the presence of discrepancies in the documents of various departments (e.g., on subsoil use, cadaster of real estate, the tax service, statistics).

In the region, despite the decline in industrial activity of recent decades, there has been an adequate reduction of pollution intensity, rationalization of resource consumption, environmental tense situation has developed in a number of rural areas. Environmental factors is given little

attention in the preparation of the basic documents of the country and individual regions. Until now, the basic law embodied mechanisms to ensure integration of environmental considerations in the development of economic decisions are environmental impact assessment of state ecological expertise, the use of which is carried out mainly in the preparation of feasibility studies or construction projects.

In this connection, it is advisable to be sure to take into account the environmental factor in the development and decision-making on strategic development of socio-economic systems as a systematic underestimation of this factor leads to an unbalanced development of the basic systems of the region (social, economic, environmental and institutional).

**Conclusions and Offers.** These experiments allow to assert the use of the proposed level of development indicators for monitoring systems of different scales: global, regional, national and local via subsystem performance as economic, environmental, social, institutional, allowing you to tailor and unambiguously assess the current level of sustainable development of rural areas as open socio-economic ecosystems.

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