

МАТЕМАТИЧНІ МЕТОДИ В СУСПІЛЬНИХ І ГУМАНІТАРНИХ НАУКАХ



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SUSTAINABLE CITY DEVELOPMENT AS A KEY FACTOR OF COUNTRY ECONOMIC DEVELOPMENT

The current state of implementation tasks the sustainable development of cities and communities in Ukraine are analyzed. The dynamics of changes in the solvency ratio of the borrower, the number of monuments national importance, and the number of employees engaged in tourism. The state of ensuring timely notification of the population about emergencies and emissions of pollutants into the atmosphere is described.

Keywords: sustainable development, solvency, cultural heritage, air pollution index, maximum allowable concentration.

Проаналізовано сучасний стан виконання завдань сталого розвитку міст та громад в Україні. Наведено динаміки зміни коефіцієнта платоспроможності позичальника, кількості пам'яток національного значення, кількості працівників, зайнятих туристичною діяльністю. Охарактеризовано стан забезпечення своєчасного оповіщення населення про надзвичайні ситуації та обсяги викидів у атмосферне повітря забруднюючих речовин.

Ключові слова: сталий розвиток, платоспроможність, культурна спадщина, індекс забруднення атмосфери, гранично допустима концентрація.

Problem statement

In the modern activities of mankind, issues related to various aspects of sustainable urban development are considered as a key factor in the development of modern economy. Sustainable development of cities makes them viable, capable of adaptation, mitigation of adverse effects, to stimulate positive socio-economic and environmental changes. Sustainable development covers all aspects of healthy development the city and should provide solutions to financial, economic, social and environmental problems.

In Europe and Central Asia, urban residents make up more than two-thirds of the total population. Accordingly, the cities of these countries face a wide variety of challenges related to climate change, economic transformation, demographic change, and finding sustainable solutions to these problems is becoming an increasingly important task for governments and city leaders.

The main solution to these problems is to transform large cities into rational and sustainable communities, whose residents will be able to enjoy such benefits as reducing energy costs, improving service quality, reducing waste, creating a more favorable urban environment, creating opportunities for economic activity and development.

Analysis of recent research and publications

The United Nations Sustainable Urban Development Initiative (SCI) is working to address the challenges of sustainable urban development in Europe and Central Asia (ECA) and to support cities and public programs. The main idea of this initiative is that the cities of the ECA countries can learn a lot from their neighbors — the cities of Western Europe. They can provide practical examples of how policy change and investment can be facilitated. This will allow ECA cities to better prepare for future urban development challenges.

The SCI initiative aims to optimize the solution of economic, financial, social and environmental challenges of cities. Activities within the initiative are carried out in 4 main areas, which together are called “Community for the dissemination of applied knowledge” [1]:

- conducting informational and practical seminars;
- development and implementation of diagnostic tools for specific cities;
- reforms of socio-economic policy and investment strategies;
- organization of project financing, technical assistance, assistance in project implementation.

The sustainable development of cities and communities is one of the global goals of sustainable development (CSD) of the United Nations (UN).

The tasks of sustainable development of cities and communities include ensuring until 2030 [2]:

- access to safe and affordable housing;
- inexpensive and environmentally sustainable transport systems;
- open to all and environmentally sustainable urbanization;
- preservation of world cultural and natural heritage;
- reduction of losses from natural disasters;
- reduction of negative environmental impact of cities;
- providing access to safe and open to all green areas and public places;
- improving the quality of national and regional development planning;
- implementation of an integrated approach to management in cities and towns;
- assisting the least developed countries in building sustainable and durable buildings.

Ukraine, like other UN member states, has joined the global process of sustainable development. During 2016—2017, a large-scale process of adapting the CSB to the Ukrainian context continued.

Quality monitoring and evaluation is necessary to achieve the CSD as an integral part of building a civilized and democratic society, planning development and making managerial decisions. The analysis of the CSB data allows identifying current problems in a timely manner, to determine the priority (priority) of solving economic and social policy problems.

Issues and strategies of sustainable development of enterprises, cities and communities are covered in many works (for example, [3—6]), in particular in [5] it is established that the problem of sustainable development of industrial enterprises must be addressed taking into account biological, geographical, economic and social facilities of a particular country, as well as a set of factors and environmental conditions. The article [6] analyzes the national specifics of state organizational and legal regulation of planning and development of urban areas and their compliance with the main provisions of the concept of sustainable development.

Purpose statement

The aim of the work is a comparative analysis of the implementation of sustainable development of cities and communities (target number 11) in Ukraine as of 2019 and provides proposals to ensure the achievement of objectives.

Statement of basic materials

Let's analyze the state of solving the problems of sustainable development of cities and communities in Ukraine for the period 2015—2019.

Ensuring the availability of housing. In Fig. 1 shows the change in the year of the borrower's solvency ratio (RTI), i.e. the ratio of monthly expenses of the borrower and his family members to service the debt on a soft mortgage loan obtained from the state or local budget, and total monthly income.

The reduction of the RTI coefficient from 0,36 in 2015 to 0,19 in 2019 was achieved due to the Government's improvement of the procedure for citizen participation in the program to provide the population with affordable housing. It should be noted that currently programs to provide affordable housing for various categories of citizens cover 100 % of the regions of Ukraine [7].

Special attention is paid to mortgage lending to ensure the affordability of housing. In 2022, the mortgage rate in Ukraine will be 7 %. For comparison, in Fig. 2 shows the lowest average mortgage interest rates in Europe in 2022. The highest interest rates are in Andorra and Bulgaria (4,5 %), Croatia (5 %), Norway and Hungary (6 %), Macedonia (7,5 %), Bosnia and Herzegovina (8 %).

Thus, to address the issue of housing affordability in Ukraine by 2030, there is a further reduction in the borrower's solvency ratio, for example, by reducing interest rates on mortgage lending.

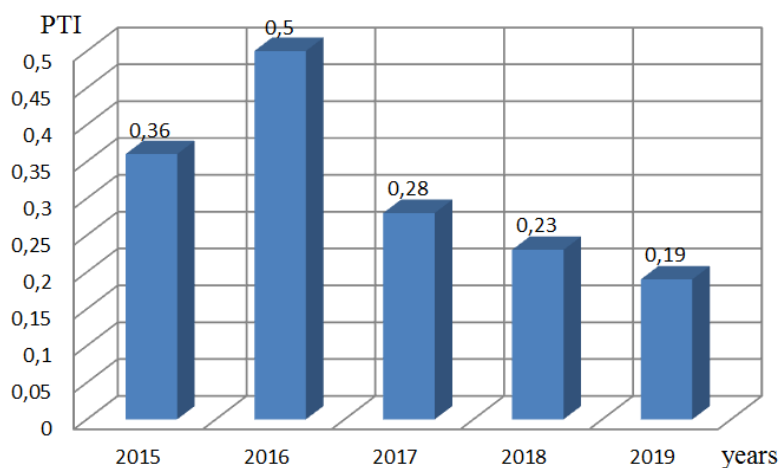
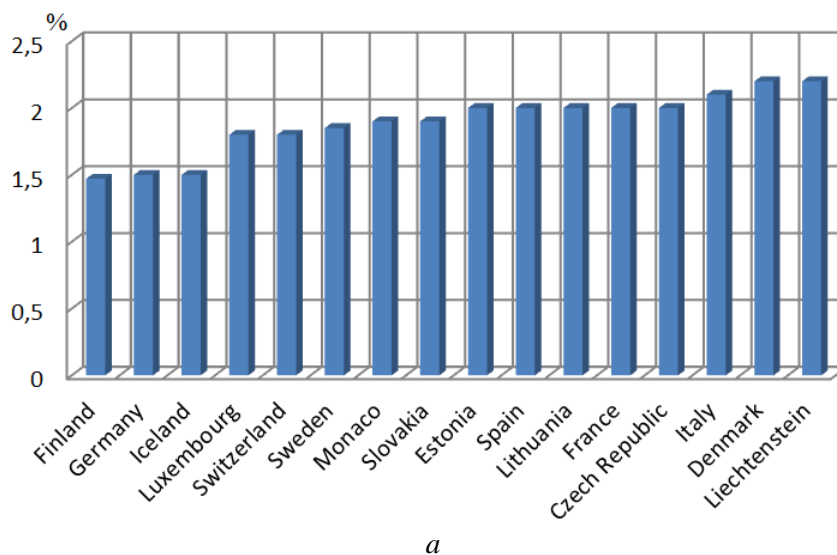
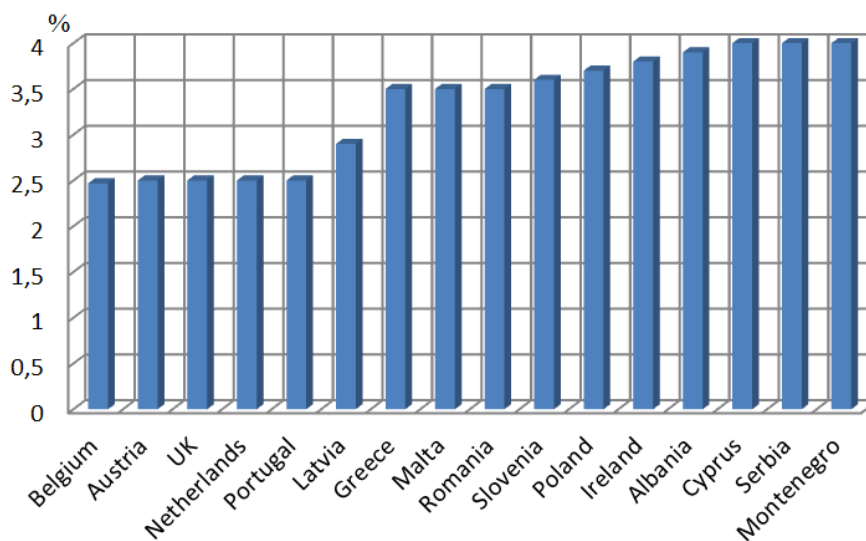


Fig. 1. Change in the solvency ratio of the borrower in Ukraine over the years



a



b

Fig. 2. Lowest interest rates (average values) on mortgage lending in European countries in 2022

Ensuring the development of settlements and territories exclusively on the basis of integrated planning and management with public participation. In Ukraine, during the implementation of decentralization reform, it was possible to achieve 100 % approval and implementation by all 25 regions of regional development strategies developed with public participation. It should be noted that the availability of regional development strategies and action plans for their implementation is a necessary condition for the regions to receive funds from the state fund for regional development.

Ensuring the preservation of cultural and natural heritage with the involvement of the private sector. The number of monuments of national importance included in the State Register of Immovable Monuments of Ukraine for 2015—2019, and the dynamics of changes in the area of the nature reserve fund of national importance for the same period are shown in Fig. 3 and 4 [7].

As follows from Fig. 3, there is an increase in the number of monuments of national importance included in the State Register of Immovable Monuments of Ukraine to 992 in 2019. This was due to a change in approaches to understanding the cultural heritage of the state as a whole, and reforming the accounting of immovable cultural heritage has made it possible to digitize standardized processes of accounting for cultural heritage.

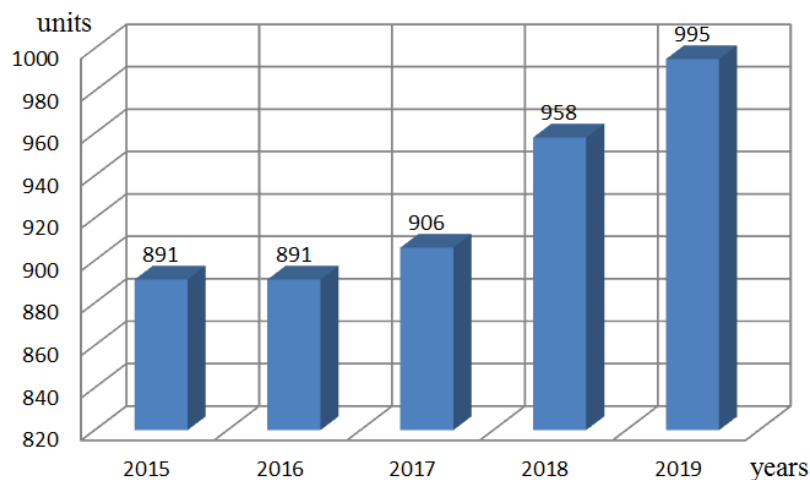


Fig. 3. Number of monuments of national importance included in the State Register of Immovable Monuments of Ukraine for 2015—2019

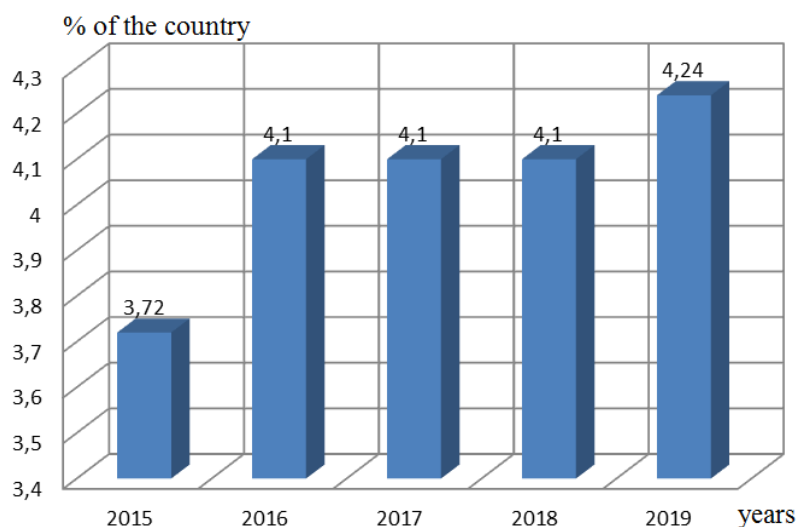


Fig. 4. Dynamics of change in the area of the nature reserve fund of national importance in Ukraine in% of the country's territory for 2015—2019

The increase in the area of the nature reserve fund of Ukraine to 4,24 % of the country's territory in 2019 (Fig. 4) became possible due to the implementation of a number of regulations on the creation and expansion of territories and objects of the nature reserve fund of national importance, increased the area of the nature reserve fund of Ukraine by more than 80,000 hectares, part of which is a UNESCO World Heritage Site [7].

The number of cultural and natural heritage sites in Ukraine for 2021, which are included in the UNESCO World Heritage List, is 7 (6 cultural and 1 natural), including:

- St. Sophia Cathedral and adjacent monastic buildings, Kyiv-Pechersk Lavra (Kyiv);
- ensemble of the historical center of Lviv;
- Struve geodetic arc;
- primitive beech forests of the Carpathians and other regions of Europe (natural);
- residence of the metropolitans of Bukovina and Dalmatia;
- wooden churches of the Carpathian region in Poland and Ukraine;
- ancient city of Chersonesos Tavria and its choir.

For comparison, in Fig. 5 shows the countries with the largest number of UNESCO World Heritage Sites in 2021. The total number of UNESCO World Heritage Sites as of 2021 is 1,154, of which 897 are cultural, 218 natural and 39 mixed in 167 member countries of the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage.

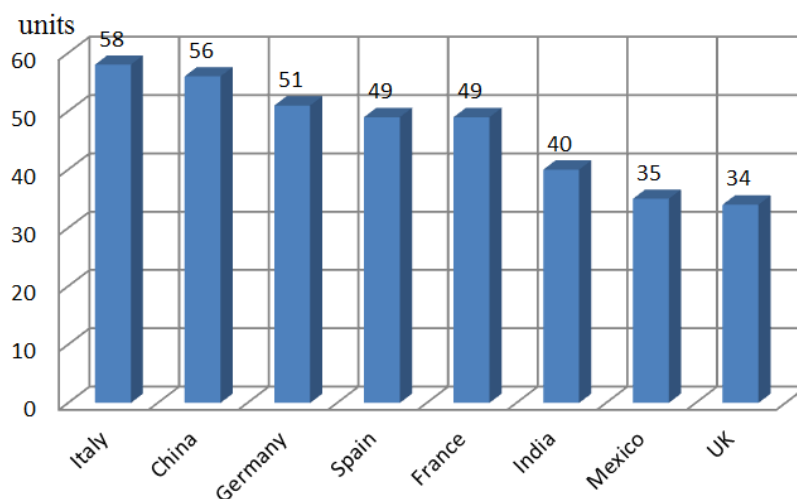


Fig. 5. Countries with the largest number of UNESCO World Heritage Sites

Therefore, further work to increase the number of monuments of national importance included in the State Register of Immovable Monuments of Ukraine, the area of the nature reserve fund of national importance and cultural and natural heritage sites that may be included in the UNESCO World Heritage List, is necessary for the sustainable development of cities and communities in Ukraine. In particular, it will ensure the implementation of local development strategies aimed at economic growth, job creation, tourism development, recreation, local culture and local production.

In fig. 6 shows the dynamics of increasing the number of employees engaged in tourism activities in Ukraine since 2015. The increase in the number of employees in tourism in Ukraine is due to the implementation of the Strategy for Tourism and Resorts until 2026, as well as an increase in the number of monuments of national importance, the area of nature reserves and the presence of 7 cultural and natural heritage sites included to the UNESCO World Heritage List [7].

In order to achieve sustainable development of cities and communities, it is important to ensure timely notification of emergencies of natural, man-made, social and military nature [8, 9], as well as satisfactory condition (with minimal emissions) of ambient air.

There is a positive trend in the implementation of these issues. Thus, the level of implementation (creation, modernization, improvement) of local automated centralized alert systems in 2019 reached

0,2 %. Emissions of pollutants into the air also decreased compared to 2015 to 86,1 %, although the number of cities increased to 36, where the average annual concentrations of major pollutants in the air exceed the average daily maximum permissible concentrations (MPC).

In Fig. 7 provides information on the excess of average annual concentrations of major pollutants in the air in the cities of Ukraine in 2019 [7].

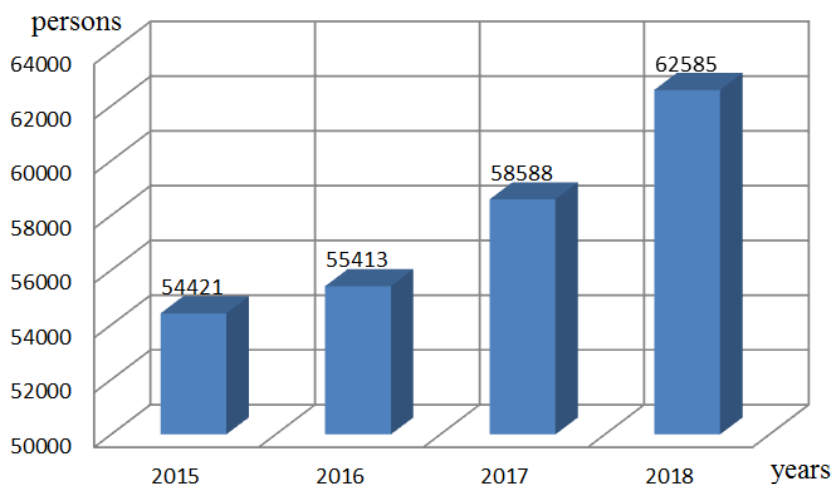


Fig. 6. The dynamics of increasing the number of employees engaged in tourism in Ukraine

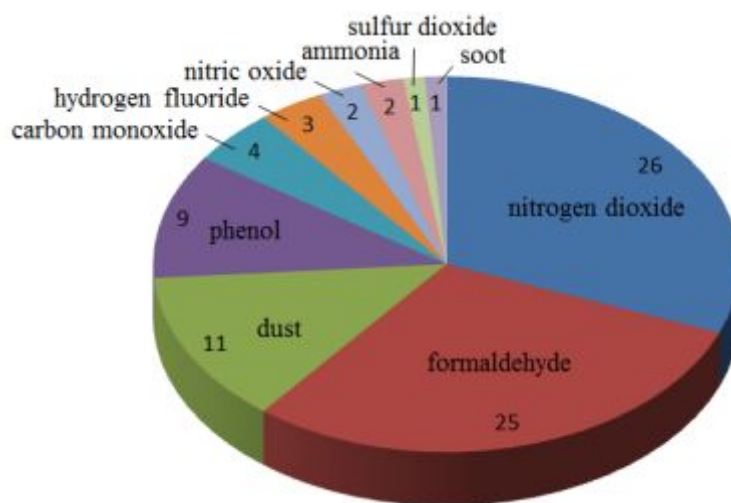


Fig. 7. Information on the number of cities in Ukraine in which the average annual concentrations of pollutants in the air exceed the average daily MPC (as of 2019)

The most polluted cities in Ukraine are Mariupol, Dnipro, Odessa and Kamianske (Dnipropetrovsk region). In Fig. 8 shows the values of air quality indices (AQI) of these and other most polluted cities of Ukraine in 2019 [10].

It should be noted that the AQI is calculated for the five substances with the highest normalized MPC, taking into account their hazard class. To assess the level of air pollution, there are 4 levels of AQI:

- low, with AQI less than 5,0;
- increased, with AQI from 5,0 to 7,0;
- high, with AQI from 7,0 to 14,0;
- very high, at AQI from 14,0 and above.

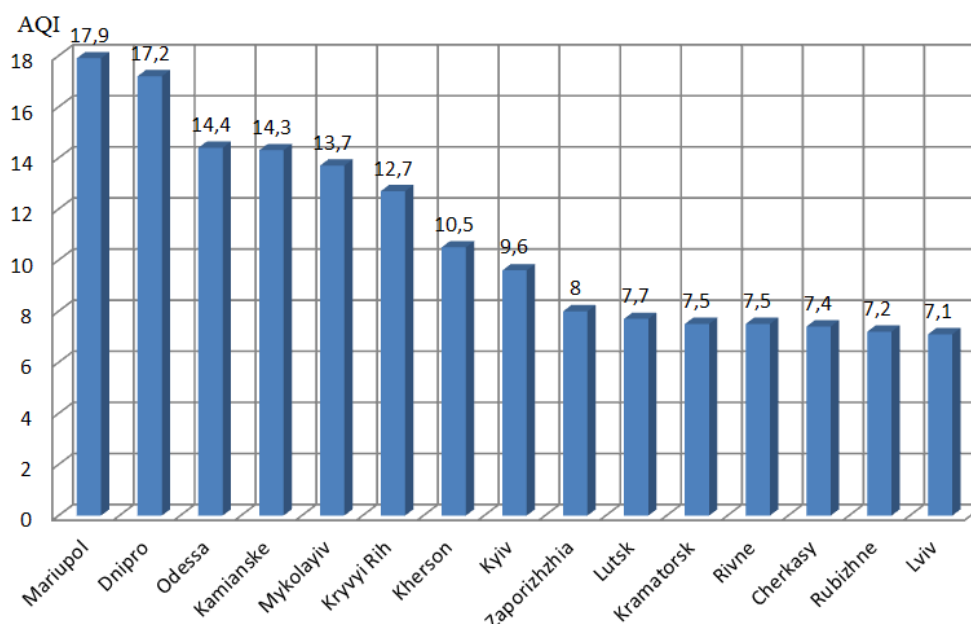


Fig. 8. Values of air quality indices (AQI) in the most polluted cities of Ukraine (as of 2019)

Thus, the cities of Mariupol, Dnipro, Odessa and Kamianske have a very high level of AQI, and others, shown in Fig. 8, — high. The lowest indicators of AQI from all cities of Ukraine, where hydro-meteorological organizations conduct observations, are observed in Izmail (2,7), Svitlovodsk (2,6) and Horishni Plavny (1,2).

The total level of air pollution in Ukraine in 2019 is high (ISA is 8,2). Compared to 2018, it increased slightly from 7,6 due to the increase in the average annual content of formaldehyde [10].

The main reason for the negative dynamics of air pollution is the increase in anthropogenic impact on the environment. The biggest air pollutants are thermal power plants, metallurgical and chemical enterprises (emissions of sulfur, carbon and nitrogen compounds), road transport (emissions of carbon monoxide, nitrogen dioxide, lead, toxic hydrocarbons).

Conclusion

From the review we can identify the main trends in ensuring further achievement of the goals of sustainable development of cities and communities in Ukraine.

1. Mandatory monitoring, analysis of results and evaluation of the effectiveness of work performed on the issues.

2. Maintaining positive trends in the short and long term in terms of housing affordability, preservation of cultural and natural heritage, public safety, reducing the negative impact of pollutants, etc. and planning further measures leading to sustainable development of cities and communities.

3. Raising the level of education and awareness of the population by proving greening plans, explaining its positive aspects, educating the desire to change consumer behavior. To develop effective educational programs and conduct activities in environmental education, it is necessary to pay special attention to 3 areas of environmental education:

- understanding of the Earth's ecosystem and understanding of natural processes (for example, the impact of carbon dioxide on Earth's climate change);
- knowledge in the field of nature management and environmental protection (for example, reduction of household waste);
- understanding of resource conservation processes, i.e. knowledge of the effectiveness of different behaviors in terms of energy savings or emission reductions.

4. Promoting the socio-economic development of territories as a result of interaction of representatives of international organizations with the population by choosing the best environmental practices involving local communities in decision-making, preserving cultural heritage, improving human health and safety, creating new jobs and stimulating local economy.

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СТАЛИЙ РОЗВИТОК МІСТА ЯК КЛЮЧОВИЙ ФАКТОР РОЗВИТКУ ЕКОНОМІКИ КРАЇНИ

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Реферат

У сучасній діяльності людства питання, пов'язані з різними аспектами сталого розвитку міст, розглядаються як ключовий фактор розвитку сучасної економіки. Сталий розвиток міст робить їх життєстійкими, здатними до адаптацій, пом'якшення несприятливих впливів, до стимулювання позитивних соціально-економічних та екологічних змін. Сталий розвиток охоплює

всі аспекти здорового розвитку міста та має забезпечувати вирішення фінансово-економічних, соціальних та екологічних проблем.

До завдань сталого розвитку міст та спільнот відносяться забезпечення до 2030 року: доступу до безпечного та недорогого житла, недорогих та екологічно сталих транспортних систем, відкритої для всіх та екологічно сталої урбанізації, збереження всесвітньої культурної та природної спадщини, зменшення збитків від природних лих, зменшення негативного екологічного впливу міст, забезпечення доступу до безпечних та відкритих для всіх зелених зон та громадських місць, підвищення якості планування національного та регіонального розвитку, здійснення комплексного підходу управління в містах та населених пунктах, сприяння найменш розвиненим країнам у будівництві стійких та міцних будівель.

Проведено аналіз вирішення завдань сталого розвитку міст і громад в Україні за період 2015—2019 рр. З проведеного огляду можна виділити основні тенденції щодо забезпечення подальшого досягнення поставлених цілей сталого розвитку міст та громад в Україні.

Основними з них є:

- обов'язковий моніторинг, аналіз результатів та оцінка ефективності виконаної роботи з поставлених питань;
- збереження позитивних тенденцій у короткостроковій та довгостроковій перспективах у питаннях забезпечення доступності житла, збереження культурної та природної спадщини, безпеки населення, зниження негативного впливу забруднюючих речовин тощо та планування подальших заходів, що ведуть до сталого розвитку міст та громад;
- підвищення рівня освіти та поінформованості населення шляхом обґрунтування планів екологізації, роз'яснення її позитивних сторін, виховання прагнення змінити споживчу поведінку;
- сприяння соціально-економічному розвитку територій у результаті взаємодії представників міжнародних організацій з населенням шляхом вибору кращих варіантів екологічних практик із залученням місцевих спільнот у процес прийняття рішень, збереження культурної спадщини, покращення здоров'я та безпеки людей, створення нових робочих місць та стимулювання місцевої економіки.

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