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C O N T E N T

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MANAGEMENT OF INFRASTRUCTURE DEVELOPMENT PROJECTS OF UKRAINE AND RURAL AREAS

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Abstract

The article examines the rapid development of the latest methods in the management of infrastructural development projects of Ukraine in the regional dimension in modern conditions, focusing on effective management, strategic vision of development and high-quality formulation of current projects, in particular infrastructure projects. Emphasis is placed on the size of the population in Ukraine and the factors affecting the unemployment rate are indicated, as well as the project index is defined for the most important areas in the regions, in particular, such as education and health care. An analysis of statistical data was carried out for various clusters of regions of Ukraine using the method of total ranks and diversified indicators of infrastructural development. A cartographic visualization of the cluster distribution of regions by classes of the regional infrastructural development index is shown. It has been confirmed that in order to achieve strategic goals, it is necessary to implement a flexible model of city management and use innovative cooperation tools. This article is important for understanding the current trends in the management of territorial communities and the need to ensure their development through effective projects and programs.

Key words: *digitalization, modelling, project management, territorial communities*

INTRODUCTION

In modern conditions, we are observing the rapid development of territorial communities, effective management of their activities, strategic vision of development and high-quality formulation of actual projects, in particular infrastructure projects, but there are still a number of unresolved problems that require financial resources. The territorial community, realizing its responsibility for its future, is forced to join the management process, including through project activities.

Any territory has different opportunities for the development and implementation of projects, programs and project portfolios, therefore, with regional differences, the state is obliged to preserve the unity of the state space and provide its citizens with a guaranteed level of access to the products of projects and programs.

Management of innovative projects requires the involvement of active people to search for creative and promising ideas to determine the potential development opportunities of territories. It is important to strengthen responsibility and introduce communications between the authorities, citizens and business [17].

Digitization as an integral component is present in the development of modern cities and territories [10]. Digitalization is the process of using technologies to improve the usage of information as a main asset and digital business. Ringenson, et al. [15], while modernization represents the transition from traditional to modern society and forms a link between the current and future state of development [9]. Bushuyev S. [3; 4; 5], Ivanusa A [8], Popescu A. [13; 14], Todorović, M. [20] on the other hand, the implementation of infrastructure projects, programs and project portfolios in the regional dimension is an

important aspect of community development, in particular with the application of safety-oriented management approaches.

The purpose of the research is to find ways to improve the management of territorial development, to define the essence of the sustainable development strategy in the context of modern challenges.

MATERIALS AND METHODS

The research conducted in this article is based on general economic methods, which are most often used in the scientific works of scientists. The main method of research is economic and statistical, aimed at identifying modern patterns of socio-economic development of territories. With the help of a logical method, we form the main theoretical statements and conclusions, based on research conducted by leading scientists of Ukraine and the world. The conducted research was carried out on the basis of statistical information using methods of scientific knowledge and generalization. Graphical and tabular methods are used for the purpose of visual representation of the obtained results. Economic-mathematical modeling and the method of total ranks were used to construct a cluster distribution of regions by classes of the regional infrastructural development index.

The problems of managing the development of territories, including by uniting several communities to jointly solve problems, were highlighted in many scientific works. Perspective of strategic planning and its possibilities for the administrative component of territorial communities gained significant importance in the process of decentralization. Such a study was conducted by Torhal T. [21], who characterized the quality of the processes of reforming and the creation of united territorial communities in Ukraine and identified the problems of direct access of citizens to the government and the community, as well as the lack of a planning organization system. In their research, the authors thoroughly prescribe the need to improve the qualifications of officials who work in the framework of the development of regions.

A significant number of researched issues in today's conditions acquires new aspects of relevance, and singles out a number of problems and creates new opportunities for the implementation of creative ideas. There remain insufficiently developed issues of the current state of territorial development in Ukraine both in scientific and applied aspects. In particular, the adaptation of project tools to the specifics of the functioning of territories and the improvement of the methodology for evaluating the effectiveness of territorial development projects.

RESULTS AND DISCUSSIONS

The development of socio-economic processes, which has successfully begun, will contribute to the successful development of the territories of Ukraine. This concerns improving the effectiveness of interactions between state authorities, the leadership of territorial communities and representatives of public organizations. The combination of the security system, science, education and investment capital provide a breakthrough in innovation and become the basis of a strong economy.

Factors affecting the development of territories are divided into natural (possibility of using natural resources), geographical (good location), social (social stability, community activity), economic (level of income and expenses, as well as business prospects), ecological (natural environment), cultural (historical value of territories) and innovative (marketing policy, credit policy, territorial development programs, implementation of start-ups and projects in the territory).

Let's consider the territorial features of Ukraine in Figure 1, in the section of regions, analyzing the area and number of territorial communities. The largest number of territorial communities - 91 TC (Odesa region), 86 TC (Dnipropetrovsk region) and 73 TC (Lviv region), the smallest - 37 TC (Luhansk region) and 49 TC (Kherson region). In terms of the largest area, Odesa Oblast was also ranked 1st, and Dnipropetrovsk region was ranked 2nd. Lviv Region has the largest number of villages - 1,850, and Donetsk Region - 52 cities.

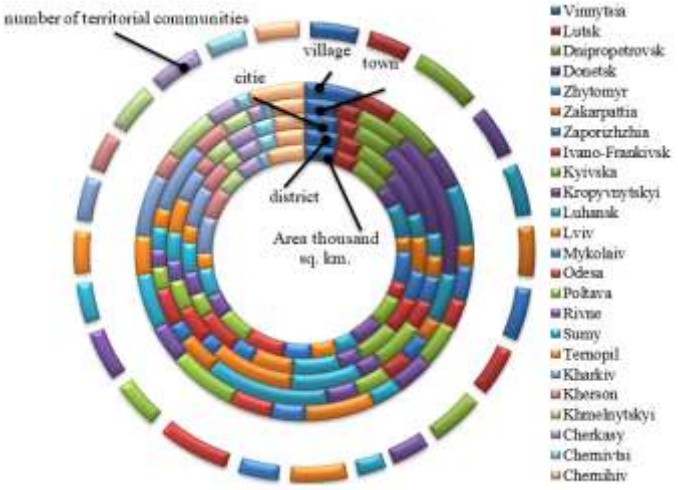

Fig. 1. Structural decomposition of territorial systems of Ukraine
Source: own development.

The administrative-territorial structure of the regions as a whole is typical for Ukraine. Territorial communities are mostly close in terms of territory, but differ significantly in population size and density. The population size is shown in detail in Figure 2.

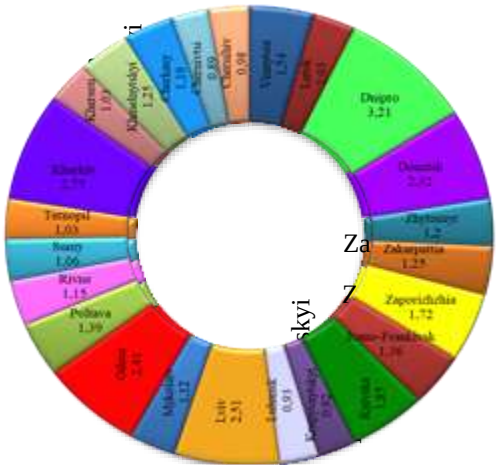

Fig. 2. Population size as of January 1, 2022, million people.
Source: own development.

In the structure of regions, there are groups of densely populated territories (Dnipro, Donetsk, Lviv, Odesa, Kharkiv) and sparsely populated (Kropyvnytskyi, Luhansk, Chernivtsi, Chernihiv). Each of these groups has its own characteristics of economic and social development. Territories that are more populated, located near the coast of the seas, are much more economically capable than mountainous areas or areas where the population density is too low. If we compare the percentage ratio of the urban population to the rural population, then in most of the country the urban population prevails, but the rural population has an advantage in Zakarpattia region (by 26%), Ivano-Frankivsk region (by 12%), Rivne region (by 4%), Ternopil region (by 8%), Chernivtsi region (by 14%).

Alternative labor market assessments have confirmed that there has been a significant increase in unemployment following a full-scale invasion, and that there is potential for job losses in some regions during the protracted war phase.

The level of unemployment increases annually, which is caused by a decrease in the financial results of enterprises, an increase in the minimum wage, thereby optimizing the number of employees, transferring them to

part-time work, or completely reducing them. Unemployment, of course, has negative socio-economic consequences both for the state, which loses tax revenues and increases unemployment benefits, thereby losing about 3% of GDP, and for the population, due to insignificant additional payments, which are difficult to live on, and due to increasing the already significant burden on working people. The unemployment rate by region is shown in Figure 3.

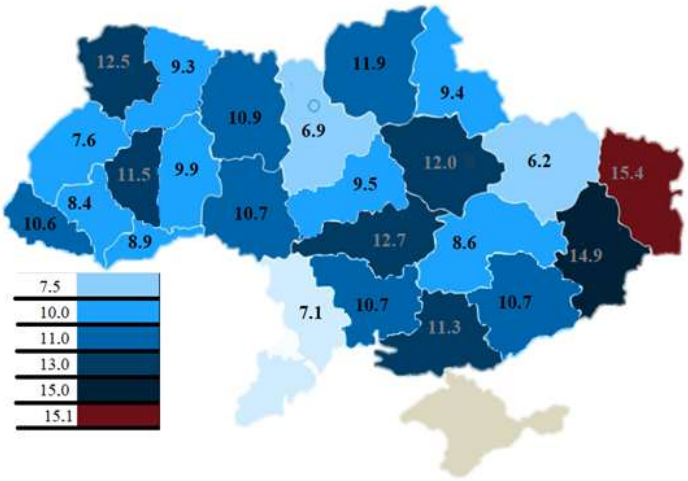

Fig. 3. Unemployment rate in the country, in %.
Source: own development.

The main cause of unemployment is various indicators both at the national level and at the level of individual regions, which depend on economic, social and political components. The worst employment situation is in Luhansk and Donetsk regions.

The highest percentage of population employment is observed in Kharkiv region (59.9% employment), Dnipropetrovsk region (58%), Kyiv region (57.8%).

In the future, the reduction of the unemployment rate will contribute to the economic growth of Ukraine. All this is possible with the correct distribution of state orders in institutions of higher education, with the training of in-demand specialists who will be relevant in the labor market, and ending with the attraction of investments in promising industries.

As a result, there is a surplus of specialists in some professions and a shortage of others in Ukraine.

The solution to this problem can be the acquisition of additional education and retraining of the temporarily unemployed. Figure 4 shows the "Education" index, formed on the basis of the number of educational institutions and the number of potential students and applicants.

Territorial differentiation of the capacity of infrastructural facilities, in particular educational ones, and the insufficient level of equipping of educational institutions remain problematic issues in education. The quality of education is based on adaptability to global development trends and society's demands. Personal orientation of the educational process and its informatization are important.

The basis of innovation is laid in the education system. The largest number of educational institutions are concentrated in Lviv, Dnipro, Odesa and Kharkiv regions.

Another important aspect of the implementation of infrastructure project portfolios is the implementation and functioning of infrastructure facilities of health care institutions.

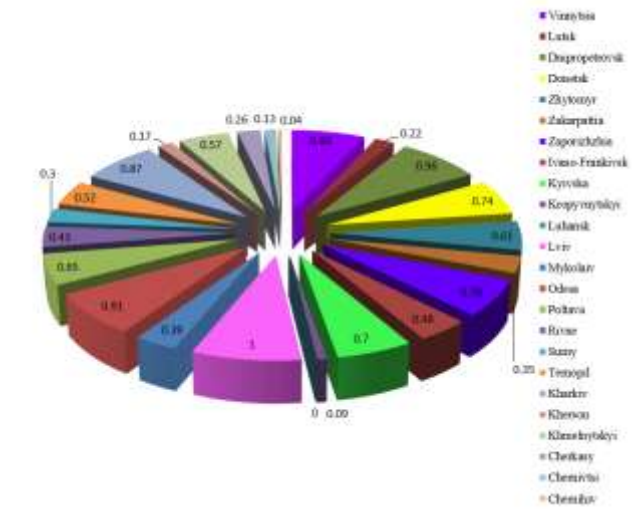

Fig. 4. Project index "Education"
Source: own development.

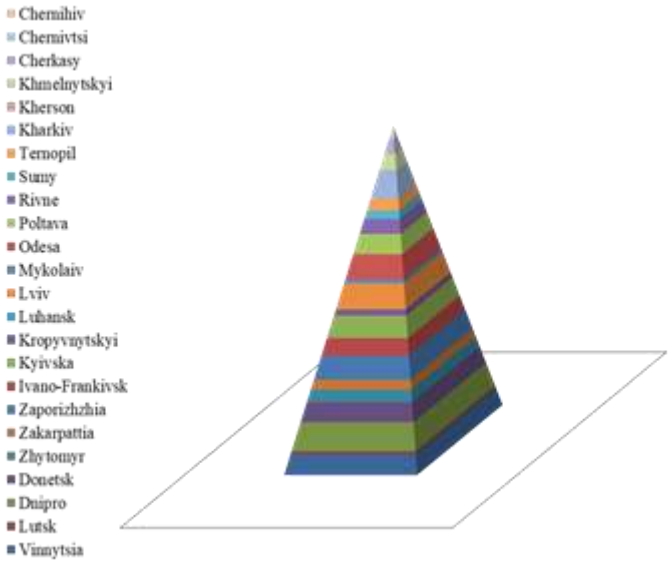

Fig. 5. Project index "Health care"
Source: own development.

During the COVID-2019 pandemic in Ukraine, the regions showed the need to coordinate the work of all structures, highlighted the importance of modern equipment with energy-efficient technologies in primary and secondary medical institutions. Apply all opportunities for the formation of a culture of health at the community level, including mental health, as well as timely response to epidemic and other emergency situations in the region [18].

To determine the financial capacity of the community, the indicator of overall income growth in conditions of budgetary and tax changes is insufficient. It is appropriate to have a practical calculations of necessary expenses and available income per 1 resident of the community, based on the provision of not only the priority important infrastructure needs of the territorial community, financing of salaries, social benefits, financing of projects to improve the social sphere of life and economic well-being of citizens living within the territorial communities [6].

It is worth using the tools of international support (on a free and non-refundable basis), fundraising (raising funds for the purpose of implementing a social project), endowment (a trust fund for the purpose of financing organizations, which is filled at the expense of charitable donations).

The main commodity items of Ukrainian imports in 2021 were: mineral fuels, oil and its distillation products, machines, equipment, products of chemical and related industries. The import and export of goods is shown in figure 5, by region (Figure 6).

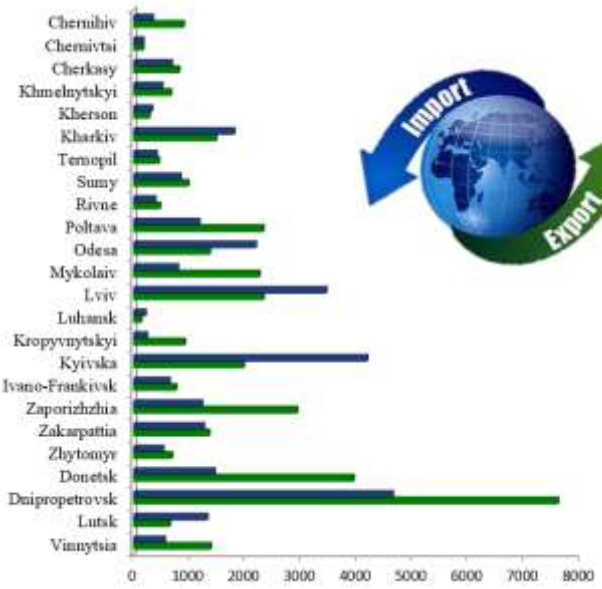

Fig. 6. Export-import transactions, million US dollars
Source: own development

As evidenced by the results displayed in Figure 6, most of the regions demonstrate an average (10 oblasts) and low (14 oblasts) level of export activity. EU countries have consistently taken a significant share in the export and import of Ukrainian goods. The share of exports of goods of one Dnipropetrovsk region to EU countries is 20% of the total export of goods of Ukraine to EU countries, and that of Donetsk region is 10%, respectively. The lowest indicators of export and import of goods in Luhansk region.

The powers of local governments are therefore directly linked to their financial strength. Both components form a functional whole. Reflecting on the scope of local autonomy, we are not only examining the scope of the tasks of local governments, but also their financial resources and freedom to shape spending policy [1].

Based on the processing of statistical data for various data clusters of the regions of Ukraine using the method of total ranks and diversified indicators of infrastructural development, we distribute the received data with the determination of the minimum, average and maximum values of the data, which is shown in Table 2.

Based on the formed classes of data clusters, we form an index of infrastructural development of the regions of Ukraine in the range [0→1]. Where 0 is the minimum indicator of the infrastructural development index, 1 is the highest indicator of the index, and we display the regional distribution of infrastructural development in the form of a diagram (Fig. 7).

Success in the implementation of digitalization of project-oriented management in the studied regions depends on the available resources in the territorial community.

Financial resources are aimed at the purchase of software that will be used in work. It is also important to be able to attract experts to conduct educational trainings on writing, submitting and implementing projects [19; 11].

Having received the general indicators of the project index of infrastructural development of the regions and indicators of infrastructural development, we form classes of infrastructure development according to the cluster distribution and the boundaries of the class boundaries (Table 3).

Table 1. Infrastructural distribution of regions by level of development

Regions	*Rank of indicators by "Territory"*	*Ранг "Територія"*	*Index "Territory"*	*Rank of indicators by "Population"*	*Rank "Population"*	*Index "Population"*	*Rank of indicators on "Employment and unemployment"*	*Rank "Employment and unemployment"*	*Index "Employment and unemployment"*	*Rank of indicators by "Education"*	*Rank "Education"*	*Index "Education"*	*Rank of indicators by "Health care"*	*Rank "Health care"*	*Index "Health care"*	*Rank of indicators by "Economic indicators"*	*Rank "Economic indicators"*	*Index "Economic indicators"*	*Indicator of infrastructure development*	*Index of infrastructure development of the region*	*Class of infrastructure development*
Vinnytsia	*50*	*7*	*0.74*	*90*	*18*	*0.26*	*51*	*13*	*0.48*	*67*	*5*	*0.83*	*35*	*7*	*0.74*	*51*	*9*	*0.64*	344	0.63	1 class
Volyn	*97*	*19*	*0.22*	*75*	*9*	*0.65*	*71*	*24*	*0*	*159*	*19*	*0.22*	*101*	*22*	*0.09*	*76*	*15*	*0.36*	579	0.17	3 class
Dnipro	*24*	*1*	*1.00*	*51*	*2*	*0.96*	*35*	*3*	*0.91*	*31*	*2*	*0.96*	*6*	*1*	*1*	*5*	*1*	*1*	152	1	1 class
Donetsk	*41*	*6*	*0.78*	*85*	*16*	*0.35*	*66*	*23*	*0.04*	*87*	*7*	*0.74*	*42*	*8*	*0.7*	*26*	*4*	*0.86*	347	0.62	1 class
Zhytomyr	*52*	*8*	*0.70*	*78*	*11*	*0.57*	*62*	*20*	*0.17*	*123*	*10*	*0.61*	*70*	*14*	*0.43*	*68*	*13*	*0.45*	453	0.42	2 class
Zakarpattia	*101*	*21*	*0.13*	*74*	*7*	*0.74*	*55*	*16*	*0.35*	*153*	*16*	*0.35*	*77*	*16*	*0.35*	*77*	*16*	*0.32*	537	0.26	3 class
Zaporizhzhia	*70*	*12*	*0.52*	*65*	*5*	*0.83*	*49*	*12*	*0.52*	*82*	*6*	*0.78*	*26*	*5*	*0.83*	*32*	*7*	*0.73*	324	0.67	1 class
Ivano-Frankivsk	*88*	*14*	*0.43*	*79*	*13*	*0.48*	*52*	*15*	*0.39*	*135*	*13*	*0.48*	*44*	*10*	*0.61*	*79*	*17*	*0.27*	477	0.37	2 class
Kyivska	*40*	*5*	*0.83*	*74*	*7*	*0.74*	*27*	*1*	*1*	*92*	*8*	*0.7*	*34*	*6*	*0.78*	*18*	*2*	*0.95*	285	0.74	1 class
Kropyvnytskyi	*93*	*17*	*0.30*	*90*	*18*	*0.26*	*63*	*21*	*0.13*	*192*	*22*	*0.09*	*94*	*19*	*0.22*	*89*	*19*	*0.18*	621	0.09	3 class
Luhansk	*69*	*11*	*0.57*	*78*	*11*	*0.57*	*47*	*10*	*0.61*	*221*	*24*	*0*	*120*	*24*	*0*	*116*	*23*	*0*	651	0.03	3 class
Lviv	*29*	*2*	*0.96*	*58*	*4*	*0.87*	*48*	*11*	*0.57*	*23*	*1*	*1*	*19*	*3*	*0.91*	*21*	*3*	*0.91*	198	0.91	1 class
Mykolayiv	*107*	*23*	*0.04*	*77*	*10*	*0.61*	*32*	*2*	*0.96*	*141*	*15*	*0.39*	*96*	*21*	*0.13*	*56*	*10*	*0.59*	509	0.31	2 class
Odesa	*29*	*2*	*0.96*	*48*	*1*	*1*	*37*	*4*	*0.87*	*35*	*3*	*0.91*	*20*	*4*	*0.87*	*26*	*4*	*0.86*	195	0.92	1 class
Poltava	*63*	*10*	*0.61*	*82*	*15*	*0.39*	*59*	*19*	*0.22*	*102*	*9*	*0.65*	*42*	*8*	*0.7*	*34*	*8*	*0.68*	382	0.56	2 class
Rivne	*98*	*20*	*0.17*	*68*	*6*	*0.78*	*40*	*6*	*0.78*	*138*	*14*	*0.43*	*69*	*12*	*0.52*	*98*	*20*	*0.14*	511	0.31	2 class
Sumy	*82*	*13*	*0.48*	*80*	*14*	*0.43*	*40*	*6*	*0.78*	*154*	*17*	*0.3*	*87*	*17*	*0.3*	*69*	*14*	*0.41*	512	0.3	2 class
Ternopil	*102*	*22*	*0.09*	*88*	*17*	*0.3*	*65*	*22*	*0.09*	*133*	*12*	*0.52*	*71*	*15*	*0.39*	*98*	*20*	*0.14*	557	0.22	3 class
Kharkiv	*38*	*4*	*0.87*	*56*	*3*	*0.91*	*39*	*5*	*0.83*	*44*	*4*	*0.87*	*10*	*2*	*0.96*	*26*	*4*	*0.86*	213	0.88	1 class
Kherson	*95*	*18*	*0.26*	*91*	*21*	*0.13*	*51*	*13*	*0.48*	*162*	*20*	*0.17*	*111*	*23*	*0.04*	*103*	*22*	*0.05*	613	0.11	3 class
Khmelnytsk	*89*	*16*	*0.35*	*90*	*18*	*0.26*	*57*	*17*	*0.3*	*127*	*11*	*0.57*	*56*	*11*	*0.57*	*67*	*12*	*0.5*	486	0.35	2 class
Cherkassy	*88*	*14*	*0.43*	*101*	*23*	*0.04*	*44*	*8*	*0.7*	*156*	*18*	*0.26*	*69*	*12*	*0.52*	*61*	*11*	*0.55*	519	0.29	3 class
Chernivtsi	*132*	*24*	*0.00*	*93*	*22*	*0.09*	*44*	*8*	*0.7*	*189*	*21*	*0.13*	*95*	*20*	*0.17*	*116*	*23*	*0*	669	0	3 class
Chernihiv	*54*	*9*	*0.65*	*120*	*24*	*0*	*57*	*17*	*0.3*	*197*	*23*	*0.04*	*93*	*18*	*0.26*	*83*	*18*	*0.23*	604	0.13	3 class

Source: own development.

Table 2. Cluster distribution of regions according to the indicator of infrastructural development and the index of infrastructural development of regions

Value	Indicator of infrastructural development	Index of infrastructural development of the region
Average value	447	0.4
The minimum in the group	152	0
The maximum in the group	669	1

Source: own development.

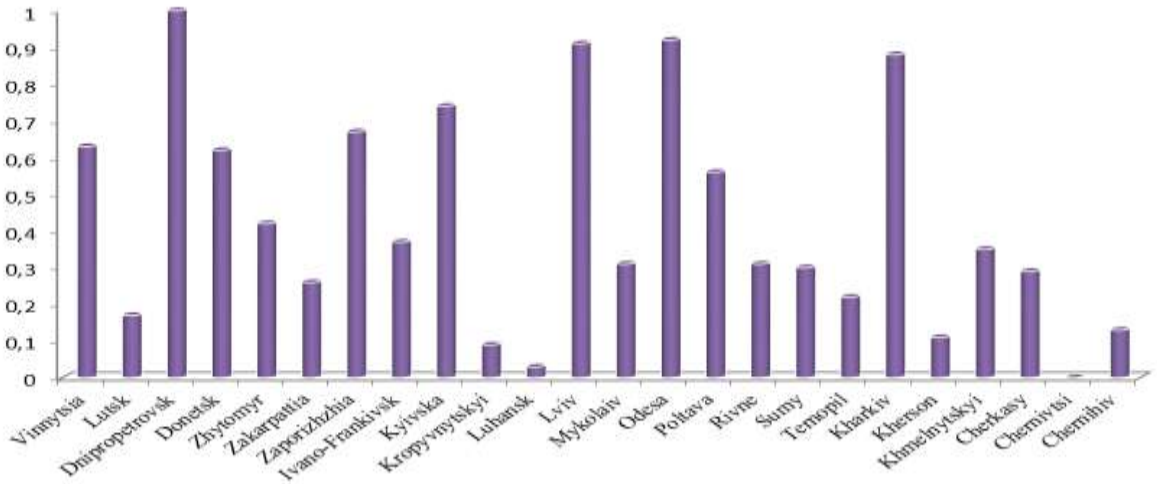

Fig. 7. Project index "Infrastructural development of regions"
Source: own development.

Table 3. Cluster distribution of regions by classes of the regional infrastructural development index

№	class of infrastructure development	lower	upper	lower	upper
1	3 class of infrastructure development	0.00	313.19	0.00	0.30
2	2 class of infrastructure development	313.19	581.64	0.30	0.56
3	1 class of infrastructure development	581.64	669.00	0.56	1.00

Source: own development.

Based on the research, we will form 3 classes of the regional infrastructural development index: 1 class – the infrastructure of the region is developed; 2 class – the infrastructure of the region is moderately developed; 3 class - the infrastructure of the region is underdeveloped.

The struggle of cities for leadership in the world market of smart solutions requires the search for directions for the development of smart technologies that make life easier for citizens, and therefore their implementation must be well planned and reliable. Considering the uniqueness of each city, including its culture, level of physical infrastructure development, socio-economic progress, as well as financial and technological capabilities for the implementation of smart technologies, the development of smart infrastructure must take into account local needs and conditions. The world experience of implementing smart projects and creating smart cities can only serve as a partial example for imitation.

The application of a digital solution in the functioning of smart cities will improve the entire infrastructure of the regions [16]. Digitalization plays an important role in the development of smart cities. Some authors believe that advanced digitalization is not enough for the successful development of a smart city, and the need for effective program management is more effective [2]. Smart cities are ready to be flexible in strategic management. Taking into account the opinion and scientific work of Ibrahim and Morsy [7], we can say that in fact smart cities are sustainable, but on the other hand, the adaptation and introduction of new technologies into already existing structures is

quite difficult, because it requires the willingness of the latter to perceive new processes in projects [12].

Fig. 8. Cartographic visualization of the cluster distribution of regions by classes of the regional infrastructural development index
Source: own development.

Modern project and program management strategies actively use the latest technologies [20]. Infrastructure of territories should meet the needs of city residents in terms of lifestyle, safety, cultural foundations and modern improved behavior patterns.

CONCLUSIONS

The analysis of statistical data for different data clusters of the regions of Ukraine using the method of total ranks and diversified indicators of infrastructural development made it possible to distribute the received data with the determination of the minimum, average and maximum data values. Based on the formed classes of data clusters, an index of infrastructural development of the regions of Ukraine in the range [0→1] was formed. Where 0 is the minimum indicator of the index of infrastructural development, 1 is the highest indicator of the index, and we display the regional distribution of infrastructural development in the form of a diagram. The obtained general indicators of the project index of infrastructural development of the regions and indicators of infrastructural development made it possible to form classes of infrastructure development according to cluster distribution and the boundaries of the class boundaries. Based on the conducted research, 3 classes of the regional infrastructural development index were formed.

In today's conditions, the priority is the correct definition of priority tasks and the search for approaches, levers, methods and tools that would ensure maximum efficiency in managing the development of territories and ensure proper coordination of all government institutions. The timeliness of management decision-making should have a scientific basis with well-defined priorities.

Today, the most relevant directions of territorial development projects are: new construction in accordance with the requirements prescribed in the standards and reconstruction of existing buildings; creation of modern digitized community management systems; improving the quality of providing online services for the population; capital repair of roads and modernization of streets; ensuring the appropriate level of security and civil protection; cultural and educational development of the community; attraction of international investments for conducting business in certain territories and ensuring their competitiveness; improvement of the transport

interchange; special attention should be paid to educational institutions and medicine.

It is necessary to implement a flexible model of city management, using innovative tools of cooperation, partnership relations and various forms of contracts. The development of smart infrastructure ensures a balance between all participants, namely, it involves the population, public organizations, state and local authorities, the non-state sector, as well as various business associations and international partners, to establish business processes, increases the stability and sustainability of the city, ensures the safety of citizens, improves the quality of life and contributes to the improvement of the environment.

The integration of the smart infrastructure development policy within the framework of other spheres (industrial, financial, environmental, energy, social and others) will contribute to the establishment of effective cooperation between various subjects in order to achieve the common goal of increasing the level of "smart development" of Ukrainian cities.

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