

**The determination of the stability of the city by the construction  
method of integrated indicators and prognosis its development**

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Annotation. To achieve the goals of sustainable development of the city, the socio-economic situation is analyzed and objectively assessed. One method for assessing the sustainable development of the city is the method of constructing integrated indicators, which allows you to analyze the situation of each subsystem of the city's functioning and identify problematic issues that impede the overall sustainable development. The probability of three scenarios of development and on the example of the city of Odessa has been prognosticated for socio-economic development. The results of the work allow the authorities to recommend specific measures on the prospects for its further development.

Key words: indicator approach, integral index, index of stability, socio-economic development, city, strategy.

Urban sprawl is already a thing of the past, because without certain strategic goals, it is impossible to predict how the development process will take place, what changes will take place in the future, and how the city will respond to new challenges. In order to effectively develop, make the most of its strengths and develop the weaknesses, stand out against the background of the region, the city must function in accordance with the pre-established development strategy.

Ukraine actively began to search for its own place in Europe. A country's development strategy is, first of all, a development strategy for its regions and cities, enterprises and organizations. Studying the best experience in the development of territories, the use of resources and strategies for the

development of cities and regions, the state is integrating into world economic processes, international structures and organizations.

Strategic development is a document that defines the main directions of its development. The main objectives of the relevant strategy are: improving the quality of life of the population, growing the city's economy, preserving its identity. The strategy as a document without fail includes a vision of the future of the city, priority directions of development, targets, key initiatives and a plan for their implementation. Its implementation will eliminate the most important problems of the city, realize its potential and enhance competitive advantages. For the implementation of the objectives laid down in the strategy, a base of investment projects is being developed that are aimed at the dynamic development and increase in external and internal investments [10].

In connection with the foregoing, in our study, the experience of the development of cities in the highly developed countries of the world was interesting, which allows us to reveal the prospects for the development of domestic cities.

Foreign strategies are more focused on the development of a common image of the city (vision). Therefore, a significant part in the strategic development plans of foreign cities is occupied by the general image of the city. Often, the city authorities are developing a document called "vision", which also provides information accessible to all residents of the city, which outlines its development prospects. Analysis of such documents of foreign cities allowed us to identify common and distinctive features with similar domestic documents. In a strategic plan for the development of foreign cities there may be: strategic goals, directions and other elements of a strategic direction. At the same time, foreign strategies almost never contain the section "Mission of the city" and rarely provide indicators. Ukrainian developers of such strategies, on the contrary, distinguish their strategic vision in a separate block. At the same time, the general image of the city is often not included in the strategy, and if it is

present, it is a small paragraph of information. As for the mission of the city, almost all Ukrainian cities contain this part. However, it is often mixed with the strategic goals of the city, so experts in this direction rarely distinguish between these two concepts. In general, the strategy is the expected result of urban development.

From the point of view of the substantive aspect, it is advisable to say that both foreign and domestic approaches to the formation of a development strategy are based on realistic goals, and the strategies themselves do not contain special terminology and are presented in an accessible and understandable language for each. However, foreign strategies, unlike Ukrainian ones, often do not contain quantitative indicators, on the basis of which it is possible to determine whether the expected results were achieved or not [11].

The analysis of the substantive elements of the development strategy of foreign cities is presented in Table 1. It reflects those elements that are present or absent in the strategies of each of the cities considered.

Table 1

Content elements of the development strategies of foreign cities  
(compiled according to data [7-11])

City	Purpose	Quantitative data	Peculiarities
London	Realistic	Absent	There are repetitions
Saskatoon	Realistic	Absent	Clear terminology
Sydney	Realistic	Present	Clear terminology
Stockholm	Absent	Absent	Clear terminology
Seattle	Realistic	Present	Clear terminology
Berlin	Realistic	Absent	Clear terminology
Krakow	Realistic	Present	Clear terminology

Analysis of the substantive elements of the strategic development of Ukrainian cities is presented in table 2.

Table 2

Content elements of the development strategies of domestic cities  
(compiled according to data [12-16])

City	Purpose	Quantitative data	Peculiarities
Kyiv	Realistic	Present	Clear terminology
Odessa	Partially realistic	Present	Clear terminology
Lviv	Realistic	Present	Clear terminology
Dnipro	Missing	Present	Clear terminology
Mykolaiv	Partially realistic	Present	Clear terminology

The analysis of the development strategies of Ukrainian cities confirms the similarity of the content aspect. Their goals are practically realistic, the text is presented in an accessible language, without special terminology, and there are also quantitative data of perspective development.

Comparing the meaningful vision in the development strategies of Ukrainian and foreign cities, changes in the structure and content direction are proposed that can be used by experts in the field of strategic development. These directions include:

1. The overall image of the city should occupy a central place in the development strategy; therefore, it is advisable to include it as a starting point for understanding the course of further actions.

2. Elements such as the mission and strategic goals of the city's development should be clearly distinguished. Since a mission is a brief statement of the unique role of a city, and a goal is a statement of intent.

3. It is very important to include quantitative indicators in order to understand the ways of planning and the results achieved, as well as to be able to evaluate the effectiveness of planned activities.

4. When creating a development strategy, it is important to set realistic goals in order to be able to achieve them within the available resources of cities.

5. Mandatory openness and use of the views of citizens (residents of the city) in various areas that are planned for the implementation of projects and plans.

Strategic approaches to the development of cities and other territories were widely discussed in foreign and domestic scientific literature. The methodical approaches to strategy development at the state and regional levels have been developed, priority directions of strategy development have been determined, the factors of application of strategic approaches of development on macro- and meso levels are grounded [1, 2].

In the investigated problem, the use of different methods is possible: induction and deduction (for partial and general conclusions), analysis and synthesis (for analysis of literature and aggregation of the obtained data), statistical data processing (for comparison of social and economic development of the city for 2015- 2017), the method of the sum of places (to identify the competitive position of the city), the indicator method (for analyzing the city's of social and economic development), and others.

Purpose of the study is to reveal issues related to the development of city development strategies and the definition of the of social and economic state of Odessa using the indicator method.

Setting of the problem: to investigate the process of creating strategic plans and ways to assess them; to analyze the social and economic situation in Odessa; to investigate the effectiveness of using new methods for assessing the social and economic development of the city of Odessa.

In order to assess social and economic development, we have chosen a method for constructing integrated indicators of sustainability of the city's development [3-5], and on the basis of it the estimation of the stability of social and economic development of the city of Odessa from 2015 to 2017 is given. At

the fundamental level of the methodology there is a solution to the problem of constructing an integral indicator, which allows to assess the sustainability of the city, based on integral indicators of more specific subsystems. As the main subsystems of sustainable development of the city, the subsystems of economic development, social sphere, infrastructure and the natural environment are distinguished.

For the analysis of social and economic development of Odessa in 2015-2017, the index method of stability of social and economic development was selected by the indicator method, which includes two subsystems with the following elements:

- 1) economic development: industry, services, construction;
- 2) social sphere: demographic situation, income of the population, social security.

In order to determine the relative share of the city of Odessa, the correlation between city and region indicators was used. The relative share of the city of Odessa in the Odessa region, according to the main social indicators, was: by the number of available population, 42,2%; on the average annual number of hired workers, 59,9%; by the number of registered unemployed persons, 19,4%; by the number of average monthly wages, 108.7%. Following the dynamics of the past three years, it was concluded that almost all indicators of social development in the city deteriorated in 2017, compared with 2015, except for the average monthly wage. The latter increased by 18.8%, which is due, to a greater extent, to inflation of the national currency.

The given data show degradation of such elements of social development of the city as the population and the labor market. The indicators characterizing income and social services are analyzed. The city's share in the total amount of unpaid wages is 76%. The amount of unpaid wages for employees of the city enterprises (taking into account economically active enterprises, economic entities, in respect of which procedures for restoration of the debtor's solvency or

recognition of bankruptcy as well as economically inactive enterprises are implemented) in 2017 increased by UAH 4717 or by 37.1%, compared to 2015. The increase in the total amount of unpaid wages was mainly due to economically active enterprises.

The relative share of the city of Odessa in the Odessa region on the payment of housing and communal services by the population:

- 1) from payment of services for payment - 64,7%;
- 2) with the payment of services by the population - 64,2%;
- 3) from the level of payment for services by the population - 99%.

According to the traced data of the last three years, there is an upward trend in the payment for housing and communal services. Accrual of the population for housing and communal services to their payment increased by 49.5%, while the amount of payment and the level of payment increased by 54.7% and 3.4%, respectively. In addition, the average charges for housing and communal services per personal account holder in 2017, taking into account electricity (at a rate of 150 kW per month), compared to 2015, increased from UAH 537.7 to UAH 771.3 or 43.4%. Trend of debt for 3 months and more is as follows: gas supply - debt increased from 3.2% in 2015 to 33.1% in 2017; central water supply and drainage system - increased from 16.1% to 21.0%; maintenance of buildings and structures of adjoining areas - decreased from 21.6% to 20.6%; household waste disposal - decreased from 20.6% to 18.1%; centralized heating and hot water supply - decreased from 20.9% to 15.9%.

The analysis of the provision of subsidies to the population for years 2015-2017 shows that in 2017 subsidies for the reimbursement of expenses for the payment of housing and communal services applied to 23.1 thousand families, which is 40.5% more than in 2015. The average size of the targeted subsidy for reimbursement of expenses for the payment of housing and communal services for one family in 2017 increased by 11.2 UAH compared to the corresponding period of 2015 and amounted to 136.7 UAH. The average size of targeted

subsidies in 2015-2017 was respectively: 125.5 UAH/family; in 2016 - 121.7 UAH/family; in 2017 - 136.6 UAH/family. The relative share of the city of Odessa in the Odessa region for subsidies for reimbursement of housing and communal services: by the number of families applying for subsidies - 40.5%; by the number of families with subsidies allocated - 37.4%; for the total amount of subsidies allocated - 42.2%; with an average grant size of 112.9%. The given data testify to the positive dynamics of subsidies for the reimbursement of expenses for the payment of housing and communal services. The number of families applying for subsidies during this period increased from 19463 to 23111 families, or 18.7%. Also, the number of families with subsidies from 17,646 to 19,257 families has increased, or by 9.2%. The total amount of targeted subsidies has increased from 2213755 to 2633102 UAH, or 19%. The average size of the targeted subsidies per family grew from 125.5 to 136.7 UAH per family, or 8.9% over the past three years. According to the indicator, "the average size of subsidies assigned" of the city of Odessa exceeds the corresponding indicator of the region by 12.9%.

The analyzed criminogenic situation in Odessa city for years 2016-2017 shows a general reduction of offenses. According to the Odessa Region Prosecutor's Office, during the year 2017, the city registered 10958 criminal offenses (42.6% of the total number of registered criminal offenses in the region), which is 28.6% less than in 2016, where the incest was 15349 cases. Of the total number of criminal offenses detected by the law enforcement agencies, 5232 are serious and especially grave, which is 2171 less than in 2016 (7403 offenses). In the total number of crimes, 63.7% were the crimes against property, 7.4% - crimes against traffic safety and operation of transport, 5.0% - crimes against life and health of the person, 5.0% - crimes against the authority of state bodies authorities, local self-government bodies and associations of citizens, 4.4% - crimes in the field of professional and professional activities related to the provision of public services, 3.5% - crimes in the sphere of



circulation of narcotic drugs, psychotropic substances, their analogues or precursors and other crimes against the health of the population, 2.3% - crimes in the village era of economic activities, 2.0% - crimes against public order and morality, 1.3% - a crime against justice. During 2017, 87 assassination and assassination attempts, 76 intentional grave bodily injuries, 8 rapes and attempted rape were committed (13.4% and 60.0% more than in the previous year). Compared with 2016, the number of extortion cases decreased by 56.4%, thefts by 30.3%, and fraud by 15.6%. At the same time, the number of robberies increased by 36.4%, apartment thefts - by 8.4% and amounted to 2094 and 633 cases. In 2017 490 cases of unlawful possession of a vehicle were committed, 120 cases of bribery, 84.2% and 10.1% more than in 2016. The number of drug-related cases decreased by 5.0% compared to 2016, and amounted to 380 cases. Among detected persons (1,6 thousand) who committed crimes, 23,6% were already in a criminal way, 6,5% were in a state of intoxication; 6.6% - foreign citizens, 3.8% - minors.

Given the above-mentioned social indicators of the development of Odessa in 2015-2017, it is possible to conclude that the city is developing unevenly. For a comprehensive positive social development, it is necessary to concentrate more forces and money on problematic negative social aspects in subsequent periods.

To assess the current situation regarding the economic component of the city of Odessa, an analysis of economic indicators of the city of Odessa for 2015-2017 has been conducted.

The main indicators of the city's social development for 2015-2017 and their share in the region are presented in Table 3.

The relative share of the city of Odessa in the Odessa region by the main indicators of the city's economic development is:

- 1) by volume of sold industrial products at actual prices - 42,1%;
- 2) by acceptance into operation of the total area of housing - 48,6%;

- 3) by capital investments - 65,4%;
- 4) by volume of cargo transportation by all types of transport - 87%;
- 5) by the volume of transportation - 89,4%;
- 6) by terms of services sold - 55.9%.

Table 3

The main indicators of the city's economic development for 2015-2017

Indicators	Value by years			Growth rate in 2017 relative to 2015,%	Share of the city of Odessa in the region (as of 2017),%
	2015	2016	2017		
Volume of sold industrial products at actual prices	11373,5	11869,1	12444,9	109,4	42,1
Acceptance into operation of the total area of the dwelling, ths m <sup>3</sup>	416	353,9	433,5	104,2	48,6
Capital investments in actual prices, mln. UAH	6277,0	6007,8	5534,6	88,1	65,4
Volume of cargo transportation by all types of transport, thousand tons	40538,7	37881,8	30928,6	76,2	87
Volume of passenger transportation by all types of public transport, million passengers	282,5	246,8	290,4	102,8	89,2
Volume of services sold, mln. UAH	15858,4	18917,0	18086,5	114,0	55,9

The data provided indicate improvements in the development of such elements as industry, construction, transport (passenger transportation) and services for 2015-2017. Reducing the amount of capital investment, the volume of cargo transportation indicates the decay of elements of capital investment and transport (transportation of goods).

The generalized index of each subsystem is found from the standardized values by the formula [3]:

$$I_i = \frac{1}{m+k} \left[ \sum_{j=1}^m I_{ij}^{(no3)} + \sum_{j=1}^k I_{ij}^{(neg)} \right] \quad (1)$$

where  $I_i$  – integral index of the corresponding system,

$m$  – number of positive indicators,

$k$  – number of negative indicators,

$I_{ij}^{(no3)}$  – standardized value of  $j$  positive indicator for  $I$  subsystem,

$I_{ij}^{(neg)}$  – standardized value of  $j$  negative indicator for  $I$  subsystem.

The index of sustainable development of the city is calculated according to the formula:

$$I_{CPM} = \sum_{i=1}^n w_i \bullet I_i \quad (2)$$

where  $I_{CPM}$  – index of sustainable development of the city,

$w_i$  – weight coefficient corresponding to the subsystem, satisfying the conditions:  $w_i \geq 0$ ,  $\sum w_i = 1$ .

The index of sustainability of social and economic development of the city is based on the following formula:

$$I_k = W_e + W_c \quad (3)$$

where  $W_e$  – generalized indicator of the elements of economic development;

$W_c$  – generalized index of elements of the social subsystem.

For the analysis of the sustainability of economic development, the indicator method selected the elements: industry, services and construction. As a generalization indicator, the growth rate is chosen. The analysis of the

sustainability of the city's social development was carried out according to the elements: demographic situation, income, social security. The aggregate indicator of the "demographic situation" element is the number of available population. On the basis of the analysis, the index of sustainable social and economic development of the city is calculated. Output data is selected according to the data of the Chief Administration of Statistics in the Odessa region [6].

According to the representation of the value of each subsystem, the following scales are assigned: for the economic subsystem - 0.6, for the social one - 0.4.

The indices of sustainability of the city's social and economic development from 2015 to 2017 inclusive have the following meanings - the calculation of the social and economic sustainability indices indicates a positive dynamics of development. In 2016, the index fell by 2.44%, compared to 2015, but in 2017 it grew by 0.8%, comparing with the previous year, due to the growth of stability. The main role in this process has played a social unit.

The dynamics of indicators of subsystems and the index of social and economic sustainable development of the city of Odessa for 2018-2020 is shown in Table 4.

Table 4

Dynamics of indicators of subsystems and the index of social and economic sustainable development of the city of Odessa for 2018-2020, %

	$I_t$	$I_{CP}$ M	$I_k$
2018	12,4	-3,2	6,28
2019	7,4	-1,5	3,84

20	-2,8	15,	4,64
20		6	

For each of the subsystems, we have identified lines of trends that show deviations from sustained positive or negative development. Figure 1 shows the overall dynamics of the index of sustainable social and economic development of the city. Due to the fact that in the considered subsystems there was a deviation of the corresponding indicators in 2019, this was reflected in the dynamics of the index, since this year the deviation from the trend line was traced. Despite the decline in the indicator in 2018-2020, in the coming years there is a positive trend of development.

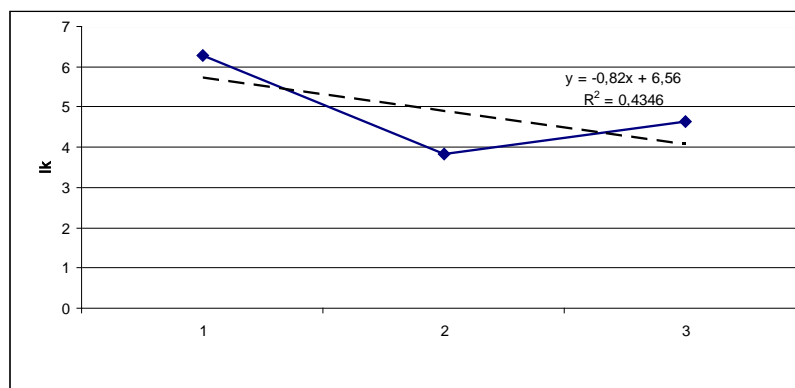


Fig. 1– Dynamics of the index of sustainable social and economic development of the city

Thus, the method of constructing integrated indicators allows to analyze the situation of each subsystem of city development and to identify problematic units that impede the overall sustainable development of the city. Taking into account the above-mentioned data and analysis of the social and economic development of the city, one can conclude that during 2018-2020 there is a positive trend of sustainable social and economic development of the city of Odesa, despite the decline of the index of sustainable social and economic development to 3, 84% in 2019. The general trend of growth is due only to the positive development of the subsystem "social sphere". In contrast, the

subsystem "economic development" has a negative tendency, indicating a decline in the economic development of the city of Odessa.

During the analysis of approaches to the formation of a strategy for the development of cities in Ukraine and abroad, the following was revealed: foreign development strategies contain the future image of a city, but the mission is considered extremely rare. Foreign development strategies most often represent illustrative material, and in Ukrainian - quantitative, ignoring the future image of the city. Thus, domestic strategies are aimed at performance indicators, but at the same time, both of them set realistic goals that allow them to plan the development prospects of the city.

The provisions of the use of the indicator approach to determine the social and economic situation at the local level allowed us to determine the subsystems of the economic and social spheres with specific elements for calculating the index of sustainability of social and economic development. Using the example of Odessa, the Sustainable Development Index was calculated, which made it possible to analyze the situation of each subsystem of the city and identify problem units that impede overall development.

According to the research, we consider it expedient for local governments to pay attention to the economic development of the city, and for this it is necessary to improve the strategy of the social and economic development of the city.

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