Assessment method of the urban development level in the context of knowledge and innovation economy

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Abstract. The assessment method of the level of industrial city (Zaporozhzhia) development influence affected by knowledge and innovation economy has been proposed in the article. Assessment of the sustainable development level is represented by three components: economic, social and environmental, each of which is characterized by certain indicators. The algorithm has been worked out to determine knowledge and innovation impact for urban sustainable development. It is comprised of three successive stages: indicators characterizing a certain sub-vector are determined in the first stage; sub-vector indexes are calculated in the second stage: the knowledge and innovation index; the knowledge and innovation index is calculated based on the additive and multiplicative model in the third stage. The knowledge and innovation index is defined as "stimulus" (booster) and "restriction" (depreciation) of urban sustainable development, that is, defined as specific ratios. To substantiate the importance of knowledge and innovation impact, not only quantitative approach to evaluation, but also qualitative analysis based on matrix methods have been applied. Changing specific ratios and the degree of specific ratios impact on urban sustainable development allows to analyze changes (increase or decrease) of sustainability level amid weights alterations. Changing specific ratios forms the priorities of economic policy and strategic landmarks.

1. Introduction

Current economic development gives urban areas a leading role in region`s functioning. Administrative-territorial division reform practice and its implementation determine the necessity of certain territorial units’ development and efficiency projected on regional development indicators in general. Aggregate territorial units form a system – a city, characterized by its components interaction. That is, the city is the center of individual`s life, which concentrates economic, social, political, environmental and economic processes, uniting peripheral territorial units around itself.

Thus, the Center`s healthy development, which is "a nutrient juice and energy source" for other territorial units becomes relevant. Moreover, the Center is determined not by geographical spatial features, but significance for regional development, being characterized by natural resource potential, population and living standards, labour market balance, structure of the economy, as well as by certain traits of local population behaviour. Other territorial units (small cities, villages) are characterized by a
small contribution to the general regional development compared to the center. Nevertheless, they are the part of the general system – a region. Being the elements of the system, they determine in a certain extent the level of its development.

The issue of urban development has become particularly significant amid intensification of decentralization processes. It allows to determine the place and role of territorial units in regional development. Besides, it is important to take into account the specific characteristics of a city, such as particular industry’s or economic sector’s dominance in economic structure, the peculiarities of the local population culture and their value orientations. It gives opportunity to maximize the territorial unit’s capacity, and accordingly, to increase the level of regional development as a whole.

Thünen I, Weber A and Christaller W [1-3], the German scholars of the late XIX century, consider a "City" as an organization and company. The scientists substantiated the theory of the location industries, which proves the possibility of obtaining economic advantages by taking into account only the spatial determinant in factors of production location. A certain territory is competitive due to the proximity of the location of sources of raw materials, target and production markets, as well as the quality of labour force, institutional environment, innovation development, an effective management system.

Determining the role of a city and its significance for the regional development, J Jacobs [4-5] emphasizes that city is a fundamental unit of economic life, active and dynamic. The last are supported by economic interaction of its internal components on the one hand and other territorial units on the other hand. Thus, can proved that regional and national economic growth is largely depends on urban dynamic development.

The concept of "city" in the scientific literature is commonly studied by its context and functionality applying the architectural and planning structure analysis. It is emphasized that the architectural and planning structure of a city determines not only the features of its construction structure, but also socio-economic infrastructure.

The architectural and planning trend was distinguished in the architectural theory as an independent scientific trend at the beginning of the twentieth century. It is explained by the significant acceleration of industrial development and changes in socio-political environment of around the world. The concentric zone theory of city structure by Ernest W Burgess is a fundamental one within the theory of architectural and planning [6]. The author of the model of the spatial structure of city emphasizes that unobstructed city growth happens in the form of concentric zone, which rays diverge from the central business district, if it is the first concentric zone. Entrepreneurial activity is focused in the city center. It has sufficiently branched infrastructure, but a small number of residents. The second zone is a transitive one with industrial enterprises, commercial institutions, as well as houses for low-income people. The third zone is a residential area for the average income employees’ families. Mainly the expensive multi-apartment residential buildings and cottages for families, having sufficient income, form the fourth zone. The fifth zone is in the suburbs, which population is characterized by shuttle migration, since they work in the central business district – the first zone. This approach to determine the features of a city is the first attempt to structure and prove the hierarchy levels, as well as interconnections between elements (zones) of a city. The author of a similar approach is Homer X [7], who proposed the alternative theory – the theory of sectors, emphasizing that urban growth is more often limited by certain sectors than by zones in general.

Economists pay significant attention to the study of a city as a system and center of economic activity, which concentrates the functions of production, consumption, exchange, and distribution, and accumulation of exports income. Their theoretical works are based on the concepts of "growth poles", "growth centers", "development levels alignment" (Myrdal G, Perroux F, Pottier P, Richardson H, Fridmann J, Boudeville J-R) [8-12].

In terms of the civilization approach, the most important achievement of the urban development theory is the awareness that city functions and develops not as a self-sufficient element, but as one closely related to the surrounding territories being directly affected by their development.
Transition from industrial to post-industrial development causes changes in the theory of urban planning shifting from techno-biased to human-biased approach. Within this approach, one should distinguish the study of Lynch K [13], who analyzes city as combination of humanistic values and ecology. The scientist focused on the identification of principles (mechanisms) of urban spontaneous development being permanently, despite the general development plan. The scholar found out that the background is in changing interests and values of different social groups embodied in the concept of "self-organization of a city". In the theory, Lynch K. considers the fundamental principles of the world of human values’ interconnection with city's spatiality through certain forms based on organic integrity. The scientist emphasizes that city is a mighty image, which enhances mind activity, having geometry as a tool for environmental and self-realization perception. That is, the attitude towards a person changes from a passive consumer of architectural environment to an active participant in its formation.

Summing up the abovementioned, it should be noted that the transition to human-biased approach causes taking into account human values and the type of urban design, which would reflect human ideas about their living environment, because it is people, but not building act as city’s "framework," and a city is their "protective shell".

The civilization movement of a society requires changes in all spheres of life: from the economic structure to socio-economic behaviour. There is no doubt in the role of cities in a modern spatial organization of a society. Their main task is to unite territories around and to form centers of their development and region in general. In this regard, the issue of the assessment of sustainability level becomes relevant. Thus, high level of "center`s" sustainability contributes to higher sustainability of surrounding territories` development.

The study’s scientific value is deeper analysis of system’s sustainable development, i.e. of a city, due to the definition of certain criteria for the "ideal" position. Practical value is determined by the ability to build the concept of financial flows distribution between economic, environmental and social components depending on their approximation to the "ideal" status to achieve the balance of city development and efficient resource allocation.

Originality in the study is determined by the analytical toolkit for assessing the level of sustainable development, which is universal and can be used for other systems’ assessment and expanded by the number of indicators.

2. Related works
Sustainable development is an important current issue in the context of limited resources and crisis phenomena in the world economy.

Theoretical aspects of sustainable development were studied by many scientists. In their research Shen X, Wang H, Jiang X L [14] analyzed the background for sustainable development and disclosed its essence, made proposals for the implementation of sustainable development concept. Deepening sustainable development analysis other scholars determined that social institutions, technical, economic and environmental innovations [15] are necessary to achieve a high level of sustainable economic development. Scientists Guzikova L A and Van L T H [16] studied the concept of sustainable development as a combination of three components – economics, society and ecology, selection of indicators for monitoring and assessment of sustainable development, substantiated promising recommendations for maintaining a dynamic balance between the triads’ elements. They examined the sustainable development on the example of Vietnam. To achieve sustainable development, scientists highlighted science and technology as a key element [17]. There is appreciation of the interconnection between technological innovation and sustainable development to achieve high level of sustainability, that is the harmony of economic, social, natural and environmental development. Chen J L, Xiao and Zhou J L [18] built a short-term model for a long-term development to distinguish more stable countries from less stable, and a combination of both models gave a comprehensive model for assessing sustainable development. Scientists identified the optimal plan and forecasted the indicator of sustainable development for 20 years. Soylemez I, Dogan A and
Ozcan U [19] distinguished 132 sustainable development indicators, including socio-economic development, sustainable consumption and production, climate change and energy, sustainable transport and sustainable development funding.

Attempts to evaluate sustainable development applying the example based on fuzzy mathematics methodology are presented in the research work of Liu K, Wang C X, Li Q Y [20]. The study results regarding urban sustainable development of Liaocheng proved the need to form understanding of sustainable development concept, strengthening its capacity and solving current issues. To evaluate sustainable development of provinces and cities in China, Huang Y J, Li, Z L [21] proposed 15 indexes. Significant attention to sustainable development as a new concept that offsets the restrictions and disadvantages of the theory of industrial city development and provides new theories and methods for reliable cities development, was paid by Yang B, Xu T, Shi L Y [22]. For quantitative analysis of the main factors influencing urban sustainable development, a method of linear dimensionless analysis was applied. Scientists marked out three groups of cities: with sustainable development, with moderately sustainable development and unsustainable development. Researchers Ruan B F, Wu H R [23] proposed the model for assessing city's ability to sustainable development aiming at providing practical recommendations. In Cobbinah’s P B and Darkwah’s R M study [24], various definitions of cities’ sustainable development were considered, which correlated with processes and practical activity of urban planning in Africa.

Today the views on key factors of urban development are being changing. Environmental development is considered as a priority affecting society as a whole and a person in particular [25-27]. Scientists analyze different methods to achieve environmentally safe position, which is the basis for balancing other subsystems [28-29]. It is necessary to add that significant development of science and technologies radically changed the development of cities and lifestyle of people [30].

3. Material and Methods
The assessment method of sustainability development level taking into account knowledge and innovation has been considered on the example of a virtual city such as the regional center of Ukraine. Quantitative assessment is based on the index method and the standardization method to bring indicators to a single measurement. Quality assessment is presented by the matrix method. The mean values of indicators are calculated on the basis of certain mathematical correlations using the formulas of the geometric mean.

4. Results
The ability to keep city’s equilibrium or maintain certain (sustainable) rates of development (pace) by achieving harmonization between its components is particularly important to achieve high levels of urban development. In this regard, the sustainable urban development is a stable development, which provides higher economic efficiency, quality and standard of living of population, natural and environmental life support. Our research extends theoretical and practical analysis of the city's sustainable development based on the assessment of knowledge and innovation impact. This assessment method of urban development gives an opportunity to determine the efficiency of its functioning and foresee future prospects, due to modern world trends in constructing a "smart city".

A real assessment of city’s development level taking into account the impact of knowledge and innovation is carried out on the basis of algorithm’s practical application, which is comprised of three successive stages. In the first stage it is defined indicators, which characterize a particular sub-vector. In accordance with the defined procedure, their standardization is made. In the second stage, it is calculated sub-vector indices: the knowledge index and the innovation index.

The statistical base for determining the knowledge index can be formed through educational indicators: for example, the number of students, students of vocational schools per 10000 population, number of students of higher educational institutions of I-IV accreditation levels per 10000 population.
To determine the innovation index, it is used the following statistical data: the number of industrial enterprises engaged in innovative activities; sales volume of innovation products; number of implemented new technological processes and innovative types of products.

The knowledge index and the innovation index assessment for comparative analysis is carried out on the example of a virtual city, which has a significant potential for the development of information and communication technologies. The period of study is two years. The formed statistical base for the assessment is presented in Tables 1-2.

**Table 1.** Analytical base of a virtual city’s indicators to calculate the knowledge index and the innovation index for the development assessment, 1st year.

| Title                                                                 | Real value | Minimum value | Maximum value |
|----------------------------------------------------------------------|------------|---------------|---------------|
| **Knowledge**                                                        |            |               |               |
| the number of students, students of vocational schools per 10000 population, persons | 90         | 32            | 119           |
| number of students of higher educational institutions of I-IV accreditation levels per 10000 population, persons | 428        | 54            | 696           |
| **Innovation**                                                       |            |               |               |
| number of industrial enterprises engaged in innovative activities, units | 27         | 1             | 49            |
| sales volume of innovation products, UAH thousand                     | 2736       | 158           | 3162          |
| number of implemented new technological processes, units              | 61         | 3             | 114           |
| implemented innovative types of products, units                       | 133        | 21            | 397           |

**Table 2.** Analytical base of a virtual city’s indicators to calculate the knowledge index and the innovation index for the development assessment, 2nd year.

| Title                                                                 | Real value | Minimum value | Maximum value |
|----------------------------------------------------------------------|------------|---------------|---------------|
| **Knowledge**                                                        |            |               |               |
| the number of students, students of vocational schools per 10000 population, persons | 85         | 27            | 111           |
| number of students of higher educational institutions of I-IV accreditation levels per 10000 population, persons | 376        | 45            | 682           |
| **Innovation**                                                       |            |               |               |
| number of industrial enterprises engaged in innovative activities, units | 27         | 1             | 49            |
| sales volume of innovation products, UAH thousand                     | 2736       | 18            | 3162          |
| number of implemented new technological processes, units              | 166        | 1             | 170           |
| implemented innovative types of products, units                       | 20         | 1             | 21            |
The next stage of the assessment algorithm involves calculations of the knowledge index and innovation index. An intermediate step is indicators’ standardization for each sub-vector (Table 3-4).

**Table 3.** Standardization of a virtual city’s indicators to calculate the knowledge index and the innovation index for the development assessment, 1st year.

| Title                                                                 | Standardized value |
|----------------------------------------------------------------------|--------------------|
| The knowledge index \(I_{\text{know}}\)                            |                    |
| number of students of higher educational institutions of I-II accreditation levels, persons | 0.667              |
| number of students of higher educational institutions of III-IV accreditation levels (public), persons | 0.583              |
| The innovation index \(I_{\text{innov}}\)                          |                    |
| number of industrial enterprises engaged in innovative activities, units | 0.542              |
| sales volume of innovation products, UAH thousand                    | 0.858              |
| number of implemented new technological processes, units             | 0.523              |
| implemented innovative types of products, units                      | 0.298              |

**Table 4.** Standardization of a virtual city’s indicators to calculate the knowledge index and the innovation index for the development assessment, 2nd year.

| Title                                                                 | Standardized value |
|----------------------------------------------------------------------|--------------------|
| The knowledge index \(I_{\text{know}}\)                            |                    |
| number of students of higher educational institutions of I-II accreditation levels, persons | 0.690              |
| number of students of higher educational institutions of III-IV accreditation levels (public), persons | 0.520              |
| The innovation index \(I_{\text{innov}}\)                          |                    |
| number of industrial enterprises engaged in innovative activities, units | 0.542              |
| sales volume of innovation products, UAH thousand                    | 0.864              |
| number of implemented new technological processes, units             | 0.976              |
| implemented innovative types of products, units                      | 0.950              |

The knowledge index and the innovation index are calculated in the third stage of the algorithm applying the additive and multiplicative model. Mathematical correlations for this deterministic correlation are represented by formulas:

\[
I_{\text{know}} = \frac{\sum_{i=1}^{n} I_{i,\text{know}}}{n},
\]

(1)

\[
I_{\text{innov}} = \frac{\sum_{i=1}^{n} I_{i,\text{innov}}}{n},
\]

(2)

where \( n \) – number of indicators used to score a certain sub-vector;
\[ I_{\text{know}} \quad \text{– the knowledge index;} \]
\[ I_{\text{innov}} \quad \text{– the innovation index;} \]
\[ \sum_{i=1}^{n} I_{i}^{\text{know}} \quad \text{– sum of indices of the knowledge index’s components;} \]
\[ \sum_{i=1}^{n} I_{i}^{\text{innov}} \quad \text{– sum of indices of the innovation index’s components.} \]

The assessment result is general index of knowledge and innovation presented as:

\[ I_{ki} = \sqrt[3]{I_{\text{know}} \cdot I_{\text{innov}}} \quad (3) \]

Practical implementation of the knowledge and innovation index’s calculation will be considered using the example of a virtual city (Table 5).

**Table 5.** The knowledge and innovation indexes of a virtual city, 1st and 2nd year.

| Indexes | Value | 1st year | 2nd year |
|---------|-------|----------|----------|
| The knowledge index - \( I_{\text{know}} \) | 0,625 | 0,605 |
| The innovation index - \( I_{\text{innov}} \) | 0,555 | 0,833 |
| The general index of knowledge and innovation \( I_{ki} \) | 0,589 | 0,710 |

The results of the knowledge and innovation indices calculations show a high level of innovation development due to the index of innovation. The knowledge index has a slight level of significance. The assessment result presented by the general knowledge and innovation index for a virtual city for the 1st year is 0.710, which significantly exceeds the corresponding indicator in the 2nd year.

Thus, the proposed method makes it possible to calculate the index of urban sustainable development, taking into account knowledge and innovation impact.

These determinants can both boost, and weaken the level of city’s sustainable development, that is, they are the specific ratios. To calculate the sustainable development index, taking into account the specific of knowledge and innovation, the next formula is applied:

\[ I_{sd}^{ki} = \sqrt[3]{I_{sd} \cdot I_{ski}} \quad (4) \]

The obtained results of calculations are presented in Table 6.

Assessment results’ analysis (Table 6) indicates a significant impact of knowledge and innovation on city’s sustainable development.

The statement is proved by the fact that the sustainable development index rose by 17.6 percent points fueled by the knowledge and innovation index during the first year, and by 18 percentage points during the 2nd year.

Theoretical substantiation and analytical calculations have been made to prove positive impact of knowledge and innovation on urban sustainable development. Moreover, the knowledge and innovation index has high values due to the introduction of innovations. The expansion of funding for the dissemination of knowledge and innovation takes place too amid intensification of the decentralization processes.
Table 6. The sustainable development index of a virtual city affected by the knowledge and innovation, 1st and 2nd years.

| Indices | Values |
|---------|--------|
|         | 1st year | 2nd year |
| The sustainable development index - $I_{sd}$ | 0,425 | 0,490 |
| General knowledge and innovation index $I_{ki}$ | 0,589 | 0,710 |
| The sustainable development index with the knowledge and innovation index - $I_{sd}^{ki}$ | 0,500 | 0,590 |

To prove the importance of knowledge and innovation, it is advisable to use not only quantitative approach to the assessment, but also qualitative analysis based on the matrix methods. Matrix methods are based on a matrix application – a table of ordered elements by rows and columns. The advantage of the method is the simplicity of its application. The next disadvantage has been indicated though: the process and result of the assessment give a general idea of indicator’s adjustment due to the lack of determinants affecting its level. Despite certain restrictions in their application, matrix methods allow to reveal the presence or absence of changes to determine further analysis methodology. Moreover, these methods have a convenient graphical interpretation for examination and managerial decision-making. The first indicator for assessing the impact of knowledge and innovation on city’s development is the knowledge index and the innovation index (Table 7).

Table 7. The knowledge and innovation index, sustainable development index of a virtual city, 1st and 2nd years.

| №  | Year | Sustainable development index - $I_{sd}$ | General knowledge and innovation index $I_{ki}$ |
|----|------|----------------------------------------|-----------------------------------------------|
| 1  | 1-й | 0,425                                  | 0,490                                          |
| 2  | 2-й | 0,589                                  | 0,710                                          |

Mean values of indices for the 1st and 2nd years have been made in Table 7. To do this, one should use the formula of geometric mean, which allows to take into account the low and high values of an indicator, since arithmetic mean calculation offsets low values by high ones, which reduces the objectivity of calculations and their compliance with the reality. Geometric mean of an indicator is determined by the formula:

$$
X_{\text{ge}} = \sqrt[\log N]{\prod_{i=1}^{N} X_i},
$$

where $X_{\text{ge}}$ – geometric mean of indicator;  
$N$ – number of studied businesses;  
$\prod_{i=1}^{N} X_i$ – product of values of indicator.

The necessary element of the matrix method application is formulating of a hypothesis (H1), which is confirmed or declined depending on the results. The hypothesis of our study object: the bigger the impact of knowledge and innovation is, the greater is the level of sustainable development.

The graphic interpretation of the matrix of knowledge and innovation impact on city’s development is presented in Table 8.

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Table 8. The matrix of knowledge and innovation impact on city`s development.

| The knowledge and innovation index is higher than average | The sustainable development index is higher than average | The sustainable development index is lower than average |
|----------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| The knowledge and innovation index is higher than average | I quadrant | II quadrant |
| The knowledge and innovation index is lower than average | III quadrant | IV quadrant |

The structure of matrix includes four quadrants:

The first matrix quadrant: the sustainable development index is above average and the knowledge and innovation index is above average too. If a city falls into this quadrant, then the hypothesis is confirmed, since there are high knowledge and innovation index and sustainable development index.

The second matrix quadrant: the sustainable development index is lower than average and the knowledge and innovation index is above average. If a city falls into the second quadrant, it is necessary to analyze the reasons for the low level of sustainable development in detail, because there is a high level of the knowledge and innovation index.

The third matrix quadrant: the sustainable development index is below the average and the knowledge and innovation index is above average. If a city falls into the third quadrant, its main task is to create conditions for increasing the sustainable development index through the effective application of knowledge and innovation.

The fourth matrix quadrant: the sustainable development index is below average and the knowledge and innovation index is below average. If a city falls into the fourth quadrant of the matrix, then the main task is to figure out the reasons for knowledge and innovation low development and ways to boost their implementation.

The theoretical interpretation of the matrix approach allowed its practical implementation (Table 9). Based on the analysis of the matrix (Table 9), one can conclude that the H1 hypothesis is correct, that is, the greater the impact of knowledge and innovation is, the higher is the level of sustainable development. In the 1st year, a virtual city falls into the IV quadrant, which shows the low level both of the knowledge and innovation index and the sustainable development index.

Table 9 The matrix of knowledge and innovation impact on city`s development.

| The knowledge and innovation index is higher than average | The sustainable development index is higher than average | The sustainable development index is lower than average |
|----------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| The knowledge and innovation index is higher than average | 2nd year | - |
| The knowledge and innovation index is lower than average | - | 1st year |

The opposite trend characterizes the 2nd year as the city reveals high level of both indicators. Thus, the matrix method application indicates the impact of knowledge and innovations on sustainable development.

Taking into account that the contribution of the proposed indicators in the level of city`s sustainable development is different, one need to determine a specific ratio for each index. Table 10 shows the specific ratios of indicators.

Table 10 Values of specific ratios of the knowledge index and the innovation index.

| Indicator | The knowledge index | The innovation index |
|-----------|---------------------|----------------------|
| Specific ratio | 0,4 | 0,6 |
To calculate the sustainable development index, taking into account specifics of knowledge and innovation, on should use the formula 6:

\[ * I_{sd} = I_{sd} \times \left( \frac{a_{\text{know}} \cdot I_{\text{know}} + a_{\text{innov}} \cdot I_{\text{innov}}}{2} \right) \]  

(6)

Where \( a_{\text{know}}, a_{\text{innov}} \) – specific ratios of the knowledge index and the innovation index, respectively.

Formula (5) defines the additive model equivalent to the "or" value, that is, low indicator’s values will be offset by high ones. One can also use a multiplicative model (formula 7):

\[ * I_{sd} = I_{sd} \times \left( a_{\text{know}} \cdot I_{\text{know}} \cdot a_{\text{innov}} \cdot I_{\text{innov}} \right) \]  

(7)

Formula (6) contains an equivalent operation equivalent to "and", that is, simultaneously takes into account the indicators' value, without offsetting low values by high ones. Let us calculate the index by formulas (6) and (7) and compare the results of two models.

Table 11. Calculation of sustainable development index of a virtual city taking into account the specifics of knowledge and innovation by additive and multiplicative models, 1st and 2nd years.

| Year   | The sustainable development index by additive model (f. 5) | The sustainable development index by multiplicative model (f. 6) |
|--------|-----------------------------------------------------------|---------------------------------------------------------------|
| 1st year | 0,127                                                      | 0,123                                                         |
| 2nd year | 0,205                                                      | 0,205                                                         |

The data analysis of Table 11 indicates that the sustainable development index in the 2nd year significantly rose by 1.5 times. It is emphasized that the proposed approach allows to change specific ratios of indicators and take into account each contribution to the city’s level of sustainable development, that is, to analyze how the level of sustainability changes (increases or decreases) when altering specific ratios. This allows to make a conclusion on the degree of knowledge and innovation impact on the city’s level of sustainable development, to form economic policies and determine strategic guidelines for further actions to increase the level of sustainability.

5. Conclusion

Analysis of the history of urban development makes it possible to distinguish two periods: adaptation to the industrial conditions and taking into account the peculiarities of post-industrial period. At the same time, the first phase is defined as standard, that is, the conformity of urban organization and construction to certain standard indices. The second phase is optimization, which considers optimization criteria while urban planning, for instance a high level of development due to the application of current natural and human potential. Approaches to understanding the concept of a "city" can be grouped in a certain way: the first is techno-biased, and the second human-biased. That is, the concept of a "city" in terms of the civilization approach is the transition from an industrial society to post-industrial, from techno-biased to human-biased approach. The support of sustainable development is a trait of a human-biased approach, because it involves balancing components affecting life of a society.

The calculations indicate the impact of knowledge and innovation, which fuels industrial city’s sustainability growth in the context of growing decentralization.

On the basis of the abovementioned one can sum up that in the process of decentralization new opportunities for urban development based on knowledge and innovation appear. The assessment of city development shows its significant potential. Its implementation requires figuring out effective tools to get urban areas sustainable development due to structural harmonization and positive impact of knowledge and innovation.
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