The participative budget of making a city sustainable: quintuple helix approach

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Abstract. For transition economies, urban management processes are also in transition, which also means a situational opportunity to apply an integrated approach to the implementation of innovative projects, in which economic and political, as well as social, socio-cultural and environmental directions of development can receive a positive stimulus. Purpose of the study is to analyze the structure of participatory budgeting projects on the continuum “science and education – environment”, in accordance with the methodological approach to justify the innovative development of the city (based on helix-modeling). The paper has outlined an approach to activation the principles of sustainable and inclusive development at the local level, on the example of the participatory budget of Kyiv city in Ukraine. At the methodological level, the stages of the evolution of helix-modeling to the quintuple level have been analyzed in detail, the results of which are proposed to be implemented in accelerating the transformation of the projects structure aimed at the development of economic, social and environmental aspects of citizens life, namely in the fields of education, science, culture, sports, ecology, etc. Analysis of the change in the structure of participatory budgeting in Kyiv for the period 2017-2019 allows us to talk about the optimistic transition scenario of the city and the country in whole to the real pace of achievement the Sustainable Development Goals 2030. Strengthening the current positive changes with the help of state support, as well as ensuring a sufficient responsible investment, allows at a project level to succeed in improving the sustainability of the city.

1 Introduction

Urban sustainability is one of the current areas of research within the concept of sustainable development [1–3]. In the conditions of transformation [4], the specificity of the situation lays not so much in the smart city – the global trend of urban planning and urban ecology of the last decade, but in the constant maintenance of sustainable and innovative urban development.

Contrary to the fact, that scientific sphere in Ukraine as of 2020 is in the situation of waiting for reforms; innovation activity begins exactly in this sphere. And then from here innovations gradually spread to other spheres of society life and development of the country and its cities. From education and science begins all-encompassing progress, in which business and industry, the public and activities related to the environment are involving. It is clear that without state support it is impossible to stabilize the sustainable development of cities and achieve the Global Goals at the international [5] and national [6] levels (especially Goal 11 “Sustainable cities and communities”), given the possible threats and impact of crisis factors.

Along with direct investment, an important tool for provision of sustainable urban development is a participatory budgeting. Since this process is relatively

new for Ukraine, it is advisable to theoretically substantiate it on the basis of approaches to innovation modeling, which complement the approaches to modeling the relevant investment processes [7; 8].

It is also advisable to make extensive use of foreign experience in participatory budgeting. At the beginning of the 21st century, Europe adopted this sustainable mechanism from Latin America and, as of 2010, applied it in dozens of cities. The participatory budgeting gained the greatest development in Italy, Portugal, Spain, France, Germany, and the United Kingdom. The most common models of the participatory budgeting development in Western Europe are as follows: participatory democracy (clearly defined rules, good quality deliberation; combining strong participation with social justice), proximity democracy (informal rules, deliberative quality weak or average; combining participation with formal decision-making process) and participatory modernization (rules may be clear, weak deliberative quality; broad political consensus) [9]. In Germany, for almost two decades, participatory budgeting has evolved from a symbolic political instrument to improve communication between citizens and administration [10] to a mechanism for democratic innovation and municipal modernization [11].

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2 Methodology

The conceptual basis of the study is an evolutionary approach to innovation development modeling – the helix-modeling (Fig. 1), which includes six types of models (three prototype models and three helix models), as well as five gradual stages of transition from one model to another: from a linear model to a quintuple helix model, which summarizes the following elements of innovation development: science and education, business and industry, government and state support, the civil society, the environment and the social environment.

The proposed approach was used to analyze the dynamics of structural changes in the short term (2017–2019) on the example of the formation and use of participatory budget at the municipal level, namely the example of Kyiv city.

The information base is the online platform [18], on which project data is constantly updated.

The evolutionary approach in the context of changing the forms of descriptive helix-model, when it is transferred to the plane of formation of the participatory budget of the city, allows to identify features of its innovative development and to substantiate expediency of acceleration of transformation of projects structure.

3 Results

The logic of the study consists of, firstly, on the actualization of a set interrelated factors of sustainable development, including reflection in indicators that

characterize the social and environmental components of sustainability and inclusiveness, at the level of the economic region of Ukraine, the center of which is Kyiv city; and also, secondly, on the implementation of the analysis of the structure of project directions within the participatory budget of Kyiv city on the basis of an evolutionary approach to helix-modeling of innovation activity.

3.1 Rating analysis of sustainable and inclusive development indicators of the territory

When conducting analysis of sustainable and inclusive development indicators of the Central economic region of Ukraine, their comparison with similar indicators of other economic regions of Ukraine were carried out and, accordingly, the results of the rating assessment were obtained (Table 1). The results (above all, the first place by level of higher education, as well as the second place by level of Internet access) prove the existence of preconditions, and therefore the expediency of innovative modeling of participatory budgeting in Kyiv. Also the composition of the main problems can be seen preliminarily (for example, VII place – overcrowding housing or VI place – the inability to satisfy recreational services), which, on the one hand, reflect the situation in the country, and, on the other hand, indicate bottlenecks in urban development and therefore it should affect the structure of the participatory budget of Kyiv.

Fig. 1. The evolution of helix-models and its sustainable context (based on [16; 17]).

Table 1. Comparative analysis of sustainable and inclusive development indicators of the Central economic region of Ukraine, 2019 (according to [19; 20]).

Indicators	Value	Ranking
Number of household members who rated their health as good, thousand	3112,25	II
Number of household members who rated their health as bad, thousand	424,49	III
Households whose members constantly denied themselves the most necessary, in addition to food, thousand	654,30	III
Share of persons suffering from 4 or more signs of material deprivation of 9 signs, %	14,90	II
Share of population living in overcrowded housing, %	54,50	VII
Share of households that are (very) dissatisfied with housing conditions, %	13,10	II
Share of households that are (very) satisfied with housing conditions, %	60,60	I
Number of persons who can allow minimum recreational services, thousand	2298,80	VI
Number of persons who reported that they used Internet services at least once a day, thousand	2952,60	II
Number of households with Internet access at home, thousand	1553,00	II
Share of population with complete higher education, %	33,80	I
Number of persons living in households who could not afford unexpected necessary expenses, thousand	2861,50	VI
The average indicator of ecological status	10,00	III
Total	–	I

3.2 Evolution of helix-modeling and its projection into the plane of formation of innovative ecologically oriented, educational and other socially significant projects

That, how helix-modeling evolved is shown in Figures 2-6: from a linear model that reflects the activities of educational and research institutions (Fig. 2, upper left corner) to a model that includes five interconnected components, integrated in the joint innovation process – quintuple helix model (Fig. 6).

Fig. 2. Triple helix-modeling scheme for innovation activity in emerging countries (based on [21]).

The structure of participatory budgeting in Kyiv is presented in Table 2.

Fig. 3. Triple Helix-modeling scheme for innovation activity in countries with economies in transition (based on [21]).

Fig. 4. Triple helix-modeling scheme for innovation activity in developed countries (based on [21]).

Fig. 5. Quadruple Helix-modeling scheme for innovation activity (based on [15]).

The analysis results of the changeability of the structure of innovative projects directions within the participative budgeting of Kyiv (Table 2) allow to speak about the optimistic scenario of transition of the capital of Ukraine to real rates of achievement of Sustainable

Development Goals by 2030 (by overcoming the coronavirus pandemic and its consequences in the short or medium term perspective 2021–2023) under the condition of accelerating the transformation of the project structure

towards the balance of economic, social and environmental factors, and at the same time increase funding by rising the volume of responsible investment.

Table 2. Projects of the participatory budget of Kyiv, 2017-2019 (project cost in 2019: UAH 50,000 – 3 million) (according to [18]).

Categories of projects	Period	Number of projects: all, winning, %			Number of votes cast, % per year, trend			Cost of projects: all, winning, %		
Education	2017*	76	18	23.7	28020	28,3		54355309	15026066	10.7
	2018**	75	28	37.3	31739	45,2		25838568	10377291	40.2
	2018***	165	29	17.6	172732	49,8		285349395	57909982	20.3
	2019	295	135	45.8	192596	39,5		219802938	58345294	26.6
Sports	2017	89	12	13.5	22260	22,5		58286296	10848183	18.6
	2018	42	14	33.3	12704	18,1		14789451	5162387	34.9
	2018	116	17	14.7	79027	22,8		198933838	31331915	15.8
	2019	138	38	27.6	79239	16,3		126088215	20356399	16.1
Culture, tourism	2017	65	3	4.6	9912	10,0		44221186	1918735	4.3
	2018	21	5	23.8	4657	6,6		7526261	1742731	23.2
	2018	34	4	11.8	24325	7,0		57255287	6925000	12.1
	2019	78	15	19.2	37609	7,7		66066332	14563595	22.0
Health	2017	38	5	13.2	14078	14,2		21855650	4166000	19.1
	2018	6	2	33.3	2077	3,0		1989936	800000	40.2
	2018	28	3	10.7	23360	6,7		47476184	5960893	12.6
	2019	26	11	42.3	23388	4,8		37274699	8039884	21.6
Social protection	2017	30	2	6.7	4476	4,5		19781017	1293100	6.5
	2018	21	7	33.3	5601	8,0		7320170	2750042	37.6
	2018	22	1	4.6	4325	1,2		35773962	1850000	5.2
	2019	32	15	46.9	16578	3,4		15263694	4191334	27.5
Infra-structure	2017	28	3	10.7	4843	4,9		18212164	2992549	16.4
	2018	11	2	18.2	2593	3,7		2733409	799980	29.3
	2018	12	0	0	2244	0,6		20476000	0	0
	2019	17	3	17.7	6942	1,4		14717256	1042600	7.1
Security	2017	26	2	7.7	4103	4,1		16411352	1980719	12.1
	2018	10	2	20.0	1175	1,7		3642675	769895	21.1
	2018	10	2	20.0	7320	2,1		17709851	3780000	21.3
	2019	16	4	25.0	3298	0,7		13691455	1201973	8.8
IT	2017	19	0	0	1267	1,3		12263997	0	0
	2018	7	2	28.6	2180	3,1		2391115	785519	32.9
	2018	15	1	6.7	8577	2,5		28383907	2000000	7.0
	2019	17	1	5.9	3528	0,7		21415954	741054	3.5
Others	2018	8	2	25.0	2572	3,7		2115105	503000	23.8
	2018	10	0	0	2074	0,6		16632020	0	0
	2019	22	6	27.3	8081	1,7		17586941	2251781	12.8
Energy	2019	76	19	0.25	36505	7,5		48684801	7465896	15.3
Public space	2019	55	18	32.7	34110	7,0		49858463	11550493	23.2
Ecology	2017	40	7	17.5	10130	10,2		26317569	4218339	16.0
	2018	17	1	5.9	3652	5,2		6182506	400000	6.5
	2018	31	0	0	8768	2,5		56476009	0	0
	2019	35	9	25.7	11848	2,4		20965023	3302023	15.8
Civil society	2018	13	2	10,9	1299	1,8		4452347	799948	18.0
	2018	30	1	3.3	14331	4,1		53802254	2000000	3.7
	2019	330	44	13.3	33618	6,9		83361237	7862000	9.4
Total	2017	411	52	12.7	99089	100		271704540	42443691	15.6
	2018	231	67	29.0	70249	100		78981543	24890793	31.5
	2018	473	58	12.3	347083	100		818268707	111757790	13.7
	2019	1137	318	28.0	487340	100		734777008	140914326	19.2

*Cost of projects (UAH): 1 thous. – 1 mln, **1 thous. – 400 thous., ***401 thous. – 2 mln, **** Trend of total project cost

Fig. 6. Quintuple Helix-modeling scheme for innovation activity (based on [16]).

Based on these results and taking into account the experience of Germany [22; 23], as well as recommendations for ecologically oriented recreational development [24; 25] and the introduction of international standards to strengthen the resistance to the coronavirus pandemic [26], an indicative structure as a benchmark for the sustainability of Kyiv city in the medium term is proposed in the paper (Fig. 7).

Fig. 7. Structure of project directions (according to the total cost of winning projects) within the participatory budget of Kyiv.

The main share (it is proposed to triple its weight in order to accelerate the response to the pandemic) in the structure belongs to security. Other shares have an approximately equal weight, which corresponds to the principle of balance: the weight of ecology, infrastructure and civil society increases, but the weight of recreation, and education decreases, which is possible in the conditions of distance learning.

4 Discussion

Trends and prospects for the development of educational sector and its support in the side of the state and international organizations, in particular in Germany, which has one of the most progressive and effective systems of education and science [27–33] within participatory budgeting requires a balanced approach to attracting investment. It is necessary to strengthen the role of public-private partnership, which will ensure the guarantee of completion the projects in full of planned costs, as well as control over the quality of their implementation, including in the period after the completion of projects. This provision is principal: the sustainability of cities and, in particular, of educational sector means ensuring the support of realization innovative, especially inclusive, projects over a long period of time, now, as a rule, till 2030. For countries with economies in transition responsible investment is extremely important, especially aimed at the development of inclusive education.

5 Conclusion

The study of the participatory budgeting contribution to the sustainability of the city, on the example of Kyiv in Ukraine, based on the methodological approach of innovative helix-modeling is conducted in the paper. The evolution of helix-models, ranging from the basic model (triple helix model) to the ecologically integrated model (quintuple helix model) demonstrates the importance of not just taking into account the additive principle, but the integration of five components (science and education, business, government, public, environment) in the plane of innovative projects implementation formed on the principles of sustainability and inclusiveness. The analysis of the participatory budgeting structure, aimed at increasing the sustainability of Kyiv city, confirms the positive dynamics relevant to the evolutionary approach of helix-modeling. Given the pandemic crisis, as well as the peculiarities of the Sustainable Development Goals implementation in Ukraine, a benchmark of this structure in the medium term 2021-2023 is proposed in a study, which is based on a balance of six components: ecology, recreation, security, civil society, infrastructure projects and education. Taking into account the specifics of the current situation, security has the largest share, the share of education and recreation should decrease, but the share of the environment, including the recreational environment increases due to the expansion of “green” public space. An increment of the share of civil society to accelerate the development of democracy in the country is also important.

Prospects for further research are related to the analysis of the possibilities of applying the participatory budgeting mechanism within the European Green Deal, in particular such strategies as “A zero pollution ambition for a toxic free environment”, “Accelerating the shift to sustainable and smart mobility”, and “Supplying clean, affordable and secure energy” at the municipal level.

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