

Conceptual modeling of the paradigm of the land market sustainable and harmonious development

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Abstract. In this article we explore the problems of scientific and practical modeling of the paradigm of the land market sustainable and harmonious functioning and development. The article proposes a conceptual modeling of the land market as a specialized commodity market for sustainable development based on the application to it of advanced requirements for environmentally friendly, green, energy-efficient solutions. The purpose of this research is to develop a set of theories, concepts, principles, organizational and economic mechanisms, paradigms and new empirical knowledge on modeling a sustainable harmonic land market that will be capable to generate advanced requirements for the sustainability of territories in investment projects and programs based on the mandatory cost management of environmentally-oriented life cycles capital construction objects at the stage of land development. The object of this study is the sustainable and harmonious development of the land market. The subject of the research is the processes and mechanisms of modeling sustainable and harmonious development of the land market, including the principles of ensuring the synchronous development of the land market relative to the sustainable development of territories, along with ensuring the requirements of sustainable development of both development territories and land plots on the basis of the principle of harmony.

Key words: sustainability, development, land market, conception, life cycle, harmony, circular economy.

1 Introduction

The global concept of sustainable development requires its creative application in all types of commodity markets in the current conditions of development. This includes the problems of scientific and practical modeling of the theory of sustainable functioning of the land market. This is crucial in the context of growing turbulence in the economic development of both Russia and the entire world. We noted the lack of effectiveness of the sustainable development of the construction industry, as it is impossible to ensure sustainable stable development without targeted adaptation actions in a changing environment.

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The executed studies've shown the high scientific and practical significance of research in the development of the land market sustainability theory based on environmentally oriented life cycles.

The proposed scientific findings will consist in the development of conceptual approaches, principles, theoretical models of the land plots harmonic market with the components of its sustainable development.

The executed studies proved a wide range of target sustainability indicators and land market sustainable development models. Baronin S.A. dealt with the development of the land market [1] and environmentally oriented life cycles [2] in his research; I.M. Potravny and N.N. Yashalova [3] were focused on the environmental development of the regions; environmental safety of development research was done by V.I. Telichenko and A.A. Benuzh [4], S.V. Pupentsova [5] did the research of environmental development planning, L.N. Orlov [6] did the environmental risk management research. The structure of the cities' transition to sustainable development and measures to develop the sustainability of territories are also proposed in the studies by A. Sodiq [7], S.E. Bibri [8], R. Emas [9], H. Girardet [10]. The transition to sustainable development through the environmental component is done in the articles of H. Washington, M. Maloney [11], H. Xie [12], Yu Chen [13], R. Boudjadja [14], and through the economic component - in the studies of E. Gawel [15], M. Dziembała [16], O. Gorb [17], V. Klimovich [18], A. Janik [19], K. Tomislav [20]. The synergy of the ecological and economic components predetermines the development of sustainable and harmonious markets of the modern economy.

The necessity for theoretical developments in modeling the sustainable development of the land market specifies the priority of developing a specialized concept of sustainability. With this being said, we consider the problems of modeling the sustainable development of the land market to be linked with models of sustainable development of territories. Moreover, we must comply with the principle of advancing synchronous development of the land market in relation to the sustainable development of territories. It is crucial to ensure the requirements for sustainable development of both construction areas and land plots based on the principle of harmony.

The theoretical economic modeling of the processes of the land market sustainable harmonic is based on the understanding of two fundamental issues for the implementation of investment projects: a) a traditional project with standard requirements for sustainability (project A); b) a project with increased requirements for green, environmental, energy-efficient, technical and technological standards (project B).

As per our opinion the main issue in the implementation of the territories land market sustainable development concept is in the action of two mutually exclusive trends: first, it is the priority of maximizing the income of the state and municipalities from the sale of land plots to citizens and legal entities (V1); second, it is a decrease in investment attractiveness (V2) for land plots and projects that must be implemented with increased requirements for green standards, environmental friendliness, energy efficiency, innovativeness of technical, engineering and technological solutions, and the level of application of digital information technologies. This defines a significant increase in the cost of capital investments and the risks of implementing these investment projects and programs (IP). The theoretical economic modeling of the processes of a sustainable harmonic land market is based on the understanding of two fundamental issues: a) a traditional project with standard requirements for sustainability (project A); b) a project with increased requirements for green, environmental, energy-efficient, technical and technological standards (project B).

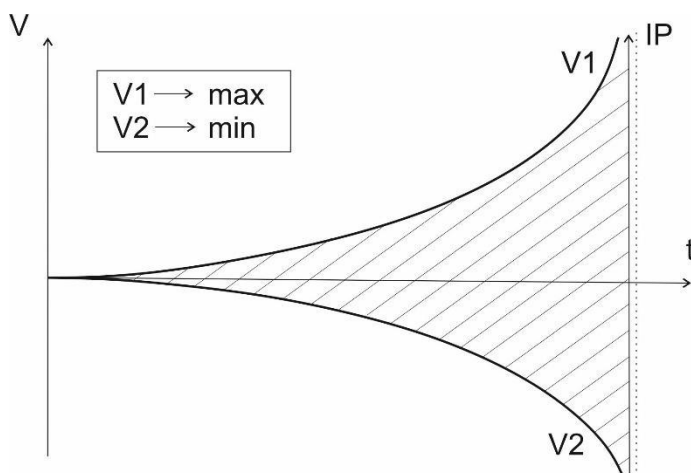


Fig 1 Diagram showing the problem area of the study of the implementation of the land market sustainable development concept

The working hypothesis of this research suggests that the solution of the above problem situation defines the need for conceptual modeling of the land market as a specialized commodity market for sustainable development based on the application of advanced requirements for environmentally friendly, green, energy-efficient solutions, a circular economy and other advanced engineering standards of construction through the possibility of forming a special supply and demand for land plots with an innovative type of permitted use for sustainable harmonic development of territories (SHDT).

The purpose of the research is to develop a set of theoretical provisions, concepts, principles, organizational and economic mechanisms, paradigms and new empirical knowledge on modeling a sustainable harmonic land market that will be able to generate the advanced requirements for the sustainability of territories in investment projects and programs based on the mandatory cost management of environmentally oriented life cycles of capital construction objects at the stage of land development.

The main objectives of the research: 1. To identify the problems and scientific hypothesis of the conceptual transformation of the land market based on the sustainable development of territories using an environmentally-oriented approach to construction life cycles; 2. Define the concept of "harmony of the land market" for SHDT; 3. To form theoretical models of the land market as a market for sustainable and harmonious development based on environmentally-oriented construction life cycles.

2 Materials and Methods

In the course of the research we used the methods of modern epistemological tools such as abstract-logical one, statistical-economic one, methods of socio-economic forecasting, extrapolation, mathematical analysis.

In this research we also used a variety of sources among which there were fundamental and applied scientific works devoted to the general theory of stability. We used the classic works of economic science as the base as well as the works of Russian and foreign scientists on the legal

and regulatory aspects of sustainable development and land markets. Research works of domestic and foreign organizations in the field of sustainable development together with federal, regional and sectoral statistics of the Russian Federation were used to obtain empirical data. Legislative and regulatory acts of the federal and regional authorities, published printed and electronic materials, collections of scientific conferences, materials of scientific research of the authors and other documents related to the problem in question were used as the base. Using the data from various sources made it possible to obtain a proper understanding of the sustainable development of the economy and land markets in Russia and abroad. The results of this study can be used in further scientific work and development of laws aimed at supporting sustainable development.

Regarding the sustainable development of territories in a turbulent economy, the problem of ensuring the efficiency of the land market is a point. This is determined by the fact that this type of market is fundamental in the management of sustainable socio-economic development of both territories, investment projects, programs, as well as industries, regions and enterprises of the country.

The phase of land market business activity is considered to be a "catalyst" or the kick-off of the investment development of all life cycles of the reproduction of capital construction objects where the pre-investment, investment and operational phases are traditionally singled out. From an economic perspective, the starting point of all life cycles is the pre-investment stage, with the land market as its key element that launches the start of the investment and operational phases of projects.

This is no doubt that the concept of sustainable development of territories determines the necessity for the formation and sustainable development of the land market as synchronous processes. The author's vision of the conceptual paradigm of sustainable development of territories also leads to the conceptual transformation of the land market as a special institutional element of territories' global sustainability management. The investment phase is associated with significant costs for the investor, while the operational phase is associated with even more significant operating costs for long periods of ownership. This is what determines the importance of pre-investment justifications at the stage of the land market, which are able to reduce the cost of construction and operation.

The project is the most manageable when it is at the pre-investment phase when there are no ready-made capital construction facilities, and even the construction site is not developed. It is exactly at this phase that one should most carefully approach the planning of a capital construction object. It is exactly here that the result of the application of the state policy of sustainable development of territories, which should be laid down at the stage of the functioning of the land market as a stable socio-economic system, will most clearly reveal.

On Figure 2 we show in details the total life cycle costs of project A, implemented in the traditional way, and project B with the priority of applying the concept of sustainable and harmonious development of territories. The t_p stands for period during which a land plot is provided to legal entities or citizens for ownership or leasing. The $S_{ip,A}$ и $S_{ip,B}$ stand for The total cost of land plots for projects A and B respectively.

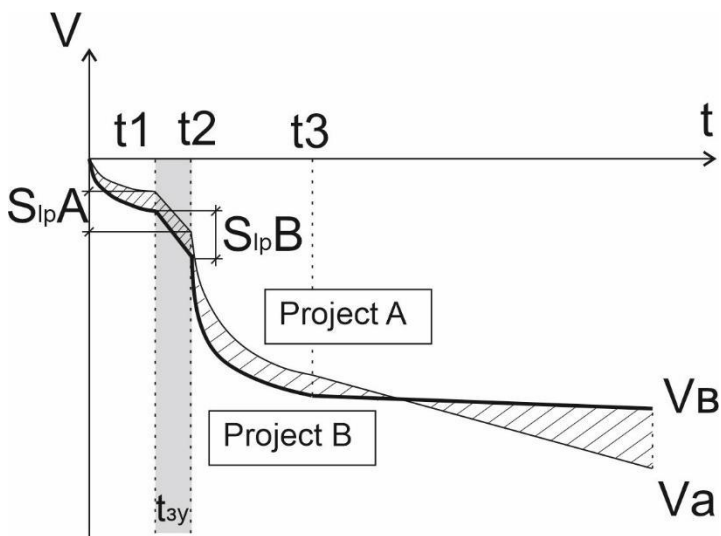


Fig. 2 A two-scenario model of the total life cycle costs of a project implemented in the traditional way (project A) and a project with the priority of applying the concept of sustainable and harmonious development of territories (project B)

Definitively, the planned results of the subsequent stages of the life cycle of sustainable and harmonious development of projects, programs and territories should also be taken into account in the process of regulating the effectiveness of the implementation of land market procedures.

3 Results

3.1 Clarification of the term "harmony of the land market"

In the course of the research we defined the "harmony of the land market" as a set of qualitative properties of the components of the land market system, which allow the implementation of the eco-market ideology in it through environmental orientation, ethical use of natural resources, environmental protection, green and cyclical economy in balanced combination with urban planning solutions in the field of land improvement based on the sustainable development of human civilization. In our opinion, harmony as a principle of sustainable market functioning should become a tool to reduce the developing turbulence of world economic development based on the formation of the prevailing type of thinking of mankind in all spheres of management.

3.2 Theoretical model of a harmonic land market and its sustainable development components

The analysis of various theoretical and practical sources of land markets allowed the authors of this research to develop a model of the territorial market for land plots. This model includes such basic elements as demand, supply, internal and external environment of territorial markets, selling methods of land plots, purpose, market infrastructure subsystem and the criteria for social and economic efficiency.

The developed authors' model includes a number of main subjects that influence each other. The formation and functioning of the land market segment depend on innovative demand and innovative supply, which should be considered as multiple entities. According to the method of

sale (R) of land plots, two types of land rights realization can be named: auction (A) and direct sale (DS). The auction is used for the sale of land plots with not delimited ownership and with the rights not belonging to third parties. Direct sale is practiced between individuals and legal entities on the secondary land market with an unlimited number of sellers and buyers. As a result, the developed authors' model shown in Figure 3 describes the interaction of the main subjects that influence each other the most in the territorial land market. This model can be used for further research of land markets and will help to think out the mechanisms for their regulation. However, it is also proposed to introduce a competitive sales (CS), when, in addition to the cost aspect, other parameters of the planned project can be evaluated, for example, environmental friendliness, "greenness", etc.

The initial model provides an integrated approach to achieving social and economic efficiency in the land market and creating a land market for sustainable and harmonious development (F). Within this approach, it is proposed to single out several subsystems conditionally divided into components of the stability of this type of market.

Component C1 refers to economic efficiency and includes two components: C1.1 - profit of the land plot seller (organizer of sales at auctions and competitions) and C1.2 - profit of the investor (where both components aim to maximize).

Component C2 refers to social efficiency and it is associated with the improvement of living conditions for families (aims to maximize).

Component C3 refers to the economic reliability of transactions and it is related to the quality of legislation, control of corruption and other aspects (aims to maximize).

Component C4 refers to the speed of transactions and consumer satisfaction with the speed of the transaction (aims to maximize).

Component C5 refers to the ecological state of land and includes such elements as environmental friendliness, energy efficiency and building harmony (aims to maximize).

Component C6 refers to the life cycle costs and it is targeted to minimizing the total costs (aims to maximize).

Generally, these components can help creating a sustainable and efficient land market that will contribute to the development of the social and economic domain.

Such influence elements as innovative land supply $\sum P_i$ and innovative demand $\sum S_i$ are also the part of this model. $\sum P_i$ cannot be formed without amending a number of legislative documents and administrative acts or updating territorial planning schemes of SHDT, master plans of SHDT, land use and development rules of SHDT. The formation of $\sum S_i$ is impossible without national, regional and municipal government support programs for the SHDT.

The model distinguishes 4 blocks by ownership types: the market of land plots owned by municipalities (F), state-owned land plots (P), the ones owned by legal entities (K) and the ones owned by individuals (B). Also, according to the purpose of land plots N, a division into two groups was made: territories of traditional development (TTD) N1 and territories of sustainable and harmonious development (TSHD) N2. This split resulted in eight model segments: F1-2, P1-2, K1-2 and B1-2.

For the F1 market the components related to the specified segment get the notation C1.1-C1.6, F2 - C2.1-C2.6 respectively, etc.

In the general form the model of sustainable and harmonic land market S_{nn} is proposed to be structured as per below:

$$\text{SHDT} = f(\sum S_i; \sum P_i; N; R; C1^{\max}; C2^{\max}; C3^{\max}; C4^{\max}; C5^{\max}) \rightarrow \max; S_{nn2} = f(C6^{\min})$$

(1)

For the purpose of theoretical development of the processes of land plots territorial markets modeling S_{nn} , we took the challenge and solved the task of more detailed structuring of the land plot market. The performed research and analysis made it possible to propose the authors' model of a sustainable land plots territorial market, presented further (see Fig. 3).

The model of sustainable and harmonious land plots market assumes the existence of interaction between subjects and objects of innovative demand. It also takes into consideration the innovative transformations with a special priority on the environmentally-oriented reproduction of capital construction projects for territorial development. The land market harmony includes an integrated approach that allows you to implement the ideology of the eco-market through the use of natural resources, taking into account their ethics and environmental protection. In such a model, a green and cyclical economy together with urban planning solutions for improving land plots based on the sustainable development of human civilization, should be also considered.

Based on our opinion, harmony should become the principle of market sustainable functioning in order to reduce the developing turbulence of world economic development. This can be achieved by the formation of the prevailing type of mankind thinking in all spheres of management. This approach will help to create a better land market system that will contribute to the sustainable and harmonious development of the territory as a whole.

It should be noted that in the theoretical modeling of sustainable development of territories the investment management is supposed to be implemented by the cycle of sustainable development of territories (CSDT).

With above being mentioned it is also very important to modernize the existing models of land development into a specialized model of sustainable functioning.

The development and implementation of investment management are essential in the theoretical modeling of sustainable development of territories. This requires the modernization of land management existing models and the creation of specialized models that ensure the sustainable functioning of the territories. Studies have shown that for the effective operation of the innovative land market it is necessary to synchronize its functioning with the sustainable and harmonious development of territories. To achieve this it is necessary to analyze the functional system, which consists of interacting functional components of managing the development of territories.

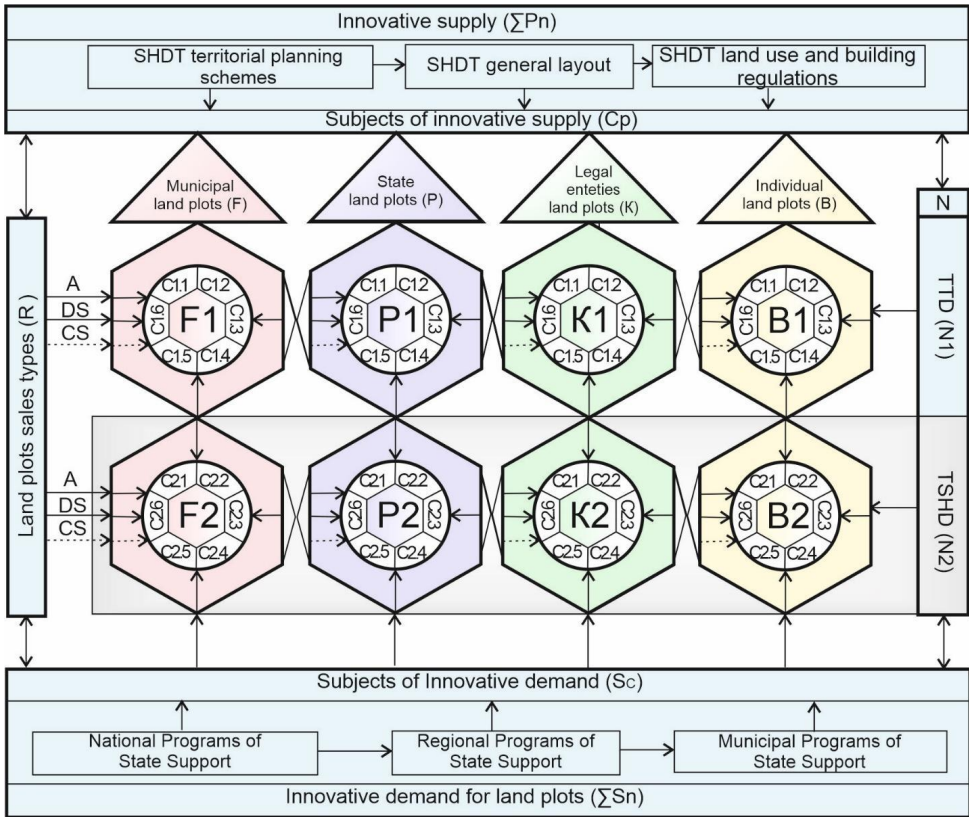


Figure 3 A model for the formation of a land plots sustainable market with the priority for environmentally-oriented construction

The theoretical modeling proposed by the authors includes the interpretation of regional investment and construction complexes as two main interacting subsystems: a demand subsystem taking into account innovative demand and a supply subsystem (including innovative supply). The result of theoretical modeling is a structural and functional model of sustainable development management based on economic activity state regulation in the erection of capital construction projects. The target function of this model is designed to ensure the maximum efficiency of the structural interaction between the system components. Thus, the creation of investment management and the modernization of land management models are key factors for achieving sustainable development of territories.

4 Discussion

Modeling of sustainable and harmonious development is a complex scientific and practical task that we tried to address in this research. However, a number of debatable issues remain within this issue.

Such debatable issues should include the measures that can be proposed for the sustainable and harmonious development of the land market, as well as more detailed consideration of the role of the land market as a specialized commodity market for sustainable development.

The debatable issues also include a discussion if the developed conceptual model will arise and stimulate the attention of investors and contribute to the formation of special demand and

supply for land plots, as well as the significance of the developed conceptual model of the paradigm of sustainable and harmonious development of the land market for the country's economy and its long-term transformation.

The number of debatable issues noted above should be considered not so much as the research weak points but mainly as the challenges for its development.

5 Conclusion

Currently, sustainable and harmonious development is one of the key issues for many sectors of the economy, including the land market. In a fast changing economic environment (especially in Russia) it is important to develop a specialized sustainability concept for the land market that meets the development requirements of both construction sites and land plots based on the principles of harmony.

As a result of the research, the conceptual model of the land market was developed as a specialized commodity market for sustainable development based on the application of advanced requirements for environmentally friendly, green, energy-efficient solutions. This model makes it possible to ensure the sustainability of construction areas and land plots while maintaining the principle of harmony. An important element of the model is the mandatory cost management of environmentally-oriented life cycles of capital construction objects at the stage of land development.

Thus, the conceptual modeling of the paradigm of the land market sustainable and harmonious development is important for ensuring the high-quality and stable development economy of the country. It is an innovative and promising field that can stimulate investor attention and help to generate special demand and supply for land. The developed provisions can help to ensure the stability of the territories and the market as a whole, as well as overcome instability and carry out a long-term economic transformation of the market based on the innovative segment of the land market.

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