

# Development of Low-Rise Investment-Construction Projects Based on the Principles of Public-Private Partnership

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**Abstract**—The subject being examined is the development of low-rise residential construction. The aim of the research is the development of investment activity methods in low-rise residential construction by means of public-private partnership projects. This article is focused on the method of low-rise construction investment activities namely the utilization of public-private partnership (PPP) principles in implementation of such projects. It also analyzes forms, models and mechanisms of public-private partnership project implementation existent in the building sector. The classification of Russia's regions according to the level of the building complex development is carried out and degree of the state participation in PPP projects according to the region's socio-economic development is studied. The impact degree of various factors on building sector is researched and a new scheme of cooperation in low-rise construction based on public-private partnership is suggested. Interpretation of received data is conducted using pictorial schemes, tables and formulae. Obtained results laid the foundation for reduction of construction costs and increase in affordability of low-rise accommodation for certain categories of residents within the framework of public-private partnership. Results of the research can be utilized in regional sector strategic planning.

**Keywords**—*component; formatting; style; styling; insert*

## I. INTRODUCTION

It has been a long time since cooperation of the state and business in Russia commenced. It has always aimed at solution of socially significant issues and the building complex is not an exception in this respect. This cooperation has gained considerable popularity recently due to instability in the country on the one hand and opportunities for expenditure reduction and risk sharing for investors on the other. Russian legislation controls implementation of public-private partnership projects under the Federal Law "On the public-private partnership, municipal-private partnership in the Russian Federation and introduction of amendments to certain legislative acts of the Russian Federation" as of July 13th 2015 No. 224-FL and the Federal Law "On concessionary agreements" as of July 21st 2005 No. 115-FL.

Public-private partnership – is an economic sector-specific form of interaction of public and private sectors for the purpose of development and implementation of key social projects.

Public-private partnership in low-rise construction – is a balanced cooperation of the state and members of the building complex for the purpose of socially-oriented and publicly significant facilities construction; consumer provision with available, safe, environmentally friendly, energy-efficient and comfortable housing which leads to improvement of country's economic situation as well as solution of welfare problems and raising standards of living in Russia.

## II. LITERATURE REVIEW

Currently the analysis of building complex issues is conducted by such researchers as Y.A. Ivashkina [1], V.A. Voronin [2], G.A. Denisov [3], M.I. Kamenetskiy [4], L.V. Dontsova [5], G.N. Talashkin [6], V.V. Bredikhin [7], A.I. Solunskiy, Y.K. Efremova [8]. The mentioned researchers deal with the analysis of the complex from different points of view although the majority treats the housing problem solely from the point of view of high-rise construction development in spite of the fact that low-rise construction has considerably increased over the past few years and is now providing half of the total amount of building activity in Russia.

Issues of low-rise construction development are studied in works of V.S. Kazeikin, S.A. Baronin, A.G. Tschernykh, A.N. Androsova [9], A.N. Asaul [10], P.G. Grabovoy [11], Y.Y. Bondarenko, L.V. Ivanenko [12], S.G. Sheina [13], S.A. Prigarin [14] and others.

The most efficient method of low-rise residential construction in Russia is the enforcement of public-private partnership projects which in their turn are to provide citizens with affordable low-rise housing. Development of PPP activities in low-rise construction is dealt with in the works of A.V. Tschernov [15], Y.E. Vtornikova [16], S.A. Korostin [17] together with the National Agency of Low-Rise and Cottage Construction (NALRCC) and others. There is also a lot of information on implementation of investment-construction projects in different economic sectors based on PPP principles in foreign sources [18, 19, 20, 21, 22, 29] which can be adopted in Russian residential low-rise construction practice.

Literature review [23, 24, 25, 26] on the studied topic highlights that the low-rise construction development issue is actual and there are certain issues which require a more

detailed study such as the problem of investment activity in low-rise residential construction namely in the part of PPP mechanism development [27].

**III. THEORETICAL PART**

Official documents regulating activities in the sphere of PPP are scarce and lack specification in different economic sectors resulting in absence of normative legal acts division between construction, housing and utilities complex, transport, state-financed institutions, education and other sectors in spite of each sector being peculiar and having its own economic and legal particularities.

In this article the authors refer to the building sector which contains a major part of investor-potential projects as well as projects unable to be fulfilled unless additionally supported by public authorities due to the current economic situation.

Development of normative legal acts aiming at improvement of PPP in regions' building sector requires:

1. Taking into consideration particularities of a region, initial conditions and local developmental policy.
2. Considering the strategy and model of socio-economic development of the region to ensure conformity with pursued aims and objectives as well as objective prospects of their legal enforcement in every region.

3. Conducting analysis of existing normative legal acts in the sphere of PPP to decide which of them need improvement or termination; which are aligned with federal legislation and which contradict it.

4. Selecting forms and mechanisms, management and supervision organs in PPP sphere of the region's construction sector and establish liaison between subjects of the construction sector and the state and distribute rights and duties, share potential risks and guarantees between the participants.

Considering the existing regulatory and legal framework it is essential to consider the main forms, models and mechanisms of PPP in more detail from the point of view of their applicability in low-rise construction (Fig.1).

Considering the given scheme of PPP implemented in the building complex it can be concluded that there is a considerable variety of forms, models and mechanisms of PPP and each project has its own model of functioning and implementation. Obviously, it is not the full list of PPP models in the building complex as every investment-construction project is unique and can combine several functioning models.

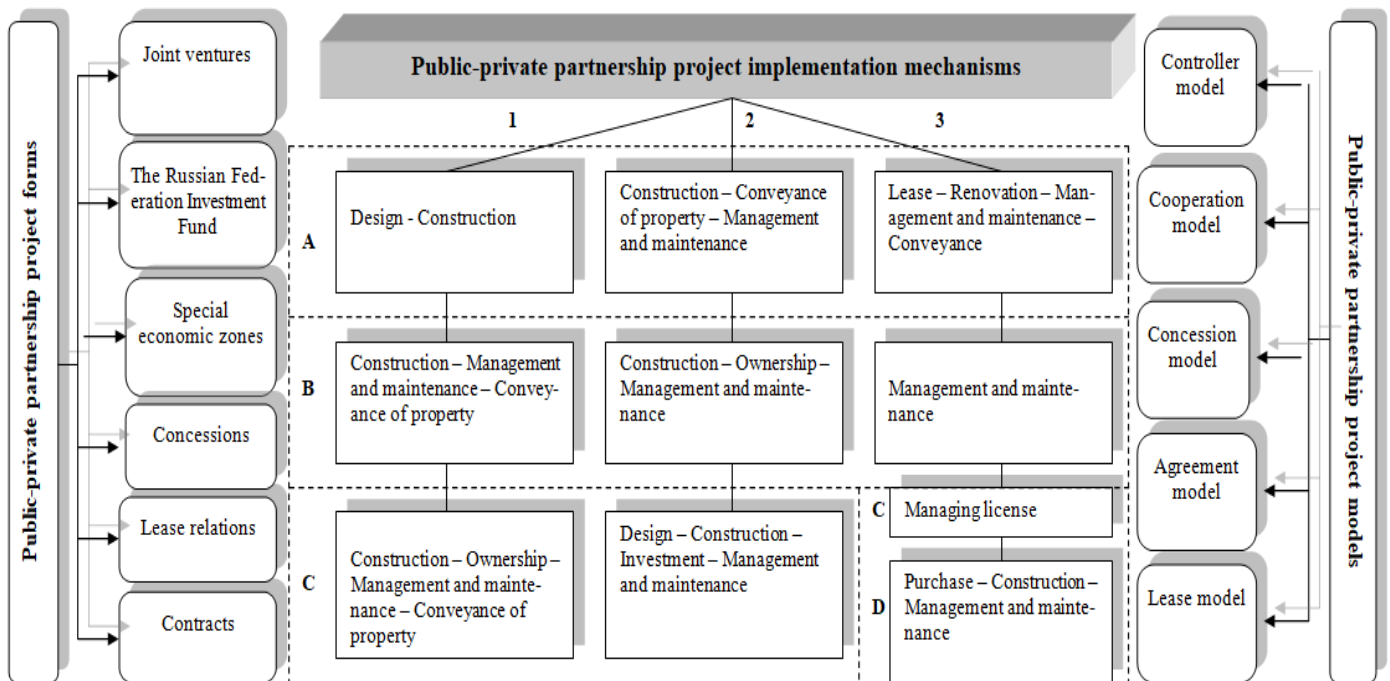


Fig. 1. Building complex forms, models and mechanisms of PPP implementation

**IV. METHODOLOGY**

Classification of regions according to the level of development requires us to use Table 1 in order to arrange them by the region's building complex development level (Table 1).

Points are assigned to each parameter in the table characterizing building sector development level and regions are classified by summarizing all them.

Participation of the state in investment-construction projects based on the PPP principles varies and depends on socio-economic development of the region. Therefore, public-private projects acquire different form of collaboration between private investors and the state which is depicted in (Table 2).

Ascription of types to regions depends on their socio-economic development. The ascription is accompanied by a considerable number of risks which can be taken into account by the method of indicative planning based on risk recognition

through defining and classifying factors determining condition of the building sector. These factors represent a hierarchical four-level system: internal environment factors (IEF), external environment factors (EEF), circumstantial and unpredictable occasion factors (COP), innovation factors (IF), and natural and climatic factors (NCF).

TABLE 1. Classification of regions in accordance with their building complex development level

No	Building complex development index	Development level, points	Region type
1	Employment of population in building sector	<b>0 – not given; 1 – low; 3 – normal; 5 – high.</b>	<b>0 – 10 – critical; 10 – 20 – extensive; 20 – 30 – moderate; 30 – 40 – growing; 40 – 50 – intensive.</b>
2	Presence of construction companies		
3	Availability of material resources		
4	Availability of technical resources		
5	Sufficiency of financial resources		
6	Building complex development level		
7	Investment prospects		
8	Construction volume		
9	Economic resilience of construction companies		
10	Dwelling density		

Overall factor impact (FI) is calculated by the formula:

$$FI = \sum IEF + \sum EEF + \sum COP + \sum IF + \sum NCF$$

External environment factors are represented by political, financial-economic risks evoked by tax and economic policy of the state; foreign exchange and inflation risks; risks resulting from inadequate regulatory and legislative framework in construction etc. These are the risks which cannot be corrected by the subjects of the building sector.

Among internal environment factors engineering and technological, planning and prediction, management and other risks can be named. The risks of this category appear in the process of implementation of a PPP project.

Circumstantial and unpredictable occasion factors are social risks (connected with population's living standards and income level), force majeure circumstances, lack of efficient control over the construction process, government authorities' disregard of quality and environmentally-friendly construction; additional expenses on rectification of environmental pollution consequences.

Innovation factors include existence of innovative technologies in construction and degree of their implementation in production along with the degree of energy-efficient technology implementation in an investment-construction project and the like.

Natural and climatic factors are also independent of the building sector subjects and are comprised of risks associated with geographical peculiarities of the region namely with the terrain type, soil quality, climatic features influencing construction production technology in the region and the ecological risks.

TABLE 2. Degree of the state participation in PPP projects according to socio-economic development of the region

Region's type	Region's description	Low-rise housing project	Form of PPP	State participation	Risk extent
<b>Intensive</b>	large, all cities are developed and densely populated	development of the suburban areas through residents' resettlement from substandard and hazardous housing; population density reduction in cities	utilization of mixed types of PPP forms	minimal	low
<b>Growing</b>	large, all cities are developed and densely populated 50/50	development of the suburban areas through residents' resettlement from substandard and hazardous housing	utilization of mixed types of PPP forms	minimal, varies in settlement and resettlement of residents	low
<b>Moderate</b>	fastest growing and medium-scale cities	development of the suburban areas through residents' resettlement from substandard and hazardous housing; population density reduction in cities through reclamation of new territories	utilization of mixed types of PPP forms	may vary in settlement and resettlement of residents	average
<b>Extensive</b>	regions with prevalence of insufficiently developed cities, abundance of undeveloped territories	residents' settlement through reclamation of new territories	social form	maximal	high
<b>Critical</b>	depressive cities possessing a substantial number of undeveloped territories	residents' settlement through reclamation of new territories due to existence of vast undeveloped areas	social form	maximal	high

Therefore, ranking of factors according to the degree of their impact on the building sector and socio-economic

development level of the region becomes possible. Moreover, it becomes clear that the factor influence can be: 1) negligible; 2) relatively important; 3) moderate; 4) considerable; 5) critical.

Taking the given factors into consideration allows defining and systematizing risk occasions in the building sector. Ranking, probability calculation and the building sector impact degree can be conducted by means of simulation modeling approach discussed further. It is essential for specification of initial conditions and consequences of scenario modelling, evaluation of scenario implementation effects and correspondent alternative models. Impact of the studied factors is presented in Table 3.

The existent scheme of cooperation among the participants of PPP projects is not considered to be highly efficient and needs improvement for it has not yet brought any considerable results which means there are not enough ongoing projects and regions still lack necessary regulatory documents for low-rise residential construction. Therefore, a new PPP project implementation scheme for low-rise construction is to be provided (Fig.2).

The main feature of this variant of cooperation is the fact that public-private partnership not only helps develop the building sector but also embodies socially important projects and supports sharing of risks which evolve during project implementation.

TABLE 3. Factor impact on region's building sector

Region types		Intensive region	Growing region	Moderate region	Extensive region	Critical region
Impact factors	External	5	10	15	20	25
	Internal	4	8	12	16	20
	Circumstantial and unpredictable occasion	3	6	9	12	15
	Innovation	2	4	6	8	10
	Natural and climatic	1	2	3	4	5
<b>Building sector impact degree (calculated), R</b> Negligible ( $0 \leq R \leq 4$ ) Relatively important ( $5 \leq R \leq 8$ ) Moderate ( $9 \leq R \leq 11$ ) Considerable ( $12 \leq R \leq 19$ ) Critical ( $20 \leq R \leq 25$ )						

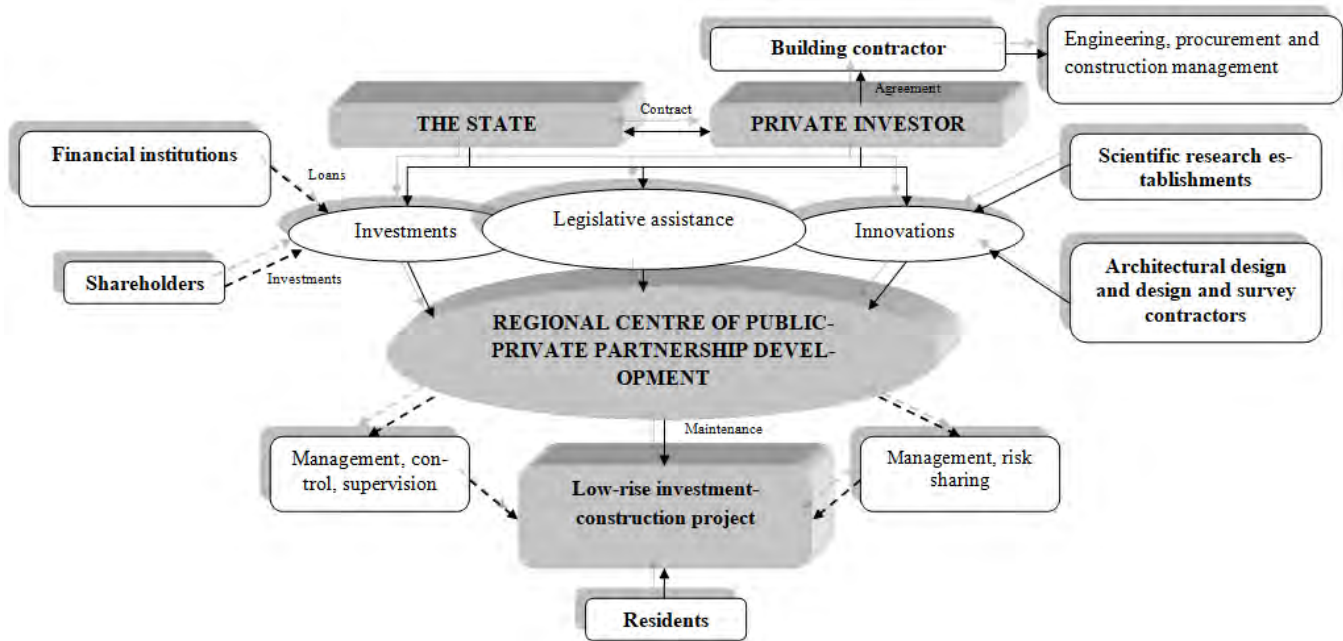


Fig. 2. The scheme of collaboration in low-rise construction projects based on principles of public-private partnership

Picture 2 aims at revealing the authors' idea of complementing the existent scheme with introduction of regional centres of PPP development. Such centres will be able to deal with operation and maintenance of new buildings as well as provide educational services to customers which will significantly improve PPP activities.

Experience has proven that the majority of regions in Russia is not concerned with efficiency of PPP projects completion and, although some of them do host centres of PPP development these centres have only a formal character and do not participate in project implementation. The authors suggestion is to vest these centres with authority to control, supervise and manage such projects and give them an

opportunity to manage and coordinate resulting risks which will considerably facilitate cooperation between the state and subjects of the building sector. Such operator is as well necessary in resolving legal issues, however, such function is not considered enough in the current Russian legislature for there is lack of normative and legal documents in the sphere of PPP while there is an objective need in development of new normative and legal acts and editing of the existent ones. The focus on development of regional normative and legal acts originates from the fact that a considerable number of socially important projects abide particularly at the regional level and represent various spheres and sectors of economy.

The given model relieves private partner of onerous obligation to maintain a PPP building and, therefore, increases attractiveness of such projects for construction companies. Initiation of the centres also reduces risks for private and public partners.

On condition of proper legislative standardization and introduction of necessary conditions for regional PPP development centres functioning utilization of the suggested scheme will become efficient in development of low-rise construction on the whole territory of the Russian Federation.

#### V. CONCLUSION

The results of the analysis of organizational, legal and financial aspects of PPP projects implementation expand theoretical basis of low-rise PPP projects implementation and provide practical recommendations on how to improve organization-management mechanism of low-rise investment-construction projects based on PPP.

Major results of the research according to the aim of the research:

1. The analysis of the existent forms of PPP and regulatory and legal framework of contractual and legal relations of PPP subject regulation discovered peculiar features of PPP project implementation in low-rise construction. Their consideration in development of PPP organization-management mechanism in investment-construction project implementation allows reducing partner risks and assuring successful project realization.

2. The necessity of PPP organization-management model enhancement in low-rise investment-construction projects on the basis of organizational mechanism analysis and legislative environment analysis is justified.

3. On the basis of project risk assessment the main risk areas are defined and risk matrix defining risk degree influence on the building sector is developed.

4. Generalization of practical experience in PPP project implementation in the building sector allowed determining possible degree of the state participation in PPP projects in accordance with socio-economic development level of the region.

5. Suggestions on improvement of organization-management model of PPP low-rise investment-construction projects are made. Namely, it is justified that the most efficient utilization of PPP institution in the building sector requires creation of regional centres of PPP development with operation and maintenance of buildings and provision of educational services assigned to them.

Practical importance of the results consists in their applicability for the purpose of PPP model improvement in existent and prospect PPP based low-rise investment construction projects [28].

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