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MECHANISMS FOR STIMULATING INVESTMENT IN CAPITAL REPAIRS AND ENERGY EFFICIENCY OF APARTMENT BUILDINGS IN UZBEKISTAN

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Annotation: This article analyzes the barriers and drivers of investment in major renovations and energy efficiency improvements to Uzbekistan's housing stock. Using statistical data, regulatory analysis, and a comparative study of international and national practices, key factors hindering housing modernization are identified: limited solvency of the population, insufficient owner motivation, weak legislative and institutional incentives, and outdated engineering and heating infrastructure. A variety of financing mechanisms are considered, including government co-financing programs, preferential bank lending, private investor participation, public-private partnerships (PPPs), and combined schemes. A hybrid cost-sharing scheme is proposed, combining budget funds, bank loans, shared participation by owners, and support. Such schemes can increase the affordability of major renovations and energy-efficient solutions, reduce the burden on households, and accelerate modernization. The study's findings can serve as a basis for developing government housing and utilities policies and programs for sustainable housing renovation.

Keywords: Major repairs, energy efficiency, apartment building, investments, housing stock, financing, government co-financing, preferential loan, public-private partnership, residents, motivation, accessibility, outdated utilities, household energy, modernization, sustainable development, housing and communal services, reconstruction, lending, green lending, ESCO, budget, bank financing, modernization investments.

МЕХАНИЗМЫ СТИМУЛИРОВАНИЯ ИНВЕСТИЦИЙ В КАПИТАЛЬНЫЙ РЕМОНТ И ЭНЕРГОЭФФЕКТИВНОСТЬ МНОГОКВАРТИРНЫХ ДОМОВ (МКД) В УЗБЕКИСТАНЕ

Аннотация. В статье анализируются препятствия и драйверы инвестиций в капитальный ремонт и повышение энергоэффективности жилого фонда Узбекистана. На основе статистических данных, анализа нормативных документов и сравнительного изучения международных и национальных практик выявлены ключевые факторы, тормозящие модернизацию жилого фонда: ограниченная платёжеспособность населения, недостаточная мотивация собственников, слабое законодательное и институциональное стимулирование, а также устаревшая инженерная и теплотехническая инфраструктура. Рассмотрено множество механизмов финансирования государственные программы софинансирования, льготное банковское кредитование, участие частных инвесторов, модель государственно-частного партнёрства (ГЧП), а также комбинированные схемы. Предлагается гибридная схема распределения затрат, сочетающая бюджетные средства, банковский кредит, долевое участие собственников и поддержку. Такие схемы способны повысить доступность капитального ремонта и энергоэффективных решений, снизить нагрузку на домохозяйства и ускорить реализацию модернизации. Результаты исследования могут стать основой для разработки государственной жилищно-коммунальной политики и программ устойчивого обновления жилого фонда.

Ключевые Слова: капитальный ремонт, энергоэффективность, многоквартирный дом, инвестиции, жилищный фонд, финансирование, государственное софинансирование, льготный кредит, государственно-частное партнёрство, жильцы, мотивация, доступность, устаревшие коммуникации, бытовая энергетика, модернизация, устойчивое развитие, ЖКХ, реконструкция, кредитование, green lending, ESCO, бюджет, банковское финансирование, модернизационные инвестиции.

O'ZBEKISTONDA KO'P QAVATLI UYLARNI KAPITAL TA'MIRLASH VA ENERGIYA SAMARADORLIGIGA INVESTITSIYALARNI RAG'BATLANTIRISH MEXANIZMLARI

Annotatsiya: Maqolada O'zbekiston uy-joy fondini kapital ta'mirlash va energiya samaradorligini oshirishga investitsiyalarning to'siqlari va ta'sir etuvchilar tahlil qilinadi. Statistik ma'lumotlar, me'yoriy hujjatlarni tahlil qilish va xalqaro va milliy amaliyotlarni qiyosiy o'rganish asosida uy-joy fondini modernizatsiya qilishga to'sqinlik qiluvchi asosiy omillar aniqlandi: aholining to'lov qobiliyatining cheklanganligi, egalarining motivatsiyasining yetarli emasligi, Qonunchilik va institutsional rag'batlantirishning sustligi, shuningdek, eskirgan muhandislik va issiqlik muhandisligi infratuzilmalari. Moliyalashtirishning ko'plab mexanizmlari ko'rib chiqilib davlat dasturlari birgalikda moliyalashtirish, imtiyozli bank kreditlari, xususiy investorlarning ishtiroki, davlat-xususiy sheriklik modeli, shuningdek birlashtirilgan sxemalar keltirilgan. Byudjet mablag'lari, bank krediti, mulkdorlarning ulushli ishtiroki, qo'llab-quvvatlashni birlashtirgan gibrid xarajatlarni taqsimlash sxemasi taklif etiladi. Bunday sxemalar kapital ta'mirlash va energiya tejaydigan yechimlarning mavjudligini oshirishi, uy xo'jaliklariga yukni kamaytirishi va modernizatsiya qilishni tezlashtirishi mumkin. Tadqiqot natijalari davlat uy-joy kommunal siyosatini va uy-joy fondini barqaror yangilash dasturlarini ishlab chiqish uchun asos bo'lishi mumkin.

Kalit so'zlar: kapital ta'mirlash, energiya samaradorligi, ko'p qavatli uy, investitsiyalar, uy-joy fondi, moliyalashtirish, davlat tomonidan birgalikda moliyalashtirish, imtiyozli kredit, davlat-xususiy sheriklik, ijarachilar, motivatsiya, mavjudlik, eskirgan aloqa, maishiy energiya, modernizatsiya, barqaror rivojlanish, uy-joy kommunal xo'jaligi, qayta qurish, kreditlash, qarz berish, ESCO, byudjet, bankni moliyalashtirish, modernizatsiya investitsiyalari.

INTRODUCTION

The housing stock in the Republic of Uzbekistan is growing rapidly; as of January 1, 2025, the total number of apartments and houses exceeded 7.6 million. A significant portion of these multi-apartment buildings were constructed before the 1990s. These buildings rely on centuries-old construction and utility infrastructure, including deteriorated utility systems, which increases the risk of accidents, emergency costs, and low energy efficiency [1].

The buildings sector consumes approximately 50% of the country's final energy, making it a key priority for energy policy [2].

Under these conditions, modernizing buildings including insulation, upgrading utility systems, and improving energy efficiency is not just desirable, but strategically important. However, in practice, apartment building modernization is not progressing rapidly enough. The main reasons are a lack of financial resources among the population, low motivation, a lack of comprehensive and accessible financial mechanisms, and weak institutional support.

The purpose of this article is to conduct a systemic analysis of existing mechanisms for stimulating investment in capital repairs and energy efficiency of apartment buildings in

Uzbekistan, assess their effectiveness, identify barriers and propose optimal financing models applicable to Uzbek realities.

LITERATURE ANALYSIS

A number of studies have focused on housing stock risk management, the effectiveness of capital repair financing, and institutional and financial barriers. S.N. Popelnyukhov examined the economic and organizational risk management mechanisms in the activities of housing management organizations [3].The paper focuses on the production, operational, and financial risks arising from housing maintenance, repairs, and reconstruction. Popelnyukhov found that traditional insurance schemes, used as the primary risk protection tool, are ineffective in a market economy, as they lead to increased costs and fail to ensure the sustainability of housing management systems. Among the key problems, the author notes the lack of comprehensive and systemic risk identification models, poorly developed mitigation methods, and a lack of risk investment optimization mechanisms. As a solution, he proposed the development of dynamic economic and mathematical models of sustainability, the implementation of a hierarchical risk classification, and the use of combined management tools such as self-insurance, preventive control, risk allocation among participants, and the selection of the optimal investment volume to achieve an acceptable risk level.

The work of I.N. Zhidkikh is devoted to the methodological foundations of risk management of investment projects in the industrial construction complex [4]. The researcher emphasizes that investment projects in construction and housing and utilities are characterized by a high level of uncertainty due to technical, financial, and organizational factors. Zhidkikh found that existing risk assessment methods are fragmented, fail to consider the complex interaction of factors, and fail to reduce the likelihood of losses during capital-intensive projects. Key challenges include difficulties in forecasting operational risks, the lack of systemic tools for mitigating investment threats, and insufficient insurance coverage. The author proposes an integrated risk management model based on a combination of self-insurance, insurance, and risk-sharing mechanisms, ensuring an acceptable level of investment security.

L.P. Berzhinskaya's research is devoted to a systemic analysis of the reliability and sustainability of the region's housing stock, with an emphasis on socio-economic and man-made risks, including those caused by seismic activity [5]. The author demonstrates that the reliability of the housing stock is significantly reduced by inadequate certification of properties, the lack of regular inspection and monitoring of the technical condition of buildings, and the lack of risk forecasting tools. Berzhinskaya emphasizes that housing in seismically active regions is particularly vulnerable to catastrophic impacts. Recommendations include the use of experimental and analytical methods for assessing technical condition, the development of monitoring systems, and the development of priority public policy areas for improving the seismic resistance of residential buildings.

International sources such as the World Bank, UNDP, Energy Charter Secretariat, UNECE, and OECD emphasize that the building sector is the largest energy consumer, and its modernization is a key area for ensuring energy security and sustainable development. Reports from the World Bank, UNDP, and the Energy Charter Secretariat demonstrate that energy efficiency in residential buildings is directly linked to the sustainability of the urban environment, reduced household costs, and minimized environmental impacts. An analysis of UNECE and OECD data shows that in many countries, modernization processes are hampered by institutional barriers, a lack of financial incentives, and weak owner engagement, requiring the use of hybrid financing models, incentives for private investment, and the implementation of comprehensive energy modernization programs.

Thus, there is a sufficient theoretical and practical basis indicating the necessity and feasibility of attracting investment, but local national studies do not sufficiently illuminate ways to stimulate it in relation to Uzbekistan.

METHODOLOGY

For the analysis, a combined methodological approach was used, such as:
Collection and analysis of statistical and official data on housing stock, construction volumes, energy balances, capital repair programs, data on the share of buildings, energy consumption, and housing stock demographics.
A comparative analysis of financing mechanisms (government co-financing, bank loans, private capital participation, public-private partnerships, and international donor programs) is conducted. An assessment of their capabilities, limitations, and relevance to Uzbek realities is provided.
Economic and organizational analysis: assessment of the population's solvency, distribution of the financial burden, forecast of financial flows, and sustainability of schemes.
A systems approach considers not only economic, but also institutional, legal, and social components: motivation of owners, trust in management organizations, and transparency of mechanisms.
Modeling of heterogeneous financing schemes: combined schemes for distributing shares between the state, banks, residents and investors.

DISCUSSION AND RESULTS

The process of modernizing apartment buildings is currently hampered by a number of issues. These include financial constraints that prevent households from investing in improvements, low owner motivation, and a lack of transparency in the institutional environment. And we mustn't forget the buildings themselves, which are often characterized by high energy consumption and technical inefficiencies.
Household financial constraints. Given the average cost of utilities and household incomes, the costs of major repairs often prove prohibitive. Government statistics show an increase in housing, but not a corresponding increase in disposable income [1].
Low motivation and institutional opacity. The absence of mandatory programs, lack of trust in management organizations, poor transparency in fund spending, and the "free-rider effect" all reduce the willingness of owners to contribute.
Energy intensity and technical inefficiencies of buildings. Approximately half of the country's total final energy consumption is consumed by buildings. Meanwhile, deteriorating building structures, inadequate thermal insulation, and outdated heating and water supply systems increase consumption and costs [6].
Energy audits of pilot facilities (schools, social institutions) show that after modernization, energy consumption can be reduced by 50–60% [7].
An analysis of existing and potential sources of financing allows us to identify the following key areas: government co-financing and subsidies, provision of preferential bank loans and "green loans", attracting private investment, implementation of public-private partnership (PPP) projects, and the use of combined (hybrid) financial models.
State co-financing and subsidies. State programs (regional and national budgets) provide partial coverage for renovation and energy efficiency costs. This provides access for low-income homes and reduces the initial cost barrier. However, budget resources are limited, and the list of buildings eligible for the programs is strictly regulated.
Preferential bank lending and "green loans." The banking sector is gradually introducing preferential lending programs for renovations and energy efficiency. Loans are becoming more

accessible, but risks remain: low homeowner income, collective obligations, and the need for a repayment guarantee.

Private investment and public-private partnerships (PPPs). Private investors, contractors, and energy service companies (ESCOs) can participate in modernization projects, particularly of utility systems, with a portion of the savings passed on to residents. However, such projects require a robust legal and contractual framework, as well as transparent accounting of savings.

Combined (hybrid) schemes. The most promising option is to distribute costs among the state, banks, owners, and investors. For example: 30-40% covered by the budget, 30-40% by a bank loan, 20-30% by residents' funds; a portion may also come from the investor. This reduces the burden on one party and spreads the risk.

Table 1.

Key parameters of the housing stock and energy consumption of buildings

Indicator	Value / Share	Commentary / Source
Total number of residential properties (apartments + houses)	~ 7.6 million (as of January 1, 2025)	includes the private sector and apartment buildings
Number of apartment buildings	46,476 (as of 2025)	of which 12,604 have 5 or more floors
The share of buildings in the country's total energy consumption	~ 50%	residential + public buildings
Energy saving potential in building retrofits	Energy consumption reduction up to 50–60% (according to pilots)	insulation, heating modernization, etc.

Table 2.

Comparison of financing mechanisms for the modernization of apartment buildings

Mechanism	Advantages	Limitations/Barriers
State co-financing	Reduced costs for owners; social accessibility	Limited budget, strict house selection
Preferential loans / green loans	Possibility of attracting large sums of money, modernization in installments	Credit load, need for guarantee, risks of non-payment
Private investment / PPP / ESCO	Attracting investors, professional management, energy savings	The need for legislative protection and transparency of contracts
Combined schemes	Sharing the financial burden, flexibility, risk reduction	A set of regulations and a high level of institutionalization are required

CONCLUSIONS

Developing financing mechanisms for major repairs and energy modernization of multi-apartment housing requires a systematic approach based on a combination of institutional, financial, and organizational-technical instruments. The implementation model presented below aims to create a sustainable, predictable, and economically feasible system for modernizing multi-apartment buildings, taking into account the specific characteristics of the housing sector in the Republic of Uzbekistan.

Formation of a national program for the modernization of multi-apartment housing stock.A necessary step is the development of a National Program for the Modernization of Apartment Buildings, which provides for a multi-level financing model, including:

- state co-financing in the form of direct subsidies for major repairs, replacement of utility networks, and increased energy efficiency;
- preferential credit mechanisms available to both homeowners' associations/management companies and homeowners' associations;
- attracting private investors, primarily through public-private partnership (PPP) mechanisms and energy service contracts.

This structure allows for the financial burden to be distributed between the state, property owners, and the private sector, ensuring the necessary volumes of modernization are achieved without significantly increasing the population's payment burden.

Creation of a national guarantee fund for insuring investment and credit risks. One of the key barriers to attracting private capital for the modernization of apartment buildings is the high level of risk associated with lending to housing associations. To minimize these risks, it is proposed to create a guarantee and compensation fund that would perform the following functions:

- provision of guarantees for loans issued to homeowners associations/management companies for major repairs and energy efficiency measures;
- provision of partial co-financing of projects on a repayable basis;
- reducing the level of risk for banks, which will help lower interest rates and expand credit availability;
- increasing investor confidence in the housing services sector.

The existence of such a fund creates the basis for scaling up lending programs and stimulates long-term investments in the modernization of the housing stock.

Development and implementation of preferential financial products ("green mortgages", "green loans").A necessary element of modern housing development is the creation of incentive mechanisms for energy-efficient investments. The following is proposed:

- "green mortgages" - credit products aimed at financing major repairs, window replacement, facade insulation, and heating and ventilation modernization;
- "green loans" with a reduced interest rate, extended repayment period and flexible grace period.

A key feature of these products is that they link financial terms to the level of potential energy savings, allowing owners to reduce costs by lowering operating expenses.

Development of energy service models (ESCO) and public-private partnership mechanisms. Of particular importance are phased models for modernization of engineering infrastructure based on the principles of energy service contracts (ESCO), when:

- a private company finances the modernization of engineering systems (heat supply, water supply, ventilation);
- Investment reimbursement is achieved through proven energy savings;
- The risks of overspending or failure to achieve savings are borne by the contractor - the energy service company.

At the same time, there is a need to expand the practice of public-private partnerships, especially in the areas of modernizing elevators, heating stations, and in-house networks, where payback periods exceed the capabilities of owners.

Strengthening regulatory frameworks, transparency and oversight. To ensure the sustainability of reforms, it is necessary to create a clear regulatory framework that includes:

- mandatory technical certification of all apartment buildings;

- creation of a public register of technical condition and repair history;
- expansion of requirements for disclosure of information by management organizations;
- standardization of procedures for assessing technical condition;
- mechanisms for protecting the rights of owners and investors, including guarantees of repayment of funds.

A transparent data system reduces information asymmetry, increases trust, and reduces risks for all participants.

Conducting pilot projects and building a scalable model. Effective implementation of reforms requires testing potential solutions in the form of pilot projects, including:

- selection of 5-10 typical apartment buildings;
- implementation of various combinations of financial mechanisms (co-financing + loans + ESCO);
- monitoring:
  - saving energy resources,
  - payback of projects,
  - dynamics of operating costs,
  - level of participation and satisfaction of residents,
  - quality of management.

The results of the pilot projects should serve as the basis for adapting regulations, clarifying financing mechanisms, and scaling up reforms at the national level.

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