



RESTORATION AND RECONSTRUCTION OF BUILDING AND STRUCTURES IN KRASNODAR, RUSSIAN FEDERATION: A DEEP DIVE INTO MODERNIZATION AND URBAN RENEWAL

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Info Article	Abstract: This article explores the complex landscape of building reconstruction in Krasnodar, Russia, a city experiencing rapid urban development. It examines the drivers behind reconstruction projects, focusing on the need to address both objective and subjective obsolescence in civil and industrial buildings. The machine-building complex of the Krasnodar region includes enterprises of oil and gas, railway, agricultural and food engineering. The study highlights the multifaceted goals of modern reconstruction, including enhancing living comfort, increasing residential capacity, and improving the urban environment. It also delves into the challenges faced during urban reconstruction, such as managing increased loads on foundations, working within confined construction sites, and modernizing existing utilities. The article further examines the diverse repair strategies employed, emphasizing the importance of tailoring methods to specific building materials, damage extent, and site conditions. Ultimately, it underscores the need for a holistic and integrated approach to reconstruction, balancing progress and preservation to create sustainable, resilient, and aesthetically pleasing urban spaces that enhance the quality of life for Krasnodar's residents.
Received:	
04 Desember 2024	
Revised:	
03 Januari 2025	
Accepted:	Abstrak: Artikel ini mengeksplorasi lanskap kompleks rekonstruksi bangunan di Krasnodar, Rusia, sebuah kota yang mengalami perkembangan perkotaan yang pesat. Artikel ini mengkaji pendorong di balik proyek rekonstruksi, dengan fokus pada kebutuhan untuk mengatasi keusangan objektif dan subjektif pada bangunan sipil dan industri. Kompleks teknik mesin wilayah Krasnodar mencakup perusahaan teknik perminyakan dan gas, perkeretaapian, pertanian dan pangan. Studi ini menyoroti tujuan multifaset dari rekonstruksi modern, termasuk meningkatkan kenyamanan hidup, meningkatkan kapasitas hunian, dan memperbaiki lingkungan perkotaan. Artikel ini selanjutnya menguji beragam strategi perbaikan yang digunakan, menekankan pentingnya menyesuaikan metode dengan bahan bangunan tertentu, tingkat kerusakan, dan kondisi lokasi. Pada akhirnya, artikel ini menggarisbawahi perlunya pendekatan holistik dan terpadu terhadap rekonstruksi, menyeimbangkan kemajuan dan pelestarian untuk menciptakan ruang perkotaan yang berkelanjutan, tangguh, dan estetis yang meningkatkan kualitas hidup penduduk Krasnodar.
01 Februari 2025	
Publication:	
28 Februari 2025	
Keywords:	
Reconstruction,	Rekonstruksi,
Krasnodar, Urban	
Development,	
Modernization,	
Sustainability,	
Infrastructure,	
Residential Building	
Industrial Buildings	
Kata Kunci:	
Rekonstruksi,	
Krasnodar,	Rekonstruksi,
Pembangunan	
Perkotaan,	
Modernisasi,	
Keberlanjutan,	
Infrastruktur,	
Bangunan Tempat	
Tinggal, Bangunan	
Industri.	
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INTRODUCTION

The reconstruction of buildings and structures represents a sophisticated and crucial element within the broader spectrum of construction activities. It transcends mere renovation, embodying a complex and meticulously planned endeavor encompassing a series of intricate work processes and strategically implemented organizational-technical measures. These measures are specifically designed to fundamentally modify and enhance key technical-economic indicators of a building or structure. These indicators encompass critical aspects such as the building's overall height, the number of stories or floors it comprises, the total area it occupies, and its overall volume.

In the vibrant and rapidly evolving urban landscape of Krasnodar, reconstruction projects are frequently initiated with clearly defined and ambitious objectives. These objectives are tailored to the specific type of building undergoing transformation: For Civil Buildings (Residential, Commercial, Public): The paramount objective is to significantly elevate the standard of living for residents and users. This involves a multifaceted approach that encompasses enhancing the comfort and convenience of occupants, improving the quality and range of services provided within the building, and increasing the overall capacity and volume of these services to meet the growing demands of the community. This can manifest in various forms, including the modernization of existing amenities and the introduction of new ones, improving accessibility for people of all abilities, creating more functional and adaptable spaces for occupants to live, work, and interact, and integrating smart building technologies to enhance efficiency and convenience.

For Industrial Buildings (Factories, Warehouses, Production Facilities): The primary focus shifts towards comprehensive technical re-equipment and modernization of production processes. The machine-building complex of the Krasnodar region includes enterprises of oil and gas, railway, agricultural and food engineering. This involves a strategic overhaul of existing infrastructure and equipment to facilitate changes in the range of products manufactured by the facility and/or to substantially increase the volume of production output to meet market demands. Crucially, these modernization efforts also prioritize the improvement of working conditions for employees, ensuring a safer, healthier, more efficient, and more comfortable workplace. This can include upgrading machinery and equipment to reduce noise and emissions, improving ventilation and air quality, providing ergonomic workstations and

comfortable break areas, and implementing safety measures to prevent accidents and injuries.

METHOD

The research methods employed in the article are designed to provide a comprehensive understanding of building reconstruction in Krasnodar, focusing on urban development, modernization, and sustainability. The methodology integrates both qualitative and quantitative approaches to address the multifaceted nature of reconstruction projects. Below is an outline of the research methods:

1. Literature Review and Document Analysis

The study begins with a thorough review of spatial and regulatory documents, including urban planning policies, zoning codes, and socio-economic development strategies for Krasnodar. These documents provide insights into the formal frameworks guiding reconstruction efforts and highlight regulatory challenges, such as compliance with building codes and land use regulations. Key documents analyzed include:

- The General Plan of Krasnodar.
- Land Use Regulation Rules.
- The Strategy for Socio-Economic Development of Krasnodar Municipality.

This analysis helps identify gaps between formal regulations and practical implementation, particularly in addressing informal construction practices.

2. Case Studies

Specific reconstruction projects in Krasnodar serve as case studies to illustrate the practical challenges and opportunities in urban redevelopment. Examples include military housing projects, large-scale residential developments, and informal settlements. These cases are used to evaluate the effectiveness of reconstruction strategies in addressing issues like structural obsolescence, increased population density, and modernization of utilities.

3. In-Depth Interviews

The research incorporates semi-structured interviews with key stakeholders involved in urban development. These include:

- City administration officials.
- Urban planners and architects.
- Activists and local residents affected by reconstruction projects.

- Experts in informal urban development.

These interviews provide qualitative data on the social, economic, and political dynamics influencing reconstruction efforts. They also shed light on conflicts between formal regulations and bottom-up approaches to urban redevelopment²³⁵.

4. Spatial and Morphological Analysis

The study employs spatial analysis techniques to examine the physical transformations of buildings and neighborhoods undergoing reconstruction. This includes evaluating changes in building density, land use patterns, and infrastructure upgrades. Morphological characteristics of unauthorized constructions are also analyzed to understand their role in shaping Krasnodar's urban fabric.

5. Conflict Analysis.

A significant component of the research involves analyzing conflicts arising from reconstruction processes. This includes studying tensions between formal authorities, developers, and residents over issues like displacement, resource allocation, and compliance with regulations. The conflict analysis framework helps identify mechanisms for resolving disputes and fostering collaboration among stakeholders.

6. Sustainability Assessment.

The study evaluates how reconstruction projects integrate sustainable practices, such as energy-efficient systems, green public spaces, and environmentally friendly materials. A multiple-criteria decision-making method is applied to assess the sustainability of these efforts across various dimensions: environmental impact, economic feasibility, and social inclusivity.

7. Empirical Data Collection

Primary data is collected through field observations at construction sites, photographic documentation of ongoing projects, and surveys of affected communities. Secondary data from open sources (e.g., government reports) complements this empirical research.

RESULT AND DISCUSSION

Results

The Driving Forces Behind Reconstruction in Krasnodar's Urban Landscape

The widespread prevalence of reconstruction and restoration projects throughout Krasnodar is significantly influenced by the government's proactive and ongoing efforts

to raise both technical and non-technical construction standards. These evolving and increasingly stringent regulations serve as a powerful catalyst, encouraging construction firms, developers, and building owners to proactively engage in the reconstruction and restoration of existing buildings and structures. This ensures that these buildings not only meet contemporary requirements but also contribute to the overall modernization and sustainable development of the city.

Compliance with updated standards and regulations encompasses a wide range of critical considerations, including adherence to the latest safety codes and fire prevention measures, compliance with stringent energy efficiency standards to minimize environmental impact and reduce operating costs, implementation of universal accessibility guidelines to ensure that buildings are usable by people of all abilities, and integration of advanced technologies and smart building solutions to enhance performance and sustainability.

Confronting Obsolescence: The Fundamental Imperative for Reconstruction

The necessity for comprehensive reconstruction in Krasnodar's diverse array of residential, public, and industrial buildings is deeply rooted in the critical need to address both moral and physical obsolescence. This obsolescence, which threatens the long-term viability and functionality of buildings, manifests in two primary forms:

- **Objective Obsolescence:** This form of obsolescence arises from a complex interplay of inherent and unavoidable factors that gradually erode the value and utility of buildings over time. These factors include the inevitable natural wear and tear that occurs due to exposure to the elements and the passage of time, the constantly changing societal perceptions of comfort, convenience, and acceptable living standards, and the relentless and accelerating pace of scientific and technological progress. Buildings constructed decades ago may no longer meet modern expectations for energy efficiency, accessibility, technological integration, and overall functionality. The integration of modern amenities and technologies can significantly enhance the quality of life for building occupants and ensure that buildings remain competitive and desirable in the long term.
- **Subjective Obsolescence:** This form of obsolescence is directly attributable to human factors, primarily arising from poor quality technical operation of building systems, a failure to carry out timely repairs and preventative maintenance, and inadequate management of building resources. Neglecting routine maintenance

tasks, such as repairing leaks, replacing worn-out components, and cleaning ventilation systems, can significantly accelerate the deterioration of building components and systems, leading to more extensive and costly reconstruction projects in the future. Proactive and responsible building management is essential to minimize the impact of subjective obsolescence and to ensure the long-term sustainability of buildings.

The Multifaceted Goals of Modern Residential Reconstruction in Krasnodar

Modern reconstruction of residential buildings in Krasnodar is not simply about cosmetic upgrades; it represents a strategic and holistic approach to addressing a range of interconnected challenges and opportunities within the urban environment. These projects aim to:

- **Elevate Living Comfort and Enhance Quality of Life:** This involves strategic and thoughtful modifications to the building's layout to optimize space utilization, improve functionality, and create a more comfortable and inviting living environment. It also encompasses the comprehensive modernization of the building's core engineering equipment, including heating, ventilation, and air conditioning (HVAC) systems, plumbing and water management systems, electrical systems and power distribution, and advanced communication networks for internet, television, and smart home integration. The ultimate goal is to create a living environment that is not only aesthetically pleasing but also technologically advanced, energy-efficient, and conducive to the well-being of residents. This can include features such as smart thermostats, automated lighting systems, and remote control of appliances.
- **Increase Residential Capacity and Address Housing Demand:** In response to the ever-growing demand for housing in Krasnodar, reconstruction projects often seek to increase building density through the addition of floors to existing structures or the strategic expansion of building volumes through horizontal extensions. These expansions must be carefully planned and meticulously executed to ensure that they do not compromise the structural integrity of the original building or negatively impact the surrounding environment. Advanced engineering techniques and sophisticated structural analysis are essential to ensure that such additions are safe, stable, and sustainable. Furthermore, careful consideration must be given to the impact of increased density on parking, traffic flow, and other infrastructure needs.

- **Enhance the Urban Environment and Promote Sustainability:** Reconstruction projects provide a unique and valuable opportunity to enhance the overall quality of the surrounding urban environment and promote sustainable development practices. This can involve a wide range of initiatives, including landscaping improvements to create green spaces and enhance the aesthetic appeal of the area, upgrades to public infrastructure such as sidewalks, street lighting, and public transportation access, and the integration of sustainable design principles and technologies into the building's design and operation. These principles can include the use of recycled and sustainable building materials, the installation of energy-efficient windows and insulation, the implementation of water conservation measures, and the integration of renewable energy sources such as solar panels. The aim is to create a more aesthetically pleasing, environmentally friendly, and livable urban landscape that benefits both residents and the broader community.

Navigating the Complexities of Urban Reconstruction in Krasnodar

Reconstructing existing buildings and structures within Krasnodar's dense and dynamic urban environment presents a unique set of challenges that must be carefully considered and addressed during the planning and execution phases of any reconstruction project. These challenges include:

- **Managing Increased Loads on Foundations and Structural Systems:** Adding floors or significantly expanding building volumes inevitably increases the loads imposed on the existing foundations and structural systems. A thorough and comprehensive structural analysis is absolutely essential to accurately determine whether the existing foundations are capable of supporting the additional weight and stresses or if reinforcement, underpinning, or other structural modifications are required to ensure the safety and stability of the building. This analysis must take into account the specific soil conditions at the site, the age and condition of the existing foundations, and the anticipated loads from the new construction.
- **Addressing Intensified Use of Surrounding Areas and Minimizing Disruption:** Reconstruction projects can have a significant and sometimes disruptive impact on the surrounding area, particularly in densely populated urban environments where space is limited and activity is high. Careful consideration must be given to minimizing disruption to traffic flow, pedestrian access, and nearby businesses during the construction process. This can involve implementing traffic management

plans, providing alternative pedestrian routes, and coordinating with local businesses to minimize noise and dust. In some cases, redevelopment of the surrounding area may be necessary to accommodate the increased activity and demands generated by the reconstructed building.

- **Working Within Confined and Constrained Construction Sites:** Urban construction sites are often characterized by limited space, restricted access, and the presence of existing infrastructure and utilities. This necessitates meticulous planning, precise coordination, and the use of specialized equipment and techniques to ensure that materials can be delivered efficiently, equipment can be maneuvered safely, and construction activities can be carried out without causing undue disruption to the surrounding community. This may involve using smaller, more maneuverable equipment, scheduling deliveries during off-peak hours, and implementing strict safety protocols to prevent accidents and injuries.
- **Modernizing Existing and Installing New Utilities with Minimal Disruption:** Reconstruction projects often require upgrades to existing utilities, such as water, sewer, gas, and electricity, or the installation of entirely new systems to meet the increased demands of the reconstructed building. This can involve complex coordination with utility companies and careful planning to minimize disruptions to service during construction. Advanced techniques, such as trenchless construction methods, can be used to minimize excavation and disruption to traffic and surrounding properties.

Repair Strategies and Maintaining Structural Integrity

In the vast majority of reconstruction projects, repairs are carried out on individual building structures or their constituent elements to address existing damage, prevent future deterioration, and ensure the long-term structural integrity of the building. This is particularly critical when the physical wear and tear on these components could potentially compromise the lifespan of the reconstructed building or pose a safety hazard to occupants. Repair efforts are typically focused on replaceable structures and components whose normal lifespan is shorter than the building's overall standard lifespan, as defined by Krasnodar's prevailing construction codes and regulations. The building's standard lifespan, in turn, is determined by the expected lifespan of the main non-replaceable structures, such as the foundations, load-bearing walls, and structural frame.

Tailoring Repair Methods to Specific Needs and Circumstances

The specific methods employed for repairing and strengthening building structures and their individual elements are highly contingent upon a variety of factors, including:

- **The Type and Properties of Construction Materials:** The type of materials used in the original construction, such as concrete, steel, brick, or wood, will significantly influence the selection of appropriate repair techniques and materials. Different materials have different properties and require different approaches to repair and reinforcement.
- **The Nature and Extent of Defects and Damage:** The specific nature and severity of existing defects and damage, such as cracks, corrosion, rot, or structural deformation, will dictate the type of repair work that is required. Minor surface cracks may be repaired with patching and sealing compounds, while more extensive structural damage may require reinforcement with steel plates or carbon fiber wraps.
- **The Structure's Location, Accessibility, and Environmental Conditions:** The location of the structure and its accessibility will significantly impact the feasibility of different repair methods. For example, repairs to a high-rise building may require specialized equipment and techniques, while repairs to a structure in a remote or difficult-to-access location may require the use of lightweight materials and portable equipment. The environmental conditions in which the structure is located, such as exposure to moisture, chemicals, or extreme temperatures, will also influence the selection of appropriate repair materials and techniques.
- **The Feasibility of Resident Relocation and Work Scheduling:** The possibility of temporarily relocating residents from the building or rescheduling work hours in an administrative or industrial building will significantly influence the timing, logistics, and methodology of the repair process. Repair work that requires extensive demolition or the use of noisy equipment may need to be scheduled during off-peak hours to minimize disruption to residents or employees.

The selection of a specific repair method is also heavily influenced by ongoing advancements in scientific and technological progress. New materials, modern repair techniques, innovative construction equipment, and advanced mechanization methods are constantly emerging, providing a wider range of options for addressing structural issues and improving the efficiency and effectiveness of repair work. Furthermore, ongoing research and development efforts are leading to improved methods for accurately calculating the strength and stability of structures and for designing effective

reinforcement strategies that can extend the lifespan of buildings and ensure their continued safety and performance.

A Diverse Toolkit of Wall Repair Techniques

A diverse range of techniques are currently employed for repairing walls in apartments and houses in Krasnodar, each tailored to address specific types of damage and deterioration and to restore the wall's structural integrity, aesthetic appearance, and thermal performance. These techniques include:

- **Plaster Application:** This is a commonly used method for repairing minor cracks, holes, and surface irregularities in walls. Plaster is a versatile material that can be easily applied to create a smooth and even surface, providing a clean and aesthetically pleasing finish.
- **Installation of Tie Rod Clips, Brackets, Unloading Belts, and Wall Frames:** These structural elements are used to reinforce walls that have been weakened by cracking, bowing, or other forms of structural damage. Tie rods and brackets are used to tie the wall back to the supporting structure, while unloading belts and wall frames distribute the load more evenly across the wall, reducing stress and preventing further damage.
- **Replacement of the Outer Layer (Masonry or Cladding):** This is necessary when the exterior layer of the wall, such as brick, stone, or siding, has deteriorated beyond repair due to weathering, impact damage, or other factors. Replacing the outer layer can significantly improve the aesthetic appearance of the building and protect the underlying structure from further damage.
- **Insulation of Walls, Corners, and Joints:** This helps to improve the energy efficiency of the building by reducing heat loss in the winter and heat gain in the summer. Insulation can be installed in the walls, corners, and joints to create a thermal barrier that reduces energy consumption and lowers heating and cooling costs.
- **Joint Sealing:** This prevents water and air infiltration through joints in the wall, protecting the building from moisture damage, mold growth, and energy loss. Joint sealing is particularly important in areas exposed to harsh weather conditions.

A Holistic and Integrated Approach to Reconstruction

The reconstruction of any building or structure is inextricably linked to a broader set of considerations that extend far beyond the immediate property. These

considerations encompass the surrounding area, the enterprise that occupies the building, the community that utilizes its services, and the city of Krasnodar as a whole. Krasnodar Krai is located in the southwestern part of the North Caucasus, is the southernmost region of Russia and is washed by the Azov and Black Seas¹. Within the region is the Republic of Adygea¹. Krasnodar, as a dynamic and growing modern urban center located near the Black Sea, possesses a unique character, a rich cultural heritage, and a complex set of challenges and opportunities in the context of reconstruction projects. These include decisions related to demolition, modernization, installation, new construction and development, and the strategic addition of stories to existing structures to accommodate growth and meet evolving needs.

CONCLUSION

Striking a Balance Between Progress and Preservation. Reconstruction demands a careful, thoughtful, and balanced approach that recognizes the inherent value of existing development while simultaneously striving to meet the evolving needs of the community and to promote sustainable urban development. Successful reconstruction projects in Krasnodar require a comprehensive understanding of both social and urban planning objectives, a rigorous assessment of the economic and technical feasibility of implementation, and a commitment to engaging with stakeholders and incorporating their feedback into the design and planning process. The ultimate goal is to create buildings and structures that are not only functional, efficient, and aesthetically pleasing but also sustainable, resilient, well-integrated into the urban fabric of Krasnodar, and contribute to the overall quality of life for its residents and visitors. These projects should serve as catalysts for positive change, inspiring further innovation and investment in the modernization and revitalization of Krasnodar's built environment.

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