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Learning, unlearning, and relearning from the past: Reassessing socialist modernist collective housing for sustainable urban regeneration in Sarajevo

This article addresses a sustainable approach to urban regeneration in post-communist residential neighbourhoods in Sarajevo. The area explored is located in the municipality of Novo Sarajevo (literally, New Sarajevo), featuring well-known but somewhat controversial apartment buildings built after the Second World War, from the 1950s to the 1970s. At the time, this area epitomized the social and economic progress and expansion of the city from east to west, and it expressed the ideals of socialist modernist urban planning and architecture. More than seventy years later, following social, economic, and cultural transition after the war in the 1990s and new urban developments, this area and the city face multiple challenges, from decay to social bias. One key challenge is to adapt the residential architecture from socialist modernism to meet contemporary requirements of functionality and sustainability. This research proposes the "new urban protocol" as a collaborative model combining tools and procedures for sustainable urban regeneration while focusing on reevaluating, retrofitting, and reprograming the architectural legacy of socialist modernism.

Keywords: new urban protocol, socialist modernism, collective housing, sustainability, Sarajevo

1 Introduction

Sarajevo's urban evolution can be recognized from its linear form as a straightforward timeline, which is probably unique in the world. The main urban development in the Miljacka Valley extends about 9.5 km along an east-west axis in chronological order, from the earliest Ottoman era in the east, followed by the Austro-Hungarian legacy overlapping with the interwar early Yugoslav period, continuing with the communist Yugoslav era, and mixing with the contemporary period in the west (Aganović, 2009). The iconic panoramic view of historical Sarajevo vividly reflects its diverse past and its unique heterogeneous cultural identity. In contrast, the recent developments that followed reconstruction after the war in the 1990s were mostly built in the western part and on the city's hillsides, and they are not integrated with the urban planning of previous periods, resulting in discontinuities in the urban fabric. Driven by the transition from communism to capitalism in Bosnia and Herzegovina, accompanied by sudden globalization and the uncritical adoption of liberal market economy after the war, the public domain has lost its primacy over the power of private investors. Consequently, recent large-scale collective housing developments, designed to merely reflect global tendencies, often lack a reference to the local context or the needs of the population, and can thus be described as "nameless settlements" (Čakarić & Idrizbegović Zgonić, 2020). In parallel, as a spontaneous response to the socioeconomic demands of population growth, informal housing continued to sprawl on the city's hillsides (Islambegović, 2020).

At the same time, in midst of the disparities of recent developments in Sarajevo, the modernist apartment buildings from the communist period have remained in a state of a transitional limbo. Today, these neighbourhoods face functional and sustainability challenges and are exposed to deterioration due to neglect and improvised transformations, including a negative bias associated with communist ideology. Therefore, this article focuses on modernist residential architecture from the communist period in Sarajevo by assessing three key topics: its legacy, energy efficiency, and adaptability. Nearly three decades after the war, it is now appropriate to reevaluate the status quo and consider sustainable strategies for urban regeneration. This is particularly important because the socialist modernist neighbourhoods in Sarajevo have never undergone substantial or systematic refurbishment since their construction. This has allowed uncoordinated, improvised, and do-it-yourself interventions as well as private appropriation and fragmentation of shared spaces (Samic & Zagora, 2021).

The formulation "learning, unlearning, and re-learning" refers to a comprehensive critical assessment of communist-era residential architecture as a prerequisite for sustainable urban regeneration. First, "learning" implies acknowledging the inherited values within the urban and architectural scope. Second, "unlearning" signifies critically assessing outdated doctrines and opening up to new perspectives. Finally, "relearning" refers to reinterpreting the universal values of modernism from a contemporary perspective. This approach includes addressing issues such as discontinuities and anomalies in the urban environment, the decline of the public, and the domination of the private domain, and how they have impacted rights and obligations concerning the common realm, particularly public spaces in post-communist society.

The hypothesis of this study is as follows: sustainable regeneration of residential neighbourhoods from the socialist modernist period in Sarajevo can be achieved by first identifying the key stakeholders and their roles, followed by recognizing the values pertaining to legacy (learning), while critically assessing their current state in physical, environmental, and sociocultural terms to detect weaknesses (unlearning) and to pinpoint specific opportunities for improvement (relearning). The article proposes a strategic roadmap, starting from critical assessment to reprogramming and retrofitting the socialist modernist architectural legacy, involving a collaborative effort by various stakeholders, from residents to authorities, to bridge the gap between the public and private realms.

This article stems from a multidisciplinary research project focusing on urban regeneration of the municipality of Novo Sarajevo with regard to urban planning and architecture. Following the formulation of the research problem and hypothesis, the next section defines the key theoretical concepts and refers to case studies on urban regeneration of modernist housing. Section three demonstrates the methodology developed for the study area, a representative modernist neighbourhood from the communist period, which includes urban mapping, creating a GIS database, and recording building typology IDs. The fourth part of the article connects two aspects: assessing the legacy of modernist architecture from the communist period on the one hand, and evaluating its current status, focusing on energy efficiency, on the other. Following the process of learning, unlearning, and relearning, the fifth section proposes and describes a collaborative strategic tool called the new urban protocol. The conclusions serve as applied guidelines for dealing with issues in a similar context and, at the same time, they are aligned with broader sustainability goals.

2 Theoretical background and key concepts

This study examines the challenges of sustainable urban regeneration using a case of socialist modernist architecture. Urban regeneration, as "a comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental conditions of an area that has been subject to change" (Roberts, 2000), aligns closely with the United Nations 2030 Agenda for Sustainable Development (United Nations, 2015) and the principles of the New European Bauhaus initiative (European Comission, 2021). Specifically, sustainable urban regeneration practices are associated with Goal 11: Sustainable Cities and Communities. Several case studies were consulted and examined; specifically, the renovation of modernist social housing in France, Denmark, and Lithuania. The most notable social housing transformation project is the Grand Parc housing complex in Bordeaux by Lacaton and Vassal, which involved the renovation of 530 housing units originally built in the 1960s. Although the sociocultural context of this case study differs from the focus of our research, it offers valuable lessons, including a renovation approach based on energy efficiency standards, and additions and extensions that improved living conditions and accessibility for the residents (BAUA et al., 2022). In Denmark, there have been several waves of basic renovations of modernist social housing built in the 1970s, from the 1990s to the most recent and comprehensive retrofit from 2008-2013, which focus on energy efficiency, sustainability, and social cohesion. This most recent retrofit was achieved as part of the National Building Fund program, which manages capital and public subsidies for social housing by employing diverse strategies, such as building recycling, rehabilitation, energy renovation, and social retrofitting (Peters, 2016). Taking in hand problems such as the low reputation of modernism housing, noncompliance with the energy efficiency and accessibility standards, and unused or open areas with crowded traffic, the Lithuanian studio Pupa transformed the Rumpiške and Kaunas districts in Klaipeda as cases of good practice in comprehensive urban regeneration (BAUA et al., 2022). The project was financially supported by the EU, and it consisted of public space transformation, as well as renovation and extension of buildings carried out in a participatory process.

A special feature of this research is the architectural and sociocultural aspects of the legacy of socialist modernism. A 2018 exhibition and publication by MoMA rekindled significant interest in the unique legacy of modernism in former Yugoslavia, often referred to as the "third way". This architectural and ideological position, positioned between Soviet communist and Western capitalist models, remains particularly relevant to the enduring urban condition in Sarajevo (Stierli, 2018). Even more so, the distinct path of the city of Sarajevo is related to the consequences of the war and urbicide, which differentiates it from other cities in the region and elsewhere in Europe, requiring a unique approach in the context of sustainable urban regeneration. Across Europe, housing developments display recurring urban and architectural patterns, but nuanced distinctions explain why certain developments face decline, whereas others remain attractive liveable environments (Monclus, 2018). The standardization of residential units, designed to maximize functional space, played a key role in the development of these, in which specific types were systemically applied and celebrated (Kolešnik, 2012). In Sarajevo, these forces have profoundly shaped the city's modernist housing developments, embedding them within the broader European discourse of urbanization and social housing. However, these developments are now at a critical juncture, requiring a comprehensive and systematic regeneration model. This model must be rooted in both architectural and socioeconomic research, and capable of addressing the emerging needs for retrofitting and sustainable renovation. Such interventions must go beyond mere aesthetic enhancements, embracing a holistic approach to upgrading buildings while incorporating principles of environmental sustainability (Peters, 2016). As evidenced across Europe, similar housing developments are undergoing transformative shifts in ownership patterns, modes of habitation, and urban renewal strategies, as articulated by Caramellino et al. (2023). A key theoretical approach can be found in Moudon's interdisciplinary urban morphological framework, which emphasizes that housing developments must be understood through three essential components: form, resolution, and time (Moudon, 1997).

3 Materials and methods

This article was written as part of the project NOVO! Novo Sarajevo (literally, 'NEW! New Sarajevo'), conducted from 2022 to 2024 at the University of Sarajevo's Faculty of Architecture, emerging as a critical examination of sustainability issues and the social and cultural challenges of socialist urban districts (Zagora et al., 2024). The project proposes reinventing residential neighbourhoods in the municipality of Novo Sarajevo typically associated with socialist modernist urban planning and architecture (Figure 1a). The municipality of Novo Sarajevo covers 9.19 km^2 with a population of 64,814 (Statistika.ba, 2024). According to the latest census from 2013, this municipality is the most densely populated municipality in the city of Sarajevo, with 7,524.5 inhabitants per square kilometre. The area selected for this study (Figure 1b) encompasses 44 hectares (the study area presented in this article is part

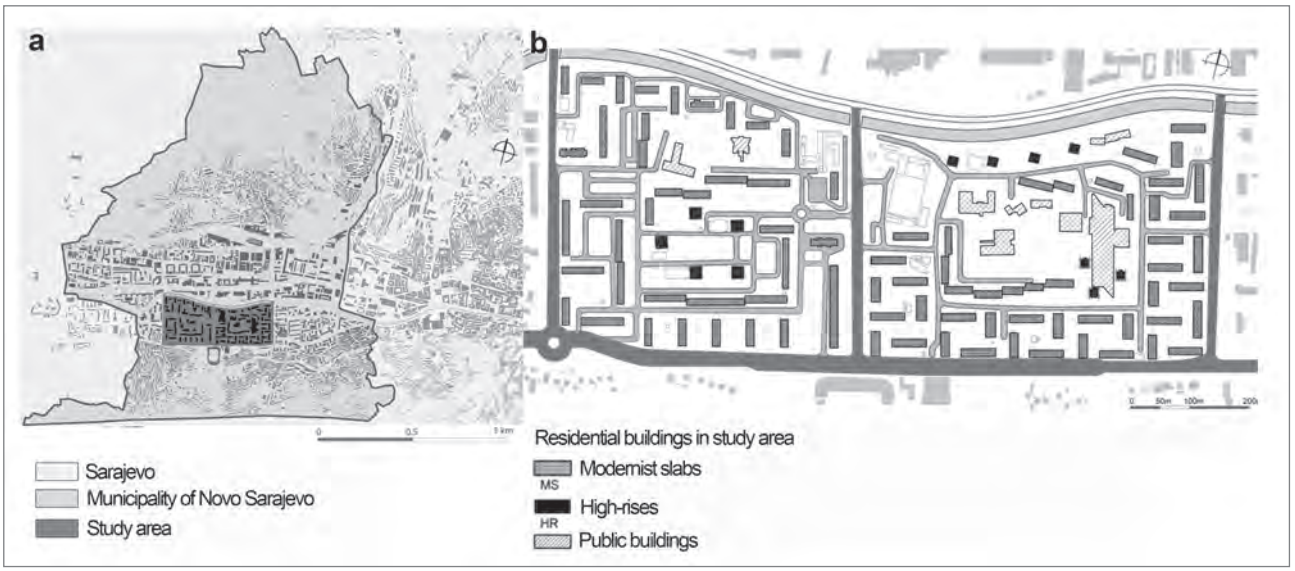

Figure 1: a) Municipality of Novo Sarajevo; b) study area showing residential building typology: modernist slabs and high-rises (illustration: authors).

of the total 127.16 hectares studied in the interdisciplinary project) of mainly residential neighbourhoods, with a small share of mixed-use and public functions, which were intensively urbanized from the 1960s to the 1970s (Drustvo arhitekata Sarajeva, 1965). The area consists of two blocks, delineated by the Miljacka River to the north and a parallel street to the south, and the two blocks are separated by a smaller north–south street (Figure 1b).

The urban concept of the first block features buildings distributed along the perimeter and accompanied by green areas, linked with an interior ring road with on-street parking encircling centrally located shopping areas, facilities, primary schools, and a cultural centre. The adjacent development is located to the west in the Hrasno district (Figure 1b). The main features of the area are a square in the middle of the development, a defined urban morphology of five-story modernist apartment buildings, and accentuation with four twenty-story residential towers. Unlike the Grbavica development, the ground floors of the residential buildings in the Hrasno development contain public facilities and are connected to the outdoor area (Aganović, 1977).

The project NOVO! Novo Sarajevo employs a methodology called the new urban protocol as a set of tools for urban transformation. It consists of four key steps: urban mapping and compiling a GIS database, co-design as an innovative collaborative approach, bringing together all the relevant actors in the placemaking process, and digitalization of analytical data and the use of innovative visualization tools in testing participative urban transformation scenarios. The research proceeded from the urban scale, creating a GIS database covering 127 hectares. It observed environmental data, structures, and user behaviour. Following the urban analysis, accompanied by citizen participation workshops, the research focused on the housing legacy of socialist modernism as a valuable but undervalued urban asset. The article discusses the results, focusing on reevaluation, reprogramming, retrofitting, and reinventing this architectural legacy within a sustainable urban regeneration framework. The research continued by recording the relevant data for the typical residential buildings at the site. Following the data collection (see Table 1), the buildings were categorized into types based on urban and architectural criteria, and interventions on the façades (mostly made by individual owners) were noted. The data on typical buildings were analysed from the perspective of protection of architectural legacy, as well as from the sustainability perspective, focusing on energy efficiency. In parallel, interviews and surveys were conducted with the residents, maintenance companies, and professionals to create a roadmap for interventions, which is presented in section five of this article.

4 Assessment of the socialist modernist residential building typology

4.1 Assessment of legacy

The assessment methodology is based on the Madrid Document, which specifically focuses on the preservation of twentieth-century heritage (ICOMOS General Assembly, 2017). This document collectively outlines the criteria necessary for assessing the value of architectural heritage from the twentieth century, forming the basis for a comprehensive methodology.

Table 1: Data collected for the two building types: modernist slab and high-rise.

	Type 1	Type 2
Location	Aleja Lipa, Kemala Kapetanovića	Hasana Brkića, Grbavica
Architect	—	Ivan Štraus
Architecture typology	Modernist slab	High-rise
Urban typology	Linear buildings in a cluster	High-rise buildings in a cluster
Floors	5	21
Construction	1959–1962	1976
Rebuilding	After 1998	1999
Valorization	Contextual value, urban layout, different social strata	Architectural value, aesthetic value, contextual value, vertical landmark
Form	The structures have a rectangular linear form, and ground-floor passages facilitate user communication. The façade has a continuous rhythm of openings accentuated by balconies.	The high-rise buildings are constructed with a reinforced concrete skeleton structure, with concrete foundations and brick walls. The roof is a walkable flat surface. The façade is yellow.
Authenticity and preservation	The buildings were badly damaged during the war. Reconstruction involved minimal and fast repairs with an attempt to apply colourful façades.	The construction elements, including foundations, walls, roof structures, and roofing material, show original features with partial preservation. Certain components such as the ground floor façade have undergone alterations, whereas the upper floors, primarily residential, retain their original appearance to a considerable extent.
Positive aspects	Good sunlight, ample vegetation, and a built-up coefficient in line with design standards	Good insulation in most apartments, convenient access to daily amenities, proximity to green spaces, access for disabled persons, and a large elevator
Negative aspects	Absence of distinctive landmarks for spatial orientation, mixed traffic near schools and preschools, poor accessibility, lack of elevators, small balconies, lack of parking space	Hallway layouts and building access detracting from overall functionality and user experience

Source: authors.

The Docomomo methodology is a key approach for modern architecture, offering clear definitions and evaluation criteria. It includes an overview of the property's identity and history, followed by a descriptive section that includes a typological classification. Evaluation is conducted using five key criteria: technical value, social value, cultural/aesthetic value, historical value, and an overall assessment. The final section details the documentational value as an asset for methodology (Docomomo International, 2024). One might not treat these buildings as individual monuments but rather as a valuable urban and architectural landscape legacy deeply ingrained into the identity of the city.

The profound political and socioeconomic changes in the recent history of Sarajevo and Bosnia and Herzegovina resulted in a cultural void. This was followed by transition, recovery, and re-learning. In the discourse on socialist modernism in collective housing, a nuanced dichotomy emerges between the universal progression of modernist architecture and its local evolution. This dichotomy is anchored in the synthesis of general socialist ideals and the region's unique traditional and architectural continuum. The urban and architectural concepts in Bosnia and Herzegovina evolved from these international and universal ideas of socialism and modernism, which simultaneously embraced a revolutionary contemporary paradigm and a locally nuanced process of evolution from traditional forms (Kulić et al., 2012). This movement in socialist modernism showcases distinct local characteristics while embodying principles of social progress and innovative thinking. It goes beyond structural form, emphasizing practical application of theoretical principles for modernization and national renewal. Although it was burdened by technical constraints and human nature, socialist modernism prioritized quality of life and community.

In discussing the urban and architectural value of socialist modernist collective housing in Sarajevo, *legacy* is a more apt term than *heritage*. This is supported by examining various components, including the specific material and functional value of urban and architectural layouts. Non-material aspects, such as the social cohesion inherent in the communist legacy and the quality of living spaces created by modest resources, are also crucial. The criteria category Essential Properties/Typology emphasizes the importance of recognizing twentieth-cen-

tury architecture as valuable and encompassing authenticity, representativeness, integrity, context, and physical condition. The category Function and Significance encompasses historical value, artistic value, technical and aesthetic value, and spatial organization. The category Documentary and Social Value focuses on documentary, scientific, and social values, and the category Specific Criteria includes economic values and similar (Table 2). This comprehensive methodology for assessing the twentieth-century architectural legacy of housing developments integrates both international and regional criteria (Komisija, 2024). This architecture goes against the modern tendency to categorize and separate, emphasizing a continuous dialogue between traditional and modern values. This resistance signifies a holistic approach to architecture, in which form and function are not distinct entities but part of a continuous socio-material network. The movement, characterized by its emphasis on scientific planning, social equity, and cultural relevance, is reflected in a living and vibrant urban tissue that can provide insight into the potential of architecture to shape communities and reflect their evolving aspirations and values (UNHABITAT, 2024).

Typology serves as a framework for understanding the diversity and commonalities among the residential structures in the area. The survey of the buildings has shown that housing was the dominant function and that buildings were of two characteristic types (Figure 2). The most common type is linear modernist slabs, with several variations. The second typical category is high-rises with more pronounced variations. In socialist modernist architecture, the high-rise type has a different monumental scale and reshapes the silhouette of the city. These structures were not isolated entities but rather components of a cohesive architectural composition. The towers were strategically positioned in diagonal alignments, where the repetition of forms not only reinforced the rhythmic aesthetic but also conveyed a sense of organized progression. Alternatively, the high-rise type could also appear in clusters of three and five towers to create a bold and visually commanding presence in the urban landscape.

Even though modernist development was standardized and the apartments were small, the skilled architects of the time produced some of the most useful and efficient floorplans in Sarajevo's housing developments. Architectural uniformity was not a stylistic choice but a reflection of the social values of equality and collective identity, and of very modest financial means. Even though they are modest and repetitive, the façades were characterized by proportion and harmony achieved without any unnecessary visual gestures (Piekarski et al., 2021).

In urban typology, modernism had a transformative impact on the cityscape, moving away from the traditional street grid in

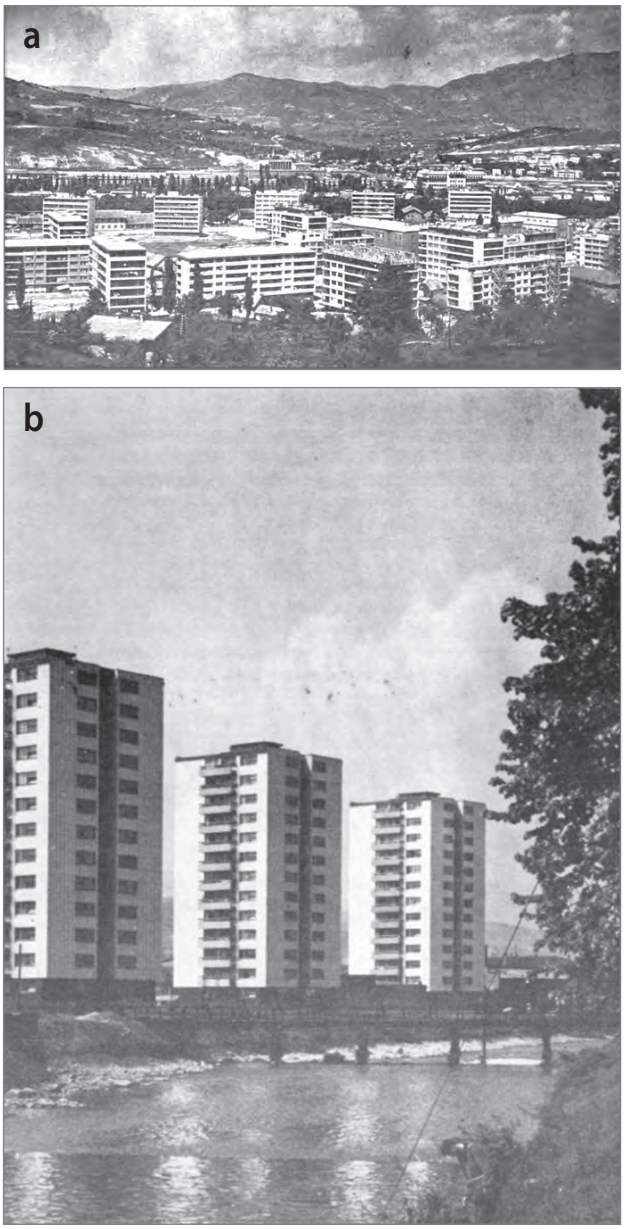

Figure 2: Archival photos of the study area from the 1950s and 1960s: a) modernist slabs; b) high-rises (source: DAS Društvo arhitekata Sarajeva, 1963).

favour of green open spaces and prioritizing the improvement of living conditions for urban residents. An example of this transformation can be observed here, where the urban composition is comprised of individual slabs arranged into semi-open developments or high-rises in vast green spaces. The socialist modernist semi-open developments pattern in Sarajevo is a unique blend of historical, architectural, and urban-planning elements that emerged during the communist era. These developments fostered community cohesion, aligning with the communist ideology that emphasized collective living and social interaction. The communal spaces within these developments were designed to promote social interactions (Andrusz et al., 1996). The urban pattern evolved from traditional develop-

Table 2: Assessment criteria for the two dominant types.

	Modernist slab	High-rise
Essential properties/typology	Authentic expression of its time, representative of its typology in urban and architectural schemes, ambient value, maintains urban integrity with partial architectural integrity	Authentic expression of its time, representative of typology, landmark, less ambient value
Function and significance	Aesthetic value in composition and functional integrity, following a neutral modernist horizontal geometry, abstract reduction, and scarcity, semi-open interplay between buildings and open space, testimony to typical way of life in certain period, low material value/quality	High structural quality, functional quality, energy efficiency, testimony to typical way of life in certain period, innovative, envelope made of low-quality material
Documentary and social value	Testimony to typical way of life in certain period, high social value, inclusion of all socioeconomic strata, documentation original not available in most cases	Testimony to typical way of life in certain period, high social value, inclusion of all socioeconomic strata, available documentation, known architects
Specific criteria	High economic value validated through high real estate prices and location of developments, alterations and interventions can even increase the architectural value	High-rise buildings built by the renowned architects Hamdija Salihović and Ivan Štraus

Source: authors.

ments to incorporate open views, cross ventilation, and better connections to green spaces, offering a universal form for city growth.

Individually, neither the modernist slabs nor the high-rises are structures of high architectural value. Only as an integral part of the urban landscape and as settlements can they be categorized as a defining urban tissue of high ambient value. Recognizing the key reasons for why the classical approach to designating heritage values cannot be applied here calls for a broader perspective (Cantacuzino, 2003).

The analysis of Sarajevo's modernist slabs and high-rises (Table 2) reveals a complex interplay of architectural innovation, urban planning, and socioeconomic integration, juxtaposed with challenges of preservation and individualistic alterations. Current threats to the architectural and historical value of the housing area lie in individual and non-systemic practices. The individual appropriation of common spaces, such as balconies and hallways, and unregulated modifications, from both top-down initiatives and individual actions, have led to inconsistent and often unsightly alterations. The degradation of the buildings' exteriors and the alteration of shared spaces undermines the original architectural intent and heritage value. As previously stated, the buildings themselves are not protected as architectural heritage; they can and must be a subject of thoughtful renovation, retrofitting, and upgrading to preserve their relevance and maintain the legacy of socialist modernism. The interventions can be subtle or more extensive, but they must begin with meticulous study and knowledge of the principles and processes that were essential in creating these developments. In addition, the interventions should be progressive, socially sensitive, functional, timeless, and harmonious (BAUA et al., 2022).

4.2 Assessment of energy efficiency

Energy consumption and efficiency are an important aspect of residential buildings, both new and old. Based on two European Parliament directives (2002/91/EC and 2006/32/EC), the European international research project Typology Approach for Building Stock Energy Assessment (TABULA) was launched in 2009. It was cofinanced by the EU program Intelligent Energy Europe (Institut Wohnen und Umwelt GmbH, 2012). The main objective of the project was to create a harmonized model of European housing typology and define unique indicators of the energy characteristics of buildings but with energy-efficiency measures in mind. The result is a set of comparable data "which enables a projection of the actual national building stock consumption and the energy saving potential" within the EU (Institut Wohnen und Umwelt GmbH, 2012). Even though Bosnia and Herzegovina is not part of the EU, there was a strong need to establish what the energy-saving potential was in residential buildings in Bosnia and Herzegovina and how it compares to other countries. Based on the TABULA methodology, the book *Typology of Residential Buildings in Bosnia and Herzegovina* was published in 2016; it provides an overview of different building types and times and their main characteristics (Arnautović-Aksić et al., 2016) (Arnautović-Aksić, Burazor, Zagora, & al., 2016). In the

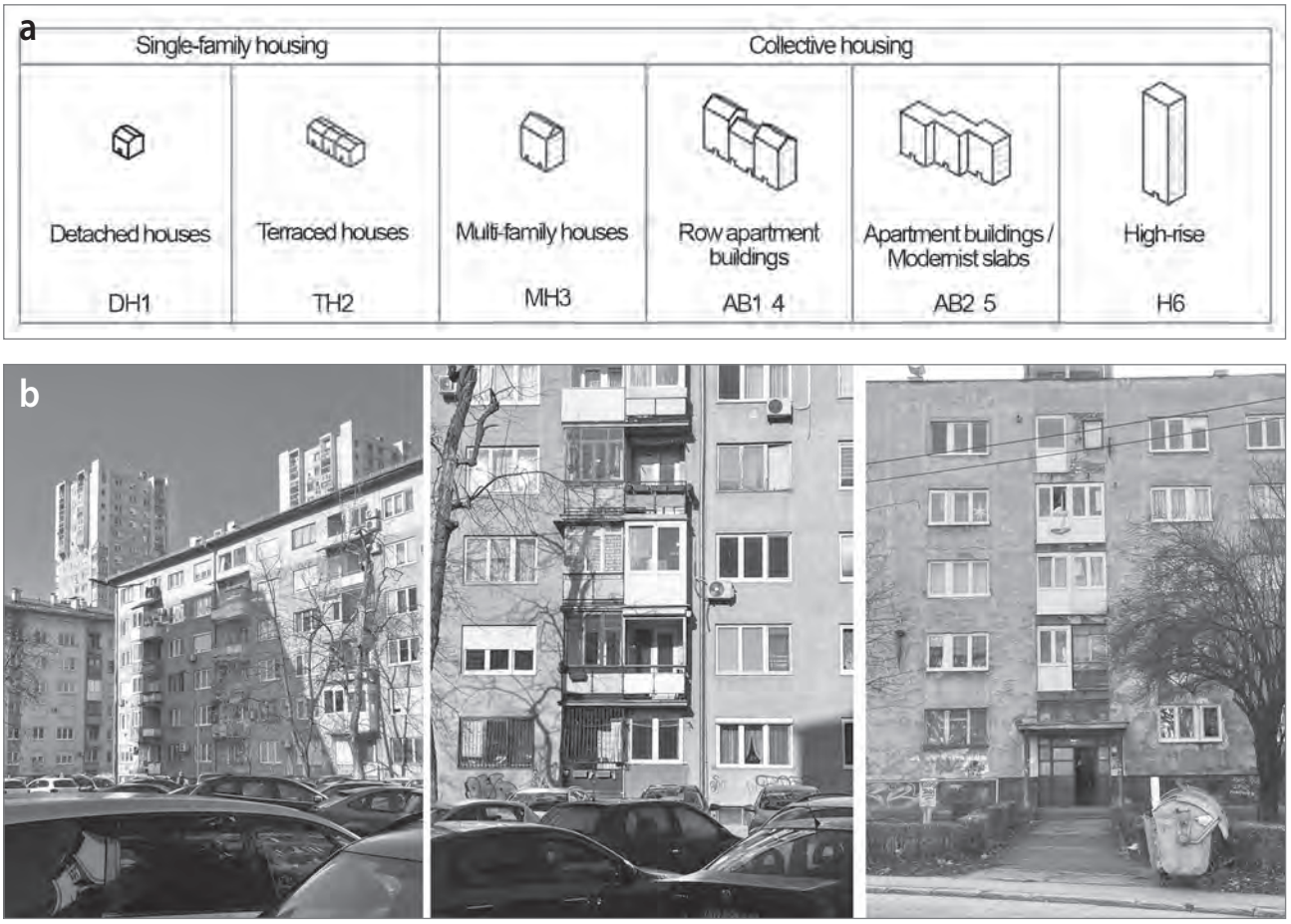

Figure 3: a) Residential building types in Bosnia and Herzegovina (source: adapted from Arnautović-Aksić et al., 2016); b) current status of the buildings in the study area (photos: authors).

case of the modernist legacy, the published data provide useful insight into collective housing from that period (Figure 3).

Overall, modernist slabs account for only 16.04% of the total number of dwelling units and 6.50% of energy needs for heating of residential buildings in Bosnia and Herzegovina (Arnautović-Aksić et al., 2016). However, this does not mean that these measures are a waste of resources. They may be difficult to implement based on ownership and legal procedures, but proposed energy-efficiency measures directly impact the quality of life in the city (Sendi et al., 2023). The reason why modernist slab building envelopes must be addressed is because, at the time they were built, no rules and standards for insulating buildings existed, and they were introduced only after they were built (Salihović et al., 2016).

The observation of the high-rises at the site, together with surveys and interviews with the apartment owners, show the extent of individual alterations to this type, indicating that earlier refurbishment did not meet all the energy-efficiency requirements. The main points of energy-efficiency improvement measures are exterior walls and windows and doors (the thermal envelope). Although windows were changed, their glazing characteristics ($U = 3.14$ W/(m^2·K)) were insufficient, and that is why residents changed them very soon after the refurbishment (instalment of double or even triple glazing with exterior blinds). The response from the residents of the high-rise buildings in the Grbavica development serves as a good example of the issues that must be immediately tackled. Only 57.69% of apartment owners actually lived in these apartments, whereas the rest were rented to others or not even used (Kreševljaković & Burazor, 2023). The four residential skyscrapers that were severely damaged during war were fully refurbished and the original façade was reinstalled. The visual examination and measurement at the site have shown a high percentage of interventions on the exterior appearance of the buildings. Out of 192 apartments, 40.63% had glazed balconies, 18.27% had external blinds, 43.27% had air conditioners, 12.02% had changed the colour of the windows, and 11.06% had a change in the geometry of the windows (Kreševljaković & Burazor, 2023). Furthermore, in 28.85% of the apartments, the internal organization was modified. These figures only show that the refurbishment to the original state did not correspond to the needs of the tenants, and they made those

Table 3: The two-level strategy of retrofitting and urban regeneration of socialist modernist residential neighbourhoods at the urban, architectural, and interior scales.

Scale	Issues	Level 1: basic retrofit	Level 2: advanced retrofit
Urban: public spaces	Maintenance	New recycling policies	Reorganization of garbage disposal
	Parking spaces, physical barriers	Improvements (wheelchair access)	Resident-only vehicle access, new pedestrian zones
	Fire escape routes	Adapting to new fire safety standards	Adding roof escape routes
	Lack of lighting and urban furniture	Including energy-efficient lighting and urban furniture	Placemaking of public space
	Inactive public and communal spaces	Reactivating public spaces	Converting undefined areas into public spaces
Architecture: building envelope (façade and roof)	Low energy efficiency	Minor energy-efficient retrofit: replacement of windows, repairing roof	Major energy-efficient retrofit: installation of ventilated façades
	Monotonous façades	Minor redesign of façades together with energy efficiency	Major redesign of façades with energy-efficient retrofit
	Disputable aesthetics	Consistent approach to cladding	New envelope additions for entire building to improve functionality
	Small non-functional balconies and loggias	Installation of uniform glass panels to enclose loggias	Prefab additions of new terraces and brise-soleils
	Unclear wayfinding and lack of urban identity	Enhancing access pathways and building entrances	Creating design accents and introducing new passages in buildings where necessary
	Inaccessible/privatized/deteriorated flat roofs	Reclaiming open-air common areas such as roofs and terraces	Full roof retrofit
Interior: building floorplan	Inactive ground floors	Interior remodelling of ground floor to accommodate public functions	Building additions on ground floor to connect it with outdoors
	Structural integrity	Inspecting structural stability	Reinforcing foundations and other structural elements
	Privatization of common spaces	Communal storage areas	Expanding basement to accommodate garages
	Accessibility issues	Adding ramps	Adding elevators
	Communal spaces	Holding community meetings and workshops	Reclaiming privatized communal spaces
	Small apartments	Combining small apartments into larger units	Building extension to enlarge functional apartment area

Source: authors.

changes without building permits and in a DIY manner. Therefore, those individual interventions, although necessary from the point of users, inevitably affected the overall aesthetics of the entire building and even entire developments. Now, the only way to make improvements is to adopt a holistic approach to the interior and exterior refurbishment of these buildings.

5 Private-public action schemes: the new urban protocol

Apartments that have become private property in the last thirty years in Sarajevo are generally renovated with little or no professional or administrative control. Notably, the prevalence of socialist modernist housing in Sarajevo is significant, encompassing a diverse demographic spectrum from low-income to moderately and well-off households. In the context of sustainable urban regeneration in Novo Sarajevo as part of the project

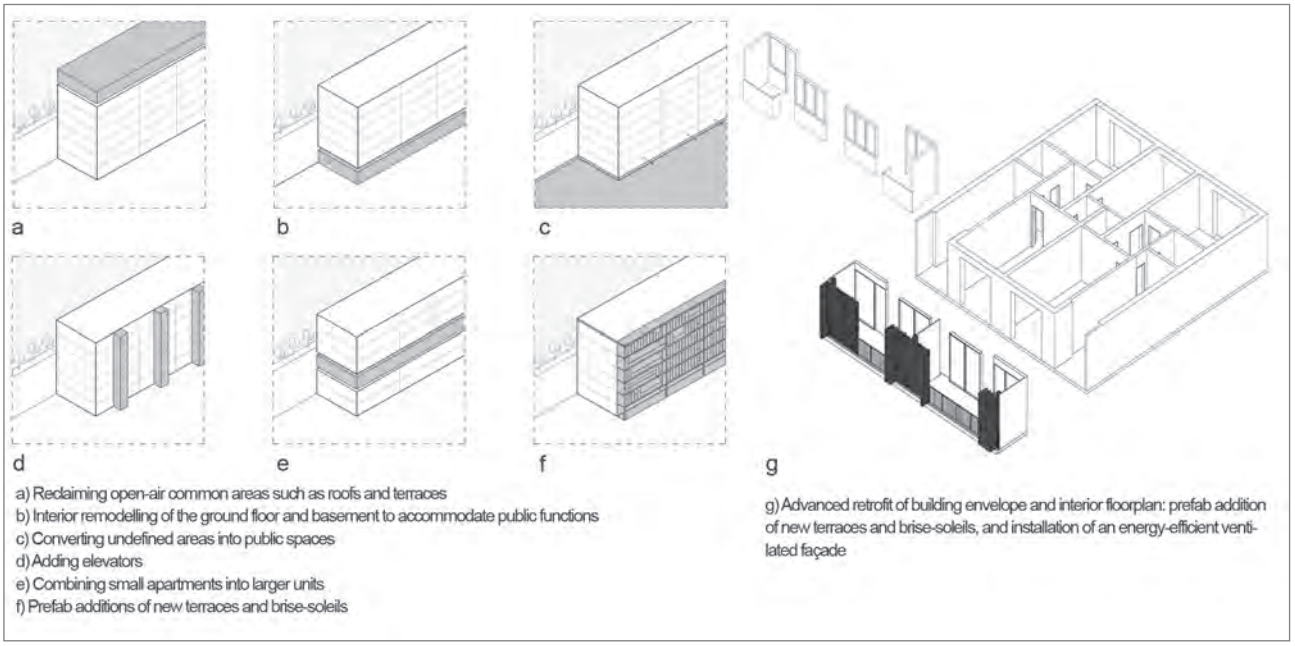

Figure 4: Potential interventions at the urban, architectural, and interior scales (illustration: authors).

NOVO! Novo Sarajevo, it was imperative to consider an integrated approach that aligned with global and regional sustainability frameworks. Following the assessment of both the architectural legacy of socialist modernism collective housing and its energy efficiency, a collaborative model for sustainable urban regeneration was created. Motivated and inspired by examples from Denmark and France, and acknowledging the lack of such strategies and guidelines for renovation in Sarajevo, this study proposes a strategic tool involving protocols for renovation, following the values of urban regeneration strategies and guidelines and at the same time reflecting global and regional sustainability and aesthetic principles. This involves creating inclusive, resilient, and aesthetically pleasing (urban) spaces that cater to the diverse needs of the community while adhering to environmental sustainability and digital transformation goals. There is a strong wish to include residents' perspectives in planning and developing common infrastructure to create liveable and safe (outdoor) spaces. The Law on Maintenance of Common Parts of Buildings and Building Management (SCr. *Zakon o održavanju zajedničkih dijelova zgrade i upravljanju zgradom*, Službene novine Kantona Sarajevo, no. 3/2012) allows structures to be upgraded following guidelines. Several stakeholders are described in this law: private owners, maintenance managers for the entire building, local communities, municipalities, and maintenance companies registered to carry out construction in common spaces. The new urban protocol combines top-down and bottom-up initiatives for retrofitting socialist modernism collective housing in line with the available budget for making needed changes while preserving the authentic character of the structure.

Refurbishment can occur at three different scales: the urban scale, which includes the wider neighbourhood area and public spaces; the architectural scale, which considers the building envelope (the façade and roof); and the interior scale, which focuses on improving the functionality and accessibility of communal areas and individual apartments. To valorize the heritage of these areas, a specific local strategy and guidelines need to be adopted. A comprehensive approach is recommended, targeting the entire area, building, or open space, rather than simply meeting energy-efficiency requirements. A catalogue of certified designs and companies for individual interventions should be created, and the process should be streamlined and not left for improvised alterations (Glendinning, 2008). The process from the initial idea to the actual implementation of these interventions should follow a structured protocol. One notable pathway for initiative origination is from academic institutions, as exemplified by the project NOVO! Novo Sarajevo. In this project, architecture students, under the expert guidance of their professors, developed tangible intervention proposals. These proposals are designed to benefit residents, administrators, and municipalities by offering innovative solutions to enhance the quality, sustainability, and preservation of the architectural potential of these buildings.

Interventions can be categorized into two levels for improvements: basic retrofit (level 1) and advanced retrofit (level 2), as shown in Table 3. Level 1 interventions are typically smaller in scale and scope, focusing on specific, localized improvements. In contrast, Level 2 interventions are more ambitious, encompassing larger-scale changes that may involve significant structural modifications and upgrades (Table 3, Figure 4).

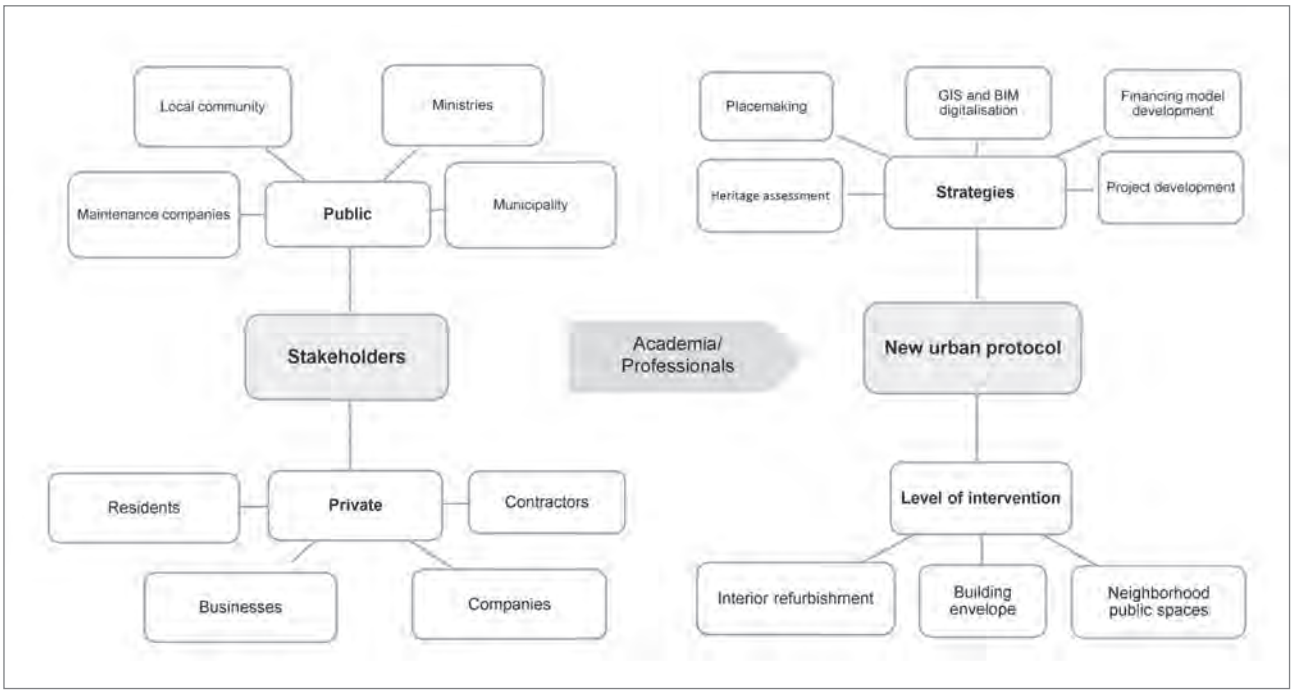

Figure 5: The new urban protocol for regeneration of socialist modernist residential neighbourhoods (illustration: authors).

Level 1 (basic interventions) implies that the community members are empowered to propose interventions that address their specific needs. An experienced team of professionals then refines and develops the idea into a feasible project, handling all aspects from design solutions to securing necessary approvals and financial investments. For these interventions, the funding is split between residents and maintenance companies. In urgent cases, municipalities may contribute up to half of the estimated costs. Level 2 (substantial interventions) deals with the building envelope and/or with public spaces, envisaged as a collaborative effort of the residents and municipalities. The municipality can provide approval, support, and financial backing for these projects. For larger-scale endeavours, higher government levels may offer cofinancing opportunities. In addition, initiatives such as UN Agenda 2030 and New Bauhaus can access EU funds specifically dedicated to creating meaningful impactful changes in communities.

6 Discussion

The new urban protocol is anticipated to bring together private and public stakeholders in a collaborative effort to create and implement strategies for urban regeneration of residential neighbourhoods, with diverse scopes and scenarios of interventions. In the context of this research, the array of participants involved in the proposed interventions included academics and professionals, the local community, the municipality, the Canton of Sarajevo, and the Federation of Bosnia and Herzegovina. In addition, this group included institutions that can provide subsidies and programmes for leveraging available EU funds. The essential first phase of the protocol encompassed data collection and digitalization (GIS database, BIM models) of the sites initiated by the municipalities and the authorities in charge of spatial planning and finance, conducted jointly with professionals and researchers in architecture, urban planning, and the social sciences. Following the digitalization and data collection, the sites were assessed according to the predefined criteria from the perspective of architectural heritage and sustainability. Simultaneously, the local community and the residents were invited to participate in place-making events and workshops held by the researchers. The collective requirements articulated in such events serve as inputs for professionals in project development in various scenarios and levels of intervention. This broad spectrum of stakeholders reflects the multifaceted nature of the interventions and the wide range of interests and resources that they draw upon. The proposed guidelines and structured strategy in the form of the new urban protocol suggested by this study should serve to better implement interventions and future maintenance. The methodological framework for interventions is proposed by the academic sector, whereas the initiative should be implemented top-down by the local communities while including all other stakeholders. This approach will ensure that the interventions contribute to sustainable urban regeneration of socialist modernist buildings in Sarajevo (Figure 5).

In addition, urban regeneration, a topic of ongoing discussion and policy consideration, warrants a critical examination of its intersection with gentrification and social exclusion. This process, often intertwined with political and ideological visions, is frequently cloaked in narratives of inclusion, community, and participation (Newth, 2019). However, these terms may mask deeper issues of gentrification, raising questions about the true nature and implications of urban regeneration (Libby Porter, 2013). The discussion centres on whether urban regeneration predominantly serves as a vehicle for gentrification. It necessitates exploring the nuances between market-led and government-led approaches to regeneration (Libby Porter, 2013). Crucially, while recognizing the positive outcomes of urban regeneration, it is equally important to acknowledge and address the challenges faced by marginalized groups or those adversely impacted by these initiatives. The discourse must balance the benefits of regeneration with the needs and concerns of all community members, ensuring equitable and inclusive development. The importance of meticulous attention to detail, especially in documenting residential buildings' characteristics and categorizing them into types, serves not just as an academic exercise but as a practical approach to identifying patterns, needs, and potential interventions. Furthermore, exploration of the dynamic interplay between traditional forms and modernist principles highlights the necessity of blending historical insights with contemporary demands, leading to more informed and adaptable architectural practices. By looking at the complexities of administrative procedures, the article acknowledges the real-world challenges of implementing theoretical concepts and designs. This approach is crucial for moving beyond theoretical discourse to the realm of practical application, ensuring that the proposed interventions and guidelines are not only visionary but also actionable and grounded in the context of current regulatory and procedural landscapes. The detailed analysis and proposed solutions thus aim to bridge the gap between innovative architectural thought and the pragmatic aspects of implementation, fostering a more coherent and effective pathway toward the revitalization and thoughtful development of urban spaces.

7 Conclusion

The reassessment of socialist modernist collective housing in Sarajevo as a model for sustainable urban regeneration is a strategic framework that integrates the key concepts of learning, unlearning, and relearning from previous architectural and urban models. The architectural legacy of this era, with its urban layouts formed as continuous green space in semi-open developments, has contributed to the environmental long-term sustainability of these areas. The proposed new urban protocol builds upon this legacy, focusing on holistic reevaluation, retrofitting, and reprogramming of these architectural and urban structures. This approach views buildings extended into the surrounding public spaces used by the communities they serve. It offers a balanced strategy to revitalize these areas while adapting them to contemporary needs and respecting their overall context.

This research demonstrates that collective modernist housing with its distinct building types is well-suited for inclusive and sustainable retrofitting strategies. These align with frameworks such as the United Nations Agenda 2030 and the New European Bauhaus initiative, particularly in addressing energy efficiency. Despite a plethora of legal and ownership challenges, implementing energy-efficiency measures alongside thoughtful redesign can significantly enhance residents' quality of life by improving comfort, reducing emissions, and supporting long-term sustainability goals. The strategies emphasize sustainability and aesthetics, as well as the importance of collaboration among the general public, experts, businesses, and institutions.

The absence of renovation guidelines in the municipalities of Sarajevo underscores the need for urban regeneration strategies that integrate residents' perspectives, prioritize environmental sustainability, and embrace systemic upgrades. The exploration of socialist modernist zones at the urban, architectural, and interior levels reveals the necessity of interventions that range from basic to advanced retrofitting. These interventions, whether proposed by academic initiatives or residents, should follow a structured framework that involves a wide range of stakeholders. The collaborative model - referred to as the new urban protocol - ensures that these interventions address the diverse needs of the community while contributing to broader high-quality goals, thus creating sustainable urban living.

The focus of this new urban protocol is learning from the architectural legacy of socialist modernism by recognizing its value and integrating its principles into contemporary practice in redesigning and creating new residential buildings or neighbourhoods. Equally important is unlearning outdated dogmas that no longer serve present or future needs, allowing a shift in perspective that permits adaptation and change. In Sarajevo, relearning is particularly critical due to the complex socioeconomic transitions and the impact of war. Relearning involves an objective stance toward the current state, avoiding both uncritical nostalgia and disregard for the past, while reconciling historical wisdom with modern demands for functionality and sustainability.

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