

Architecture as an Evolving Infrastructure: Adaptability and Exaptation in Southeastern European Socialist Mass Housing

Ludovica Rolando

ludovica.rolando@polito.it

Ss. Cyril and Methodius University in Skopje

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Abstract

This paper reframes socialist mass housing in South-Eastern Europe as a dynamic, evolving infrastructure rather than a fixed heritage to be preserved or demolished. Drawing on the biological concept of exaptation (Gould & Vrba, 1982), it argues that the modular design of socialist-era estates has enabled residents to co-opt existing built elements for new uses—enclosing balconies, converting garages, reorganising interiors—in response to the housing pressures generated by neoliberal transition. Through the case studies of Karpoš and Aerodrom neighbourhoods in Skopje, the research traces the interdependence between architectural enabling conditions, informal practices, and their subsequent institutionalisation, combining archival records with oral testimonies to reconstruct how these transformations unfolded over time and gained legitimacy within local planning frameworks. Against *tabula rasa* logics of demolition and new construction, the paper advocates for incremental, community-led transformation, positioning architecture as a civic tool and the existing building stock as a reservoir of latent potential for addressing contemporary affordability and adequacy crises, while offering a transferable framework for rethinking post-socialist urban housing more broadly.

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Introduction

When the ancestors of the giant panda shifted from a carnivorous diet to a strict regimen of bamboo, they faced a mechanical dilemma: stripping leaves requires a dexterous thumb, which bears lack. Unable to design a new digit from scratch, evolution improvised. It repurposed a small wrist bone, the radial sesamoid, enlarging it until it functioned as a makeshift “false thumb”. As Stephen Jay Gould (1980) observed, this anatomical solution is inelegant and structurally imperfect, yet adequate for survival. This biological quirk illustrates a broader principle. Charles Darwin had already theorised, through the concept of pre-adaptation, that the relationship between a structure and its function is not rigid; a trait developed for one adaptive reason can be co-opted for an independent use. Expanding on this mechanism, Gould and Vrba (1982) coined the term *exaptation* to describe how organisms opportunistically reuse available structures for novel, unforeseen functions.

This principle of exaptation can be powerfully applied to architecture through a post-functionalist lens, framing the built environment as an evolving infrastructure. In the urban realm, this translates into the inherent adaptability of the already built environment, which is continually co-opted into new projects for different uses and meanings. This phenomenon is strikingly evident when examining the post-socialist cities of South-Eastern Europe (SEE). In this context, the vast stock of socialist-era mass housing has undergone, since the 1990s, a progressive privatisation accompanied by “the rampant growth of an informal city in an almost organic process” (Diener, 2012, p. 15). Amidst the chaotic transition from a centrally planned system to a market economy, the new flat owners of these estates modified their apartments by expanding and enclosing balconies, thereby gaining more living space. Garages were converted into shops, and ground and first-floor apartments were renovated into offices, resulting in the commercialisation of previously residential spaces (Mariotti & Hess, 2023).

These informal and often illegal transformations operate within a grey area created by the eclipse of state regulation, shifting conventions from the societal to the private sphere through particularised and heterogeneous solutions masked by a simulation of legality. There is a notable absence of control and uniformity in the built environment, whose formal and material consistency is largely determined by private initiatives within a context of progressive deregulation (Dragović, 2019). Consequently, significant issues regarding maintenance, health standards, and structural safety emerge. However, these bottom-up forms of spatial appropriation and transformation can simultaneously be understood as a phenomenon enabled by the architecture itself, whose redundant and modular design has facilitated a principle of exaptation. In this architectural inflexion, exaptation helps us define a concept of legacy in opposition to traditional processes of patrimonialisation and monumentalisation. The urban field is always a secondary effect of intentions and displaced uses, whose material traces constitute a reservoir of qualities to be re-read and re-written rather than merely preserved.

This theoretical lens shapes the literature this paper draws on, which spans three interrelated fields: the urban history of socialist mass housing in Yugoslavia, the architectural theory of adaptive buildings, and the emerging scholarship on cooperative housing in post-socialist contexts. The transformation of the built environment in post-socialist cities, particularly in South-Eastern Europe (SEE) and the former Yugoslavia, has been a growing focus of research. Scholars have examined the complex political and socio-economic shifts from state socialism to neoliberalism (Horvat & Štiks, 2015), as well as the defining features of the post-socialist city itself, understood as an urban form shaped by its socialist past and continuously evolving in the transition period that followed (Hirt, 2013). During the socialist era, urban planning was characterized by large-scale mass housing and collective building practices that blended utopian visions with pragmatic modernism (Badnjar Gojnić, 2023; Mrduljaš et al., 2012; Stierli et al., 2018). These developments functioned as critical urban experiments intended to house the growing middle class and reshape societal dynamics through architecture (Alfirevic & Simonovic-Alfirevic, 2015; Engel & Rogge, 2024; Kulić et al., 2012; Rodrigues Lima et al., 2023).

However, the historical trajectory of these structures demonstrates that buildings are not static entities but dynamic systems that adapt and change after their construction (Brand, 1995). Theoretical frameworks suggest that mass housing can act as an infrastructure, the “support” within which houses can be built according to user needs and desires (Habraken, 1972), with architectural features frequently repurposed over time, much like non-adaptive evolutionary traits (Gould & Lewontin, 1979). In contemporary SEE contexts, which are now characterised by housing commodification and increasing vulnerabilities in residential real estate and mortgage markets (European Mortgage Federation, 2022; European Systemic Risk Board, 2022; Hegedüs et al., 2017), residents have actively initiated spatial transformations. This has resulted in widespread informal interventions, notably the physical enlargement and extension of apartments, illustrating the enduring tension between contemporary individual needs, real estate dynamics, and the collective legacy of socialist housing estates (Bouzarovski et al., 2011; Diener et al., 2012; Mariotti & Hess, 2023).

Yet these pressures have also begun to catalyse alternative responses. Emerging research documents a significant latent demand for cooperative and affordable rental models across the region, suggesting that the dominance of homeownership reflects a structural absence of alternatives rather than cultural preference (Pósfai & Jelinek, 2024). This nascent cooperative sector draws on distinctly regional traditions: the Yugoslav practices of self-management and reciprocal mutual aid offer a cultural foundation that distinguishes these emerging models from both Western imports and discredited state-socialist cooperativism (Pósfai & Jelinek, 2024). The sector nonetheless remains fragile and undertheorised, with little scholarly attention to how existing informal spatial practices might already prefigure or inform such collective models.

While a growing body of literature has documented the socialist mass housing legacy in Yugoslavia and the subsequent phenomenon of informal apartment enlargements, and while emerging research has begun to map the structural conditions and potential of cooperative housing in the CSEE region, these two fields have yet to be brought into dialogue. Specifically, the informal spatial practices of residents, understood here through the lens of architectural exaptation, have not been examined as both a symptom of the same housing crisis that cooperative models seek to address, and as a reservoir of

spatial and social knowledge that could inform community-led housing strategies. Current scholarship lacks a synthesis that connects the material history of Yugoslav mass housing, evolutionary architectural theory, and the emerging cooperative housing sector in the region. This paper proposes that the informal enlargements of socialist apartments in post-socialist Skopje are not merely an index of housing precarity, but a form of resident-led spatial agency that anticipates and potentially informs more formalised models of collective housing.

To bridge this gap, this paper investigates how residents' agency — operating on the threshold between the formal and informal — arose in post-socialist Skopje following the transition to neoliberalism. It aims to understand how these practices influenced the architectural transformation of the mass housing legacy and subsequently affected urban planning regulations. By doing so, the study asks two primary research questions: How can these informal, bottom-up practices redefine the notion of built heritage as a transformative and evolving process? And could these spatial strategies offer a blueprint for more affordable and sustainable housing today? Specifically, the paper explores how these resident-led modifications might mitigate displacement, lower environmental and economic costs by prioritising renovation over demolition and potentially inform the emerging cooperative housing sector in South Eastern Europe.

To address these questions, the research pursues four distinct objectives. First, it seeks to describe the underlying processes and the actor-network, focusing on the agency of residents, architects, and developers. Second, the study assesses the reciprocal relationship with urban planning, identifying how these extensions exploit “grey areas” in regulations while simultaneously forcing regulatory adaptations. Third, it aims to analyse the material characteristics of apartment extensions and spatial transformations. Finally, it endeavours to theoretically link these informal adaptations with emerging cooperative housing initiatives in the region.

To achieve these objectives, this study employs a qualitative, multi-method approach centred on the case studies of the neighbourhoods of Karpoš and Aerodrom in Skopje, North Macedonia, both built between 1968 and 1981 as mass housing projects developed under the self-management system of the Socialist Federal Republic of Yugoslavia (SFRY). The neighbourhoods have undergone significant transformation, enlargement, and adaptation following the neoliberal turn and the subsequent privatisation of real estate. The foundational context is established through extensive archival research, a comprehensive literature review, and a desk-based analysis of cadastral records to map the shifting regulatory landscape. This data is triangulated with empirical fieldwork comprising site visits, ethnographic observations, and visual methods to document the physical realities of the apartment extensions. Finally, socio-spatial dynamics and actor-networks are captured through semi-structured interviews with key stakeholders, including residents and architects.

The findings reveal that informal apartment extensions function as a socio-spatial safety net, driven by actor-networks that operate within regulatory voids. The capacity to enlarge and adapt existing living spaces has enabled residents to accommodate evolving needs without the financial burden of relocation, effectively preventing displacement in an increasingly unaffordable housing market. These extensions are facilitated by an intricate network of residents, architects, and developers who strategically navigate grey areas in urban planning regulations. The study concludes that such informal, bottom-up strategies offer a valuable framework for formalised adaptation, one with implications for heritage, densification, and the emerging cooperative housing sector in the region.

A viable alternative

The case of Skopje shares a post-socialist trajectory characteristic of the broader South-Eastern European (SEE) region, marked by rapid privatisation, regulatory fragmentation, and the progressive withdrawal of the state from housing provision. The collapse of Yugoslavia triggered a near-total transfer of the public housing stock to private ownership: the 1990 Law on the Sale of Socially-Owned Apartments (Z.P.S.O.S.) transferred ownership to resident families without simultaneously redefining responsibilities for building maintenance — a legislative gap whose spatial consequences remain

legible in the built fabric today (Official Gazette of the Republic of North Macedonia, 1990). This shift fundamentally reframed housing from a social good to a market commodity, yet occurred without coherent long-term policy frameworks: North Macedonia's national Housing Strategy, adopted in 2007, expired in 2012 and has never been renewed (Hyresgästföreningen, 2022). Planning legislation underwent repeated revisions that deregulated construction while fragmenting regulatory authority, producing conditions that would come to enable, and in some cases actively incentivise, informal spatial transformation. Across the wider SEE region, comparable dynamics unfolded: in Montenegro, for instance, utility fees tied to construction activity accounted for up to 43% of municipal budgets between 2008 and 2012 (Dragović, 2019), illustrating how fiscal dependence on development revenues undermined effective planning oversight more broadly.

The resulting housing landscape is marked by a structural paradox: residential construction has expanded while access to adequate housing has contracted. In Skopje, the population has declined by over 9% in two decades, yet the 2021 census recorded 36.6% of apartments as unoccupied, while prices rose by 12.4% in early 2022 alone (Hyresgästföreningen, 2022). New construction targets investors rather than residents, generating units that are overpriced and inadequate in quality. Access constraints fall hardest on younger cohorts: over 60% of 25–34-year-olds in North Macedonia still lived with their parents in 2019, one of the highest rates in Europe (Eurostat, 2022), while housing inspection remains largely absent: only four of Skopje's municipalities employ dedicated housing inspectors. Social housing provision is virtually non-existent, leaving residents with no institutional recourse to address deteriorating affordability conditions.

In this context, the informal enlargement and transformation of existing apartments emerges as a *de facto* adaptive strategy, enabling residents to expand their living space in place within their established neighbourhoods, without bearing the financial burden of relocation to larger, and increasingly unaffordable, units elsewhere. Understanding how this adaptive strategy materialised requires tracing the specific regulatory and institutional conditions that made it possible. The pivotal legislative moment came with the 1990 Z.P.S.O.S., which transferred ownership to resident families without simultaneously redefining responsibilities for building maintenance (Official Gazette of the Republic of North Macedonia, 1990), transforming the planning system from an instrument for equitable provision into a mechanism for mediating competing private interests (Mariotti & Hess, 2023). The organisational void left by the dissolution of the Self-management Interest Community for Housing (SIZ), today residually reconstituted as the Public Enterprise for Management of Residential and Business Space, was progressively filled by private initiative and municipal permissiveness, institutionalised through two principal mechanisms.

The first is the Detailed Urban Plan (DUP). Though not designed to regulate modifications to existing buildings, DUPs exert decisive influence over what transformations become possible through parcel enlargement and the introduction of new categories of permissible interventions (Fig. 1). The DUP provisions that enabled apartment extensions were not originally conceived for this purpose: the increased buildable area and ground footprint were intended to govern hypothetical future demolition and reconstruction, not the expansion of existing structures. It was residents and developers who identified and exploited this regulatory gap, effectively repurposing a planning instrument designed for a different logic. Under North Macedonian law, DUPs are produced by private firms rather than municipal departments and can be commissioned and financed directly by private individuals or legal entities, an arrangement that creates an evident overlap between public and private interests, further blurring the boundary between regulation and opportunity.



Fig. 1 Detailed Urban Plan, Karpos I, 2004. The dashed line in the plan indicates the possible increase in the footprint and building volume.

The relationship between plan and practice in Skopje rarely follows the expected sequence: transformations are frequently initiated before a plan is amended or adopted, with residents and investors negotiating directly with municipal authorities to steer regulatory frameworks towards their desired outcomes (Avramoska & Murru, 2026). The second mechanism is retroactive legalisation. The 2011 Law on the Disposal of Illegally Constructed Buildings allowed owners to regularise unauthorised constructions for a nominal fee of 61 MKD (approximately €1) per square metre, followed by cadastral registration. Rather than an exceptional remedy, this became an ordinary governance tool, producing a performative cycle in which construction generates the need for recognition, recognition creates legal and real estate value, and that value fuels further transformation (Avramoska & Murru, 2026). This dynamic is consistent with what Diener (2012) describes as the gradual integration of informal practices into a form of “open law”: a heterogeneous legality that acknowledges customary rights within a flexible and poorly defined set of procedures for planning, approval, and adjudication.

These enabling conditions — regulatory, technical, and socio-economic — converged to make apartment extension a viable alternative. Mariotti and Hess (2023) identify three primary drivers: housing shortage in the early post-socialist period, the normative void during transition, and the structural viability of prefabricated mass housing typologies for expansion and enclosure. To these must be added the progressive unaffordability of the housing market: following a period of moderate price growth, residential prices in Skopje increased by 38.47% between 2020 and 2023 (Zinoski et al., 2024; NBRNM Housing Price Index), with apartments increasingly acquired as financial assets rather than homes. In this context, extending an existing apartment in place became not only spatially rational but economically preferable to purchasing a smaller, and typically lower-quality, unit on the market. As Diener (2012) observes of the post-Yugoslav context more broadly, informal urban growth of this kind progressively drew in the middle classes, embracing conventional architectural types and urban patterns that had previously been rare in unauthorised construction. A dynamic particularly evident in Skopje, where developer-led extensions have produced building transformations indistinguishable in ambition, if not always in quality, from formal residential development (Fig.2).



Fig. 2 A development with informal bottom-up additions in the foreground, set against a developer-led extension in the background. Photo by the author.

The actor-network sustaining these transformations involves residents, architects, developers, and municipal authorities in a structured yet informal set of relationships. When initiated autonomously by residents, extensions typically take the form of balcony enclosures using light materials such as glazing, plasterboard, or masonry. When driven by a developer, the intervention is more radical: a new structural frame of columns and beams encases the existing building, enabling the addition of new floors and volumes. Developer-led interventions require a private agreement with at least 51% of the building's residents (Mariotti & Hess, 2023); the scope of the works, whether the addition of floors, balcony enclosures, elevators, new façades, or modifications to building installations, is determined by that agreement. However, when a developer is involved, the intervention typically includes the construction of additional floors, a proportion of whose newly built surface area is retained by the developer for resale and profit, constituting the economic basis of the exchange. Architects, often operating at the margins of formal professional practice, provide the technical knowledge necessary to navigate permit procedures and manage the interface between private initiative and municipal bureaucracy. Municipal authorities oscillate between enforcement and accommodation, with outcomes frequently shaped by direct negotiation rather than procedural compliance. The result, in Diener's (2012) terms, is an architecture of negotiation, in which planning and legal control is limited to protecting the real estate market from outright arbitrariness, while anything beyond that remains a matter of negotiation between actors with unequal but mutually dependent interests.

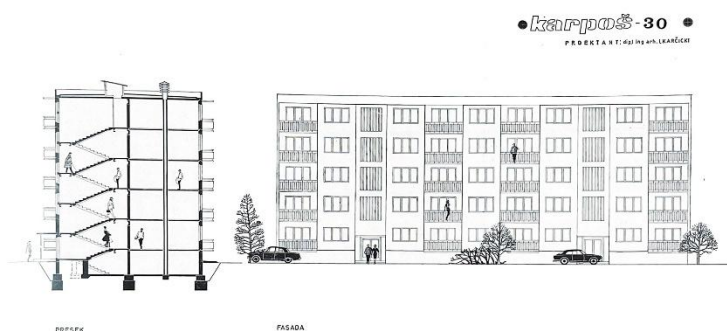
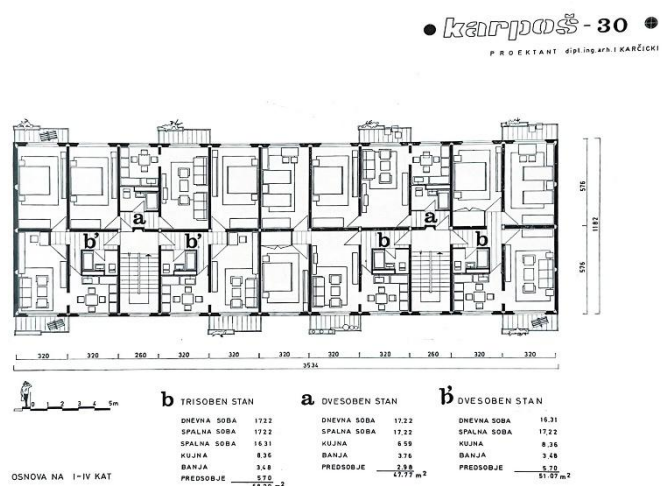
Having examined the processes and actor-networks through which these transformations are made possible, the following sections turn to their spatial and material manifestations. The analysis proceeds in two stages: first, the exterior transformations documented across the buildings of the Karpoš municipality; then, the interior reorganisations recorded within two individual apartments, one located at Partizanski Odredi, in the municipality of Karpos, at the boundary with Taftalidže, and one at ASNOM in the municipality of Aerodrom.

Exterior transformations: the Karpos neighbourhood

Situated in the north-western part of Skopje, Karpoš developed as one of the city's principal residential districts in the decades following the devastating earthquake of 1963, which destroyed much of the existing urban fabric and triggered an extensive programme of state-led reconstruction. The neighbourhood was conceived according to the tenets of socialist modernist planning: a carefully ordered arrangement of residential slabs set within a continuous green matrix, with schools, kindergartens, and everyday services distributed at pedestrian scale to serve the resident community. Its spatial organisation reflected a broader political ambition: to reshape collective life through

architecture, providing equitable access to housing and public space for a rapidly growing urban population.

The fieldwork conducted for this study covered the communities of Karpoš I, II, III, and IV. The survey involved a systematic reconnaissance of each community, identifying buildings that had undergone enlargement and classifying the observed interventions into recurring typologies of adaptation. The physical transformations documented in Karpoš are inscribed in a built fabric shaped by two distinct constructive logics, each of which has conditioned the nature and extent of subsequent extensions. The earlier buildings in Karpoš I, constructed before the 1963 earthquake, are four-storey structures built with in-situ cast load-bearing cross walls, each staircase serving two apartments per floor. The post-earthquake buildings in Karpoš II, III, and IV, by contrast, were erected using large-format prefabricated reinforced concrete panels produced by the Karpoš Factory, a technology transferred from the Soviet Union, which donated both the factory equipment and technical expertise to support Skopje's reconstruction. The factory, located within the neighbourhood and operational until the 1990s, produced standardised panels with a maximum span of 5.6 by 3.6 metres. The load-bearing logic of the system imposed a fixed spatial grammar on the apartments, allowing only minimal internal openings between panels and no wide apertures between structural bays (Interview, Karpoš Factory engineer, 08.05.2026). A one-bedroom apartment in Karpoš measured 30.5 square metres, a two-bedroom unit 47.7 to 51 square metres, and a three-bedroom unit 68.3 square metres, each equipped with a balcony of approximately one metre in depth spanning a full prefabricated panel width of 3.2 metres (City Archive of Skopje, 1968). Though compact, these dwellings were designed for efficient living and provided residents with direct access to collective green spaces, schools, and amenities within walking distance (Fig.3-4).



Figs. 3-4 Typical plan, façade and section of a Karpos factory-prefabricated concrete building. Architect: Ilija Karčicki. Source: Institute for Housing-Communal Management, City Archive in Skopje, 1968.

It is precisely this compactness, combined with the structural rigidity of the prefabricated system, that has driven the demand for spatial extension. Expansions in Karpoš follow three principal material configurations, differentiated by their structural approach, regulatory basis, and the degree of collective coordination they require. The most radical and visually distinctive transformation concentrates primarily in Karpoš I and involves the construction of an independent external skeleton of reinforced concrete columns and beams encasing the existing building. This new frame, whose maximum distance from the existing façade is defined by the DUP parcel boundary, supports both the enlargement of existing apartments through enclosed balconies, loggias, or additional rooms, and the addition of entirely new floors above the existing roofline. The resulting buildings, wider at the upper levels, slenderer at the base, correspond to what Diener (2012) describes as “mushroom houses”, a morphological type characteristic of post-socialist informal densification across the former Yugoslav cities (Fig. 5-6). Notably, the DUP boundary line that legitimises this expansion was not originally conceived for this purpose: it was intended to define the maximum buildable envelope in the event of future demolition and reconstruction, not to authorise the incremental thickening of existing structures. It was residents and developers who identified and instrumentalised this regulatory gap, obtaining building permissions on the basis of technically compliant drawings while frequently building according to different arrangements in practice (Interview, Karpoš Factory engineer, 08.05.2026).



Figs. 5-6 Example of a “mushroom” extension compared with the original building shown on the right. Photo by the author.

A second and more widespread configuration consists of the addition of an independent extension structure only at the level of existing balconies, on one or more façades, enclosing and expanding the outdoor space into habitable rooms (Fig.7). This type of intervention does not necessarily require collective agreement across the entire building and can be initiated by individual apartment owners,

which explains its greater frequency and its more heterogeneous material outcomes. Where a developer coordinates the intervention, a coherent structural frame encloses the full façade; where residents act independently, the result is a fragmented elevation punctuated by gaps where non-participating apartments have declined to extend, producing the irregular, layered geometries that now characterise much of the neighbourhood's built fabric. The individual and financially selective nature of this process — dependent on each owner's willingness and purchasing power — is directly legible in the material inconsistency of the resulting façades (Avramoska & Murru, 2026).



Fig. 7 Building showing a type 2 extension configuration in Karpos III: the addition of an independent structure solely at the level of the existing balconies. Photo by the author.

A third configuration concerns the transformation of the roofline through the addition of a pitched roof, enabling the creation of habitable attic space (Fig. 8). Unlike the previous two types, this intervention does not exploit the DUP parcel boundary but draws on a separate legislative provision: the Law 142/2015, Article 47 permits habitable attics provided the roof pitch falls between 5% and 60% and the maximum ridge height does not exceed four metres. This type of extension is prevalent across Karpoš II and III. Taken together, these three configurations constitute a cumulative material archive of the transformation process: each added layer, structural frame, or reshaped roofline records a specific regulatory opportunity, a household decision, and a negotiated agreement between actors with divergent but converging interests. The built result is not the product of a coherent design logic but of successive, partially coordinated approximations, a selective and incremental densification whose formal irregularity directly reflects the fragmented, negotiated nature of the process that produced it.



Fig. 8 Building showing a type 2 and type 3 configuration extensions in Karpos II. Photo by the author.



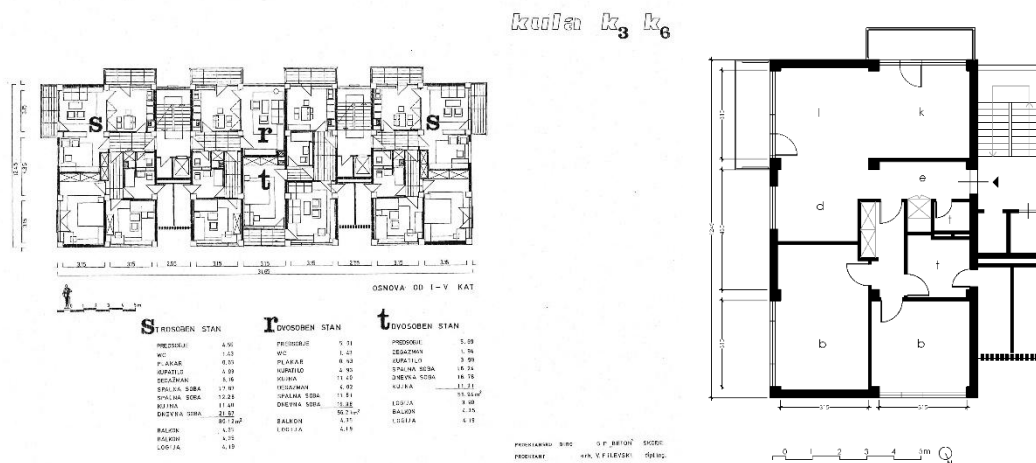
Fig. 9 Map of Karpos municipality with buildings 'extension types. Drawing by the author.

Interior transformations: the Partizanska case

The 'Partizanska' residential ensemble, developed between 1967 and 1974 along Partizanski Odredi Boulevard, one of Skopje's principal traffic arteries, offers a counterpoint to the exterior densification documented in Karpoš. Designed by architects Vojkan Filevski (towers) and Trifun Janev (slabs) and built by GP Beton, the ensemble comprises 19 buildings, a combination of slabs and towers of up to ten storeys, set within an extensive green matrix covering 7.7 hectares. The project served a dual urban purpose: to define a coherent street façade along the boulevard and to increase residential density in an area previously characterised by low-rise prefabricated single-family houses. With an average dwelling size of 81 square metres, the ensemble housed a predominantly middle-class population and was distinguished by generous ceiling heights, large windows, and high-quality cross-ventilated units, spatial standards that stand in marked contrast to the reduced dimensions typical of contemporary residential production in Skopje (Siljanoska & Korobar, in Mrduljaš et al., 2012). Following privatisation in the 1990s, building maintenance deteriorated, though the ensemble has retained much of its original character: compared to other housing estates in the city, individual façade interventions have remained relatively limited, and the green spaces between buildings have been substantially preserved.

It is primarily at the interior scale that transformation has unfolded in Partizanska. The apartment visited during fieldwork is a third-floor unit at Partizanski Odredi 125 with three exposures, occupied by the same family since its original allocation. It illustrates a pattern of incremental spatial reorganisation driven by changing domestic habits and evolving standards of comfort (Interview, resident Partizanska, 06.05.2026). The most significant intervention involved the demolition of the wall separating the kitchen from the corridor and living area, converting what was originally a sequence of enclosed, functionally distinct rooms into a continuous open-plan space. The original

A second recurring transformation concerns the enclosure of balconies. The apartment contains two balconies, one of which has been converted into a glazed veranda, effectively annexing outdoor space into the interior. A French balcony in one of the smaller bedrooms has similarly been closed off (Fig.10-11). These interventions, characteristic of the broader phenomenon documented across Karpoš and Aerodrom, respond to the same logic of spatial expansion in place: gaining usable square metres without relocation. Neither the internal demolitions nor the balcony enclosures were registered with the cadastre or subject to building permits. Such condition is described by the resident as a widely shared understanding of the regulatory threshold: internal non-load-bearing walls fall outside the scope of mandatory declaration, and even exterior modifications carry no formal reporting obligation (ibidem). The structural elements of the building were not touched, though the resident noted the absence of any institutional mechanism to verify that neighbours exercised equivalent caution.



What the Partizanska case illuminates, beyond the specific spatial transformations, is the qualitative gap between the original housing stock and contemporary residential production. The apartment's 2.60-metre ceiling height, its large windows, its original rosewood parquet flooring, and the spatial generosity of its plan are repeatedly contrasted by residents with the reduced standards of new construction, characterised by smaller windows, lower ceilings, enclosed loggias rather than open balconies, and minimal storage. In this context, the preference for adapting an existing apartment rather than purchasing a new one is not merely economic but reflects a qualitative judgement about what constitutes adequate domestic space, which the market, oriented towards investor returns, is increasingly failing to accommodate.

Interior transformations: the Aerodrom case

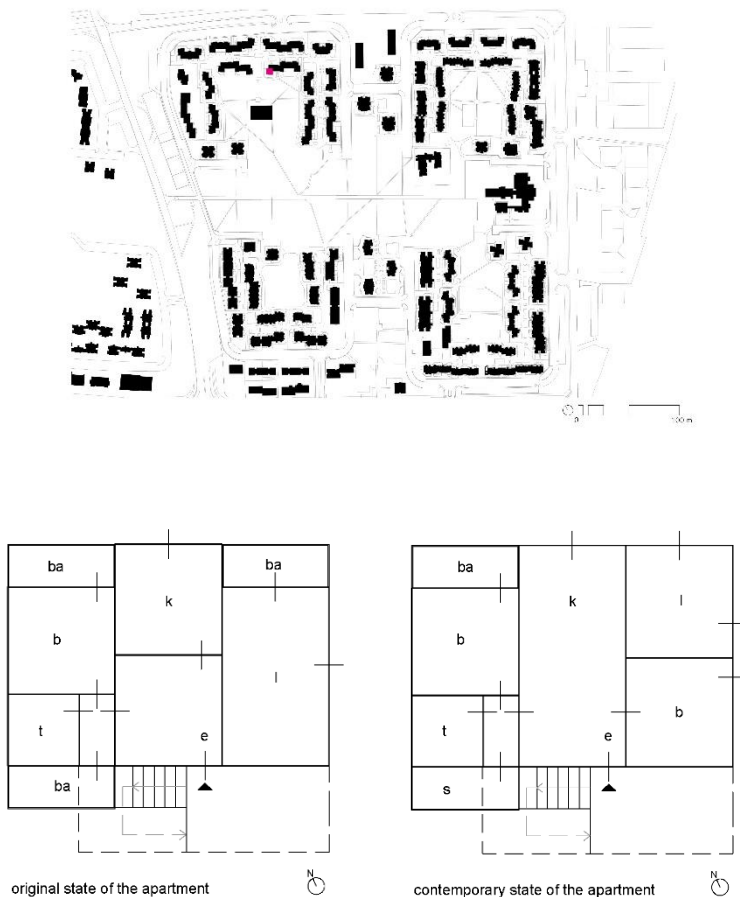
The Aerodrom housing development represents a different scale and urban ambition from the Karpoš neighbourhoods examined above. Conceived as the largest residential area to be built in Skopje following the 1963 earthquake, the district was planned to house 100,000 inhabitants across 141 hectares along Jane Sandanski Boulevard. The initial urban concept was developed through a Yugoslav competition won by JUGINUS from Belgrade and subsequently elaborated by the Institute for Town Planning and Architecture of Skopje. The construction was carried out between 1965 and 1981 by GP Beton and GP Ilinden. The ensemble comprises 520 buildings of varying typologies (row housing, slabs, and towers reaching up to nineteen storeys) with an average dwelling size of 78 square metres. The planning concept was organised around pedestrian movement as its primary structural principle, with buildings set between traffic flows and a generous central green area. All ground-floor apartments were provided with private gardens, and the combination of different building types was explicitly intended to accommodate diverse social groups within the same residential environment (Korobar & Siljanoska, in Mrduljaš et al., 2012). Construction was financed through the SIZ, which accumulated funds from working organisations and distributed apartments according to each organisation's share of investment. Following privatisation, the area has remained relatively well preserved, though signs of ageing are visible and green spaces have been progressively encroached upon by parking.

As in Partizanska, the transformations most clearly legible in Aerodrom operate at two scales: selective modifications to the exterior envelope of individual buildings, and more substantial reorganisations of interior space driven by changing household needs. At the exterior, the most common interventions involve the enclosure of fire escape staircases and balconies, and, in some cases, the application of external insulation cladding to improve thermal performance. This constitutes a pragmatic response to the absence of any coordinated building maintenance programme, which, since privatisation, has devolved entirely to individual apartment owners. The absence of any formal condominium administration means that these interventions proceed without collective governance: decisions are made unilaterally, their cumulative effect on the building envelope uncoordinated and visually heterogeneous (Interview, resident Aerodrom, 06.05.2026).

The interior transformations documented in the visited apartment follow a pattern structurally similar to that observed in Partizanska, though driven by a more explicitly spatial necessity. The unit is located on the second floor of ASNOM 24, benefits from three exposures, and has been inhabited by the same resident for 33 years (Fig.12). The apartment was originally a two-room unit: a closed kitchen separated from the rest of the dwelling by a partition of glass and wood, with a small balcony behind it, and a living room occupying what is now a bedroom, with a north-facing balcony where the current living room is located. As the household grew and a child required a separate room, the balcony was enclosed to create an additional bedroom, the living room was relocated into the former balcony space, and the kitchen partition was removed to integrate cooking and living areas into a more continuous plan. An additional window was opened in the newly created bedroom to compensate for the loss of direct exterior access (Fig.13). The decision to enclose the balcony was described not as a preference but as a practical necessity: the resident recalled using it as an outdoor living space every morning before work, furnished with cupboards, a table, and chairs, but acknowledged that its north orientation limited its usability to summer months. When the child reached the age of ten and required independent space, the couple had been sleeping in the living room on a sofa bed; the enclosure resolved an unsustainable domestic arrangement (Interview, resident Aerodrom, 06.05.2026).

Neither the interior modifications nor the balcony enclosure were registered with the cadastre or subject to permit procedures. When asked whether the apartment would need to be restored to its original condition in the event of a sale, the resident was unequivocal: the obligation does not exist in practice, and if it did, it would effectively freeze the entire Skopje property market, given that the vast majority of apartments in the city have been modified without authorisation (*ibidem*). This observation is consistent with the broader regulatory dynamic described in the previous section: informal transformation has become so pervasive that its retroactive normalisation is not only tolerated but structurally embedded in the functioning of the housing market.

The Aerodrom case also surfaces the relationship between informal spatial appropriation and collective safety. Following a fatal nightclub fire in a nearby town in early 2025, the Skopje municipality announced inspections of all residential buildings to verify compliance with fire safety regulations. In Aerodrom, the external fire escape staircases, accessible from individual apartments through external doors and small balconies, had in many cases been enclosed and privatised by residents, effectively rendering them unusable as emergency exits. The threat of forced removal generated significant anxiety among residents, but the inspections were never carried out. The only measure implemented was the installation of fire extinguishers in common areas, which residents appropriated for private use, prompting the neighbours to lock them in a cabinet to which only one resident holds a key (ibidem). The episode condenses, in miniature, the broader condition of post-socialist collective housing in Skopje: a built environment shaped by the progressive privatisation of shared space, the erosion of collective responsibility for common areas, and the absence of institutional mechanisms capable of reconciling individual adaptation with collective safety. As the resident observed, interior spaces are meticulously maintained while common areas and building exteriors are neglected. This well represents a spatial expression of the shift, described by Diener (2012), from societal to private conventions that has characterised the post-socialist urban condition across the former Yugoslav cities.



Figs. 12–13 Top: Plan of Aerodrom with the building under study highlighted in magenta. Construction: GP Beton, Skopje. Design: JUGINUS and Institute for Town Planning and Architecture of Skopje. Source: Stojanovski, 2026. Bottom: Second-floor plan scheme of the flat under study, showing before and after user modifications, with kitchen (k), living (l), balconies (ba), bedrooms (b) and a toilet (t). Drawing by the author.

Towards a cooperative housing sector: an alternative between state and market

The dynamics documented in Karpoš and Aerodrom reveal a fundamental tension at the heart of post-socialist urban transformation. The informal spatial practices that have enabled residents to remain in their neighbourhoods and adapt their homes to changing needs have done so at a significant collective cost: the progressive privatisation of shared space, the erosion of common responsibilities, and the consolidation of speculative logics. What is missing is not the capacity for spatial transformation, but an institutional actor capable of channelling that capacity towards non-speculative, collectively governed, and socially equitable ends. It is precisely this institutional gap that the emerging cooperative housing sector in Central and South-Eastern Europe seeks to address. The housing markets of the CSEE region can be characterised as “super” homeownership regimes, with individual ownership expanding beyond 90% of the housing stock, while the public housing stock is marginal and severely residualised. States have systematically withdrawn from affordable housing provision while supporting middle-class homeownership through subsidies that have fuelled price bubbles rather than addressing structural need (Pósfai & Jelinek, 2024). As a result, between 20 and 30% of the population, including middle-class households, struggles with housing affordability issues. Survey research across eight CSEE countries shows that between 13 and 26% of urban populations would be willing to access affordable rental and cooperative housing, were such options available.

MOBA Housing SCE, a transnational network of cooperative housing initiatives established as a European Cooperative Society in 2020, has sought to articulate such an alternative. The MOBA model is founded on the principle of creating affordable housing in a strictly anti-speculative manner, through collective ownership of buildings and collective institutional responsibilities, as opposed to individual ownership and individualised risks, coupled with democratic decision-making and active participation of members. This model explicitly positions itself not as a nostalgic revival of state socialist cooperative forms, which in many countries of the region served primarily as vehicles of hidden privatisation (Pósfai & Jelinek, 2024), but as a contemporary reinvention of the region's deeper traditions of self-management and reciprocal mutual aid. In Yugoslavia, self-management was widespread across different segments of life from work to housing, and the practice of reciprocal mutual aid in building, known as “moba” in Serbo-Croatian, was deeply embedded in the housing culture of the region. It is this tradition, rather than the party-controlled structures of the socialist period, that the emerging sector seeks to renew.

The significance of this model for the argument developed in this paper extends beyond financing. What the cooperative sector offers, in the specific context of post-socialist mass housing, is a qualitatively different actor, capable of stepping into the space currently occupied by private developers to guide its transformation according to collective, non-speculative logic. Where developer-led extensions in Karpoš have produced additional floors whose surplus reverts entirely to private profit, a cooperative actor could broker analogous interventions in which a share of the new surface area is retained as collectively owned space — shared facilities, affordable units, or services open to the wider neighbourhood — managed outside the speculative market. By prioritising renovation and densification of existing buildings over demolition and new construction, such an approach would reduce both environmental costs and displacement pressures. By institutionalising the collective governance of building transformation, it would replace the fragmented, individually negotiated arrangements currently prevailing with transparent, democratically accountable processes. And by anchoring residents within their established neighbourhoods through collectively governed tenure, it would counteract the expulsive dynamics of a market that increasingly prices long-term inhabitants out of the areas where their social and spatial roots lie. The informal collective capacities already visible in Skopje, in the negotiations over DUP amendments, in the mutual agreements between neighbours, in the persistence of residents despite deteriorating affordability, do not need to be invented: they need an institutional framework capable of formalising and directing them towards the common good.

Findings and Conclusions

This paper set out to investigate how residents' agency and informal practices, operating at the threshold between the formal and informal, arose in post-socialist Skopje and transformed the mass housing legacy of Karpoš and Aerodrom. The empirical analysis, conducted through archival research, fieldwork, and semi-structured interviews, has produced four interconnected sets of findings, each corresponding to one of the study's stated objectives. The study demonstrates that apartment extensions in Skopje are not isolated individual decisions but the product of a structured network of residents, architects, developers, and municipal authorities, operating at the threshold between the formal and informal. Two principal regulatory mechanisms have institutionalised this process: the Detailed Urban Plan, instrumentalised to legitimise structural extensions through a parcel boundary repurposed as an expansion limit it was never intended to define; and the 2011 Law on the Disposal of Illegally Constructed Buildings, which has functioned not as an exceptional remedy but as an ordinary governance tool, generating a performative cycle in which construction precedes authorisation, regularisation confers value, and value incentivises further transformation. Together, these mechanisms confirm that the grey areas exploited by informal actors are consolidated operational modes within the regulatory framework.

At the material scale of spatial transformation, fieldwork documented three distinct exterior typologies in Karpoš: a) the full external skeleton frame producing “mushroom house” morphologies, b) the selective balcony extension, and c) the pitched roof conversion, each conditioned by the constructive logic of the building stock and the regulatory instrument that enables it. At the interior scale, the cases of Partizanska and Aerodrom reveal a consistent pattern of balcony enclosures, partition removals, and spatial reorganisations undertaken without cadastral registration, reflecting not negligence but a widely shared understanding of a regulatory threshold that applies neither consistently nor equitably. A counter-intuitive finding emerges from this evidence: the original socialist housing stock offers higher living standards than much of the contemporary residential production that has come to neglect them. Most importantly, it is precisely this redundancy, modularity, and spatial generosity that have enabled the extensions documented in this study. The exaptive capacity of these buildings is not incidental but structural: a quality latent in their design that residents and developers have identified and exploited, and that the market, oriented towards investor returns and minimal floor areas, is unable to replicate.

Returning to the two primary research questions, the evidence supports the following conclusions. First, the transformations documented in Karpoš and Aerodrom demonstrate that the socialist mass housing stock is a living infrastructure, whose modular and redundant design has facilitated precisely the kind of exaptation that evolutionary theory describes, rather than a fixed legacy to be preserved or demolished. Every added terrace, enclosed balcony, and reshaped roofline records a household decision, a regulatory negotiation, and a material contribution to an architecture that continues to evolve. This calls for a radically different conception of heritage: the stewardship of a capacity for transformation rather than the preservation of an original state. The built fabric of Karpoš is valuable partly because of its alterations, as evidence that architecture can absorb and register the changing needs of the people who inhabit it.

Second, regarding whether these spatial strategies could offer a blueprint for more affordable and sustainable housing, the evidence suggests that they can, but only under the condition that the actor-network sustaining them is restructured. As currently organised, the informal transformation of mass housing serves primarily as a mechanism for individual spatial gain and speculative value extraction, with collective costs distributed unevenly across building populations who cannot all participate on equal terms. The fire extinguisher episode in Aerodrom crystallises this dynamic: in the absence of collective governance, even the most basic shared responsibilities dissolve into competing private interests. What the cooperative housing model proposed in the final section of this paper offers is not a different set of spatial strategies, but a different actor capable of deploying the same strategies — DUP negotiation, structural extension, building densification — within a framework of collective ownership, democratic governance, and anti-speculative tenure. By retaining a share of new surface area as collectively owned space, by prioritising renovation over demolition, and by anchoring residents within their established neighbourhoods through non-market tenure, such an actor could transform the exaptive logic that has operated informally for three decades into a replicable, institutionalised model for affordable and sustainable urban renewal.

The limitations of this study should be acknowledged. The qualitative, case-based approach offers depth of interpretation rather than statistical generalisability, and the fieldwork is concentrated in two neighbourhoods of a single city. Further research is needed to assess the transferability of these findings to other post-socialist contexts, to quantify the environmental gains of renovation over demolition at scale, and to evaluate the conditions under which cooperative actors could realistically assume the intermediary role proposed here. Nevertheless, the study contributes to three distinct fields. To the scholarship on post-socialist urban transformation, it offers an empirically grounded account of the regulatory mechanisms and actor-networks through which informal densification operates, moving beyond descriptive catalogues of morphological change. To architectural theory, it demonstrates the analytical purchase of the exaptation concept applied to the built environment, proposing a post-functionalist understanding of heritage as evolving infrastructure rather than a fixed monument. And to housing policy, it articulates a connection that the literature has not previously drawn between the informal spatial practices of post-socialist residents, the material affordances of the socialist building stock, and the institutional ambitions of the emerging cooperative housing sector in Central and South-Eastern Europe.

The false thumb of the giant panda was not designed; it was repurposed. The apartment extensions of Karpoš and Aerodrom were not planned; they were negotiated. What this study proposes is that the next transformation of this housing stock need not be either: it can be collectively designed, institutionally governed, and deliberately exaptive, a living infrastructure consciously directed towards the common good.

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