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BORDERLANDS OF HOUSING NEIGHBOURHOODS AS RESIDUAL OR LIMINAL SPACES: COMPARATIVE STUDY OF CASES IN BUDAPEST

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This paper aims to analyse and classify urban borderlands. The formation of urban boundaries is influenced by natural, infrastructural, property (social), and urban design principles. Based on the categorisation of urban residual space, the spatial configurations of three regular homogeneous residential areas (historical, socialist-modern, contemporary) in Budapest are presented by combining a quantitative and qualitative approach. The role and presence of their boundaries in the city are explored through map-based and SpaceSyntax analysis. In addition, their qualitative attributes – such as lost space, neglected space, liminal space, and border vacuums – are introduced based on the literature and fieldwork. The objective of this research is to draw attention to under-represented and under-managed urban situations, in order to better understand the impacts of borderlands on the use of space and their role in creating spatial segregation. Moreover, in post-socialist cities like Budapest, the analysis of these spaces is crucial for further complex and successful urban development.

***Key words*: urban borderlands, post-socialist cities, open space, border vacuum, liminality, Budapest.**

INTRODUCTION

There are different narratives of urban history, and the traditional morphological approaches within architecture are increasingly being complemented by new overviews based on social (Straub, 2015) or natural (Rahm, 2020) factors. Two different but interdependent developmental attitudes shape the life of cities. On the one hand, we can speak of a more responsive system that works with existing structures, constantly transforming and recycling them. The palimpsest city (Kroessler, 2015) functions as a whole, and every new intervention takes away and/or adds something to the existing physical and social environment. On the other hand, there are new greenfield developments or projects in which the extant urban context is completely erased and replaced by something brand new. These areas created by rapid and drastic action are "aliens" in the city at the moment of their birth. Thanks to their uniform architectural appearance and clear spatial limits, these urban fabrics maintain isolation for the long term. They become cities within the city. However, their external boundaries play a prominent role: they draw the limits for the autonomous urban unit, even though the new urban unit and the surrounding city can communicate only in these areas. With the help of these boundaries, the city can be more than just a patchwork of juxtaposed urban forms (Neutelings, 1991), and instead be a heterogeneous fabric that is unified in its diversity. Consequently, it is crucial to shape urban boundaries consciously.

Since the beginning of the 20th century, the growing need for urbanisation has led to the shaping of the city by large-scale, action-based, island-like developments, rather than by the context-sensitive palimpsest method. The new parts completely rewrite the historical fabric or incorporate former natural landscapes. Before the Second World War, the form of most European cities – including the capital city of

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Hungary, Budapest – was characterised by the Alonso theory (Alonso, 1964; Bertaud, 2004). The city centre was most intensive in its form (density and height of the buildings) and usage (population density, real estate position, etc.), while all these indicators decreased as the distance away from the urban core increased. However, in the socialist era (between 1950 and 1990 in Hungary) nationalisation of the land and housing stock created a new situation. The land value became independent of its position within the city. The centrally planned economy, the need for mass housing construction, and the negation of the values of the past resulted in a completely different spatial distribution logic (Kiss, 2019). In Budapest, most of the new housing estates were built in the transition zone around the city centre or in the new outer zone attached to the city (Losonczy *et al*., 2020). The city became an enormous, polycentric patchwork with intensive, high-density, city-within-a-city areas. The new modernist urban form, with its panel technology, differentiated the new mass housing areas from their surroundings. After the regime change in 1990, this type of mass housing development stopped, and in addition, 95% of the housing stock became private. However, even today new types of large-scale housing developments continue to shape the city, and these international real estate developments are based on the market value of re-privatised land.

This research is based on the quantitative and qualitative analysis of the urban boundaries in three urban residential neighbourhoods of Budapest. How are their boundaries shaped? How is it possible to characterise their spatial qualities? How does the quality influence their use of space and their role within the city? If the urban boundaries are spatial and social edges between two homogeneous urban units, they make the city into a patchwork, but they can also behave like an invisible thread in the heterogeneous fabric of the city, helping integration. If the boundaries between homogeneous urban units are strong, then the city is a patchwork, composed of spatially and socially fragmented parts. Alternatively, boundaries can work as stitches, helping the communication and integration of differently developed parts.

LITERATURE REVIEW: CATEGORIES OF URBAN BORDERS

Urban boundaries

A border or boundary separates two or more territorial units. It can be natural or built, physical or mental, visible or invisible, permeable or impermeable. There are different spatial scales of boundaries between countries, regions, counties, areas of countryside, agglomerations, cities, districts, neighbourhoods, blocks, and plots. These separations between properties or administrative units are established to avoid potential conflict (Paasi, 1998; Brambilla, 2010; Roßmeier and Weber 2021). Physical borders, e.g. walls, ditches, fences between neighbourhoods, gated communities or plots, etc., provide control of the passage between two territorial units, and they show the limit between the outside and the inside. Indeed, they not only separate two sides physically, but also mentally (e.g., my house, my rules) (Rumford, 2006).

There is a medieval German saying that goes 'Stadtluft Macht Frei' ('city air makes you free'), because the city was a walled refuge from the outside world, from the countryside, where internal security was guaranteed by the laws and military body of the city. However, the role of the city wall has changed throughout history, and the pressures of urbanization pushed city walls further out, eventually tipping them down and reusing their place. In many cities, these walls still stand, but without their original everyday function. At the same time, the natural need for an enclosure, a sense of protection and defensibility, persists, not at the level of the whole city, but rather the level of a neighbourhood, block, plot, house, or apartment (Minton, 2009). Therefore, the enclosure or at least the demarcation of a territory is both a historical and a contemporary phenomenon. As a consequence, the areas of cities are socially and spatially segregated, reflecting specific economic, educational, and other differences and culture (e.g., medieval castles or ghettos in European cities, or contemporary gated communities, business districts, etc.). Some of the current developments tend to work again to this division, but most projects only recreate or reinforce them. The smallest unit of boundaries is linked to the protection of private property. In general, the boundary between different owners' land is built elements providing physical, visual, or mental limits: e.g., high closed walls, translucid, transparent or green fences, low hedges of indicative value, or even changes in the pavement, which all fragment the urban space.

Types of boundaries

Following the classical urban morphology, we talk about the boundary elements of urban areas, defined by natural, infrastructural, property (social), and architectural facts (Pinon, 1991). Their sequence also reflects temporality: the large-scale natural environment is in most cases unchanged in the long term; the infrastructural elements are the result of main state investments, and generally, they reuse the lines of the past; property relations are related to the geographical and infrastructural conditions, and they already change more rapidly (e.g., in post-socialist countries, nationalisation and privatisation redrew the land property system twice in the second half of 20th century). Architecture – buildings and urban space among them – should use these three previous boundary types as clear preconditions.

Natural border

In many cases, cities were created at the crossroads of different natural areas, taking advantage of natural border situations. The historical development of Budapest reflects this phenomenon well. The Romans used the Danube as the Limes of the Empire and built their cities only on the right bank. In the Middle Ages, both sides were already inhabited: Pest occupied the plain and the river, Buda the hills and the river's edge, and their existence was based on mutual trade based on the control of the passage across the Danube. The river, hundreds of metres wide, also acted as a solid natural boundary, isolating the two cities. Therefore, before the first permanent bridge (1849) and the unification of the cities as Budapest (1873), the river also functioned as an administrative border. Today, eight bridges connect the two banks, but the mental map of the city's inhabitants still shows a strict differentiation between Buda and Pest.

Infrastructural border

Building, strengthening, and operating transport links with the surrounding settlements is the driving force of the city's development. Urban infrastructure lines, such as railways, highways, and multi-lane main roads fragment every city. They are essential elements of the urban network that are necessary for providing rapid transport, but they cut through existing neighbourhoods for kilometres. Between the separated sides only a few problematic passages (elevated, underground, polluted, etc.) provide some connections. It is no coincidence that the design of these infrastructural nodes is defined as fluid space, reflecting the flow of vehicles (Jerković-Babović *et al*., 2020). Nevertheless, the provision of pedestrian and cycling passages within cities is a crucial urban acupuncture tool (Lerner, 2016; Apel-Muller, 2018). In addition, contemporary, large-scale urban regeneration programmes also try to change and humanize inherited transport-based infrastructures.

Property and social border

Spatial and social segregation has always been found in cities. Inner walls within protected cities appeared as conscious segregation, achieved by the spatial demarcation of the ruling class in both Western (e.g., castles, palace complexes) and Eastern (e.g., Beijing's Forbidden City) culture throughout history. In addition, the first gated communities appeared at the beginning of the 20th century, and today, real estate development based on broadly understood security (economic, social, natural, etc. components) has become a common feature of new investments worldwide (Kovács and Hegedűs, 2014; Benkő, 2017). Controversially their residents and workers are constantly using other parts of the city, because the gated area provides only the desired security, novelty value, and protected housing or a protected workplace, with open space that goes with it, but nothing more. In the ever-growing metropolises of Asia, South America, and Africa, global real estate development has also turned urban development generally into a private affair. The city within a city concept is based on vast real estate, creating neighbourhoods isolated from their surroundings. New developments are being built further and further away from the centre, sometimes creating not only gated communities, but gated cities with housing, jobs, educational institutions, and shopping, and leisure centres. The urban form follows modern open block patterns, but the first step in construction – as in ancient and medieval town foundations – is the creation of a defensive wall (or impenetrable fence) and controlled gates. By contrast, the Downtown Dubai project (Firley and Grön, 2013), a 200-hectare city centre built between 2004 and 2013, is surrounded not by walls but by highways. It gives the appearance of a modern form of openness, but in reality, the Downtown Dubai project is a contemporary private world based on surveillance and discipline.

Urban form borders

In addition to the boundaries given by nature, infrastructure, and property, buildings and their urban forms impose physical and visual urban boundaries. In historical European city centres, enclosed blocks form explicit, continuous walls of space. The boundary between public and private space coincides with the walls of buildings, or transitional space between public urban space and private interiors (Benkő, 2020). In contrast, in modern housing estates, building masses are free-standing in open space, and the built form is independent of both the street and the property system. Most contemporary developments combine the architectural advantages of modern free-standing buildings with the legibility and the controllability of traditional block structures drawn by fences. In these situations, the public realm is present exclusively outside the development blocks as in the historical patterns. Nevertheless, in inherited modern housing estates, at least in most post-socialist countries, the spaces between buildings are still public. The urban blocks function as a continuous public green park with solitary residential slabs and towers.

Qualitative spatial categories of urban borders

The abandoned, underused, and under-managed public spaces of cities have been the subject of increasing attention in urban studies since the 1960s. Jacobs' (1961) *border vacuums*, Trancik's (1986) *lost space*, and Koolhaas' (2002) *junkspace* designations are similar neglected urban spaces, and several other notions have also been introduced e.g. *residual space, urban wastelands, terrains vagues, dead zones, no man's lands, vacant lands* and *liminal space* (Mariani and Barron, 2014). Carmona (2010a, 2010b) summarizes *under-managed* space and describes several subtypes of different qualities. The qualitative dimensions of this type of urban space (Schneller, 2005) are increasingly dominant in theory, analysis, and assessment (Gehl and Svarre, 2013), because they are more and more dominant parts of contemporary cities.

The research highlights four theories. Jacobs (1961), a classic today, points out that large monofunctional units fragment the city, and that everyday communication and urban life cease to exist between the individual units. She states: "a border – the perimeter of a single massive or stretched-out use of territory – forms the edge of an area of 'ordinary' city. Often borders are thought of as passive objects, or matter-of-factly just as edges." (Jacobs, 1961, p. 257). In addition, it should be pointed out that border zones are often influenced by railway tracks, busy roads, highways, or large institutional and industrial premises (Douvlou *et al*., 2008). Thus, their boundaries are a kind of *dead zones*, or *urban vacuums*. Jacobs bases her findings on the American zoning system and sees the main problem in the endlessly spreading suburbs. However, the theory of the modern functional city (van Es *et al*., 2014) that became the background of post-war housing-estate developments all over the world, is based on spatial and functional division creating *border vacuums* on the edges of cities.

Trancik (1986), in addition to the *border vacuum*, identifies two additional types of spaces as *lost spaces* for users. The first is *in-human spaces* (underpasses, overpasses) caused by complex, intricate and multi-level transport systems. The second is cold, dirty, and abandoned public spaces created by the lack of ownership or a perceived sense of ownership of open space and the resulting lack of care (such as open spaces left in public ownership in former socialist housing estates). They are *no man's lands*.

To define the quality of public spaces in cities, Carmona (2010a) creates two groups, *over- and under-managed spaces*, and then breaks these down into further sub-groups. Among the five types of Carmona's *under-managed space categories* (*neglected, invaded, exclusionary, segregated, and third space*), the *neglected* and the *invaded* space are the most relevant for the analysis of urban boundaries.

Carmona's *neglected space* is similar to spaces that Trancik defines as *lost space*, but Carmona's viewpoint highlights its positive aspects. *Neglected space* is unused, abandoned, and undervalued, but that is why it could have community-building power (e.g., for subcultures) that we cannot find in *lost spaces*. For those users who are not accepted by the majority of the city (e.g., homeless people), these spaces represent a sense of calm and openness (Bene, 2020). For them, it is the space of the community (Worpole and Knox, 2007).

In contrast to *neglected space*, *invaded space* is an urban space that has been taken over by the increased car traffic of the 20th century, displacing pedestrians and separating drastically the two sides of a road. In addition to the land requirements of car traffic – passing or parking vehicles – *invaded space* imposes constraints and negative impacts (e.g., dirt, noise, visual pollution) on spatial experience that severely weaken ordinary urban life, or even make it impossible (Gehl and Gemozoe, 2001).

In addition, it is meaningful to explore the potential of transport nodes: namely, their liminality (Zukin, 1991; Shields, 1991; Sennett, 1990). *Liminal space* is used simultaneously and intensively by crowds of people from different social classes, ethnicities, religions, etc. Excessive use creates tension, but at the same time, it provides opportunities for encounters and communication.

Based on the literature overview, the research uses the following qualitative space categories to describe urban borders: *lost space* and its subtypes (*border vacuum, in-human space, no man's land*), *over- and under-managed space* and its subtypes (*neglected space, invaded space*), and *liminal space*.

METHODOLOGY AND CASE STUDY SELECTION

Methods

The research focuses on the borderlands of three residential areas in Budapest. Each of them can be considered relatively homogeneous from a complex urban planning point of view, in relation to their physical and social context. They are located close to the historical city centre, they are densely built-up, and are a kind of mega-projects of their construction period. Their dimensions are different, but they each represent one of 173 administrative units, in this case, the so-called "urban neighbourhoods" of contemporary Budapest. Újlipótváros is a product of the first half of the 20th century, a traditional grid in which the street network is filled with various closed-block patterns, József Attila housing estate is Budapest's first modern housing estate from the 1960s and 1970s, while Nádorkert is an example of contemporary large-scale real estate development (Figure 1 and Table 1).

The boundary zones of the three districts were assessed according to the boundary categories (natural, infrastructure, property, urban form) and spatial quality characteristics as described in the literature review. In addition to theory, the comparative analysis was based on SpaceSyntax analysis and fieldwork (mapping). The methods for the boundary categories used were mixed.

Figure 1. Map of Budapest with the three case studies.
1. Újlipótváros 2. József Attila housing estate 3. Nádorkert
(Source: made by authors using SchwarzPlan plan - schwarzplan.eu)

The *natural boundaries* were found on professional maps of the Budapest Green Strategy (Budapest, 2021) and they were easily visible and interpretable through observation of reality.

In the case of *infrastructure boundaries*, the integrity and segregation of the street network were investigated by SpaceSyntax analysis. SpaceSyntax makes it easier to see which parts of the street network are more connected to their surroundings and which are less, simply by their geometric design. The geometric design has a major impact on the quality of urban life – geometrically highly segregated areas attract insecure environments and segregated populations, while neighbourhoods around highly integrated streets are characterised by excessive car traffic and in-human spaces.

The *social boundaries* resulting from *property* ownership were analysed using a free online map based on the 2011 Hungarian census (KSH, 2013), which shows the income of the inhabitants of each neighbourhood on a 100x100m pixel scale. Using these economic and social factors, it was possible to infer whether a social boundary is drawn at the border of each neighbourhood.

In the case of *urban form borders*, the SpaceSyntax analysis was based on the open space between building masses and the fenced areas within them. The geospatial analysis in open space showed areas that are locally integrated (or segregated) by geometry. However, these data-driven maps only reveal the potential of the area, which does not necessarily translate into real spatial quality.

Study areas

Újlipótváros

Újlipótváros is one of the latest historical residential areas of Budapest. Located in the northern part of the city centre, its first development phase at the turn of the 19th and 20th century resulted in typical inner courtyard buildings following the traditional closed block pattern. At the beginning of the 1930s, the development continued with a new urban planning and architectural concept, following the theory of the Bauhaus School. The whole neighbourhood is characterized by an orthogonal, chessboard-like road network, closed urban housing blocks (with inner courtyards, joint-courtyards, or frame-like buildings), and highly structured, well-designed open spaces (Körner and Kissfazekas, 2022).

József Attila housing estate

The József Attila housing estate was built in the southern part of Budapest on the site of a former sprawling emergency housing settlement. After the demolition, the construction began in 1957, and József Attila housing estate became the first large-scale modern area in Budapest, composed of stand-alone cubes, slabs, and towers. In the state-socialist era, the land and the buildings were public. There is no more traditional urban structure, but a huge green park with an organically designed street network. A kind of spontaneity can be observed both in the urban morphology pattern and in the use of different types of building design (Gyergyák *et al*., 2017).

Nádorkert

In 2022, the whole of the Nádorkert neighbourhood has just been completed as BudaPart, a new mixed-used contemporary area in the southern part of Budapest. It is an international, market-based development with 3,000 flats, 250,000m^2 of offices, and 15,000m^2 of commercial space (Mizsei, 2017). Moreover, this investment is one of the largest housing developments in the capital since the change of regime in 1990. The master plan used typical contemporary solutions: transparent urban blocks with closed and continuous street lines and tower buildings, providing high-density, high-rise urban fabric.

RESULTS

Natural borders

Each of the three areas has one important natural border (Figure 1). While Újlipótváros and Nádorkert are located on the banks of the Danube River, the József Attila housing estate is protected by an urban forest lane, the so-called Kiserdő (Small Forest). The Újlipótváros waterfront is developed within the historic city centre, but a multi-lane motorway embankment separates pedestrians from the Danube. Therefore, the area can be defined as *invaded space*, but it is not a typical *under-managed space*. The pedestrian promenade follows the waterway, and on the side of the residential zone, the well-kept fenced parks from the 1930s provide green leisure facilities. The natural boundary of the József Attila housing estate is a forest which used to mark the former border of Budapest. Today, the forest is abandoned and unmaintained, and as a consequence, this *neglected space* is often used and inhabited by subcultures and homeless people. Nádorkert's waterfront is a brand new *over-managed space*, owned by a private investor but opened for public use. In addition, the Kopaszi-gát green zone, a high-quality river beach, was developed next to the new high-rise residential neighbourhood.

Infrastructural borders

On the maps showing the intensity of the road network, the best-connected roads are highlighted in white (Figures 2, 3, and 4). This implies that these roads are also the ones with the highest traffic volumes, creating invaded spaces. Three of the four border roads in Újlipótváros can be considered *invaded spaces* (the Danube embankment, the Great Boulevard on the southern border, and the main road running along the eastern side). The Great Boulevard and the eastern, main road are fully embedded on both sides. Therefore, they also function as *liminal spaces* – as evidenced by the functions they contain (shops, pubs, restaurants, offices). Because of a few under- and overpasses, the eastern border of Újlipótváros is full of *in-human space* (Figure 5). The József Attila housing estate is bordered by two radial arterial roads, the main road from the north and a highway access road from the south. The "protection strip" next to the highway creates a *border vacuum*, while the main road creates a *liminal space*. There is a multi-lane and multi-level infrastructure to the north of the Nádorkert, while to the west it is bordered by the main road. The northern and western boundaries are both lost space, but the northern boundary zone is also home to tents inhabited by homeless people, hence it is a *neglected space*.

Figures 2, 3 and 4. The road network of Újlipótváros, József Attila housing estate, and Nádorkert (Source: made by authors using DepthmapX)

Figure 5. Infrastructural border in Újlipótváros East (in-human, invaded, and liminal space) (Source: Authors)

The results reflect the morphological characteristics of the sites well: Újlipótváros, as a typical well-connected orthogonal grid; József Attila housing estate, as a large-scale island-like territorial unit within the city; and Nádorkert, as an isolated inclusion, with only a few entrances and a really weak connection with the road-network.

Property and social borders

The Hungarian Central Statistical Office prepared economic and social data-based open access maps using the 2011 census. These maps show the spatial division of the city into residential and non-residential areas. Then, the distribution of pixels of different shades within residential areas reflects its social composition. The historic city neighbourhood, Újlipótváros is heterogeneous, but the social border in the south side (near the city centre) is well visible. The omitted pixels reveal a largely uninhabited area on the eastern side that includes one of the main railway stations and one of the biggest shopping malls in Budapest. Although the negative effects of the railway tracks could affect this boundary zone, the plaza compensates for it (Figure 6). The map of the József Attila housing estate shows that it is surrounded by

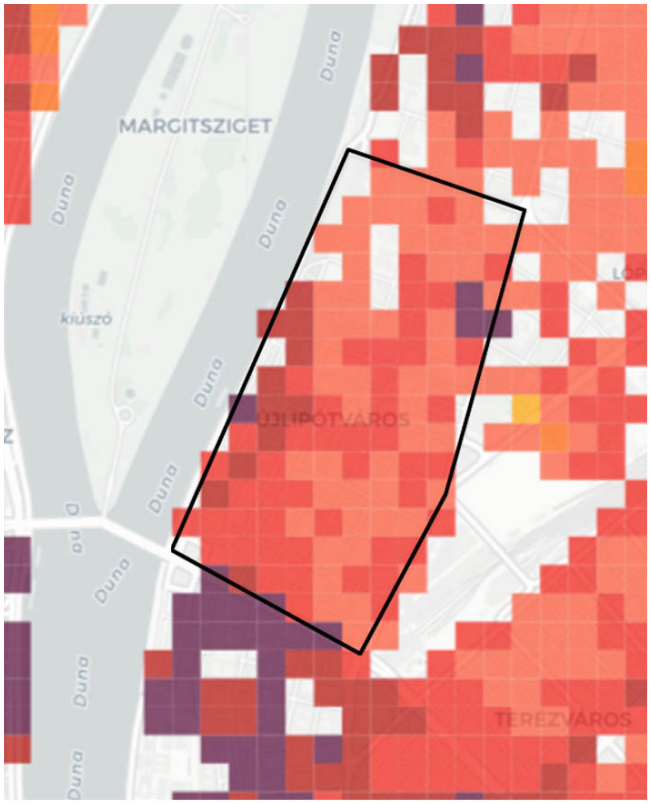


Figure 6. The income map of Újlipótváros lighter pixels mean lower income, darker pixels mean higher income (Source: https://geoxmap.carto.com/viz/fc6f49ac-d288-11e6-9805-0ee66e2c9693/public_map)

other functional inhabited land. Two areas (west and south) could be classified as *no man's land*, and the third is the forest mentioned above, a natural *neglected space* (east). In addition, this forest is not only a physical boundary but also a social one because the other side of the forest has a different shade to the József Attila housing estate. No data is available for the Nádorkert area, which was a former industrial zone, an undeveloped urban wasteland waiting for investments at the time of the 2011 census. Well defined by its natural

and infrastructural borders, its northern neighbour is a university campus, while to the west is a changing office area, and to the south, industrial land, a *lost space*.

Urban form borders

SpaceSyntax maps, built from the geometric shape of roads, show where local centres can develop. Újlipótváros as a whole has a balanced, unified spatial system, thanks to its orthogonal street grid. Three boundaries of the area (north, south, west) are of the same shade as the surrounding streets, while the eastern boundary is much lighter. It suggests that the eastern boundary may have a positive effect, acting as a *liminal space*. It is confirmed by the infrastructure map and the variety of functions attached to this street: a market, a church, a plaza, and shops. In the case of the József Attila housing estate, the importance of the public space in the centre of the district and the roads leading to it in terms of urban design is striking. Looking at the boundaries of this area, the south part is darker (which reinforces the presence of the adjacent *border vacuum*), while the lightness of the north boundary indicates the strength of its liminality. Although it is true that many features are attached to this street, it is still an *under-managed space* due to the nature of the multi-lane arterial road. No localised densification is observed in the area of Nádorkert. More important spatial connections have developed in its surroundings, making this area a quiet, segregated unit without a centre. Of its boundaries, only the location of the western main road is whiter than its surroundings. Therefore, it would be an ideal location for integrated functions, but at present, it is still only enclosed office space and space dominated by cars. It has the potential to transform into a *liminal space*, although right now it is more of an *invaded space* (Figures 7, 8, and 9).

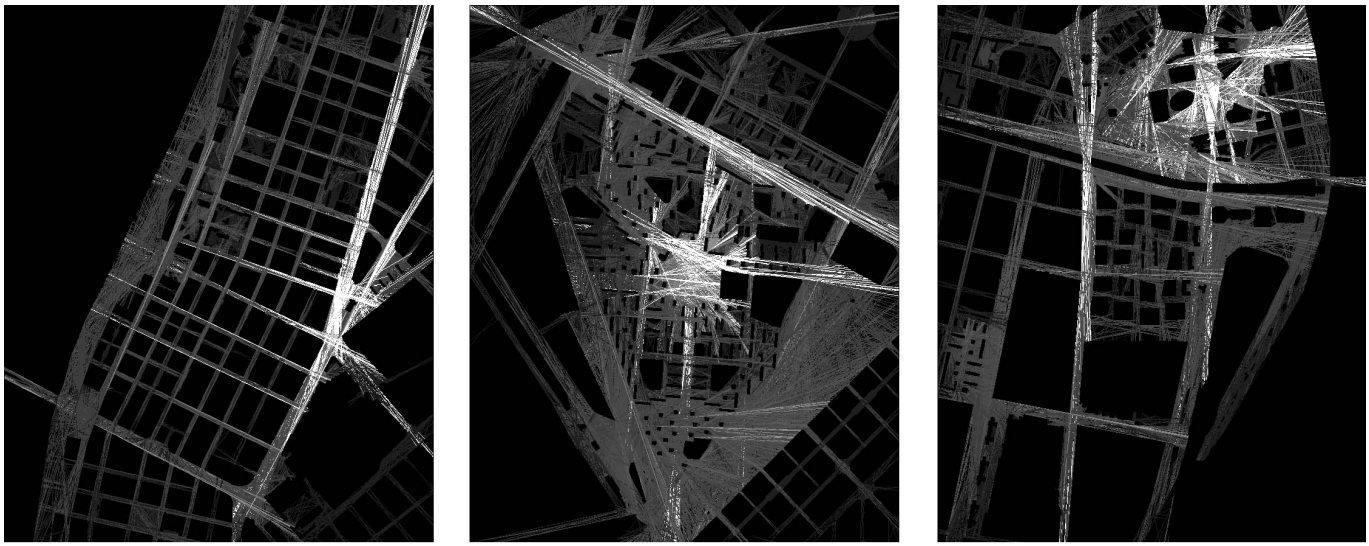
Comparison of the borderlands

To summarize the results, the table shows the relevant data, including the type and quality of the boundaries for each area (Table 1). After examination of the 12 boundary zones, most of them (10/12) could be characterized as negative qualitative units of the city (*under-managed, neglected, invaded, lost space, border vacuum, in-human space*, or *no man's land*). As an exception, Újlipótváros-North cannot be considered an urban boundary. Although the administrative boundary is located there, no special natural, infrastructural, social, or architectural boundary has been established. In addition, Nádorkert-East is an over-managed boundary with a high-quality riverbank. Overall, the border zones of the study areas are under-represented, poorly functioning, and insufficiently integrated. While the presence of urban boundaries is universal and necessary for social safety and controllability, their form, design, and quality largely determine whether they contribute to the social and psychological safety of urban users and are fit for human use (Lynch, 1984). Unfortunately, edges are formed between the different urban forms, reinforcing the patchwork structure of Budapest. In order to develop an organic, liveable, and usable urban fabric, these areas need to be redefined and put on a human scale.

DISCUSSION AND CONCLUSION

The research is based on the quantitative and qualitative analysis of the urban boundaries in three urban residential neighbourhoods of Budapest's urban core, completed in different periods. Although the three sites under study (historical, socialist-modern, and contemporary) are characterised by different spatial and socio-cultural contexts, it can be said that the presence of urban boundaries is a key feature of them. The borderland should function as a liminal space connecting and separating the neighbourhoods, but in most cases, it can simultaneously be classified as residual space.

For example, the position of the major linear urban infrastructures (highways, railways) often has a negative impact on the land value, provoking not only spatial but also social segregation. These lines create multidimensional, sharp boundaries within the city, which act as a kind of invisible wall breaking the organic, inclusive, open, and people-centred system of the city. However, these liminal spaces have particular spatial characteristics. The research proved that the urban boundaries at the edges of the mainly



Figures 7, 8 and 9. The open space maps of Újlipótváros,József Attila housing estate, and Nádorkert (Source: made by authors using DepthmapX)

Table 1. Summary of the three case studies: basic data for the three housing areas and the spatial quality of their borderlands (Source: www.ksh.hu)

Policy unit/name of Budapest's neighbourhood		**Újlipótváros**	**József Attila Housing Estate**	**Nádorkert**
Population 2011		36888	12748	planned 5000
Name of the analysed housing areas		Újlipótváros	József Attila housing estate	Budapart
Dimension		125 ha	100 ha	30 ha
Dwelling units		23294 (2011)	8524 (2011)	3000 (2021)
Dwelling density/ha		186	85	100
Construction period		1876-1940	1957-1981	2014 onwards
Architectural style		late historicism & Bauhaus	modern large housing estate, partly prefabricated	contemporary development
Property system (2022)		by plot	private plots within the public land	by block
Urban fabric		enclosed urban blocks, each block consists of 6-20 different plots with one building	open blocks, green park with stand-alone buildings	transparent block with closed ground floor and towers
Density		middle-rise/high density	middle-rise/high density	high-rise/high density
Technology		traditional (masonry, bricks)	industrial technology (partly prefabricated)	reinforced concrete
Open space		traditionally structured and well-formed	continuous public open space	well-structured and limited
Private outdoor space of the residential buildings		inner courtyards of a building or of a block	no private or semi-private outdoor space	inner courtyards of the block
Urban boundaries		N=Natural, I=Infrastructural, P=Property and Social, U=Urban Form		
North	Type	no border	I + U	I
	Quality	no border	liminal/under-managed	lost/neglected
East	Type	I + P + U	N + P	N
	Quality	liminal/invaded/in-human	neglected	over-managed
South	Type	I + P	I + P + U	P
	Quality	liminal/invaded	no man's land/border vacuum	lost
West	Type	N + I	P	I
	Quality	invaded	lost	lost/liminal

homogeneous residential neighbourhoods are generally grouped into negative qualities. However, the original goals were different, because in the pre-modern period, the traditional urban grid (Újlipótváros) was intended to create a unified network for the city, meanwhile, the borderlands of the modern (József Attila housing estate) and contemporary development (Nádorkert) were shaped to create introverted neighbourhoods. But the results are the same, and nowadays, their borderlands are characterised by desolation (lost space, urban wasteland), deprivation of property (no man's land), the excessive appearance of infrastructure, and occupation of human spaces (invaded space). In addition to the negative connotations, it is necessary to highlight the potential of borders as breeding grounds for subcultures, or the more and more relevant role of natural borders (waterway, forest) within the contemporary city. Overall, apart from a few positive examples, the boundaries of the study areas are under-represented and under-managed, and their spatial quality is inferior to their inner parts.

Nevertheless, the study highlights the importance of urban boundaries in planning and design to ameliorate the everyday experience of urban users. Several questions can be raised on this issue, which may have implications for future urban use and development. How can we live in our patchwork cities if most of the boundaries of the neighbourhoods, even in the urban core, are invaded or neglected space? How can we develop these un-formed borderlands in the future to provide a more human-centred and ecological urban environment? How can we influence urban policy and real estate to understand the importance of the transformation and the maintenance of borderland zones? Moreover, how can we work against spatial and social segregation in fragmented cities?

While the research does not aim to provide simple answers to these complex questions, perhaps one point could be highlighted about new investments and the rehabilitation of existing elements. A global trend is that more and more investments are being characterised as brownfields, redefining an area within an existing urban framework. Much more effort needs to be invested in the planning stage to ensure that new developments become living parts of the city rather than a brand-new patch within it. Consequently, it would then be more likely to fit in with existing natural, infrastructural, social, and urban form by reusing urbanised residual spaces. Therefore, in addition to adapting to the existing system, there is a great opportunity for these projects to rewrite the urban framework, erase and refine boundaries, and create more liveable, human-centred, environmentally conscious, and responsible border zones.

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