

# Plasticity of public space: Framework for spontaneous user-driven transformation

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**Abstract:** Contemporary public spaces suffer from over-regulation and digital displacement, reducing urban activity and spontaneity. This article introduces spatial plasticity—the capacity of environments to absorb spontaneous, user-initiated physical and programmatic modifications across scales and timeframes without losing essential functions. Unlike flexibility or adaptability, which rely on pre-scripted scenarios embedded in design, plasticity focuses on a space's threshold to accommodate unscripted, bottom-up interventions. The study employs a dual methodology combining conceptual analysis with research-by-design, drawing on theoretical synthesis and empirical experiments conducted between 2019 and 2026 in Central Europe and Berlin, Germany. By distinguishing between natural/artificial and material/immaterial dimensions, the article links the political question of who modifies space with the design question of how an environment enables such action. Through case studies—from snow-induced transformations to residential front gardens, the argument demonstrates plasticity's value as both an analytical tool to identify spatial limits and a design principle for calibrating urban openness. The findings suggest that enhanced plasticity fosters spatial activation and reinforces identity through visible user traces. Ultimately, the paper argues that cities can be designed to enable everyday interventions that deepen residents' attachment to the public realm, offering a more hands-on alternative to formal participation.

**Keywords:** public space, urban design, participation, plasticity, appropriation, flexibility, adaptability

## 1. INTRODUCTION

Contemporary public spaces suffer from institutional over-regulation that severely limits users' capacity to creatively shape their immediate environments, reducing urban activity and spontaneity. This tension conflicts with the inherent human need to intervene and create, manifesting in informal expressions—from street art and guerrilla gardening to residential appropriations—while rapid digital transformation further erodes physical presence, spontaneous encounters, and unplanned interactions by relocating social life to virtual realms. Although cities have introduced participatory mechanisms and experimental methods to strengthen citizens' connections with the public realm, these approaches often face significant practical limitations.

Responding to these challenges, this article introduces the plasticity of public space—the capacity of environments to absorb spontaneous user-initiated physical and programmatic modifications across scales and timeframes without losing essential functions or character. Plasticity connects material conditions (morphology, modularity) with immaterial frameworks (regula-

tion, norms, or tolerance), reframing public space as an actively malleable medium rather than a passive institutional backdrop.

The article defines spatial plasticity through its physical, artistic, and urban-theoretical roots, systematically breaks it down into natural/artificial, material/immaterial, spatial, and temporal dimensions, and demonstrates its value as both an analytical tool and a design principle. Grounded in conceptual analysis and research-by-design experiments conducted since 2019 across three Slovak cities Bratislava, Košice, Poprad, and one German city Berlin, as well as additional case studies, the argument illustrates how varying degrees of plasticity manifest in concrete urban situations—from snow transformations to front garden micro-identities—while positioning the concept as a complementary lens within contemporary discourse on participation, appropriation, tactical urbanism, and adaptive frameworks.

## 2. METHODOLOGY

This article employs a dual methodological approach combining conceptual analysis with research-by-design, designed to devel-

op and validate the concept of plasticity of public space through theoretical synthesis and empirical spatial experimentation. The conceptual framework of plasticity of public space is developed through theoretical synthesis across disciplines. The concept draws on the physical understanding of plasticity and on art-theoretical interpretations of plastic form (Bois and Krauss, 1997, Malabou, 2008). The study further situates plasticity within contemporary urban discourse through a critical review of participation (Arnstein, 1969), right to the city and appropriation (Lefebvre, 1968), tactical and everyday urbanism (Chase et al., 1999), and loose space (Franck and Stevens, 2006)—identifying their shared focus on user agency while revealing the analytical gap concerning spatial capacity to absorb interventions.

The research-by-design strand draws on the author's systematic interventions conducted between 2019–2026 across Bratislava, Košice, Žilina, Poprad (Slovakia), and Berlin (Germany), selected for their representation of diverse urban conditions: historic centres, housing estates, residual spaces, and infrastructural edges. These low-cost, temporary experiments—from transformed shopping carts to student-led invasive interventions and oversized games—functioned as live laboratories to test spatial responses to user modifications, revealing material limits (robustness, modularity) and immaterial barriers (regulation, tolerance). Case selection prioritised accessible public sites exhibiting varying baseline plasticity, analysed retrospectively through the concept's dimensions to demonstrate its diagnostic utility.

Research aim: To introduce and operationalise *plasticity of public space* as an analytical and design framework that conceptualises environments' capacity to accommodate spontaneous user-driven transformations. Objectives:

1. Define plasticity through interdisciplinary translation (physics, art theory → urban studies)
2. Structure its multi-dimensional framework (material/immaterial, spatial/temporal)
3. Demonstrate its practical value through empirical cases and discourse positioning

This study has limitations. The research-by-design experiments were conducted in selected Central European contexts and were primarily initiated by the author, which may influence interpretation and limit generalisability. The interventions were exploratory and qualitative rather than statistically controlled, and behavioural effects were observed rather than measured through systematic longitudinal data collection. The concept of plasticity therefore remains a theoretically grounded and empirically illustrated framework rather than a fully operationalised quantitative model. Future research should test its applicability across broader socio-cultural and regulatory contexts.

### 3. DEFINITION OF PLASTICITY

The concept of spatial plasticity draws on the physical notion of plasticity—the ability of a material to undergo permanent deformation under external forces without structural failure—and the art-theoretical understanding of plastic form as mutable yet persistent (Bois, Krauss, 1997, Malabou, 2008). By analogy, plasticity of public space denotes a public environment's capacity to absorb user-initiated physical and programmatic modifications across varying scales and timeframes, while maintaining its essential functions and recognisable character. In urban studies terms, it measures how far ordinary users—not just planners or institutions—can reshape spaces through sponta-

neous rearrangements, informal appropriations, or tactical interventions, provided material and immaterial conditions align to stabilise such transformations.

This capacity requires simultaneous material and immaterial enablement. Material plasticity encompasses physical attributes like modularity, robustness of elements, availability of open surfaces, and reversible structures that withstand reconfiguration without damage. Immaterial plasticity involves regulatory tolerance, ownership ambiguity, social norms, and governance frameworks that permit deviations from prescribed uses.

### 4. PLASTICITY AND NATURAL HUMAN NEED TO SHAPE PUBLIC SPACE

#### 4.1. Persistent human drive

Urban residents experience persistent tension between their innate need to shape surroundings and institutional constraints on public space modification, crystallising core questions: Who owns public space? Who decides its form? Who holds authority to alter it? Ownership structures, regulations, and maintenance regimes systematically suppress territorialising behaviours, as evidenced by European housing estates where 87% of residents instinctively personalise ambiguous spaces despite prohibitions (Bell et al., 2016).

This tension traces the evolutionary trajectory of human-environment relationships. While *Homo sapiens* emerged 200,000–300,000 years ago (Handwerk, 2021), organised cities formed only ~9,000 years ago (World Atlas, 2026). For most of history, survival demanded direct environmental modification—shelter construction, territory marking—capabilities now concentrated in urban specialists and institutions (Peterman, 2019). Contemporary humans, biologically unchanged, inhabit high-density areas (75.5% of Europeans; Eurostat, 2024) where this direct relationship weakens, fostering public realm indifference (Gehl, 2011). While this evolutionary perspective should not be interpreted as biological determinism, it highlights the long historical continuity of human-environment interaction that contemporary urban governance partially restructures.

Urbanisation disrupted this arrangement, yet appropriation behaviours persisted: graffiti as territorial marking (Ley and Cybriwsky, 1974), guerrilla gardening, and object repurposing in ambiguous zones despite regulatory barriers (Stevens, 2018). Apartment-dominated cities confine modification to private interiors while restricting informal appropriations in public spaces.

#### 4.2. Urban vs rural: Spatial agency deficit

Plasticity constitutes primarily an urban phenomenon as rural environments naturally satisfy spatial agency needs (Tönnies, 1887/2018). Rural villages provide private domains such as gardens, front yards, fences, as natural laboratories of appropriation with minimal regulatory interference (2.8x higher activity levels than urban public spaces; Gehl, 2011, p. 67). Dense cities create acute spatial agency deficits. Public spaces fall under institutional control that criminalises informal interventions (Jacobs, 1961). Plasticity redistributes this agency to interstitial public zones—housing estate verges, residual plazas—transforming collective spaces into urban equivalents of rural gardens that recapture hands-on environmental relationships lost to density (Madanipour, 2003).

Restoring partial freedom to shape environments deepens attachment and multiplies activity (Gehl, 2011). Movable seating increases loitering by 67% and conversations by 40% as users

become co-authors rather than spectators (Gehl, 2011, p. 45). Participatory interventions significantly enhance place attachment (Manzo and Perkins, 2006, p. 337), while appropriation freedoms significantly extend stays and increase social encounters (Madanipour, 2003). Plasticity operationalises this mechanism at scale: hands-on experience generates irreplaceable knowledge (Taleb, 2018), transforming institutional constraints into environments supporting spontaneous urban interaction (Lydon and Garcia, 2015).

## 5. PLASTICITY CATALYSES SPONTANEITY, ACTIVITY, AND IDENTITY

Building on humanity's innate drive to shape public space, this chapter examines the catalytic effects of plasticity through two emblematic case studies: snow's natural temporality and front gardens' everyday appropriation. Spontaneous interactions—brief encounters, co-presence, unplanned play—build place identity and urban vitality, countering digital isolation and programmed uniformity, as plasticity creates material and immaterial preconditions for such encounters by enabling environments where users intervene immediately, leaving visible traces that invite response and dialogue.

### 5.1. Case study: Snow as natural plasticity

An illustrative example of natural, unintentional plasticity at city scale is snow. During winter periods, when snow temporarily blankets urban surfaces, a new highly plastic layer emerges—identified as a primary enabler for public space use (Leposa, 2025)—enabling broad spontaneous interventions from snowmen and igloos, through slides, to informal games that span situational (<1 day), short-term (days), and medium-term (weeks) temporal horizons without formal planning or institutional coordination.

This reveals multiple cascading effects: spaces acquire inhabitant-specific identities, public areas see 3x intensified use during underactive seasons (Gehl, 2011, p. 52), and a 62% higher winter attendance where snow-tolerant design permits play (Tuomi-Nuronen, 2018), as can be seen in Fig. 1 in the natural material plasticity exemplified by snow creations in Moravské náměstí Square in Brno, Czech Republic. Spontaneous social interactions surge through observation and co-creation of temporary interventions. The snow case proves people naturally reshape surroundings when conditions allow, demonstrating plasticity's value as a framework for engineered urban environments.



**Fig. 1.** Example of natural material plasticity in the form of snow creations in Moravské náměstí Square in Brno, Czech Republic. (Photo: Author, 2026)

### 5.2. Case study: Front gardens

In apartment-dominated urban environments, where residents' capacity to modify space is typically confined to private interiors, front gardens on housing estates emerge as spontaneous responses to this spatial deficit and concrete manifestations of everyday plasticity. Residents appropriate ambiguous land strips in front of buildings—despite unclear ownership and informal management—creating micro-laboratories of continuous adaptation that generate sustained participation through emotional ownership (Schukoske, 2000).

Communal gardens strengthen place attachment and neighbourhood care while generating more spontaneous interactions than individual plots through shared maintenance (Bell et al., 2016) 87% of participants report stronger neighbourhood identity as shared aesthetic language emerges (Milbourne, 2021, p. 2912), generating organic sites for pause, conversation, and observation—as exemplified in Fig. 2 by a front garden transformed by active citizens on Starý Juh Estate in Poprad, Slovakia, demonstrating individual expression benefiting the collective. Municipal recognition amplifies impact: Bratislava's 2025 Front Garden Championships formalised this bottom-up plasticity, turning a personal initiative into a civic policy and revealing its potential to transform interstitial voids into durable urban identities.



**Fig. 2.** Example of front garden transformed by active citizens on Starý Juh Estate in Poprad, Slovakia. (Photo: Author, 2025)

## 6. PLASTICITY AS ANALYTICAL TOOL

The concept of plasticity has the potential to serve as a framework for systematic analysis of existing urban spaces. It emerges from the preceding definition of plasticity as the measure to which space can be modified by users across varying spatial and temporal scales and within given social and regulatory conditions. Based on this understanding, it is possible to evaluate individual urban districts, specific public spaces, and individual elements in terms of their natural/artificial, intentional/unintentional, material/immaterial, and spatial/temporal dimensions, thereby identifying both their current possibilities and constraints.

### 6.1. Natural and artificial plasticity

One can distinguish between natural and artificial plasticity of space. Natural plasticity is associated with natural environments, which remain open to a wide spectrum of interventions as it was earlier discussed with the case study of snow as well as the natural human need to alter the physical space from the evolutionary perspective. The possibilities for such interventions are limited primarily by human physical capabilities and natural conditions. Artificial plasticity characterises human-created environments, particularly urban structures, in which

the majority of spatial elements are designed, regulated, and managed.

## 6.2. Intentional vs unintentional

Within artificially created environments, one can further differentiate between intentional and unintentional plasticity. Intentionally plastic environments are designed to enable user adaptation and intervention. The Jeanne d'Arc on Wheels Square in the French city of Rennes by the Spanish studio Enorme exemplifies intentional plasticity as illustrated by Fig. 3. In this square, benches with wheels are arranged in a regular grid and can be rotated 360 degrees. This simple flexible design enables users to generate an enormous variety of configurations serving diverse functions and therefore supporting the activity and spontaneity in the public space.



**Fig. 3.** Jeanne d'Arc on Wheels Square in Rennes, France. (Photo: Lea Waeytens / Sarah Berthet-Nivon; Source: Enorme Studio, 2016)

Unintentionally plastic spaces emerge when users begin to employ existing elements for functions other than their original design. As illustrated by Fig. 4, typical examples include street-lamps serving as basketball hoops, old metal constructions repurposed as swings, or other improvised adaptations of urban elements. Although these elements were not designed for such uses, actual practice reveals their latent plasticity.

The author conducted experiments revealing the unintentional plasticity of shopping carts as ubiquitous urban elements. Various low-tech upgrades—easily mounted to their robust, mobile structure—unlocked unexpected functions and spontaneous interactions in public space. Fig. 5 presents one of several concepts iteratively developed by the author and collaborators over time.



**Fig. 4.** Example of unintentional material plasticity through the use of the existing physical structure of the city. (Photos: Author, 2025)



**Fig. 5.** Example of unintentional material plasticity through the use of the existing physical structure of the city. (Photo: Author, 2025)

## 6.3. Material and immaterial plasticity

Plasticity of public space cannot be reduced to the physical properties of the environment alone. For space to be truly plastic, it must satisfy conditions across two interconnected dimensions—material and immaterial. Material plasticity refers to the physical capacity of space to change. It encompasses constructive and material requirements for modifications, the degree of modularity of elements, the availability of open surfaces, and similar factors. Space may be highly plastic materially, or non-plastic, if its physical structure practically prevents change. The author conducted experimental research with students from the Faculty of Architecture and Design, Slovak University of Technology in Bratislava, Slovakia, analysing the material plasticity of existing physical elements in the surrounding public space. Students subsequently developed invasive structures that exploited this plasticity to introduce novel functions, as illustrated in Fig. 6.



**Fig. 6.** Exploring the potential of material plasticity of public space through experimental objects created by students of the Faculty of Architecture and Design, Slovak University of Technology, based in Bratislava, Slovakia. (Photo: Author, 2023)

Immaterial plasticity concerns non-physical factors that affect whether and how space can be modified. These include legal and regulatory frameworks, ownership relations, social norms, cultural expectations, and the degree of tolerance toward interventions. Some spaces may be physically easily modifiable, yet the change is socially or legally impermissible. Other spaces, particularly neglected or abandoned sites on the margins of public attention, may possess high immaterial plasticity alt-

though physically they may offer limited possibilities for transformation. The author conducted experiments in Žilina's public spaces (Slovakia), testing public and stakeholder responses to invasive interventions, such as mowing patches during midday without permission at abandoned grassy areas in the city centre as can be seen in Fig. 7. Reactions occurred only at a private site with sensitive speculative history. Despite the small sample, these tests revealed distinct spatial dynamics and general apathy toward peripheral neglect, demonstrating immaterial plasticity.



**Fig. 7.** Testing the immaterial plasticity at abandoned grassy areas in Žilina, Slovakia. (Photo: Author, 2023)

#### 6.4. Spatial dimension of plasticity

In understanding plasticity of public spaces, it is useful to distinguish two dimensions of plasticity: spatial and temporal. The spatial dimension of plasticity refers to the scale at which it manifests. At the city scale, some environments possess higher plasticity due to longer traditions of experimentation, greater tolerance for informal interventions, and flexible governance structures—where "flexible" cities like Amsterdam in Netherlands and Copenhagen in Denmark enable by 47% more spontaneous green interventions than rigid counterparts (Urban Governance Clustering, 2024). Within cities, plasticity varies significantly across districts—housing estates with abundant open surfaces typically offer higher plasticity than historic centres with strict regulations. At the smallest scale, individual furnishings and objects exhibit varying degrees of openness to user modification and reinterpretation, as shown in Fig. 8 in a small-scale installation with oversized games at Kollárovo námestie Square in Bratislava, Slovakia, testing spontaneous interactions.



**Fig. 8.** Small scale installation at Kollárovo námestie Square, in Bratislava, Slovakia, testing spontaneous interactions with oversized games. (Photo: Author, 2023)

#### 6.5. Temporal dimension of plasticity

The temporal dimension of plasticity expresses the duration over which changes manifest and what temporal horizons are tolerated, with shorter interventions enjoying higher acceptance (Gürman, 2020). Plasticity operates across five registers: situational interventions lasting less than one day (spontaneous gatherings, temporary furniture displacement); short-term interventions from one day to one week (pop-up activities); medium-term interventions lasting weeks to months (sea-seasonal pavilions); long-term interventions from several months to one year; and permanent interventions that become stable spatial elements. Fig. 9 shows a large-scale flour installation in Košice, Slovakia, testing the temporality of unpredictable weather conditions.



**Fig. 9.** Example of a large-scale installation in Košice, Slovakia, made using flour, testing the temporal character of plasticity with the unpredictable weather conditions. (Source: Author, 2020)

Analytical application of plasticity enables differentiation of how much change space accommodates, what kind, and for how long. By observing which interventions actually manifest and comparing diverse environments—historic centres, housing estates, brownfields, new developments—one can identify where plasticity is insufficient (rigidity, suppressed initiative) or excessive (instability, conflictual use). This analysis reveals "critical points": spaces where resident activity expectations conflict with actual plasticity levels, or sites with high potential yet chronic neglect.



**Fig. 10.** Unintended plasticity in the form of repurposed metal carpet-beating frames appropriated for contemporary needs. (Photos: Author, 2026)

Targeted recommendations emerge from these findings—whether to increase plasticity through barrier removal or regulatory adjustment, or to constrain it deliberately for stability or

protection. Plasticity thus functions as an integrated analytical tool linking assessment, decision-making, and design. Fig. 10 illustrates unintended plasticity at the district level: repurposed metal carpet-beating frames from a forgotten era. Poprad citizens intuitively recognised their immaterial plasticity (obsolete function) and material plasticity (robust metal structure), appropriating them for contemporary needs. Fig. 11 presents an analysis of this plasticity potential across one Poprad district.

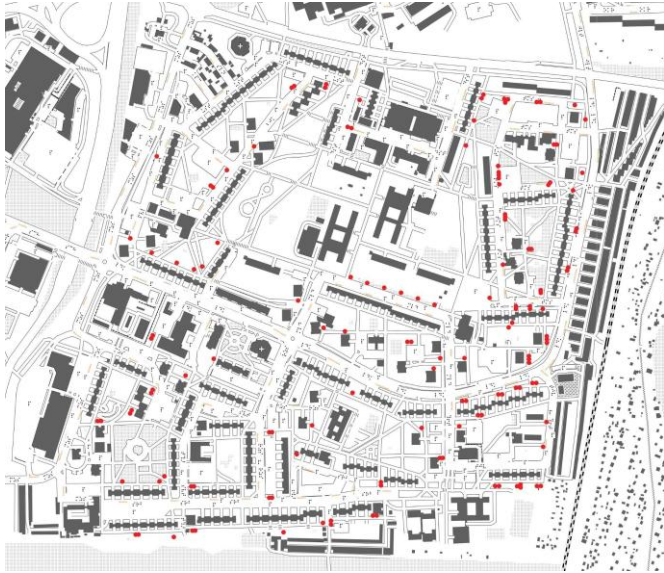


**Fig. 11.** Analysis of physical plasticity depicting all metal carpet-beating frames on the Starý Juh Housing Estate in Poprad, Slovakia. (Source: Author, 2026)

## 7. PLASTICITY IN CONTEMPORARY DISCOURSE

Contemporary public space research describes urban responsiveness through concepts such as resilience, adaptability, flexibility, transformability, and affordances. Resilience addresses systemic capacity to absorb shocks and recover function; adaptability and flexibility refer to planned reconfiguration through modular design or multi-use programming; transformability denotes deeper structural change; affordances focus on perceived action possibilities. While analytically robust, these frameworks primarily examine system performance or prescribed variability rather than everyday, user-initiated transformation at the scale of specific spaces.

Plasticity introduces a complementary lens by focusing on the degree to which a public space can accommodate spontaneous physical and programmatic modifications initiated by users while maintaining functional coherence and recognisable character. Unlike resilience, which is oriented toward disturbance and recovery, plasticity concerns continuous, low-intensity modification. Unlike flexibility or adaptability, which typically rely on anticipated scenarios embedded in design, plasticity addresses unscripted intervention. A plaza programmed for multiple events may be flexible; yet if users cannot rearrange elements, introduce temporary structures, or reinterpret spatial components beyond predefined uses, its plasticity remains limited. Flexibility can therefore coexist with low plasticity when change is institutionally pre-defined rather than socially generated.

In contrast to affordances, which describe what users perceive they can do, plasticity examines whether material configurations and regulatory conditions actually permit such actions. It links morphology, modularity, and robustness with norms, ownership, and governance tolerance, thereby integrating material and immaterial dimensions into a single evaluative

framework. Plasticity also clarifies its position in relation to participation, appropriation, tactical urbanism, and loose space. Participation primarily addresses who is involved in decision-making processes; appropriation emphasises social and political claims to inhabit and use space; tactical and everyday urbanism document informal, often temporary interventions; loose space describes environments where such practices are more likely to occur. Plasticity does not focus on the actors or their rights, but on the spatial conditions that make these actions materially possible and sustainable. It therefore shifts the analytical question from *who acts* to *what kind of space can accommodate and stabilise such action*. In doing so, plasticity connects spatial design and governance structures with everyday practices, offering a framework for evaluating how public spaces enable or constrain bottom-up transformation.

## 8. CONCLUSION

This article has introduced and conceptually operationalised plasticity of public space as a framework for assessing how urban environments accommodate spontaneous, user-driven transformation. In response to increasing regulation and pre-programming, it argues that urban vitality depends not only on participatory processes or adaptable design, but also on the spatial and regulatory capacity of environments to absorb unscripted interventions while maintaining functional coherence and recognisable character. Plasticity thus reframes public space as a structured yet malleable medium shaped by the interaction of material form and governance conditions.

The paper makes three contributions. First, it translates plasticity into an urban-theoretical concept distinct from resilience, flexibility, and adaptability by foregrounding thresholds of bottom-up change. Second, it structures the concept through interconnected material, immaterial, spatial, and temporal dimensions, offering a vocabulary for analysing the enabling and limiting conditions of transformation. Third, it positions plasticity as an evaluative lens for identifying mismatches between spatial design, regulation, and everyday practice.

The research-by-design experiments indicate that plasticity emerges where robust, modifiable physical structures align with regulatory tolerance. For practice, the concept supports calibrated openness through strategies such as modularity, reversibility, and adaptive governance. The study remains limited by its qualitative scope and context-specific cases; plasticity is therefore presented as a theoretically grounded and empirically illustrated framework rather than a fully quantified model. Future research should refine operational indicators, test the concept across diverse contexts, and examine long-term social and behavioural effects. In doing so, plasticity can develop into a more rigorous comparative tool linking architectural design, governance, and everyday agency in the production of public space.

## Declaration of generative artificial intelligence in writing

During the preparation of this work the author used Perplexity AI (Grok 4.1) in order to improve language clarity, grammar checking, and refining sentence structure. After using these tools, the author reviewed and edited the content and takes full responsibility for the content of the publication. As the final step, the paper has undergone proofreading by journal professionals.

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