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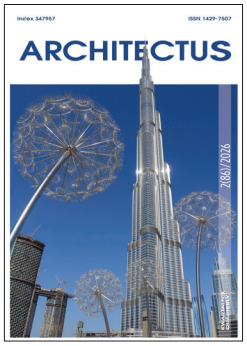
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Societal dimension of street furniture in European neighbourhoods

Abstract

Urban infrastructural decline, limited public amenities, and persistent safety concerns continue to affect many older and disadvantaged European neighbourhoods, with disproportionate impacts on vulnerable population groups. Although street furniture is often treated as a secondary component of public space, growing evidence indicates that it plays a significant role in shaping everyday social practices, accessibility, and perceived safety. This paper examines the societal dimension of street furniture and its contribution to quality of life in European neighbourhoods, with particular attention to inclusion, thermal comfort, and age-friendly use of public space. Based on an in-depth review of academic literature and selected European case studies, the analysis explores how contemporary street-furniture interventions influence patterns of outdoor use, social interaction, and perceived security. Shading and cooling elements are discussed in relation to documented surface-temperature reductions of approximately 2.6 °C, highlighting their relevance for improved thermal comfort, extended usability of outdoor spaces, and reduced heat-related risks for older citizens. The study further examines how accessibility standards, seating ergonomics, and lighting quality interact with these comfort effects to support safer and more inclusive neighbourhood environments. Participatory co-design processes are analysed as a key mechanism through which societal benefits are generated and maintained. Evidence shows that sustained engagement of residents and local stakeholders improves contextual fit, strengthens place attachment, and supports shared responsibility for public spaces. Situated within the values and principles of the New European Bauhaus, the paper frames street furniture as a social interface rather than a passive amenity and outlines directions for more systematic assessment of societal outcomes across diverse neighbourhood contexts.

Key words: street furniture, accessibility, social cohesion, climate resilience, participatory design, New European Bauhaus

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Introduction

Urban public spaces shape quality of life. In the context of this study, urban infrastructural decline refers to the progressive deterioration, obsolescence, or insufficient maintenance of neighbourhood-scale public-space infrastructure, resulting in reduced functionality, accessibility, safety, and user comfort. Ageing infrastructure denotes physical elements that remain in service beyond their intended design life or no longer meet contemporary technical, accessibility, environmental, or social requirements. In European residential districts, this condition is frequently manifested through deteriorated seating, inadequate lighting, inaccessible pathways, outdated bus shelters, degraded playground equipment, and insufficient climate-adaptation measures. Together, these deficits contribute to unequal access to public space and disproportionately affect older adults, children, and persons with disabilities (Carmona 2019). European neighbourhoods affected by ageing infrastructure and chronic underinvestment often experience declining public-space quality, reduced accessibility, inadequate thermal comfort, and increased perceptions of insecurity, all of which influence everyday patterns of social participation and outdoor activity (Carra et al. 2023).

Missing or degraded benches, lighting, ramps, signage, and other street furniture undermine accessibility, usability, and place identity; insufficient seating and lighting create hazards for vulnerable groups (e.g., poor nighttime visibility for pedestrians, barriers for persons with disabilities). Carefully designed street furniture improves comfort, safety, health, and inclusivity, while fostering social interaction, community cohesion, belonging, and respect for shared spaces (Bouman, Steg and Johnson Zawadzki 2020). European policy frameworks recognise street furniture as a catalyst for inclusive urban regeneration. The New European Bauhaus (NEB) promotes design solutions that integrate beauty, sustainability, and inclusion in everyday environments (European Commission 2025b). Although accessibility and social inclusion constitute the primary analytical focus of this paper, aesthetic quality is not treated as a secondary consideration. Following the NEB framework, beauty is understood as a contributor to human well-being, place attachment, cultural identity, and the overall quality of public space. Accordingly, aesthetic quality is considered throughout the analysis as a factor that reinforces social acceptance, community pride, and long-term stewardship of street-furniture interventions.

NEB guidance and Council conclusions emphasise participatory, multi-level, transdisciplinary processes, engaging public authorities, civil society, the creative sectors, and citizens throughout environmental design (European Commission 2025a). This paper investigates how street furniture contributes to inclusive neighbourhood regeneration through three interrelated dimensions: (1) accessibility and safety, (2) social cohesion and place identity, and (3) climate-responsive comfort supporting everyday public-space use. Particular attention is paid to the ways in which participatory design processes generate societal benefits consistent with the principles of the New European Bauhaus. It synthesises policy and procurement recommendations for embedding these insights in practice and outlines implications for future urban design and governance. The manuscript consolidates fragmented evidence concerning the societal role of street furniture in European neighbourhoods linking New European Bauhaus values to observable social outcomes. The study synthesises evidence from literature, policy documents, standards, and selected European cases to identify recurring relationships between design characteristics, participatory processes, accessibility measures, climate-responsive features, and reported social benefits. This approach supports a more systematic understanding of how neighbourhood-scale public-space interventions contribute to inclusive urban regeneration. Its contribution lies in a structured synthesis that links inclusion-oriented outcomes to design characteristics, participatory processes, and procurement-relevant considerations, thereby supporting more transparent comparison across diverse neighbourhood contexts. By bridging design theory, policy objectives, and measurable effects, the paper advances an integrated framework that responds to growing demands for evidence-based, transferable solutions in European urban regeneration practice.

State of research

Street furniture and public-space quality

Street furniture constitutes an important component of the physical environment through which public spaces are experienced, used, and socially negotiated. Although often treated as a secondary design element, contemporary urban studies increasingly recognize benches, shelters, lighting systems, wayfinding devices, playground equipment, and other small-scale interventions as forms of social infrastructure that shape everyday urban life. According to Jan Gehl (2011), the quality of public life in cities depends not only on major urban structures but also on the provision of comfortable, attractive, and accessible amenities that encourage people to remain in public space and engage in social activities. Similarly, Matthew Carmona (2019) argues that place quality emerges from the interaction between physical design, functionality, comfort, safety, and meaning, all of which contribute to social, environmental, and public-health outcomes.

Recent scholarship places street furniture within the broader concept of social infrastructure. Alan Latham and Jack Layton (2019) define social infrastructure as the network of physical spaces and facilities that enable social interaction, community formation, and collective life. From this perspective, street furniture performs functions that extend beyond utility, supporting informal encounters, rest, observation, and social exchange. Systematic reviews further demonstrate that well-designed public spaces create conditions for everyday interaction among diverse social groups, thereby strengthening social cohesion and neighbourhood resilience (Qi, Mazumdar and Vasconcelos 2024).

The importance of neighbourhood-scale interventions has become particularly evident in the context of urban regeneration. Small and medium-sized improvements to everyday public spaces are increasingly viewed as cost-effective mechanisms for addressing social isolation, enhancing quality of life, and supporting equitable access to urban ameni-

ties. Consequently, contemporary public-space research has moved beyond purely aesthetic considerations toward integrated evaluations encompassing social, environmental, behavioural, and governance dimensions.

Accessibility and universal design

Accessibility has become a central principle of contemporary public-space design, reflecting growing recognition of the diverse needs of urban populations. The transition from compliance-oriented approaches toward universal design has broadened the understanding of accessibility from barrier removal to the creation of environments that can be used safely, comfortably, and independently by the widest possible range of people regardless of age, ability, or socioeconomic condition. Within the European context, EN 17210:2021 represents an important milestone by establishing functional requirements for accessibility and usability across the built environment, including outdoor pedestrian and urban spaces. The standard is explicitly grounded in Design for All and Universal Design principles and promotes equitable access, independent use, and safety for diverse users CEN 2021 (European Commission 2021). Recent literature emphasizes that accessibility extends beyond physical mobility and includes cognitive, sensory, and social dimensions. A systematic review by Akshay Gupta, Madhura Yadav and Bibhu Kalyan Nayak (2025) found that successful inclusive public spaces combine universal-design principles with stakeholder engagement, contextual adaptation, and integrated planning processes. The authors argue that accessibility should be addressed throughout design, implementation, management, and evaluation rather than treated as a technical add-on.

For street furniture specifically, accessibility considerations encompass seating ergonomics, wheelchair manoeuvrability, tactile guidance systems, visual contrast, information accessibility, and age-friendly design. Research increasingly highlights the importance of seating availability for older adults, persons with reduced mobility, caregivers, and individuals with temporary impairments. Accessible street furniture therefore contributes not only to mobility but also to social participation, autonomy, and inclusion within neighbourhood life (Younes, Marques and McIntosh 2024).

Social infrastructure and neighbourhood cohesion

The relationship between public-space design and social cohesion has attracted growing scholarly attention in recent years. Public spaces function as settings where social bonds are formed, maintained, and reinforced through repeated everyday encounters. According to social-infrastructure theory, neighbourhood facilities facilitate trust, reciprocity, collective efficacy, and a sense of belonging, all of which contribute to community resilience and well-being (Latham, Layton 2019; 2022). Research demonstrates that social interaction is strongly influenced by environmental characteristics, including seating arrangements, spatial configuration, visual connectivity, and opportunities for informal gathering. Public spaces designed to accommodate diverse activities tend to support stronger patterns of interaction and social mixing. Jie Qi, Suvodeep Mazumdar and Ana C. Vasconcelos (2024), in a systematic review of urban public space and social cohesion, concluded that accessible and attractive public environments facilitate social encounters that contribute to community cohesion and collective identity. Within this context, street furniture can be understood as a form of micro-scale social infrastructure. Benches, communal tables, shelters, and multifunctional installations create opportunities for interaction while supporting passive forms of public life such as observation and co-presence. Evidence from environmental psychology further indicates that culturally meaningful and aesthetically distinctive elements strengthen place attachment by fostering emotional connections between individuals and their surroundings (Lewicka 2011). Consequently, street furniture contributes not only to functionality but also to neighbourhood identity, belonging, and stewardship.

Climate adaptation and thermal comfort

Climate adaptation has emerged as a major challenge for European cities facing increasing temperatures, more frequent heat waves, and intensified urban heat-island effects. Public spaces are particularly exposed to these pressures because they directly influence the comfort, health, and behaviour of urban residents. Consequently, thermal comfort has become a critical performance criterion in contemporary public-space design.

Recent reviews indicate that outdoor thermal comfort depends on multiple interacting factors, including solar radiation, shading, vegetation, surface materials, wind conditions, and water features. Among these variables, shading and microclimate-sensitive design interventions are consistently identified as some of the most effective strategies for reducing thermal stress and improving outdoor usability (Liu, Li and Xi 2023). The implications are particularly significant for vulnerable population groups, including older adults, children, and individuals with chronic health conditions. Increasing evidence suggests that thermal comfort influences not only environmental performance but also social outcomes by affecting dwell time, activity patterns, and willingness to use outdoor spaces. Public furniture incorporating shade structures, vegetation, cooling systems, or reflective materials can therefore contribute simultaneously to climate adaptation and social inclusion (Han, Jo and Kim 2023).

The growing integration of climate-responsive elements into street furniture reflects a broader shift toward multifunctional urban infrastructure capable of delivering environmental, social, and health benefits. This convergence aligns closely with contemporary European policy agendas promoting resilient, adaptive, and human-centred public spaces (European Commission 2025b; Altrock, Kurth 2024).

Participatory design and the New European Bauhaus

Participation has become a defining principle of contemporary urban governance and public-space design. Rather than treating residents as passive users, participatory approaches involve citizens and stakeholders in identifying needs, gen-

erating ideas, evaluating alternatives, and co-shaping urban interventions. Numerous studies indicate that participatory processes improve contextual fit, strengthen community acceptance, enhance legitimacy, and increase long-term stewardship of public assets (Moore, Evans 2020; Zamenopoulos et al. 2021). The New European Bauhaus (NEB) represents one of the most ambitious contemporary frameworks connecting participation, sustainability, and design quality. Launched by the European Commission in 2021, the initiative promotes the creation of places that are simultaneously beautiful, sustainable, and inclusive. Importantly, these values are supported by working principles including participation, transdisciplinarity, and multi-level engagement, thereby linking physical design outcomes with governance processes and societal transformation (European Commission 2025a; 2025b; Coujard et al. 2023; Woźniczka 2023).

Emerging NEB research emphasizes that participation should not be limited to consultation but should function as a continuous process of co-creation involving citizens, public authorities, designers, researchers, and civil-society organizations. Recent methodological frameworks developed for urban regeneration projects demonstrate that stakeholder workshops, local action groups, design charrettes, digital participation platforms, and living-lab approaches can effectively operationalize NEB principles in practice (Danilović Hristić et al. 2026).

Street furniture offers a particularly suitable domain for participatory experimentation because interventions can be implemented at relatively small scales while generating visible and tangible impacts. As a result, co-designed street-furniture projects increasingly serve as testing grounds for broader approaches to inclusive urban transformation. The literature therefore suggests that the societal value of street furniture depends not only on its physical characteristics but also on the participatory processes through which it is conceived, implemented, and maintained.

Methods

The study is based on a qualitative and analytical research design combining an in-depth review of the academic and grey literature with a structured analysis of selected European case studies. The literature review focuses on recent peer-reviewed publications, policy documents, and technical standards addressing street furniture, public space design, accessibility, safety, sustainability, and participatory processes. Particular attention is given to sources aligned with the New European Bauhaus framework and related European policy initiatives.

Scope of the study and typology of analysed street furniture

The study focuses on neighbourhood-scale street furniture understood as intentionally designed, publicly accessible physical elements supporting everyday use of public space. To establish a clear analytical scope, the examined objects were classified into four functional categories:

– Seating and resting infrastructure (benches, communal seating, shaded seating systems);

– Mobility-support infrastructure (bus shelters, bicycle parking facilities, wayfinding elements, charging points for micro-mobility);

– Environmental and climate-responsive infrastructure (shading structures, cooling installations, vegetated furniture, photobioreactor benches);

– Social and recreational infrastructure (playground elements, community tables, multifunctional public-space installations).

These categories were selected because they represent the most frequently discussed forms of contemporary street furniture within European accessibility, public-space, and New European Bauhaus literature while also covering the principal social functions investigated in this research: accessibility, comfort, safety, social interaction, and place attachment.

A purposive case-study sampling strategy was adopted. Cases were selected according to four criteria: (1) explicit relevance to neighbourhood-scale street-furniture interventions; (2) documented participatory or co-design processes; (3) reported societal, environmental, economic, or accessibility-related outcomes; and (4) alignment with one or more New European Bauhaus values or principles. The selected examples were not intended to provide statistical representativeness but rather to illustrate diverse approaches through which street furniture may contribute to social inclusion, climate adaptation, and neighbourhood regeneration. Recent projects were prioritised where publicly documented evidence of impacts was available, including effects on thermal comfort, environmental performance, social participation, or community stewardship. Measurable effects reported in recent cases include surface cooling of approximately 2.6 °C, carbon dioxide uptake of about 200 g CO_2 per day in algae photobioreactor benches, and the diversion of roughly 3 t of plastic waste through local 3D printing initiatives.

To operationalise the New European Bauhaus framework within the analysis, the study draws on established European standards, policy documents, and assessment tools, including EN 17210 and EN 301 549 for accessibility, EU Green Public Procurement criteria for furniture, and life-cycle and circular-economy approaches. These documents were used as interpretative references rather than as strict compliance criteria and supported the evaluation of accessibility, inclusion, environmental performance, and participatory governance across the selected case studies. The methodological approach reflects the interdisciplinary nature of contemporary street-furniture research positioned at the intersection of social inclusion, climate resilience, and sustainable urban development (Fig. 1).

The analytical synthesis focused on three principal dimensions identified through the literature review and repeatedly reflected in the selected case studies: (1) Accessibility and Safety, (2) Social Cohesion and Place Identity, and (3) Climate-Responsive Comfort and Environmental Performance. These dimensions were used to organise the analysis and to interpret the societal implications of different street-furniture interventions. The study examines how specific design features, participatory processes, and environmental characteristics influence everyday use of public space, perceived quality of life, and inclusion of diverse user groups.

Against this backdrop, the societal dimension of street furniture emerges as a critical lens for understanding how everyday urban elements shape accessibility, safety, social interaction, and a sense of belonging in European neighbourhoods. Addressing these interrelated social, cultural, and environmental roles requires an integrative perspective that connects design attributes with lived experience, governance processes, and broader policy frameworks.

This perspective informs the analytical synthesis that follows by situating the societal dimension of street furniture within the broader conceptual context of the New European Bauhaus (NEB). The core values and working principles of the NEB are synthesised in Table 1, which was developed on the basis of an in-depth review of academic literature, policy documents, and selected European examples. The table illustrates how the NEB values of Beautiful, Sustainable, and Together, together with participatory, multilevel, and transdisciplinary approaches, can be translated into street furniture and public space design. Rather than functioning as assessment criteria, these values and principles provide the normative and interpretative context for understanding how neighbourhood interventions may contribute to more inclusive, environmentally responsible, and socially meaningful public spaces.

To operationalise these broader principles within the analysis, an analytical framework was developed and is presented in Table 2. The framework organises the review around three principal analytical dimensions identified in the literature: accessibility and safety, social cohesion and place identity, and climate responsive comfort and environmental performance. For each dimension, the framework specifies the street furniture attributes examined, the assessment criteria applied, the principal sources of evidence, and the societal outcomes considered. Evidence was extracted from academic publications, policy documents, technical standards, and case-study reports. Accessibility and safety were examined primarily through EN 17210, EN 301 549, and relevant European accessibility, procurement, and product safety frameworks. The framework provided a common structure for reviewing the selected case studies and for comparing the reported societal implications of different street furniture interventions across neighbourhood contexts.

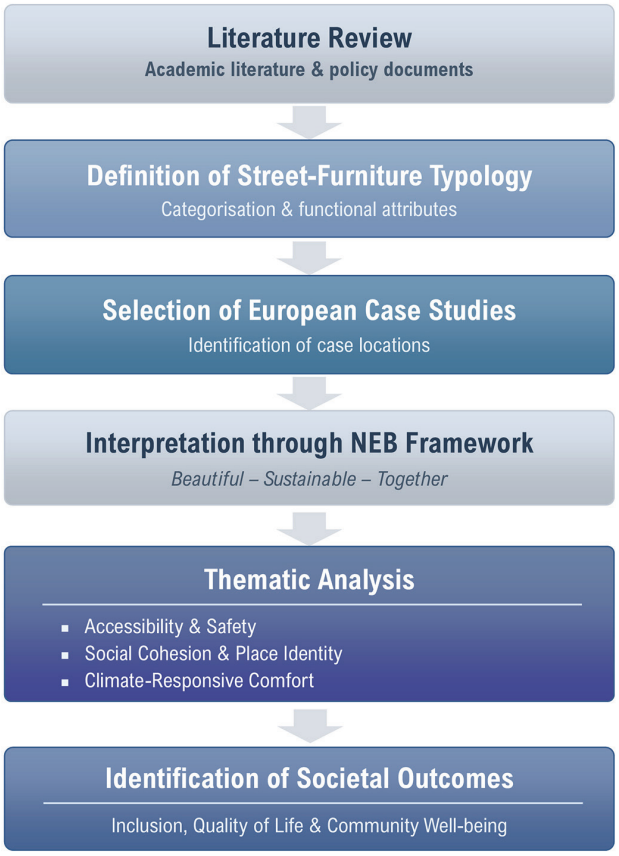


Fig. 1. Research design and analytical workflow (elaborated by B. Widera)

Il. 1. Projekt badań i schemat analityczny (oprac. B. Widera)

Accessibility and safety

Street furniture designed with universal-design principles improves accessibility and perceived safety. Barrier-free ramps, tactile paving, and ergonomic seating enable independent use by people with disabilities and older adults. EN 17210 sets accessibility requirements for the built environment, while the European Accessibility Act (Directive (EU) 2019/882) defines essential requirements for specific public-facing products and services; for interactive devices, conformity is typically demonstrated via EN 301 549 covering contrast ratios, reach ranges, and tactile/auditory feedback. Embedding these standards in design and procurement makes benches, bus shelters, and playground equipment inclusive for all user groups. Studies also highlight the role of street furniture in supporting electric micro-mobility (Zaffagnini et al. 2022). Guidance from the European Disability Forum helps public buyers verify inclusivity claims; checklists confirm armrest geometry, wheelchair leg clearance, and Braille or audible signage where needed (European Disability Forum n.d.).

Safety is a core function of street furniture and streetscape design, and it also depends on structural and material integrity. Adequate lighting, combined with well-placed, functional seating, can lower actual and perceived security risks and extend use of public spaces across seasons and times of day (Rode et al. 2017). Poor lighting and deteriorated infrastructure correlate with higher petty-crime rates and greater fear of victimisation; a Campbell review of 13 evaluations found that improved street lighting reduced crime by ~20% and supported community cohesion (Welsh, Farrington 2008). Compliance with the EU Construction Products Regulation (Regulation (EU) 305/2011) ensures playground and street-furniture products meet mechanical, fire, and chemical-safety requirements (European Commission 2017). Specifications should cap VOCs and formaldehyde in wood-based components and require ≥5 years of spare-parts availability, aligned with EU GPP criteria (ICLEI 2017). CE-marked declarations of performance and relevant EN certificates help pre-empt structural failures and harmful emissions across the lifecycle. Well-designed street furniture improves place quality and public health and strengthens local environmental resilience (Carmona 2019).

Table 1. New European Bauhaus values and working principles relevant to street-furniture and public-space design (elaborated by B. Widera)
Tabela 1. Wartości i zasady NEB w projektowaniu mebli miejskich i przestrzeni publicznych (oprac. B. Widera)

NEB Dimension (pillar)	Focus	Key design implications and illustrative examples	References
Beautiful (aesthetics and sense of place)	well-being through beauty; cultural meaning; contextual fit	briefs beyond utility; local heritage cues; community art/vernacular motifs in seating; street-prototyping with local craft (e.g., ceramics)	Melgarejo-Torralba et al. 2025; Sádaba et al. 2024
Sustainable (green and circular)	give back more than they take; mitigation; circular flows; biodiversity	EU GPP alignment (recycled steel, FSC timber, design for disassembly); 3-D-printed benches from post-consumer plastics (Print Your City); algae photobioreactor "Liquid Tree" benches (Skyforest 2023), sequester CO_2; provide shading/amenities; off-grid dog-waste biogas lamps, small-scale energy recovery	European Commission 2017; 2021; Print Your City n.d.; United Nations Development Programme 2021; George 2023; Fleming 2018; ISO 20887:2020
Together (inclusive and affordable)	universal accessibility; social cohesion; priority for vulnerable groups	wheelchair manoeuvring space; tactile wayfinding; EN 17210 in procurement; co-designed lighting + communal tables, night-time comfort, neighbourly interaction (e.g., ToNite); EquiP, addressing power asymmetries	European Disability Forum, n.d.; Howard 2025; Çarçani et al. 2023; Rode et al. 2017; Welsh, Farrington 2008
Participatory process	active involvement at every project phase	co-design charrettes; citizen panels; on-street prototyping (e.g., children choose colours/layouts for SuperBarrio); digital twins/VR "living labs" for pre-installation testing; university–municipality frameworks for process governance	URBiNAT 2023; Scerri, Attard 2023; Dogu et al. 2021; European Commission 2025a; Lourenço et al. 2024
Multi-level engagement	link neighbourhood action to city/region/EU agendas	pilots inform city adaptation and quality-of-life plans; scaling via Cohesion Policy/Horizon/NEB facilities; NEB Prizes enable transfer; rapid street-prototyping, faster path from test to implementation	Altrock, Kurth 2024; European Commission 2025b; Wacinkiewicz 2023
Transdisciplinary approach	integrate design, engineering, social science, art	hybrid teams (architects, materials scientists, sociologists) co-create bio-integrated furniture (e.g., photobioreactor benches); STARHAUS modular pavilions, evaluated on NEB criteria; "quality co-design", iterative learning; shared artefacts mediate collaboration	George 2023; United Nations Development Programme 2021; Bratu et al. 2024; De Smet, Kesdi and Pak 2025; Moore, Evans 2020; Zamenopoulos et al. 2021; Nielsen 2012

Societal benefits of street furniture

Street furniture shapes neighbourhood social life and cultural character. Interaction venues that reflect local identity strengthen community bonds. The impact has two facets: (1) furniture fosters social cohesion and cultural identity, (2) participatory design within the NEB framework empowers communities.

Social cohesion and cultural identity

Public furniture contributes to the social and cultural fabric of neighbourhoods. Context-sensitive design that echoes local heritage or community values can instil pride and belonging. Mucho Más Mayo urban art festival in Cartagena, Spain, engaged students and artists to upcycle scrap timber and fishing nets into street furniture with locally resonant motifs, beautifying the space and celebrating cultural identity (Melgarejo-Torralba et al. 2025). Such interventions strengthen place attachment and place identity, supporting long-term care for the space; evidence reviews link aesthetically and culturally anchored small-scale design with greater belonging and social rootedness (Latham, Layton 2019; Lewicka 2011). Aesthetic quality can also attract visitors and stimulate creative tourism, benefiting local businesses and cultural sectors. Street furniture fosters social cohesion when seating, shade, shelters, and movable elements create accessible, safe micro-settings for interaction (Fig. 2).

Field studies locate the densest conversation clusters along spatial edges and around movable furniture that lets users co-produce seating layouts (Loo, Fan 2023; Qi, Mazumdar and Vasconcelos 2024). Literature on microclimate shows that shade and material choices lower air/surface temperatures by roughly 1–2 °C, increasing dwell time and social contact during heat periods (Han, Jo and Kim 2023) (Fig. 3). Projects that pair functional upgrades with cultural expression, such as murals on seating or story plaques on fixtures, deepen emotional ties to place.

Table 2. Analytical framework adopted for the assessment of societal dimensions of street furniture in European neighbourhoods (elaborated by B. Widera)
Tabela 2. Analityczny model oceny społecznych aspektów mebli miejskich w sąsiedztwach europejskich (oprac. B. Widera)

Analytical dimension	Street-furniture aspects analysed	Assessment criteria	Main evidence sources	Societal outcomes examined
Accessibility and safety	seating ergonomics; wheelchair manoeuvrability; tactile guidance; visual contrast; lighting quality; shelter accessibility; age-friendly design	compliance with accessibility requirements; usability by diverse user groups; ease of independent use; perceived and actual safety; support for mobility and orientation	EN 17210:2021; EN 301 549; European Accessibility Act; European Disability Forum guidance; accessibility and public-space literature; documented case studies	inclusion of persons with disabilities; independent use of public space; age-friendly environments; perceived safety; improved access to neighbourhood amenities
Social cohesion and place identity	communal seating; gathering spaces; culturally responsive design; public art elements; multifunctional installations; neighbourhood meeting points	potential to support social interaction; place attachment; community ownership; local identity; opportunities for informal encounters	public-space and social-infrastructure literature; participatory-design studies; documented European projects	social interaction; community cohesion; place attachment; neighbourhood identity; stewardship of public space
Climate-responsive comfort and environmental performance	shading structures; cooling elements; vegetated furniture; climate-adaptive materials; circular-design solutions; nature-based interventions	contribution to thermal comfort; support for outdoor activity; climate adaptation; resource efficiency; environmental performance	climate-comfort studies; circular-economy and procurement guidance; environmental case studies; EU GPP criteria; ISO 20887	reduced heat stress; increased usability of public space; longer dwell time; environmental awareness; support for climate resilience
Participatory and governance processes	co-design workshops; citizen panels; living labs; temporary prototyping; stakeholder collaboration; community management arrangements	degree of stakeholder involvement; continuity of participation; incorporation of user knowledge; long-term community engagement	NEB guidance; co-design literature; case-study documentation; municipal programmes	greater acceptance of interventions; stronger ownership; improved contextual fit; long-term maintenance and stewardship

Cohesion and stewardship can be tracked with the Neighborhood Cohesion Index and the Collective Efficacy Scale (Sampson, Raudenbush and Earls 1997). Place attachment and sense of community are measurable in environmental surveys (Francis et al. 2012). Systematic observation protocols (e.g., SOPARC) quantify interactions and dwell time at specific furniture types, while CPTED provides a complementary frame for safety assessment (Cozens, Love 2015;



Fig. 2. Street furniture in Opera Park, Copenhagen, by Cobe, 2023 (photo by B. Widera)

Il. 2. Meble miejskie w Opera Park w Kopenhadze, projektu Cobe, 2023 (fot. B. Widera)



Fig. 3. Street furniture in Budapest contributes to lower ambient temperature (2025) (photo by B. Widera)

Il. 3. Meble miejskie w Budapeszcie obniżają temperaturę otoczenia (2025) (fot. B. Widera)

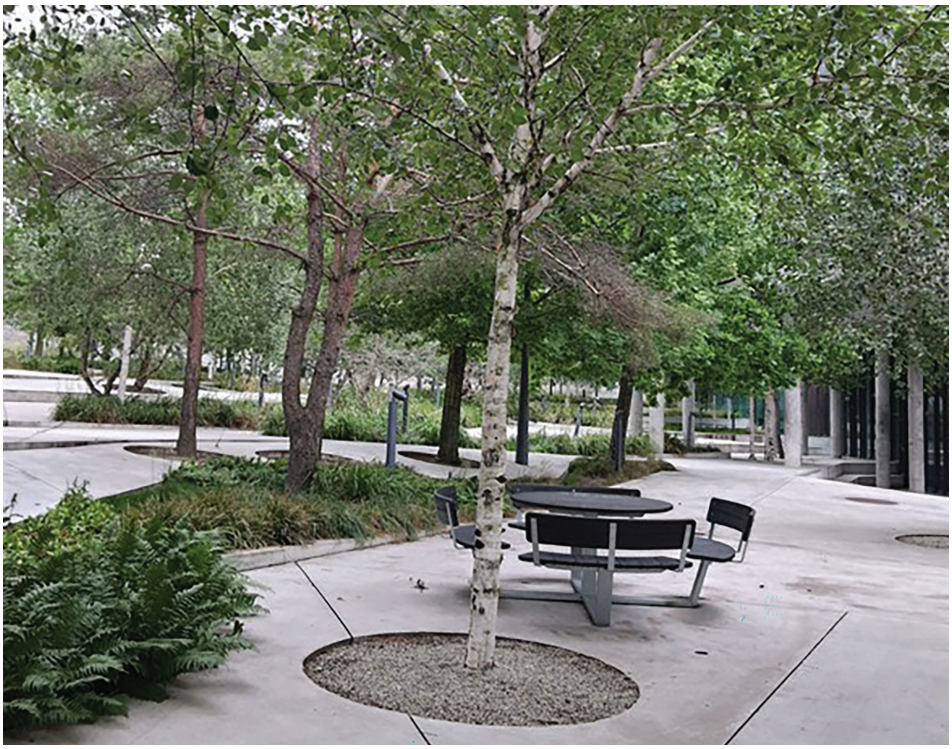


Fig. 4. Co-designed street furniture in The City Dune, Lundgaard Tranberg, Copenhagen, 2011 (photo by B. Widera)

Il. 4. Współprojektowane meble miejskie – The City Dune, Lundgaard Tranberg, Kopenhaga, 2011 (fot. B. Widera)

McKenzie et al. 2016). Street furniture is cost-effective social infrastructure that connects communities, expresses identity, and improves place quality (Gehl 2011).

Participatory design

Participatory design is central to the NEB approach. End-users and local stakeholders co-create public-spaces, improving alignment with their needs and values. Co-designed spaces show lower vandalism, reduced maintenance, and stronger community ownership than top-down projects (Sanches, Frankel 2010) (Fig. 4). Examples include the SuperBarrio playground co-created with children in Valladolid and Turin's ToNite riverfront renewal co-designed with youth and migrant groups, both functioning as "living labs" for climate-resilient, socially cohesive solutions (URBiNAT 2023). NEB principles are operationalised through recyclable or bio-based materials, nature- or algaebased shading, and seating layouts that promote neighbourly interaction (Ghira, Heilemann 2025). These interventions delivered multiple benefits; in ToNite, improved lighting and safety coincided with 18 community groups signing long-term Pacts of Collaboration to co-manage the new furniture (Howard 2025), reinforcing social cohesion.

Participatory design here functions as method, performance metric, and innovation driver. It shapes policy from the top down: EU green procurement criteria encourage circular, inclusive solutions informed by participation, and standards bodies increasingly embed user-inclusive guidance (e.g., accessibility standards cite stakeholder input). Bottom-up, it catalyses creativity: engaging citizens generates novel ideas and builds local acceptance. The European Commission has institutionalised these practices through the NEB Self-Assessment Method and Tool, which requires projects to document community involvement at each stage of design and delivery (Lourenço et al. 2024). Education and capacity-building promote co-creation, life-cycle thinking, and cross-disciplinary collaboration in architecture curricula across Europe (Eckert 2022), aligning with calls for practitioners to master participatory methods to meet new quality benchmarks in design governance (Moore, Evans 2020).

Contemporary projects demonstrate the value. The STARHAUS pavilion prototype in Romania was developed by a transdisciplinary team of architects, engineers, and community stakeholders, yielding modular public-space structures that scored highly on NEB criteria (Bratu et al. 2024). Hybrid collaborations' architects with chemists and sociologists on an algae-filled "Liquid Tree" (Fig. 5) bench that doubles as an air purifier arose directly from co-design processes, producing innovations unlikely in single-discipline settings (George 2023). Digital tools widen participation' virtual living labs and digital twins let residents test furniture in immersive simulations before construction; in Dublin, stakeholders voted via a QR-coded interface on bench configurations, and robotic fabrication adjusted prototypes overnight, while low-cost urban prototyping kits enable neighbourhood groups to trial temporary installations and iterate using public feedback (Wacinkiewicz 2023). These approaches empower communities at the individual level (voice in design) and the institutional level (partnerships between municipalities, SMEs, and citizens), linking local action to city-wide and EU agendas (De Smet, Kesdi and Pak 2025). Participatory design under the NEB reframes street furniture as something done with people, producing public spaces that are more cherished, more innovative, and aligned with sustainability and inclusion. Projects should move beyond utility and create a strong sense of place by reflecting local culture and heritage (Melgarejo-Torralba et al. 2025). NEB-inspired designs aim to give back more than they take, adopting circular and nature-based solutions that improve the environment, for example furniture that absorbs CO_2 or generates energy. Participatory, interdisciplinary processes are standard. NEB projects engage citizens at every stage assembling cross-sector teams (architects, engineers, artists, social scientists) to deliver holistic solutions. This approach echoes earlier calls for co-design in public space and elevates empowerment, where users of a space help design it.

Recent European projects demonstrate how participatory design translates NEB values into street-furniture and public-space solutions. Table 3 summarises six cases, detailing their co-creation processes, materials, technologies, and measured impacts. Each case was analysed against the three analytical dimensions identified in the methodological framework (accessibility and safety; social cohesion and place identity; climate-responsive comfort and environmental performance), while the final interpretation of outcomes was structured through the corresponding NEB values and working principles. In Budapest, the *CoolCo's Cooling Corners* installation, developed with residents, lowered sidewalk temperatures by 2.6 °C and encouraged local stewardship (Ghira, Heilemann 2025). In Turin, the *ToNite* project engaged youth and migrant groups to improve nighttime public areas with solar LED lighting and communal seating, leading to long-term co-management agreements and a reduction in petty crime (Howard 2025). The *Print Your City* initiative in Amsterdam and Thessaloniki enabled residents to design benches from recycled household plastic, diverting approximately 3t of waste from landfills and illustrating circular-economy practice (Print Your City n.d.) (Fig. 6). Digital tools further extend participation. Virtual-reality "urban living labs" allow residents to test and co-plan street modifications in immersive simulations (Scerri, Attard 2023).



Fig. 5. Algae-filled "Liquid Tree", Belgrade, Serbia (photo by B. Widera)

Il. 5. Wypełniony algami „Liquid Tree", Belgrad, Serbia (fot. B. Widera)

Conclusions

This paper demonstrates that street furniture plays a substantive role in shaping the societal quality of everyday urban environments, particularly in older and disadvantaged European neighbourhoods where access to amenities, safety, and thermal comfort remain uneven. When conceived as a social interface rather than a passive amenity, street furniture contributes to inclusion, accessibility, and perceived security, directly influencing patterns of outdoor use and neighbourhood life. The analysed cases show that design features addressing microclimatic conditions – such as shading and cooling elements – support more equitable use of

Table 3. Participatory street-furniture case studies illustrating the New European Bauhaus (NEB) approach (elaborated by K. Chojnacka, B. Widera)
Tabela 3. Partycypacyjne studia przypadków mebli miejskich ilustrujące podejście Nowego Europejskiego Bauhausu (NEB) (oprac. K. Chojnacka, B. Widera)

Project (location and period)	Participatory mechanism	Materials / technology used	Documented impact and NEB dimensions	References
"CoolCo's" Cooling Corners (Józsefváros, Budapest; 2023)	five neighbourhood charrettes; on-street mock-ups; QR code surveys	modular benches in thermally modified ash with recycled-steel frames; micro-fog nozzles; drought-tolerant planters	surface temperature 2.6 °C lower than control pavement; 83% of residents reported stronger ownership. NEB: Beautiful Sustainable Together Participatory	Ghira, Heilemann 2025
ToNite Night-time Renewal (Turin; 2019–2023)	forty-two co-design workshops; 18 Pacts of Collaboration with local groups (youth and migrant associations)	solar-powered LED lighting; recycled-plastic seating; movable planters from municipal fab-lab	project monitoring reported 24% fall in night-time petty crime along the Dora promenade; 18 groups co-manage the furniture. NEB: Together Participatory Multi-level	Howard 2025
SuperBarrio digital tool (Nantes / Porto / Sofia; 2020–2023)	gamified 3-D configurator; online voting linked to town-hall meetings	benches CNC-milled from cork agglomerate; play modules in recycled-HDPE bottle caps	1,400+ user sessions; 57% of top-voted designs built on site; NEB Awards 2023 finalist. NEB: Beautiful Participatory Transdisciplinary	URBiNAT 2023
Print Your City (Amsterdam & Thessaloniki; 2018–2019)	web interface for citizen co-design and personal plastic quotas	robotic 3-D printing of PET/PP flakes; NFC tag displaying kilograms of waste diverted	single bench reused ~120 kg household plastic; total diversion ~3 t; 15 public recycling workshops. NEB: Sustainable Participatory	Print Your City, n.d.
LIQUID3 photobioreactor bench (Belgrade; 2021–)	open call for pilot sites; citizen-science sensors feeding a public dashboard	~600 L acrylic photobioreactor with Chlorella sp.; PV-powered circulation; USB charging	Algae uptake ~200 g CO_2 day^{-1}; real-time display used in local climate-literacy activities; communications compare performance with two young trees and ~200 m^2 lawn (context dependent). NEB: Sustainable Transdisciplinary Participatory	United Nations Development Programme 2021; George 2023; Skyforest 2023
Dog-waste biogas lamp (Malvern Hills, UK; 2017–)	on-site demos with dog-owners; suggestion box for lamp and bag design	small anaerobic digester producing methane for a Victorian-style lamppost; compostable starch bags	off-grid lighting generated from dog-waste inputs; single-use plastic bags replaced by compostable alternatives; local authority support reported. NEB: Sustainable Together	Fleming 2018

public space by reducing heat stress and extending the temporal and seasonal usability of streets and squares. Reported surface temperature reductions of approximately 2.6 °C are especially relevant for older adults and other heat-vulnerable groups, as they improve walkability, enable longer outdoor stays, and mitigate health risks during heat events. In this context, environmental performance functions primarily as a facilitator of social participation and everyday comfort rather than as an isolated ecological objective. Accessibility and safety emerge as closely intertwined with these comfort effects. Barrier-free layouts, age-friendly seating ergonomics, and appropriate lighting quality reinforce perceptions of safety and encourage use by people with reduced mobility, caregivers, and older residents. The evidence suggests that when these elements are coherently combined, street furniture contributes to more inclusive patterns of social interaction and supports informal surveillance, thereby strengthening neighbourhood cohesion. Aesthetic quality further amplifies these effects by reinforcing local identity and signalling care, permanence, and legitimacy of public space interventions.

A central finding of the study is the critical role of participatory co-design in generating and sustaining societal value. Engagement of residents and local stakeholders throughout design, implementation, and maintenance phases improves contextual fit, strengthens place attachment, and supports shared responsibility for public spaces. Co-designed inter-

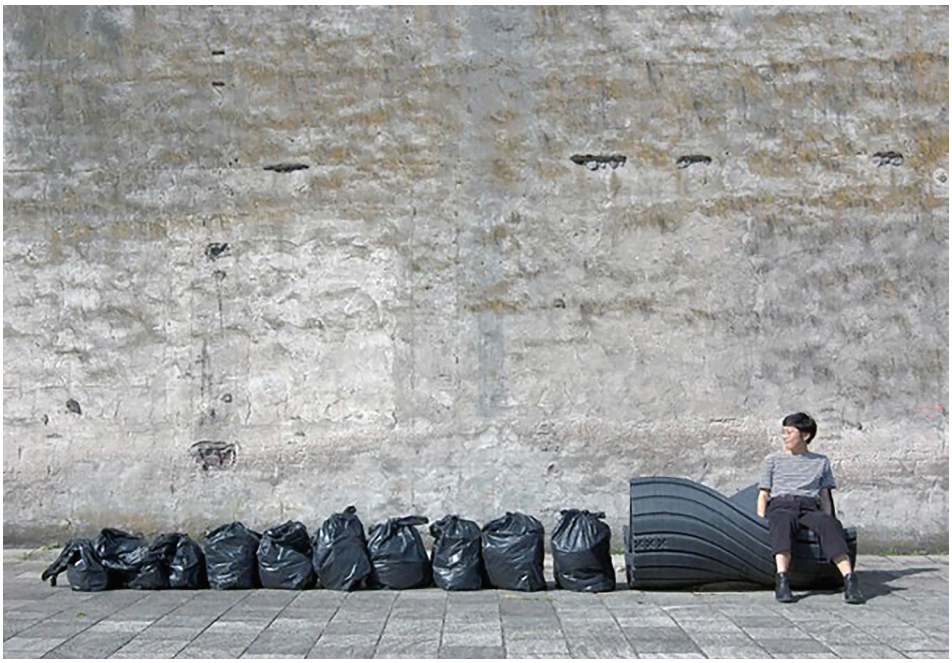


Fig. 6. Print Your City co-designed "XXX Bench" from recycled household plastic (photo by Print Your City, source: Products – Print Your City)

Il. 6. Ławka „XXX Bench" zaprojektowana w ramach projektu Print Your City, wykonana z recyklingowanego plastiku domowego (fot. Print Your City, źródło: Products – Print Your City)

ventions show higher levels of acceptance, reduced vandalism, and more consistent everyday use, indicating that social processes are as decisive as material or technical solutions in delivering long-term benefits. The synthesis of literature, policy documents, standards, and selected European case studies indicates that societal benefits are most evident when street furniture is considered as part of a broader neighbourhood system. Across diverse contexts, the reviewed examples demonstrate that seating, lighting, shading, recreational elements, and small-scale environmental interventions can influence social behaviour, perceptions of public space, and patterns of neighbourhood use well beyond their immediate functional purpose. The analysis also highlights the importance of considering design quality, governance arrangements, and local context together when assessing the outcomes of public-space interventions. The analysed cases provide concrete illustrations of how the identified analytical dimensions operate in practice. The reviewed projects demonstrate that climate-responsive interventions, accessibility measures, participatory governance arrangements, and context-sensitive design can generate complementary benefits extending beyond the immediate functional role of street furniture. Across the examined cases, societal outcomes included stronger community stewardship, improved perceptions of safety, enhanced opportunities for social interaction, greater environmental awareness, and increased accessibility for diverse user groups. Taken together, these examples indicate that street furniture can simultaneously support social inclusion, neighbourhood identity, and environmental objectives when embedded within appropriate design and governance processes. Situated within the values of the New European Bauhaus, the findings support a reframing of street furniture as a modest yet powerful instrument of inclusive urban regeneration. Thus, by aligning aesthetic quality, accessibility, and comfort with participatory processes, street furniture can address everyday vulnerabilities and enhance quality of life at neighbourhood scale.

The study is subject to several limitations. Its conclusions are based on qualitative evidence drawn from published research, policy frameworks, technical standards, and purposively selected case studies rather than on primary empirical investigation. Consequently, the identified relationships should be understood as evidence-based patterns observed across the reviewed cases rather than as universally applicable causal effects. Future research should focus on more systematic assessment of societal outcomes across diverse contexts, with particular attention to long-term use patterns, perceived safety, and distributional effects among vulnerable groups. Further work is also needed to develop comparable evaluation approaches that would allow social, environmental, and governance-related outcomes of street-furniture interventions to be assessed more consistently across different neighbourhood settings.

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Streszczenie

Społeczne znaczenie mebli miejskich w dzielnicach miast europejskich

W wielu starszych i defaworyzowanych europejskich jednostkach sąsiedzkich obserwuje się postępującą degradację infrastruktury miejskiej, ograniczoną dostępność usług publicznych oraz utrzymujące się problemy związane z bezpieczeństwem, które w sposób nieproporcjonalny dotykają grup szczególnie wrażliwych. Choć meble miejskie są często traktowane jako element drugorzędny, rosnąca liczba badań wskazuje, że odgrywają one istotną rolę w kształtowaniu codziennych praktyk społecznych, dostępności przestrzeni oraz postrzeganego bezpieczeństwa.

W artykule przeanalizowano społeczny wymiar mebli miejskich oraz ich wpływ na jakość życia w europejskich jednostkach sąsiedzkich, ze szczególnym uwzględnieniem inkluzji, komfortu termicznego oraz przyjaznego dla osób starszych korzystania z przestrzeni publicznych. Na podstawie pogłębionego przeglądu literatury naukowej oraz wybranych studiów przypadków zbadano, w jaki sposób współczesne interwencje w zakresie mebli miejskich wpływają na wzorce użytkowania przestrzeni zewnętrznych, interakcje społeczne oraz poczucie bezpieczeństwa.

Elementy zacieniające i chłodzące omówiono w kontekście udokumentowanych spadków temperatury powierzchni o mniej więcej 2,6 °C, co podkreśla ich znaczenie dla poprawy komfortu termicznego, wydłużenia czasu użytkowania przestrzeni zewnętrznych oraz ograniczenia ryzyka przegrzania u osób starszych. Wykazano również, że standardy dostępności, ergonomia siedzisk oraz jakość oświetlenia wzmacniają te efekty, wspierając tworzenie bezpieczniejszych i bardziej inkluzywnych środowisk sąsiedzkich.

Procesy partycypacyjnego współprojektowania przeanalizowano jako kluczowy mechanizm generowania i utrzymywania korzyści społecznych. Dowody wskazują, że trwałe zaangażowanie mieszkańców i lokalnych interesariuszy poprawia dopasowanie rozwiązań do kontekstu, wzmacnia więź z miejscem oraz sprzyja współodpowiedzialności za przestrzeń publiczną.

Słowa kluczowe: meble miejskie, dostępność, spójność społeczna, odporność na zmiany klimatu, projektowanie partycypacyjne, Nowy Europejski Bauhaus