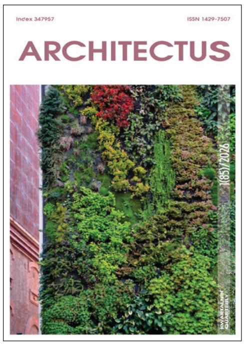

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A review of pro-climate solutions carried out in selected projects of public space

Abstract

In the face of ongoing climate change, urban public spaces must respond to new adaptation challenges. Implementing environmentally friendly solutions in their design can contribute to increasing the resilience of the urban environment to climate-related threats and improving residents' quality of life. The aim of this article is to review, identify, and develop a typology of pro-ecological solutions applied in contemporary European public space projects, with particular emphasis on measures related to water management and green infrastructure.

The research material consisted of public space projects presented during two editions of the IFLA Europe exhibition. Two main categories of interventions were distinguished: "water" and "greenery", both related to the development of blue–green infrastructure in cities. The analysis included both Nature-based Solutions (NBS) and interventions incorporating elements of technical infrastructure.

The results indicate the growing importance of integrating measures related to water retention, increasing biologically active surfaces, and strengthening ecosystem functions in the process of shaping contemporary urban public spaces.

Key words: climate change adaptation, public spaces, blue–green infrastructure, Nature-based Solutions, urban resilience

Introduction

The adverse impacts of climate and microclimate change are becoming increasingly evident, particularly in urban areas. The Paris Agreement (2015) is intended to be a catalyst for remedial action. It sets out the objective of achieving climate neutrality by 2050 and, under an ambitious scenario, limiting global temperature increase to 1.5°C above pre-industrial levels (UNFCCC 2015). The European Union (EU) has adopted numerous laws in response to these aspirations. Among them are the European Green Deal (Fetting 2020) and its follow-up document, the Nature Restoration Law (Council of the European Union 2024). The assumptions presented in these documents are intended to help the European Union (EU) achieve climate neutrality through cooperation across all sectors of the economy (including construction), which should prioritise reducing greenhouse gas emissions. Increased commitment to the development and implementation of climate-neutral solutions, as well as to minimising their adverse environmental impacts, is strongly advocated. Gradual adaptation has been identified as a key component of the long-term response to climate change impacts (Council of the European Union 2021), encompassing, inter alia, measures related to urban development. In 2015, 76.5% of the world's population lived in urban areas (European Commission 2020a), compared to 72% in the EU (PBL Netherlands Environmental Assessment Agency 2016). Most European cities are projected to continue to grow, with the share of Europe's urban population expected to rise to approximately 83.7% by 2050 (European Commission 2020b). This process will accelerate the optimisation of public space design and its use (Alberti et al. 2019). Urban areas are vulnerable to the effects of climate change, such as extreme heat, floods, droughts, and water shortages, and improper management of urban space further exacerbates these phenomena. Given the substantial proportion of the global population residing in urban areas and the projected continued growth of urban populations, it is essential to

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emphasise that climate change mitigation and adaptation measures should focus particularly on cities.

The study aimed to review climate-responsive design solutions implemented in public space projects presented at the 2018 and 2022 exhibitions of the European Region of the International Federation of Landscape Architects (IFLA Europe 2018; 2022). It examined how projects from the past decade address the local-scale impacts of climate change. The analysis enabled the identification of distinct groups of design interventions, which were subsequently classified according to specific categories of climate-related threats. This review responds to the current need to implement such measures, as emphasised by the Council of the European Union (2021), by systematising and synthesising a set of applicable solutions. Consequently, the findings may serve as practical design recommendations for the development of more resilient and climate-responsive public spaces. In addition, the study sought to disseminate knowledge about existing best practices and to raise public awareness of the potential for implementing similar interventions in publicly accessible urban areas. In the long term, this may contribute to increasing the number of pro-environmental actions at the local level, fostering strategic planning processes, and strengthening resilience across broader urban agglomerations.

State of research

The role of public spaces in enhancing local resilience to climate change has become an increasingly prominent subject of scholarly inquiry (European Environment Agency 2020). Public spaces play a crucial role in creating a satisfactory quality of life in cities, both in the social context and in terms of the efficiency of the urban ecosystem. Barcelona provides an example of a European city that has effectively leveraged the potential of public spaces in the development of its climate strategy. For several years, the municipality has implemented programmes aimed at integrating and enhancing the accessibility of public spaces (Amati, Stevens and Rueda 2023). One of the more recent initiatives involves the creation of a network of "climate shelters", designed to provide residents with refuge during heatwaves and periods of extreme cold. A vast number of the shelters is in public urban parks and gardens (Barcelona City Council 2024). However, parks are not the only key to achieving the ecological transformation of cities. The green transformation of urban infrastructure, often encapsulated in the concept of "grey to green", is assuming a prominent role in contemporary climate policy and planning. Street greening, which is popular in many cities, noticeably reduces urban heat island effects and improves stormwater management systems (Gimenez-Maranges, Breuste and Hof 2020). Analyses of the potential of streets in Vienna (Furchtlehner, Lehner and Lička 2022) and Leipzig (Marselle et al. 2022) have demonstrated the measurable effects of these measures. Properly designed public spaces also play a significant role in urban flood risk reduction. Integrated water management approaches, such as Sustainable Urban Drainage Systems (SUDS), have for many years demonstrated tangible benefits in this regard (Silva, Costa 2018). The growing scholarly interest in completed projects incorporating such solutions is reflected, for example, in an analysis conducted by Spanish researchers of projects nominated for the European Union Prize for Contemporary Architecture – Mies van der Rohe Award. Their study is focused on public spaces found near water bodies and the impact of spatial features on the effects of rising ocean levels (Dal Cin, Hooimeijer and Matos Silva 2021). The relevance of this type of research is further confirmed by the noticeable increase in the diversity of design solutions that address specific climate threats in different regions, such as heavy rainfall, heat waves, or flood risks (Forczek-Brataniec, Jamioł 2024). Hiltrud Pötz, among others, attempted to categorise pro-climate measures, including nature-based solutions (NBS), in her book *Green-blue grids. Manual for resilient cities*, dividing these measures into seven main thematic blocks: water challenges, heat, biodiversity, urban agriculture, air quality, energy, and the social and economic importance of blue-green infrastructure areas (Pötz 2016). Researchers from the European Commission, in turn, divided NBS into three main types: *Type 1 NBS – minimal or no intervention in ecosystems, with objectives related to maintaining or improving delivery of ecosystem services within and beyond the protected ecosystems; Type 2 NBS – extensive or intensive management approaches seeking to develop sustainable, multifunctional ecosystems and landscapes in order to improve delivery of ecosystem services relative to conventional interventions; Type 3 NBS – characterised by highly intensive ecosystem management or creation of new ecosystems* (European Commission 2021).

Methods

The research was conducted based on a selection of projects presented at IFLA Europe exhibitions, included in the 2018 "Landscape as a Common Ground" and 2022 "Reconsidering Nature" catalogues. The objective of the study was to categorise design initiatives addressing the climate challenges which Europe is currently facing within the framework of blue–green infrastructure. The research was based on an analysis of project descriptions highlighting the climate-responsive solutions implemented, as well as on activities previously classified in the literature. Earlier studies sought to compare pro-climate interventions identified in projects presented during the second edition of the exhibition with specific environmental stressors (Jamioł, Jaróg and Nowak 2023). They also examined the principal objectives pursued by designers such as prevention, protection, contribution to the circular economy, restoration of degraded elements, or education and assessed whether the adopted measures responded to threats characteristic of the Nomenclature of Territorial Units for Statistics (NUTS 3) regions in which the projects were located (Forczek-Brataniec, Jamioł 2024).

In the present study, neither the dataset nor the corpus of analysed projects was altered; rather, the classification framework was revised. The identified design solutions were subsequently compared with the principal climate-related challenges outlined in legal and policy documents issued by the EU, including reports of the European Environment Agency (2024). Reference was also made to the Nature-based Solutions (NBS) typology proposed by the

European Commission (2021), as well as to the categorisation framework developed by Hiltrud Pötz (2016). In the first stage of the analysis, the projects were examined according to the types of interventions implemented. In total, 114 project descriptions from 29 countries affiliated with IFLA Europe were analysed. The sample included projects located outside geographical Europe (e.g., Turkey and Israel) and outside the EU (Norway, Switzerland, Ukraine, and the United Kingdom, which withdrew from the EU in 2020). Each IFLA Europe landscape architecture association could submit a maximum of three proposals, which in many cases required pre-selection at the national level. The analysed projects were assigned alphanumeric identifiers, in which the two-digit prefix denotes the year of the exhibition, the subsequent two letters indicate the country of implementation, and the final number refers to the project's sequence within that country. It should be noted, however, that submitting a project to the exhibition did not require the use of pro-ecological solutions, and the adopted research method has its limitations and may involve a degree of subjectivity. Due to the wide range of interpretations of the solutions presented in the design drawings, the scope of the analysis covered only the design elements described in the catalogues.

Grouping similar solutions allowed us to identify two main categories related to blue-green infrastructure: "water", which includes actions aimed at managing water excess and deficit in the landscape, and "greenery", which includes solutions that strengthen and protect the integrity of green infrastructure. Subcategories of actions were assigned to the main categories, and within each subcategory, types of solutions were specified. The "water" category included: retention based on NBS, which specified: surface bioretention facilities (BR), de-sealing impermeable surfaces and application of permeable paving systems (PS); and then retention based on grey infrastructure (GRI), divided into: surface retention reservoirs (SR) and large-scale engineering solutions, including hydraulic water treatment systems (IR) and water deficit management (LWT). The "greenery" category includes protection of green infrastructure and existing ecosystems (PRG), vegetation design for enhanced biodiversity support (GBD) and restoration of lost ecosystem functions (REC).

The above categorisation was intended to systematise the analytical framework. However, it should be emphasised that blue–green infrastructure interventions are inherently interconnected and function through multiple, interacting mechanisms. Nature-based Solutions (NBS), including blue–green infrastructure elements, generate co-benefits for both water management and biodiversity enhancement. Measures such as rain gardens and retention basins increase infiltration capacity and stormwater retention, thereby reducing pressure on conventional drainage systems (Kimic, Ostrysz 2021). At the same time, they can support the creation of diverse habitats, complement urban green networks, and contribute to the conservation and enhancement of biodiversity (Bowler et al. 2024).

Results

A preliminary analysis of the use of pro-climate solutions related to blue-green infrastructure applied in completed projects from both editions of the IFLA Europe exhibition showed that they were mentioned in the descriptions of 96 projects, which constitutes 84.21% of the total and shows that the pro-ecological aspect plays a significant role in presenting project ideas. The following number of projects was assigned to individual categories: "water" – managing stormwater excess and deficit – 26 (22.81%), including in the subcategories: retention based on NBS (NBS) – 19 projects (16.67%); surface bioretention facilities (BR) – 15 projects (13.16%); de-sealing impermeable surfaces and application of permeable paving systems (PS) – 9 projects (7.89%), retention based on grey infrastructure (GRI) – 8 projects (7.02%); surface retention reservoirs (SR) – 2 projects (1.75%); large-scale engineering solutions including hydraulic water treatment systems (IR) – 6 projects (5.26%), as well as water deficit management (LWT) – 4 projects (3.51%); "greenery" – strengthening and protecting the integrity of green infrastructure: protection of green infrastructure and existing ecosystems (PRG) – 41 projects (35.96%), vegetation design for enhanced biodiversity support (GBD) – 47 projects (41.23%), and restoration of lost ecosystem functions (REC) – 9 projects (7.89%). The research also shows that 33 out of 114 projects (28.95%) included solutions that fell into both the "greenery" and "water" categories in their descriptions (Table 1).

Water – managing excess and deficit rainwater

- Retention based on Nature-based Solutions (NBS)

The "water" category was divided into three subcategories. The first one includes nature-based retention solutions, so-called NBS, which were further divided into surface bioretention facilities (BR), which included such activities as the use of retention greenery, which was designed through, among others, the use of retention basins (18_DK_030), rain gardens (22_GR_01, 22-IT_02, 22_iT_03, 18-LV_02, 22_NO_02, 22_PL_03), green infiltration ditches (922-NO_03) or biofilters (18_NL_02), as well as the de-sealing impermeable surfaces and application of permeable paving systems (PS), notable in the projects from Austria (22-AT_01), Belgium (22_BE_03), Italy (22_IT_02, 22_IT_03), Norway (22_NO_02), Poland (22_PL_01, 22_PL_03), Slovenia (22_SI_01) and Spain (22_ES_01).

- Retention based on grey infrastructure (GRI)

The second identified category – retention based on grey infrastructure – was divided into retention using surface retention reservoirs (SR), which took the form of water sculptures (22_NO_02, 18_BG_02). The analysed descriptions did not mention artificial underground retention reservoirs. The subsequent subgroup comprised large-scale engineering interventions (IR), including hydraulic water management systems such as embankments and flood protection levees integrated with extensive underground infrastructure (e.g., 18_FI_01; 18_NL_03; 18_CH_03). This category also encompassed underground sewerage systems equipped with water treatment and filtration components (e.g., 18_DK_03; 18_FR_02; 22_FI_02).

Table 1. Results of the analysis of project descriptions from the 2018 and 2022 exhibitions – assignment of activities from individual projects to selected categories and their assigned subcategories (elaborated by U. Forczek-Brataniec, K. Jamioł)
Tabela 1. Wyniki analizy opisów projektów z wystaw z 2018 i 2022 r. – przyporządkowanie działań z poszczególnych projektów do wybranych kategorii i przypisanych im podkategorii (oprac. U. Froczek-Brataniec, K. Jamioł)

Project ID	Water					Greenery			Project ID	Water					Greenery		
	NBS		GRI		LWT	PGR	GBD	REC		NBS		GRI		LWT	PGR	GBD	REC
	BR	PS	SR	IR						BR	PS	SR	IR				
18_AT_01							+		22_LT_02						+		
22_AT_01		+				+			22_LT_03								
22_AT_02									18_NL_01	+							+
22_BE_01									18_NL_02	+					+	+	
22_BE_02									18_NL_03				+				+
22_BE_03		+							18_NO_01								
18_BG_01						+			18_NO_02						+		
22_BG_01							+		18_NO_03							+	
22_BG_02						+			22_NO_01								
18_HR_01							+		22_NO_02	+	+	+					
18_CZ_01						+			22_NO_03	+							+
18_CZ_02						+	+		18_PL_01								
18_CZ_03						+	+		18_PL_02								
22_CZ_01						+	+		18_PL_03							+	
22_CZ_02	+					+	+	+	22_PL_01		+				+	+	
22_CZ_03					+		+		22_PL_02						+	+	
18_DK_01	+						+		22_PL_03	+	+				+	+	
18_DK_02						+			18_RO_01								
18_DK_03	+			+	+		+		18_RO_02								
22_DK_01						+	+		18_RO_03						+		
22_DK_02									22_RO_01						+	+	
18_EE_01						+			22_RO_02								
18_EE_02									22_RO_03						+	+	
18_EE_03									18_SK_01								
22_EE_01						+	+	+	18_SK_02								
22_EE_02						+	+		18_SK_03								
22_EE_03						+			18_SI_01								
18_FI_01				+					18_SI_02						+	+	
18_FI_02									18_SI_03						+		
18_FI_03									22_SI_01	+	+					+	

Project ID	Water					Greenery			Project ID	Water					Greenery		
	NBS		GRI		LWT	PGR	GBD	REC		NBS		GRI		LWT	PGR	GBD	REC
	BR	PS	SR	IR						BR	PS	SR	IR				
22_FI_01						+		+	22_SI_02								
22_FI_02				+		+			22_SI_03							+	
22_FI_03									18_ES_01		+						
18_FR_01									18_ES_02								
18_FR_02				+	+				18_ES_03							+	
18_FR_03							+		22_ES_01						+	+	
22_DE_01							+		22_ES_02	+					+		
22_DE_02						+			22_ES_03							+	+
22_DE_03							+		18_SE_01								
18_GR_01						+	+		18_SE_02								
22_GR_01	+						+		18_SE_03						+	+	
22_GR_02							+		22_SE_01							+	
18_HU_01									22_SE_02						+		
18_HU_02									22_SE_03								
18_HU_03									18_CH_01							+	+
22_HU_01									18_CH_02						+		
22_HU_02									18_CH_03				+		+	+	
22_IE_01									22_CH_01								
18_IL_01									22_CH_02					+	+		
18_IL_02									22_CH_03							+	
22_IT_01						+	+		18_TR_01								
22_IT_02	+	+				+	+		18_TR_02						+		+
22_IT_03	+	+				+	+		18_TR_03						+		
18_LV_01							+		18_UA_01							+	
18_LV_02	+						+		18_GB_01								
18_LV_03							+		18_GB_02	+		+					
22_LT_01							+		18_GB_03							+	

Legend:
NBS – retention based on Nature-based Solutions: BR – surface bioretention facilities, PS – de-sealing impermeable surfaces and application of permeable paving systems.
GRI – retention based on grey infrastructure: SR – surface retention reservoirs, IR – large-scale engineering solutions, including hydraulic water treatment systems.
LWT – water deficit management.
PRG – protection of green infrastructure and existing ecosystems.
GBD – vegetation design for enhanced biodiversity support.
REC – restoration of lost ecosystem functions.
(+) – a design solution that fits the issues of a specific category was included in the description of the analysed project.

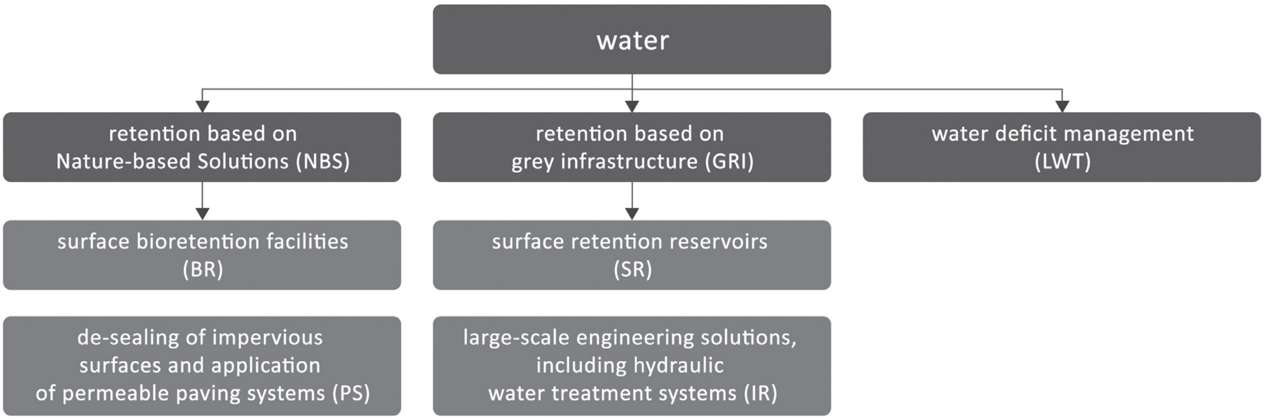

Fig. 1. Diagram illustrating the synthesis of activities undertaken in projects assigned to the "water" category (elaborated by K. Jamioł)

Il. 1. Schemat ilustrujący syntezę działań podjętych w projektach przypisanych do kategorii „woda" (oprac. K. Jamioł)

- Water deficit management (LWT)

The third distinct category presents activities aimed at preparing planned areas for periodic water shortages. Methods described include reusing collected rainwater for irrigation (18_DK_03, 18_FR_02) and selecting planned vegetation so that it can survive on natural water sources (22_CZ_03, 22_CH_02) (Fig. 1).

Greenery – strengthening and protecting the integrity of green infrastructure

- Protection of green infrastructure and existing ecosystems (PRG)

In the "greenery" group, the first identified subcategory is the protection of green infrastructure and existing ecosystems (PRG). It includes preserving existing greenery by incorporating it into the design concept (e.g., 22_AT_01, 22_GB_02, 18_CZ_02, 22_EE_03, 22_IT_01) and preserving its original, most often natural character (18_GB_01, 22_CZ_01, 18_GR_01). The projects described, among other things, the preservation of fragments of meadow undergrowth (22_CZ_02), vegetation that appeared on the site through the process of secondary succession (18_CZ_01) and the natural values of so-called wasteland (22_EE_01). The integrity of green infrastructure systems was further reinforced through measures aimed at maintaining ecological continuity and safeguarding sensitive landscapes. These included preserving the continuity of the greater fjord landscape (18_DK_02) and protecting valuable areas through the careful spatial distribution of recreational functions as dispersed elements within defined enclaves (22_EE_02). Additional interventions involved the incorporation of new design elements that accounted for erosion processes and episodic flooding (22_FI_02), the alignment of pathways to prevent dune erosion and avoid disturbance to the unique vegetation of coastal dune systems (22_LT_02), and the provision of controlled access to riverside alder forests while maintaining their distinctive ecological values (18_SE_03). System integrity was also supported through regular monitoring of flora and fauna (22_FI_01), as well as through the introduction or strengthening of legal protection mechanisms – such as improving the conservation status of coastal meadow and lagoon habitats (18_EE_01) or designating parts of the area as ecological reserves (22_DE_02).

- Vegetation design for enhanced biodiversity support (GBR)

The problem of biodiversity loss is one of the greatest negative impacts of climate change. The EU's goal is for European biodiversity to be on a path to recovery by 2030, helping people, the planet, the climate, and our economy (Council of the European Union 2024). Designing vegetation to support biodiversity (GBR) was also the most often addressed topic in the analysed projects.

Solutions assigned to this subcategory primarily focused on enhancing both the horizontal and vertical structural diversity of the landscape, as well as on the careful selection of plant species to provide shelter and food resources for local fauna (e.g., 18_CZ_03; 22_RO_01). Multi-layered vegetation compositions combining ground-cover plants, shrubs, and trees (18_LV_01) were implemented alongside perennial species (18_PL_03), with planting schemes designed to ensure continuous flowering throughout the growing season (18_LV_03). Additional measures included the integration of both deciduous and evergreen coniferous tree species (22_BG_01), as well as the prioritisation of native species (e.g., 18_GR_01; 22_IT_01), selected and arranged according to local environmental conditions (22_CZ_03; 18_NO_03; 22_PL_03). Diversification of the horizontal landscape mosaic was achieved through the introduction of new aquatic biotopes adjacent to flower beds (18_CZ_02) or grass-dominated areas (18_DK_01), the establishment of pollinator-friendly flower meadows combined with the designation of less frequently mown zones (22_EE_02; 22_DE_01), and the creation of sun-exposed stone piles to provide habitats for reptiles and amphibians (22_EE_01).

It is important to emphasise that protecting the integrity of green infrastructure whose fragmentation in urban areas is frequently associated with infrastructure expansion (Pasek 2008) as well as implementing well-designed NBS, particularly bioretention systems, can significantly contribute to the enhancement of local biodiversity. Em-

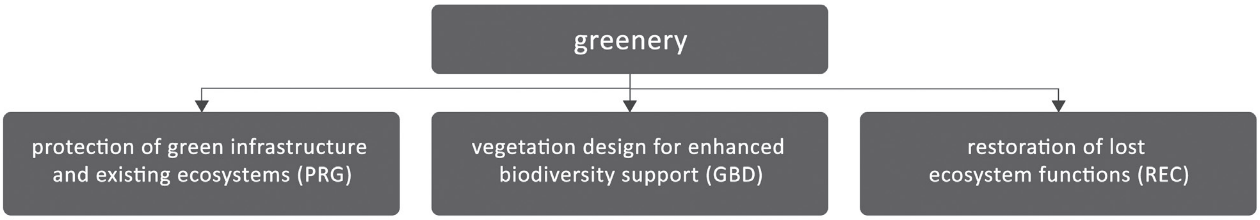

Fig. 2. Diagram illustrating the synthesis of activities undertaken in projects assigned to the "green" category (elaborated by K. Jamioł)

Il. 2. Schemat ilustrujący syntezę działań podjętych w projektach przypisanych do kategorii „zieleń" (oprac. K. Jamioł)

pirical evidence supports this claim, indicating that bioretention basins located within street greenbelts can function as small, spatially dispersed habitat patches, facilitating the movement of flora and fauna between larger natural areas (Bjørn, Howe 2023).

- Restoration of lost ecosystem functions (REC)

The analysed projects involved land undergoing reclamation – the process of restoring degraded or damaged areas to their original natural, ecological, and functional values, identified as the third subcategory (IRP 2019). This was achieved by converting intensively used arable land into pastures (22_CZ_02), cleaning water bodies to improve amphibian habitats (22_EE_01), or purifying soil using phytoremediation techniques (18_NL_01, 22_NO_03) a process in which plants are used as natural "filters" that absorb, transform, store, or neutralise pollutants. This method is ecological, inexpensive, and easy to implement (Rymsza, Gawroński and Gawrońska 2013). Another noteworthy example involves the reclamation of land previously occupied by a landfill and its transformation into recreational areas of high ecological value (22_FI_01). Further interventions related to blue infrastructure included the restoration of degraded coastal ecosystems (22_ES_03) and wetland-associated habitats (18_TR_02), the renaturation of watercourses (18_CH_01), and the reconnection of previously fragmented hydrological systems (18_NL_03). Such measures not only enhance ecological integrity but may also contribute to improved management of both excess and deficit rainfall by increasing the overall retention capacity of the landscape.

These actions are consistent with the strategy related to the second goal of the Nature Restoration Law – ensuring that at least 30% of degraded areas are effectively restored by 2030 (Council of the European Union 2024). While this law only entered into force in 2024, projects implemented over the last decade can serve as examples of solutions that can be used to positively contribute to the restoration of degraded urban areas (Fig. 2).

Other pro-ecological activities

The above categories only include activities related to blue–green infrastructure. It is important to note that these activities contribute to local microclimate improvement, including reducing the urban heat island effect (Łęczek 2022). The formation of a heat island is caused by factors such as dense development that reduces air circulation and the use of materials that absorb and retain heat in urban spaces. Another factor that worsens this effect is the significant limitation or absence of vegetation or natural water retention, which can positively contribute to local air temperature reduction (Błażejczyk et al. 2014). To reduce heat islands, designers attempted to increase the number of trees in cities (10_CZ_03; 22_AT_01) and design greenery of diverse types, not forgetting perennial flowerbeds, ground-covers, shrubs (18_PL_03), and grasses (22_EE_03). However, increasing the shaded area was also achieved by proper small-scale architecture (18_SI_03), and increasing air humidity had a positive impact on local microclimate improvement (22_BG_01). The designs emphasised reducing winter wind force achieving it by planting evergreen species (22_BG_01) and designing multi-story greenery, as well as minimising artificial lighting pollution (22_PL_03), which negatively affects biodiversity and landscape processes (Zalesińska 2024). Furthermore, interventions not directly associated with blue–green infrastructure can still contribute positively to urban climate adaptation, as well as to other environmental benefits, such as noise reduction (18_AT_01). Designers also emphasised the integration of renewable energy technologies, particularly solar energy, including on-site energy generation (18_LV_03; 18_NL_01). Another strategy contributing to emission reduction and supporting EU climate objectives involves promoting the circular economy through the use of recycled materials (22_EE_01; 22_FI_01), such as granite slabs (22_SI_01) or stones salvaged from decommissioned dams (22_FI_02), as well as the use of locally sourced materials (22_PL_03), which reduces supply chain distances and enables on-site reuse of waste. Complementary measures included design approaches aimed at minimising long-term maintenance requirements (22_PL_03). A further key aspect observed across the analysed projects was the emphasis on educational components, aimed at raising awareness of climate change, its mitigation, and the purpose of the implemented design interventions (Gkoltsiou, Forczek-Brataniec 2024).

Conclusions

The analysis of pro-ecological initiatives proved that the projects presented at IFLA Europe exhibitions constitute valuable research material, and their analysis in terms of pro-climate implementations presents a broad, albeit incomplete, range of design solutions that can be implemented in urban public spaces. It is important to emphasise that these solutions influence each other and positively change the mitigation of other negative effects. For example, enhancing biodiversity through the diversification of green spaces positively affects the microclimate, which mitigates the urban heat island effect and can thus contribute to increasing water retention and reducing the negative effects of periodic droughts.

The adopted division into categories and subcategories, along with the defined types of activities, complements contemporary landscape architecture patterns and provides an overview of solutions implemented in recent years. The analysed projects include activities already catalogued in the studies (European Commission 2021; Pötz 2016), but many of them represent solutions not previously mentioned. Together, they create a dictionary of new landscape architecture tools, a compendium of knowledge based on a creative approach to the issue, verified by a completed project. The implementation in this case may be evidence of a positive transition through the later stages: from competition and tender, through procurement, financing, regulatory approval, and finally, the implementation of pro-ecological solutions in public spaces. It should be noted, however, that the effectiveness of such interventions is highly dependent on local conditions and may vary over time.

The analysed projects were developed by multidisciplinary teams that included landscape architects, an approach considered particularly appropriate in the context of escalating climate change impacts (Gkoltsiou, Forczek-Brataniec 2024). Multidisciplinary collaboration ensures the integration of current scientific knowledge and design tools, enabling a holistic approach that harmonises interventions with both natural and cultural contexts.

During the research, a set of good practices was identified and systematically classified. In the future, their effectiveness during the operational phase can be evaluated, and their efficiency assessed. Examples of such analyses include the Green–Blue Grids: Manual for Resilient Cities (Pötz 2016) and city-published catalogues of good practices, such as those from Wrocław, where selected retention solutions in public spaces were assessed in terms of retention capacity, replacement costs, operational challenges, and water purification potential (Lejcuś et al. 2017). It is also essential to determine which measures are most appropriate for implementation in different types of public spaces. Such classification will facilitate an understanding of which interventions are likely to perform most effectively in specific urban contexts.

The research generated data on currently implemented climate-responsive solutions in public space projects, predominantly within Europe. Given the significance of the topic, a substantial sample of implementation examples from the past decade was analysed. Continued research in this area is warranted to expand and update the spectrum of climate-adaptive interventions, ensuring their alignment with the evolving dynamics of local environmental threats.

Translated by
Katarzyna Jamioł

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Streszczenie

Przegląd rozwiązań proklimatycznych w przestrzeniach publicznych na przykładzie wybranych projektów

W obliczu postępujących zmian klimatu przestrzenie publiczne w miastach muszą sprostać nowym wyzwaniom adaptacyjnym. Wdrażanie w projektach rozwiązań proekologicznych może przyczyniać się do zwiększania odporności środowiska miejskiego na zagrożenia klimatyczne oraz do poprawy jakości życia mieszkańców. Celem autorek artykułu jest przegląd, identyfikacja oraz opracowanie typologii rozwiązań proekologicznych stosowanych we współczesnych projektach europejskich przestrzeni publicznych, ze szczególnym uwzględnieniem działań związanych z gospodarką wodną oraz zieloną infrastrukturą.

Materiał badawczy stanowiły projekty przestrzeni publicznych prezentowane podczas dwóch edycji wystawy IFLA Europe. Wyróżniono dwie główne kategorie działań: „woda" oraz „zieleń", powiązane z kształtowaniem błękitno-zielonej infrastruktury w miastach. Uwzględniono zarówno rozwiązania oparte na naturze (Nature-based Solutions – NBS), jak i rozwiązania wykorzystujące elementy infrastruktury technicznej.

Wyniki wskazują na rosnące znaczenie integracji rozwiązań związanych z retencją wody, zwiększaniem powierzchni biologicznie czynnych oraz wzmacnianiem funkcji ekosystemowych w procesie kształtowania współczesnych przestrzeni miejskich.

Słowa kluczowe: adaptacja do zmian klimatu, przestrzenie publiczne, błękitno-zielona infrastruktura, rozwiązania oparte na przyrodzie, miasta odporne