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Critical Reviews

Household driven and council managed street greening: scoring cost, expertise, space, and cost-benefits of green infrastructure combinations

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ABSTRACT

While extensive research has documented the environmental benefits of green infrastructure (GI), do-it-yourself (DIY) approaches that empower individuals and communities to implement small-scale green solutions have received limited attention despite their potential to democratise urban greening and foster community engagement. This study aims to systematically characterise DIY GI implementation across UK cities and analyse the costs and benefits of GI establishment. We conducted mapping of GI configurations across major UK cities using Google street view imagery and field observations, identifying 30 street-scale and 50 household-scale GI scenarios, complemented by an extensive literature review examining small-scale GI interventions. This focus on household and streetside GI provides insights into small-scale interventions, although larger spaces such as urban forests, parks and grasslands also provide benefits, they are beyond the scope of this study. A five-level scoring framework was developed for costs, space requirements, expertise levels, maintenance demands, and cost-benefits to design DIY guidance cards for GI scenarios. Our findings reveal diversity in GI adoption, with street trees and basic grass combinations dominating street-scale implementations (20.8 % each), while household-scale approaches show remarkable variety ranging from simple grass-only configurations (18.5 %) to complex multi-feature systems. The analysis identified a linear relationship between higher GI establishment costs and increased maintenance costs, despite greater variation in the latter. The detailed DIY score reveals that household-scale combinations have greater variation in cost and higher potential benefits compared with street-scale interventions, which remain clustered at lower scores despite higher space demands. The DIY framework enables local authorities and households to make informed GI decisions, addressing key implementation barriers. Aligned with UK policies for GI, the current framework can be further enhanced through interactive platforms, planting schemes, and added metrics for biodiversity and climate adaptation.

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1. Introduction

Green infrastructure (GI) and nature-based solutions (NBS) have gained significant attention for their role in mitigating urban environmental challenges such as heat islands, air pollution, and stormwater management (Kumar et al., 2024a, 2024b; Glytsos et al., 2025). While extensive research has documented the environmental benefits of GI, the focus has predominantly been on large-scale, institutionally driven interventions (Campbell-Arvai and Lindquist 2021; Davies and Santo-Tomás Muro 2024; Abhijith et al., 2024) that form a multifunctional network. In contrast, do-it-yourself (DIY) approaches to urban greening, which empower individuals and communities to implement small-scale green solutions, have received limited attention despite their potential to democratise urban greening, foster community engagement (Navarrete-Hernandez and Laffan, 2023; Jones and Russo 2024; Abhijith et al., 2025), and make an important contribution to this multifunctional network of GI (Lourdes et al., 2022). Positioning DIY GI within the broader literature on community-based environmental management and participatory planning highlights its role as a bottom-up counterpart to state- or market-led greening programmes, where residents themselves act as planners, implementers, and stewards (Davies and Santo-Tomás Muro, 2024; Butt and Rigoni, 2025). Participatory approaches and community-based interventions can address limitations of institutionally led greening, with evidence from the UK showing that public participation supported by governance tools enhances inclusivity, resilience, and quality (Jones and Russo, 2024). Studies further underscore that embedding GI standards with genuine community engagement leads to more equitable and sustainable outcomes (Davies and Santo-Tomás Muro, 2024; Grace et al., 2025). DIY GI solutions therefore can be defined as small-scale, citizen-initiated implementations of nature-based interventions that use locally available resources, community knowledge, and grassroots organising to address urban environmental challenges. Unlike large-scale institutional projects, DIY GI solutions are characterised by their bottom-up approach, reliance on community participation, and emphasis on local ownership and maintenance. While the benefits of GI for urban cooling, air quality, biodiversity, and wellbeing are well established (Demuzere et al., 2014; Kabisch et al., 2017), most planning, funding, and technical guidance remain geared toward institutionally led, large-scale interventions (Meerow and Newell, 2017). However, such projects are often slow-moving, resource-intensive, and constrained by local authority budgets, frequently leaving behind low-income or marginalised communities, thereby exacerbating spatial disparities in GI provision (Rigolon and Németh 2018). Community-led initiatives such as guerrilla gardening, seed bombing, and grassroots tree planting offer a powerful counterpoint to top-down delivery models (Firth et al., 2011). Although typically informal and small in scale, such efforts can contribute meaningfully to the multifunctional GI network and empower communities to take ownership of their environment (de Bremond et al., 2019). Yet, their informal nature often makes them dependent on local champions, ad-hoc funding, and volunteer expertise and most existing tools and guidance are not tailored to non-expert users (Mattijssen et al., 2018). This paper presents a structured framework to support household- and street-level actors in designing and selecting appropriate DIY GI solutions, addressing a critical gap in both policy and practice. These solutions encompass a range of interventions including community gardens, rain gardens,green walls on private buildings, rooftop gardens, street tree planting initiatives, and pocket parks developed through community action (Kirkpatrick and Davison 2018; Šiftová and Fialová, 2023). While DIY GI shares some characteristics with traditional gardening and hobby balcony maintenance, several key distinctions establish its unique identity (Šiftová and Fialová, 2023; Cameron 2023). The scale of impact extends beyond individual properties to provide neighbourhood or community-wide environmental benefits, and implementation inherently involves or aims to inspire broader community participation and knowledge sharing. Thus, DIY GI deserves dedicated scholarly attention not only for its descriptive variety, but also for the way it embodies grassroots governance, negotiated equity, and community resilience in practice. The threshold at which private gardening efforts become considered DIY GI may be argued to occur when individual actions begin to generate measurable ecosystem services as part of a multifunctional network (Stafford et al., 2021). However, many factors affect biodiversity in urban gardens, with knock-on impacts for ecosystem services (Gaston et al., 2005; Adegun et al., 2021; Buckwitz et al., 2025). The implementation of DIY GI solutions involves diverse actors with varied motivations and governance structures. Individual citizens drive efforts, motivated by environmental and community goals. Community groups facilitate knowledge sharing, resources, and volunteer coordination. Municipal authorities act as enablers by providing technical expertise, permits and funding. Private organizations may also contribute funding and expertise. Governance models are often complex and diverse, ranging from grassroots volunteers to formal groups and partnerships, each offering unique strengths in flexibility, capacity, and scalability. Recognising this diversity of actors underscores that DIY GI operates at the intersection of urban governance and civil society, raising critical questions about long-term sustainability, inclusivity, and institutional support.

GI addresses societal challenges such as climate change, disaster risks, food and water security, and health inequalities by protecting and sustainably managing or restoring natural ecosystems (EEA 2023; Jones and Russo 2024; Kumar et al., 2025). The scaling of these solutions beyond local contexts remains challenging, with limited experience in replicating solutions across different urban environments (Davies et al., 2024; Oikonomaki et al., 2024). The lack of standardised methods for assessment and monitoring of GI features is a major challenge for replicating and applying them at a wider scale (EEA, 2023). Economic barriers further compound these challenges (Panduro et al., 2024), and highlight the importance of exploring more accessible, community-driven approaches to urban greening. Economic evaluation dominates the literature, with Song et al. (2018) reporting a mean benefit-cost ratio of 5.43 for GI, while Chelli et al. (2025) reported the cost benefit analysis across multiple GI types. Maintenance emerges as a crucial concern, with Kim and Arik (2025) finding that nearly 60 % of residents worried about maintenance, while 66 % of observed GI was poorly maintained. Furthermore, the quality of maintenance appears to be influenced by socioeconomic disparities; Uribe and Villaseñor (2024) reported that wealthier residences provide additional urban tree care, reflecting the “luxury effect” in GI management. Public engagement research reveals strong community support but limited participation mechanisms, with Moffat et al. (2024) finding that 73 % of residents agreed their town/city is better because of trees, yet only 24 % thought there were too few trees in neighbourhoods, while 76 % identified local authorities as responsible for urban trees. Jones and Russo (2024) found that public attitudes favour urban GI but participation requires deliberative approaches with proper policy support mechanisms. Most research addresses economic benefits (Song et al., 2018; Chelli et al., 2025; Panduro et al., 2024; Wild et al., 2024), maintenance challenges (Kim and Arik, 2025; Sexton and Lawhorn, 2025), and public participation (Campbell-Arvai and Lindquist, 2021; Davies and Santo-Tomás Muro, 2024) as separate domains, with limited integration of these factors.

Table 1 presents an overview of previous reviews that address the economic, maintenance, and participatory challenges associated with GI implementation. Song et al. (2018) and Cohen-Shacham et al. (2019) focused on the economic returns of GI and guiding principles for scaling NBS, respectively. Ying et al. (2022) and Myers et al. (2023) identified barriers such as socio-cultural, financial, and institutional constraints that hinder widespread adoption. Cameron (2023) pointed to the overlooked potential of domestic gardens in contributing to urban greening. Notably, the most recent analyses by Sexton and Lawhorn (2025), Chelli et al. (2025), Zarei and Shahab (2025), and Chau et al. (2025) have tended to focus on technical performance, economic

Table 1
Summary of key review on GI implementation challenges, economic needs, cost-benefit, and public participation factors.

Author, Year	Key Findings
Sexton and Lawhorn (2025)	Highlights the key practices of urban ecosystem resilience such as careful species selection, incorporation of genetic diversity, enhancing landscape connectivity, and applying frequent low intensity management, crucial for sustaining biodiversity under urban stressors and ensuring long term restoration success.
Chelli et al. (2025)	Conducted cost-benefit analyses that primarily focused on social benefits, with limited valuation of environmental costs, and reported predominantly positive outcomes across Europe, Asia, and the US.
Zarei and Shahab. (2025)	Successful urban NBS implementation relies on spatial justice, integrated governance, sustainable financing, technical capacity, and stakeholder engagement, while key barriers include spatial constraints, high costs, limited performance and cost data, and political fragmentation.
Chau et al. (2025)	Urban GI in Melbourne faces technical, financial, regulatory, political, and governance barriers; coordinated leadership, inclusive planning, and funding are key to overcoming these challenges and scaling implementation.
Myers et al. (2023)	Reviewing 15 studies, equity in urban tree programs demands prioritising justice dimensions and community engagement over mere planting and efficiency trade-offs.
Cameron (2023)	Gardens need policy recognition for ecosystem services and improved planning practices for urban sustainability.
Ying et al. (2022)	The economic valuations and implementation of GI in developing regions remain limited. Studies mainly focus on stormwater, ecosystems, and climate resilience, highlighting gaps in interdisciplinary definitions, cost–benefit data, and socioeconomic integration.
Cohen-Shacham et al. (2019)	IUCN's eight NBS principles guide implementation; integration, landscape scale, policy alignment are unique, yet adaptive management, monitoring, and uncertainty gaps persist.
Song et al. (2018)	Urban trees provide net positive economic returns, with a mean benefit-cost ratio of 5.43, though valuations vary due to species, age, and methods, underscoring the need for standardised global assessment frameworks in urban forestry.

viability and city-scale planning aspects of GI (e.g. evaluating centralised stormwater systems or cost–benefit optimisations). While such studies have advanced understanding of GI at municipal and regional scales, GI adoption at the street or household scale is seldom examined in the literature. In particular, previous reviews rarely explore how private residents decide to implement GI or what motivates and hinders action at the household and local community scale.

The current review addresses the deficiency of detailed information regarding costs and benefits of GI implementation in home and neighbourhood settings, thereby offering novel insights into the drivers, barriers, and opportunities for engaging individuals in localised urban greening initiatives. The paper presents the most common DIY GI found in the UK at street and household scale. This focus fills a critical niche by connecting the high-level benefits of GI documented in earlier work with on-the-ground adoption dynamics, thus providing a more comprehensive understanding of how to accelerate GI uptake at finer scales. It should be noted that the scope of this review is limited to household and streetside vegetation, while larger institutional habitats such as parks, urban forests, and grasslands provide important but distinct contributions that fall outside the present analysis.

This review article describes the existing literature on GI at individual scales to develop a practical, scalable framework for cost-effective and participatory DIY GI implementation. The specific objectives are to (1) compile and synthesise fragmented research on costs, maintenance, benefit, and public engagement into an integrated GI database focused on street and household-scale interventions; (2) extending the individual GI specific information to the most common mixed GI scenarios in the real world; (3) develop evidence-based guidance materials for both municipal authorities and individual actors by translating complex economic and technical considerations into accessible tools such as a DIY manual; and (4) bridge the persistent gap between academic studies and real-world applications by offering unified recommendations that align household-level participation, resource requirements, and urban sustainability outcomes.

2. Methodology

Recognising that GI elements frequently occur in combination rather than isolation, we designed a methodological framework that reflects this complexity. Initial evidence from Kumar et al. (2024a) highlighted the existence of mixed GI installations, a finding further confirmed by Chelli et al. (2025). Building upon these foundational insights, we expanded the original 51 individual GI categories by Kumar et al. (2024a) to around 120, in order to account for real-world hybrid configurations more accurately. Through a rigorous process of consolidation and classification, we reviewed existing literature on urban greening practices in the UK to identify the commonly existing single GI types at household and street scales. This synthesis highlighted six household GI (trees, grass, hedge, shrub, container plants, and hanging plants) and seven street GI (trees, shrubs, hedge, pocket gardens, green median, raised planters, and roadside grass) as consistently reported across residential environments. Building on these evidence-based single categories, we then generated a structured set of scenarios by combining elements that were frequently co-located in both empirical studies and field observations. This process resulted in 80 configurations, including both individual and hybrid interventions as well as a 'no GI' reference case, comprising 50 household-scale and 30 street-scale scenarios, as detailed in Table 2.

2.1. GI characterisation

To understand the occurrence of the 80 GI combinations presented in Table 2, a systematic mapping method was employed. We selected 112 major towns and cities across England and Wales, as shown in Fig. S1. City selection was guided by the Office for National Statistics (ONS, 2023) definition of built-up areas with a residential population exceeding 75,000, ensuring representation of both large metropolitan centres and medium-sized towns across England and Wales. These cities were selected as they constitute the major urban centres where greening interventions are most relevant, and our aim was to characterise the occurrence of GI scenarios across UK cities rather than conduct detailed inter-city comparisons. For contextual purposes, population density and mean Normalised Difference Vegetation Index (NDVI) were also compared over the study domain (See Fig. S2) and the result shows that approximately 87 % of 112 major metropolitan centres of England and Wales population resides in areas with mean NDVI below 0.6, in relatively low-greening environments. Within each city, three households and three streets were randomly sampled to capture variation across housing typologies and neighbourhood morphologies, while constraining street segments to 50–100 m lengths to provide a consistent observational unit. Google Street View imagery was then used to systematically code visible GI. To maximise accuracy, panels of imagery were pre-screened and the most recent images available (ranging from 2023 to early 2025) were selected. This ensured that vegetation was captured in its developed state, avoiding artefacts associated with outdated imagery. The back gardens were visible in cases with open alleyways, corner plots, or semi-transparent fencing. However, where they were not visible, aerial imagery was used to identify the GI types, as google aerial imagery offers relatively high clarity and spatial resolution suitable for small-scale vegetation mapping (Jiang et al., 2017). At each site, GI elements visible in the streetscape or household frontage were recorded based on their form, spatial arrangement, and integration. These observations were then systematically matched to the predefined

Table 2
Detailed classification of GI scenarios across street and household scales, illustrating the diversity of implemented combinations and the mixed configurations commonly observed in urban settings. Scenarios are delimited by semicolons within the table for clarity and readability.

Spatial scale	GI Scenarios
Household	No GI; Trees only; Grass only; Hedge only; Shrub only; Container plant only; Hedge + Grass; Grass + Shrub; Hedge + Trees; Trees + Shrub; Hedge + Grass + Shrub; Trees + Container plant; Hedge + Shrub; Hedge + Trees + Shrub; Shrub + Container plant; Hanging plant + Container plant; Tree + Grass + Shrub + Hanging plant; Hedge + Grass + Trees; Grass + Shrub + Container plant; Hanging plant only; Shrub + Green screen; Hedge + Trees + Container plant; Shrub + Hanging plant; Trees + Shrub + Container plant + Hanging plant; Hedge + Grass + Trees + Shrub; Grass + Container plant; Hedge + Shrub + Hanging plant; Hedge + Shrub + Container plant; Tree + Grass + Shrub; Hedge + Shrub + Container plant + Hanging plant; Trees + Grass + Hanging plant; Hedge + Grass + Trees + Container plant + Hanging plant; Grass + Shrub + Green screen; Hedge + tree + Shrub + Container plant + Hanging plant + Green screen; Tree + Grass + Green screen; Hedge + Grass + Shrub + Container plant + Hanging plant + Green screen; Hedge + Hanging plant; Grass + Green screen; Hedge + Grass + Shrub + Green screen; Grass + Hanging plant + Container plant; Hedge + Hanging plant + Container plant; Grass + Green screen + Container plant + Hanging plant; Trees + Shrub + Green screen; Trees + Hanging plant + Container plant; Hedge + Grass + Container plant + Shrub; Trees + Grass + Container plant; Hedge + Grass + Container plant + Hanging plant; Hedge + Grass + Green wall; Hedge + Grass + Trees +Container plant + Shrub; Container plant + Hanging plant + Shrub.
Street	No GI; Trees only; Shrubs only; Hedge only; Pocket garden only; Green median only; Street pot with plants only; Roadside grass only; Street tree + Roadside grass; Street tree + Roadside grass + Hedge; Street tree + Hedge; Roadside grass + Hedge; Street tree + Roadside Grass + Green median; Street trees + Street pot with plants; Street tree + Roadside Grass + Shrubs; Street Tree + Roadside grass + Hedge + Green median; Street Tree + Roadside grass + Hedge + Shrub; Street trees + Green median; Street trees + Pocket garden; Roadside grass + Shrubs; Street tree + Hedge + Pocket garden; Roadside grass + Street pot with plants; Hedge + Pocket garden; Street tree + Roadside grass + Pocket garden; Street trees + Shrubs; Roadside Grass + Hedge + Shrubs; Street Tree + Roadside grass + Hedge + Street pot with plants; Street Tree + Roadside grass + Hedge + Shrub + Green median; Street Tree + Roadside grass + Shrub + Green median.

Note: Green median - vegetated strips located in the centre of roads or between traffic lanes, typically containing grass, shrubs, or trees for traffic separation and stormwater management; Roadside grass - grassed verges or strips between roadways and pavements/property boundaries; Green screen - vertical plantings or living walls used for privacy, noise reduction, or aesthetic purposes on residential properties; Street pot with plants - containerised plantings placed in public street areas, often used where in-ground planting is not feasible due to utilities or pavement constraints; Pocket garden - small-scale planted areas integrated into urban streetscapes, typically less than 50m^2 and designed for community benefit; Hanging plant - suspended container plantings, commonly used in household applications for vertical greening where ground space is limited.

30 street-scale and 50 household-scale configurations detailed in Table 2.

2.2. Data extraction method

The DIY parameters such as cost, maintenance, required expertise, space requirement and associated cost-benefits are derived from the literature review that incorporated both scientific and grey literature. The keywords used to search the literature are presented in the Fig. S3 of 200 publications, visualised using VOS viewer. DIY parameter values for every scenario in Table 2 are not fully documented in the source literature, but reporting exact numbers for all parameter values is not the main focus of this review paper. Where there are missing values, individual GI types are assigned based on similar GI types, and for combinations, the values are added up accordingly. Therefore, the figures at each section should be interpreted cautiously, not as exact values but as an impression of the likely cost, maintenance, required expertise, space requirement and associated benefits of each GI scenario.

2.3. DIY score for GI scenarios

Based on the typology and literature synthesis, a performance assessment framework was developed to evaluate the challenges associated with implementing small-scale DIY GI across five key dimensions: level of expertise, establishment cost, space requirement, maintenance and cost benefit. Each dimension was assessed using a five-level ordinal scale reflecting the intensity of the challenge, ranging from negligible to very high. Scoring was based on a combination of peer-reviewed evidence, expert-informed estimation, and case study analysis (Table 3). The selection of five levels is based on the study by Jones et al. (2022) used to score the environmental benefits of GI.

Table 3 provides a symbolic representation of the key dimensions of DIY for GI, categorised across five levels (Level 1 to 5): negligible, low, medium, high, and very high. For level of expertise, negligible projects require minimal skills and can typically be completed with basic online tutorials. Low-level expertise involves simple assembly and basic tools, making them accessible to most homeowners. Medium-level initiatives require a moderate understanding of planning, design, and technical elements, manageable with some research and preparation. Very high-level projects involve complex technical integration across multiple disciplines and usually need specialist training or expert consultation. In terms of costs and maintenance, each level is benchmarked against the UK national minimum wage (£12/hour as of April 2024), which is a close match for the average household rate for garden work (HTA, 2024). For consistency across cities, the national minimum wage was applied as the benchmark; we acknowledge that the voluntary London Living Wage (currently £13.15/hour) is greater, and costs in London contexts may therefore be underestimated. Negligible indicates less than £5 and low costs fall below this hourly rate (i.e. £5 to £12), while medium corresponds to roughly similar to minimum wage with a maximum range till £18 (i.e. £12–£18). High (£18–£24) and Very-high (£24–£36) levels reflect costs equivalent to two and four hours of minimum wage, respectively. Space requirements are contextualised using UK housing data, which shows a median garden size of 140 m^2 in London and a national median of 188 m^2, compared with mean values of 201 m^2 and 330 m^2 respectively (ONS-UK, 2025). We use the median values for our analysis, as these are less influenced by outliers and provide a more representative measure of typical household garden space.. Negligible and low space needs suit compact urban settings, typically using under 10 m^2. Medium-level projects require 10–50 m^2, aligning with standard suburban gardens. High-level interventions need between 50 and 150 m^2, while very high projects exceed 150 m^2, making them suitable for larger residential plots or community-scale installations. The expertise requirements for GI implementation were assessed using a systematic 0–4 scale methodology aligned with Royal Horticultural Society (RHS, https://www.rhs.org.uk/) qualification standards and validated through literature review and expert consultation. Basic Level 1–2 interventions such as container planting, small pocket gardens, and simple hedge installations can be successfully undertaken by beginners with basic hand tools including spades, secateurs, and watering cans, providing immediate benefits for urban climate regulation and biodiversity enhancement while requiring minimal technical knowledge (BBC Gardening Guides, 2024). Intermediate Level 3–4 projects involving hanging systems, multi-element coordination, and complex design integration require gardening experience and understanding of plant selection, soil preparation, and irrigation needs. Advanced Level 5 interventions including street trees, green medians, and structural

Table 3
Symbolic representation for the key dimensions of DIY such as expertise, cost, space requirement and cost benefit for GI implementation.

Categories	Levels				
	Negligible	Low	Medium	High	Very High
Level of expertise					
Cost					
Maintenance					
Space requirement					
Cost benefit					

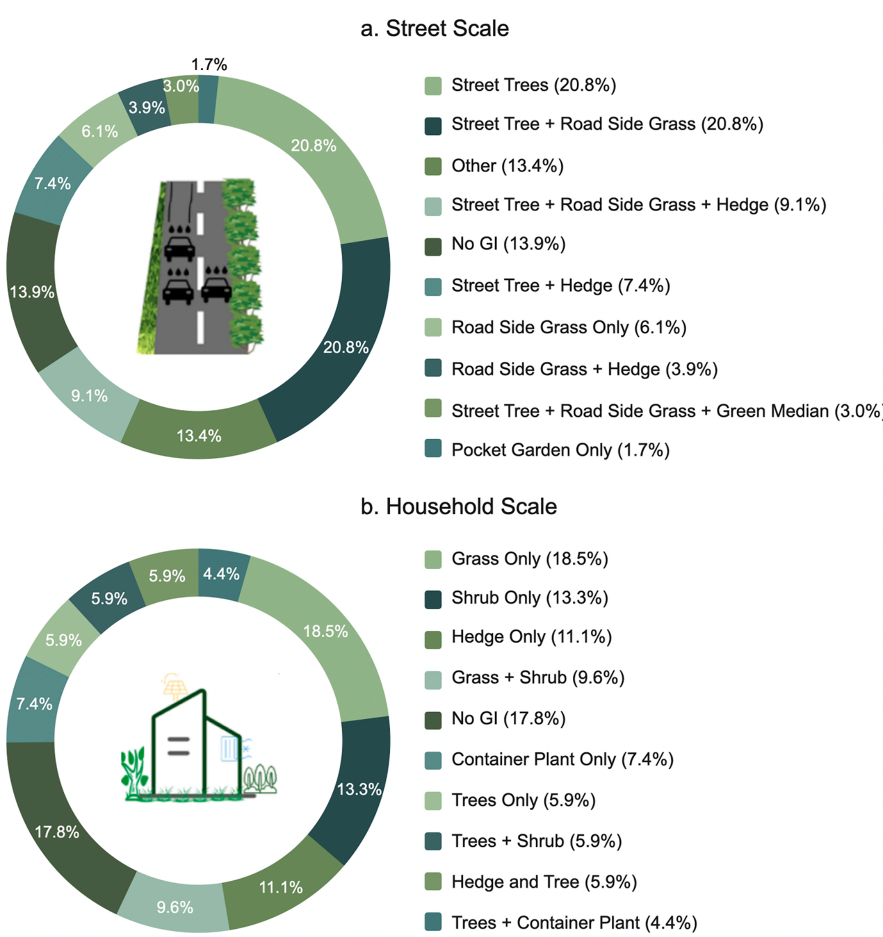

Fig. 1. Distribution of GI scenarios at (a) street scale and (b) household scale in UK cities, showing the top 10 most prevalent categories. The pie charts illustrate the relative frequency of different GI configurations, ranging from no infrastructure to complex multi-feature combinations. Complete data for all 80 identified categories are provided in Table S1.

elements must be professionally installed due to safety regulations, permit requirements, and specialised equipment needs. To enable a standardised and economically contextualised evaluation of GI cost-benefit performance, we established a five-level scoring framework anchored to the UK median annual household income (£36,700, ONS-UK., 2025) and average residential floor area (~80 m^2, ASSET-UK., 2024), yielding an estimated economic baseline of approximately £400/m^2/year. The upper bound of £400/m^2/year therefore represents the maximum expected cost benefit threshold, while the lowest bound of £50/m^2/year was set to capture the minimum plausible return from small-scale GI features, consistent with reported valuations of modest interventions such as planters and small gardens (Natural Economy Northwest, 2008; Forest Research, 2010). Estimated annual benefits of each GI configuration, expressed in £/m^2/year, were stratified into five performance tiers: Level 1 (<£50/m^2/year), Level 2 (£50–£100/m^2/year), Level 3 (£100–£200/m^2/year), Level 4 (£200–£400/m^2/year), and Level 5 (>£400/m^2/year). This income-normalised metric enables a robust comparison of GI interventions by relating ecosystem service valuation to household-level economic thresholds, thereby improving the interpretability and policy relevance of cost-benefit outcomes. Domestic gardens are known to make significant contributions to urban GI, but well vegetated gardens are insufficiently protected and need to be more effectively promoted to help secure their invaluable ecosystem services (Cameron et al., 2012; Cameron, 2023). The kinds of frameworks and practical guides described above offer significant scope to support such promotion and to engage more citizens directly in the mission to enhance GI benefits through DIY modes.

3. Mapping of GI in UK cities

The mapping of GI across UK cities reveals significant diversity in urban greening approaches at both street and household scales (Fig. 1). At the street scale, the analysis identified 25 distinct GI configurations, with "Street trees" and "Street tree + Roadside grass" each representing the most common scenarios (20.8 % each). The prevalence of these tree-centric configurations underscores the dominance of traditional street tree planting as the primary GI intervention in UK urban environments. Multi-feature combinations demonstrate moderate adoption, particularly "Street tree + Roadside grass + Hedge" (9.1 %) and "Street tree + Hedge" (7.4 %), indicating growing recognition of multifunctional GI. However, 13.9 % of surveyed locations (n = 32) still lack any GI implementation, highlighting gaps in urban greening coverage.

At the household scale, 50 different GI scenarios were identified, demonstrating diversity in residential greening practices across UK cities. "Grass only" emerges as the most prevalent configuration (18.5 %), followed closely by properties with "No GI" (17.8 %), revealing significant variation in household-level adoption. Single-feature approaches dominate, including "Shrub only" (13.3 %) and "Hedge only" (11.1 %), suggesting preferences for low-maintenance solutions. Combination scenarios such as "Grass + Shrub" (9.6 %) and various configurations incorporating container plants, hanging plants, and green screens represent emerging trends in space-efficient urban greening.

The dataset reveals that while simpler GI configurations predominate in UK cities, there is adoption of complex multi-feature systems. Street-scale interventions focus primarily on trees and grass combinations, while household-scale diversity extends to practices including green screens, hanging plants, and container gardening. This mapping provides baseline data for understanding current GI implementation patterns and identifying opportunities for enhanced urban greening strategies across UK urban environments.

4. Establishment cost of GI

Establishment costs for GI interventions vary significantly depending on typology, spatial scale, and geographic context (Song et al., 2018; Panduro et al., 2024). Fig. 2 provides a comparative overview of cost among street trees, hedge tree and green roof (Grant et al., 2023; Panduro et al., 2024; Hedging Price Guide, 2020). Fig. 2(a) illustrates the price gradient of hedging species by height and type (See Table S2). Evergreen hedges are the costliest across all height categories, particularly in the low-height class (~£11/linear meter), while deciduous and semi-evergreen species generally incur lower costs, averaging £3–7/linear meter (Hedging Price Guide, 2020). These differences reflect species-specific growth rates, maintenance needs, and nursery supply trends. Fig. 2b shows green roof establishment costs across the UK and three European countries. Costs vary widely, from ~£120/m^2 in the UK which is comparable to other countries of Europe, largely influenced by system type (extensive vs. intensive), building regulations, and installation complexity (Grace and Smith, 2022; Panduro et al., 2024). This international comparison underscores the need for context-sensitive financial planning in green roofs, while the broader principle equally applies to other greening interventions where costs are shaped by local conditions and regulatory frameworks (Grace et al., 2025).. Fig. 2c presents the cost distribution of street trees, based on unit

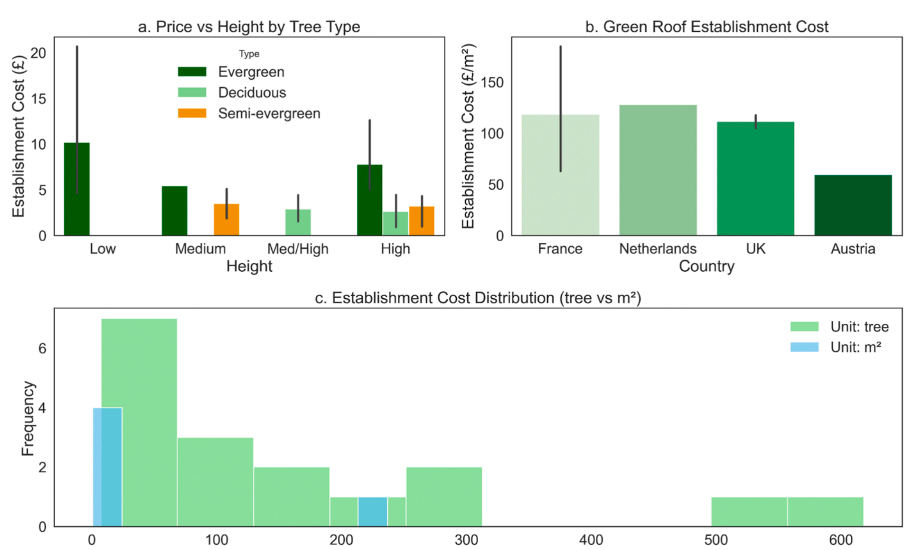

Fig. 2. Summary of establishment costs for key GI interventions. (a) Hedge establishment costs by height category showing variation between evergreen, deciduous, and semi-evergreen species; (b) Green roof establishment costs across different European countries; (c) Street tree establishment cost distribution.

costs per tree. The majority fall within the £50–200 range, though some exceed £500 due to species maturity, staking, and transport requirements (Song et al., 2018; Panduro et al., 2024). Grassed areas, such as lawn grass, are the most economical option at £2.5/m^2 (TurfOnline, 2024), followed by pocket gardens and public parkland at ~£3/m^2. Hanging baskets are priced at ~£15/unit (RHS, 2024). These figures highlight not only biological and regulatory differences but also structural barriers: high upfront costs for complex systems may limit access to more affluent households or municipalities with established green budgets, raising equity concerns for DIY GI adoption (Grace et al., 2025). We map the individual establishment cost to the 80 scenarios shown in Table S3.

5. GI maintenance costs

Maintenance requirements for GI vary substantially across intervention types, reflecting differences in vegetation characteristics, spatial scale, and system complexity. Here, we use the term 'maintenance costs' to represent the potential monetary value of these maintenance demands, recognising that actual reestablishment costs may be avoided if maintenance is carried out by the household or community. Drawing from Panduro et al. (2024) with values reported for 2021, average maintenance costs for urban green spaces range between £1.52/m^2 and £5.75/m^2 annually, with medians from £0.79/m^2 to £1.98/m^2, while tree-specific maintenance averages £28/tree/year. Simpler interventions like grass lawns involve minimal maintenance, mainly mowing and reseeding at the lowest cost bracket (~£0.04 - £1.70/m^2). Trees with height < 5 m demand structural pruning, pest control, and irrigation during establishment, accounting for higher individual maintenance needs. Vertical greening systems such as living walls are among the most resource-intensive, requiring frequent plant replacement, fertilisation, pest management, and irrigation checks, often exceeding £10/m^2/year. We extrapolated maintenance costs to all 80 GI configurations listed in Table S3 based on the information provided in Panduro et al. (2024). Fig. 3 shows the relationship between establishment and maintenance costs across household and street-scale interventions. A positive correlation ($r = 0.8$) is evident in Fig. 3, with household-scale GI (e.g. green roofs) typically incurring higher maintenance costs per unit than larger-scale public configurations. High-cost, high-maintenance systems include green roofs at the household scale and tree–hedge–pocket park combinations at the street scale. Due to issues of inflation and transferability between contexts, maintenance costs are often quoted in terms of time spent per m^2/year (Dunnett and Hitchmough, 2004; Cameron et al., 2012). Maintenance requirements therefore emerge as a central equity challenge: communities with fewer resources may face disproportionate burdens in sustaining DIY GI, risking uneven quality and sustainability across socio-economic settings (Anguelovski et al., 2018).

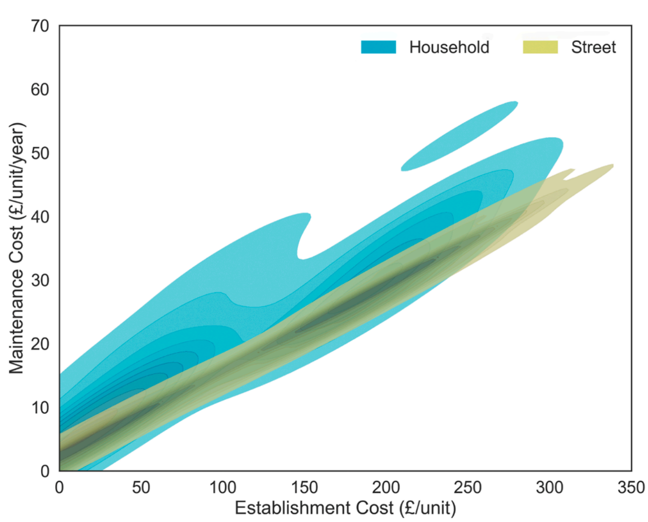

Fig. 3. Bivariate Kernel Density Estimation (KDE) plot showing the distribution of maintenance cost versus establishment cost for household and street GI interventions. The shaded regions represent density contours, with Household and Street types distinguished by colour.

6. Space requirement for GI

Following analysis of establishment and maintenance costs, understanding the spatial requirements for GI is fundamental for effective urban planning and design, particularly in the context of small-scale establishment over UK built up areas (Jerome et al., 2019). Space requirements represent a critical determinant that directly influences both initial capital investment and long-term operational success of GI projects, as outlined in Natural England's comprehensive GI framework (Houghton, 2023). The spatial demands vary considerably based on infrastructure type, species selection, characteristics at maturity, and intended ecosystem services delivery (Chen et al., 2024; Grace et al., 2025). The space requirements for all the GI scenarios are extrapolated using the information available in Grace et al. (2025), GI framework (Houghton, 2023), GI handbook (John et al., 2019) and Hedging Price Guide (2020) and tabulated in Table S4. As demonstrated in Table S4, space requirements for different GI configurations range from minimal allocations of 4–12 m^2 for simple grass and container plant combinations to complex systems requiring 80–130 m^2 for complete street transformations incorporating all major components including street trees, roadside grass, hedges, and green medians. Street trees alone typically require about 25–50 m^2 of ground space, depending on species, planting design, and mature canopy spread (which can range from 5 to 12 m in diameter). More complex configurations, such as street trees combined with roadside grass and hedges, may require 45–75 m^2 to accommodate the additional hedge depth of 1.5–2.0 m along with necessary maintenance buffer zones. According to the GI standards for England (Houghton, 2023), optimal space planning for effective GI planning requires a clear understanding of the space needed for different elements and how they fit within existing urban infrastructure, ensuring alignment with the GI framework standards (Houghton, 2023). It is therefore clear that the space for residential establishments demonstrates significant variability, yet typical household garden sizes in the UK range from 50 to 150 m^2 (Ghosh and Head, 2009). Even within these constrained spaces, however, amore intensive residential GI systems incorporating hedge, grass, trees, shrubs, container plants, hanging plants, and green screens should be achieveable, as given their minimum effective implementation area of approximately 30–80 m^2 to achieve full functionality. The spatial requirements outlined in Table S4 depicts essential representation for achieving these targets while accommodating the diverse range of GI implementations. So, for those with less space available, using space-efficient solutions such as hedge and hanging plant combinations requiring only 5–15 m^2 can still achieve multiple benefits, whilst those with more space could implement comprehensive multi-component systems that maximise ecosystem service delivery within available urban space constraints. While spatial thresholds are crucial for effective planning, tenure security and access rights are equally decisive: in many urban contexts, available space may exist but remain inaccessible for DIY GI implementation, underscoring the need for supportive tenancy and planning frameworks (Rigolon, 2016; Meerow and Newell, 2017).

7. Assessment of level of expertise

The analysis of GI scenarios reveals significant variation in individual expertise requirements, ranging from basic beginner tasks to professional-level interventions requiring formal qualifications. Based on the assessment of the different configurations across street infrastructure and household property contexts, expertise levels were categorised to five levels described in Section 2.3, aligned with Royal Horticultural Society (RHS) qualification standards and validated through literature review, and expert consultation and shown in Table S5. Level 1 (Beginner) scenarios, requiring no formal qualifications and achievable with basic tools such as spades and secateurs within 2–3 gardening sessions of learning, encompass simple single-element implementations like grass-only areas or individual shrub plantings, representing 18 % of assessed configurations. Level 2 interventions, aligned with RHS Level 1 Award in Practical Horticulture standards and requiring a few weekends of practice, involve simple coordination of multiple basic elements such as "Roadside grass + Hedge" combinations, accounting for 15 % of scenarios. Level 2 (Beginner-Intermediate) projects, requiring RHS Level 1 qualifications plus 1–2 seasons of experience, encompass container gardening and hanging plant installations demanding design skills and installation expertise, representing 21 % of configurations. Level 5 (Advanced/Professional) interventions dominate at 36 % of scenarios, particularly those involving street trees, green medians, or structural elements, requiring RHS Level 3+ qualifications or professional training due to safety considerations, permit requirements, and specialised equipment needs. The classification system was guided by key decision factors: trees with height greater than 12 m always require Level 4 professional expertise due to safety and permit requirements; public spaces demand Level 5 implementation for safety and regulatory compliance; hanging/vertical installations require Level 3–4 skills for proper installation techniques; multiple basic elements require Level 1 simple coordination abilities; and single elements remain Level 1 beginner-friendly interventions. This classification system, supported by Grace et al. (2021) who identified professional implementation barriers as priority knowledge needs, and validated against BBC gardening guidelines expert recommendations for tool selection and skill development (BBC, 2024), demonstrates that while basic GI elements remain accessible to DIY enthusiasts, the substantial economic benefits in Section 8 often justify professional implementation for complex scenarios, though as Chelli et al. (2025) emphasise, citizen knowledge remains critical for recognizing ecosystem service benefits and building community support for both DIY and professional GI initiatives. This expertise gradient reveals a structural barrier for DIY GI: without targeted training, most households will remain excluded from high-benefit scenarios. Municipal schemes that offer guidance or training could help democratise access and reduce dependency on costly professional services (Armson et al., 2013; Raymond et al., 2017).

8. Cost-benefit analysis

For cost-benefit analysis various evaluation tools were employed including i-Tree software, which provides comprehensive urban forest assessment through standardised models for air pollution removal, carbon sequestration, and energy savings (McPherson, 2003; Soares et al., 2011), GreenPass software that quantifies building-integrated vegetation performance through detailed microclimatic modelling and ecosystem service assessment (Scharf et al., 2021), InVEST models that integrate biophysical data with economic valuation for spatial ecosystem service mapping (Biasin et al., 2023), and the GI Valuation Toolkit that offers standardised methodologies across diverse NBS interventions. However, as documented by Chelli et al. (2025) in their systematic review of urban NBS studies, these tools often exhibit limitations in capturing co-benefits and temporal variability, with incomplete inclusion of the full range of benefits due to difficulties in estimating monetary values and accounting for spatial and temporal dynamics. The InVEST models demonstrated additional constraints in accounting for spatial benefit distribution and long-term ecosystem dynamics, particularly regarding the "biological time" required for NBS to become fully functional (Biasin et al., 2023). Chelli et al. (2025) measured performance data supplemented by measuring six ecosystem service indicators across 1432 m^2 over a full annual cycle, generating €340,363 in quantified benefits. These six key performance indicators (KPIs) comprised: KPI 1 - Solar radiation input reduction (€90,857 annually, 26.7 % of total benefits), KPI 2 - Evapotranspiration cooling (€75,430 annually, 22.2 %), KPI 3 - Water storage capacity (€1086 annually, 0.3 %), KPI 4 - CO_2 sequestration (€398 annually, 0.1 %), KPI 5 - O_2 production (€170,559 annually, 50.1 %), and KPI 6 - Indoor cooling capacity (€2035 annually, 0.6 %). The calculation methodology established distinct benefit coefficients for each GI type, with facade greening systems achieving the highest performance at €580.8/m^2/year through superior evapotranspiration cooling and solar radiation reduction capabilities. The comprehensive cost-benefits are extended for all the GI scenarios and the results are presented in Table S6, which later used score-based assessment following the method outlined in Section 2.3. For GI scenarios not directly measured, benefits were systematically extrapolated using proportional scaling methods for the GI combinations at street and household scale. Street-level interventions exhibited benefits ranging from €9.7/m^2/year for basic roadside grass to €265.5/m^2/year for integrated systems, while household-level scenarios demonstrated wider variation spanning €9.7/m^2/year to €818.1/m^2/year for comprehensive building-integrated solutions, emphasising the economic justification for sophisticated urban GI investments.

9. Designing of DIY card

Based on the existing and derived information about cost, maintenance, expertise and space requirement and associated benefits, using a scoring method (Section 2.3), DIY guidance cards were developed. The DIY cards organise all 80 identified GI combinations (30 street-scale and 50 household-scale configurations) and are shown in Table 4. Each combination is assigned standardised scores from L1 (negligible) to L5 (very high) across these dimensions, creating a practical decision-making tool that may enable both councils and individual households to make informed choices about GI investments. The DIY cards translate complex economic and technical information into simplified categorical scores that all users can easily interpret. Furthermore, the scores were tabulated for the individual GI type, which allows users to self-interpret additional GI combinations beyond the 80 scenarios in the present study.

From Table 4, household configurations demonstrate a broader distribution of benefit scores, with 18 combinations, such as “Trees + Shrub + Green screen” or “Hedge, Grass and tree + Shrub”, reaching the highest benefit score of 5, often coupled with high cost, expertise, and maintenance requirements. These high-scoring combinations also involve greater spatial and layering complexity, particularly when green screens or hanging plants are integrated. In contrast, street-level configurations are more homogeneously clustered at a benefit score of 1, including even complex combinations like “Street tree + Roadside grass + Hedge + Green median.” While street-scale GI interventions generally require larger physical spaces, their overall benefit ratings do not increase proportionally. This is because their ecosystem services, such as air quality improvement, pedestrian thermal comfort, and biodiversity support, are delivered primarily at the public realm level. Unlike household-scale measures that directly lower building cooling or heating demand, street-scale GI does not contribute an energy reduction component to the scoring framework, which in turn flattens the overall cost–benefit outcome. Overall, household GI scenarios exhibit greater variation and potential for high returns when multiple elements are combined.

Building on the strong policy foundation in the UK, such as the 25 Year Environment Plan and the Environmental Improvement Plan (HM Government, 2021, 2023), there is growing recognition of the need for accessible and standardised tools to guide GI implementation. GI standards are also being aligned with broader frameworks like the National Adaptation Plan and the Nature Recovery Networks (Grace et al., 2025), highlighting their cross-sectoral relevance. To complement these national efforts, the proposed GI scoring framework could be further

Table 4
Composite performance scores of common GI configurations at street and household level. Each parameter (cost, level of expertise, space requirement, maintenance, and benefit) is scored on a five-point scale using icons shaded with darker (100 %) and lighter (0 %) transparency levels: all five icons with 0 % transparency indicate the highest score (5), while progressively lighter icons with up to 20 % transparency represent lower scores (1–4).

Household					
Scenarios	Cost	Level of Expertise	Space Requirement	Maintenance	Cost-benefit
Grass only	1	1	1	1	1
Shrub only	1	1	1	1	1
Hedge only	1	1	1	1	1
Hedge only	1	1	2	1	1
Grass + Shrub	2	2	1	1	2
Hedge and grass	2	2	1	1	2
Hedge + Shrub	2	2	1	1	2
Hedge and grass + Shrub	2	2	1	2	3
Container Plant only	3	3	1	1	1
Hanging Plant only	3	3	1	1	1
Grass + Container Plant	3	3	2	1	2
Shrub + Container Plant	3	3	1	2	2
Shrub + Hanging Plant	3	3	1	2	2
Hedge + Hanging Plant	3	3	2	2	2
Grass + Shrub + Container Plant	3	3	1	2	3
Hedge + Shrub + Container Plant	3	3	2	2	3
Hanging Plant + Container Plant	4	4	1	2	2
Grass + Hanging Plant + Container Plant	4	4	2	2	3

(continued on next page)

Table 4 (*continued*)

Hedge + Shrub + Hanging Plant	£ £ £ £ £				
Hedge + Hanging Plant + Container Plant	£ £ £ £ £				
Hedge + Shrub + Container Plant + Hanging Plant	£ £ £ £ £				
Grass + Green Screen	£ £ £ £ £				
Shrub + Green Screen	£ £ £ £ £				
Grass + Shrub + Green Screen	£ £ £ £ £				
Hedge and grass + Shrub + Green Screen	£ £ £ £ £				
Grass + Green Screen + Container Plant + Hanging Plant	£ £ £ £ £				
Hedge and grass + Shrub + Container Plant + Hanging Plant + Green Screen	£ £ £ £ £				
Trees only	£ £ £ £ £				
Hedge and tree	£ £ £ £ £				
Trees + Shrub	£ £ £ £ £				
Hedge, Grass and tree	£ £ £ £ £				
Hedge and tree + Shrub	£ £ £ £ £				
Hedge, Grass and tree + Shrub	£ £ £ £ £				
Trees + Container Plant	£ £ £ £ £				
Tree + Grass + Shrub	£ £ £ £ £				
Hedge + Shrub + Container plant + Hanging plant	£ £ £ £ £				
Trees + Grass + Hanging plant	£ £ £ £ £				
Hedge + Grass + Trees + Container plant + Hanging plant	£ £ £ £ £				
Grass + Shrub + Green screen	£ £ £ £ £				

(*continued on next page*)

Table 4 (*continued*)

Hedge + tree + Shrub + Container plant + Hanging plant + Green screen	£ £ £ £				
Tree + Grass + Green screen	£ £ £ £				
Hedge + Grass + Shrub + Container plant + Hanging plant + Green screen	£ £ £ £				
Hedge + Hanging plant	£ £ £				
Grass + Green screen	£ £ £ £				
Hedge + Grass + Shrub + Green screen	£ £ £ £				
Grass + Hanging plant + Container plant	£ £ £ £				
Hedge + Hanging plant + Container plant	£ £ £ £				
Grass + Green screen + Container plant + Hanging plant	£ £ £ £				
Trees + Shrub + Green screen	£ £ £ £				
Trees + Hanging plant + Container plant	£ £ £ £				
Hedge + Grass + Container plant + Shrub	£ £ £ £				
Street Scale					
Roadside grass only	£				
Pocket garden only	£ £				
Hedge only	£				
Shrubs only	£				
Roadside grass + Hedge	£ £				
Street pot with plants only	£ £ £				
Green median only	£ £ £ £ £				
Street trees	£ £ £ £ £				

(*continued on next page*)

Table 4 (*continued*)

Street tree + Roadside grass	£ £ £ £ £				
Street tree + Pocket garden	£ £ £ £ £				
Street tree + Hedge	£ £ £ £ £				
Street trees + Shrubs	£ £ £ £ £				
Street tree + Roadside grass + Pocket garden	£ £ £ £ £				
Street tree + Roadside grass + Hedge	£ £ £ £ £				
Street tree + Roadside grass + Shrubs	£ £ £ £ £				
Street tree + Hedge + Pocket garden	£ £ £ £ £				
Street trees + Street pot with plants	£ £ £ £ £				
Street trees + Green median	£ £ £ £ £				
Street tree + Roadside grass + Green median	£ £ £ £ £				
Street tree + Roadside grass + Hedge + Green median	£ £ £ £ £				
Roadside grass + Street pot with plants	£ £ £				
Roadside grass + Shrubs	£ £				
Hedge + Pocket garden	£ £				
Roadside Grass + Hedge + Shrubs	£ £				
Street tree + Roadside grass + Hedge + Street pot with plants	£ £ £ £ £				
Street tree + Roadside grass + Hedge + Shrub + Green median	£ £ £ £ £				
Street tree + Roadside grass + Shrub + Green median	£ £ £ £ £				

developed by enhancing user-friendliness through interactive platforms, integrating planting schemes, and including new performance metrics, such as biodiversity contribution or climate adaptation value. This would enable local authorities, planners, and households to make data-informed decisions that align with UK policy goals for climate resilience and community wellbeing.

10. Conclusions and recommendations

We present a systematic mapping and analysis of GI implementations across UK cities, offering valuable insights into establishment cost, spatial requirements, technical expertise, and associated economic benefits. The review developed a practical framework translating complex technical and economic data into accessible DIY guidance cards based on five levels of scoring, addressing key barriers to widespread urban greening adoption. Through detailed assessment of 80 distinct GI configurations spanning street and household scales, this study establishes evidence-based foundations for informed decision-making in urban GI planning, design and implementation.

The following evidence-based conclusions were drawn:

- **Comprehensive GI diversity exists across UK cities at both street and household scales.** The mapping of 112 towns and cities to sample for 30 distinct street-scale and 50 household-scale configurations revealed that traditional tree-centric approaches dominate at street level (20.8 % each for "Street trees" and "Street tree + Roadside grass") whereas simple GI, such as grass and hedge, dominate at household scale (>50 % for "grass, shrub, hedge).
- **Establishment and maintenance cost shows a linear relationship across street and household scales.** GI establishment costs demonstrate wide variability ranging from minimal investments of £2.5/m^2 for grass areas to comprehensive systems exceeding £248 for complex household installations, with street trees representing the highest single-component cost at £175/tree establishment, additionally maintenance costs are scaled proportionally from £1/m^2/year for basic grass to £53/m^2/year for intensive multi-component systems.

- **Spatial requirements for GI vary widely by configuration complexity, underscoring the importance of tailored spatial planning.** The space varies from 4–12 m^2 for simple container plant combinations to 80–130 m^2 for complete street transformations, with household applications requiring 50–150 m^2 for typical UK residential properties, highlighting the critical importance of spatial planning in urban GI design.
- **Expertise requirements create significant implementation barriers with 36 % of GI scenarios requiring professional-level intervention (Level 4).** For tree installations and public space implementations, only 18 % remain accessible to beginner-level DIY enthusiasts, emphasising the need for capacity building and professional support systems.
- **GI offers strong economic justification for investment. These benefits are consistently driven by composition of GI.** Economic benefits substantially justify household and street GI investments with quantified annual benefits ranging from £9.7/m^2/year for basic interventions to £818.1/m^2/year for comprehensive building-integrated solutions, driven primarily by oxygen production, solar radiation reduction, and evapotranspiration cooling.
- **Multi-element greening configurations generally outperformed single-element setups across key evaluation dimensions.** At both the street and household scales, the combination of hedge, tree, shrub, container plant, hanging plant, and green screen achieved the highest overall benefit scores, indicating superior performance in terms of cost-effectiveness, return on investment, and spatial efficiency. Although such combinations demand higher initial investment, more frequent maintenance, and greater technical knowledge, their synergistic effects lead to significantly greater overall returns. In contrast, even complex greening schemes at the street level tended to cluster in lower benefit score regions, highlighting that layered, household-scale greening may offer higher economic viability and long-term return potential than uniform, street-scale interventions.

We draw the following recommendations from the discussions:

- **Prioritise accessible entry-level GI implementations.** Local authorities should focus initial urban greening efforts on Level 0–1 configurations such as roadside grass, hedge installations, and container plant systems that require minimal expertise and investment while building community confidence and engagement in GI initiatives.
- **Develop professional support frameworks.** Establish tiered support systems linking DIY enthusiasts with certified professionals for Level 2–4 implementations, including RHS-qualified mentorship programs, subsidised consultation services, and community training workshops to bridge the expertise gap identified in 36 % of GI scenarios. In particular, municipal investment in structured training schemes (e.g., short courses on planting, pruning, and maintenance) and community capacity-building initiatives is essential to ensure long-term skills development and wider accessibility.
- **Implement space-efficient planting for GI integration.** Urban designers and landscape architects should utilise the space requirement guidelines to optimise GI placement within existing urban constraints, prioritizing space-efficient solutions like hanging plants and green screens considering the precautionary measures in high-density areas while reserving larger allocations for comprehensive street transformations in available locations.
- **Establish economic incentive programs based on quantified benefits.** Develop financial mechanisms recognizing the £9.7–818.1/m^2/year economic benefits generated by GI implementations, including council tax reductions, property value premiums, and direct subsidies that reflect documented ecosystem service values, particularly for high-performing facade greening systems achieving £580.8/m^2/year benefits.
- **Integrate the DIY guidance cards into digital platforms accessible at individual, community, and municipal levels.** These standardised tools can be embedded within local authority websites, community-based applications, or national greening platforms, enabling users to explore evidence-based GI configuration options tailored to their space, budget, and maintenance capacities. By supporting informed decisions across diverse actors, from households to councils, this approach facilitates inclusive and scalable GI planning.
- **Advance actionable policy and community support mechanisms.** Future greening programmes should move beyond broad recommendations by piloting concrete measures such as household-level incentive schemes (e.g., subsidies, vouchers, or tax rebates), targeted support frameworks for low-income and marginalised communities (e.g., micro-grants, shared tools, and training workshops), and formal pathways for embedding DIY GI initiatives into urban planning and resilience strategies. These measures would enhance the applied relevance of DIY GI, ensure equitable participation, and strengthen long-term sustainability.

To expand the practical impact of the DIY scoring framework, future work should investigate underexplored GI types and configurations, particularly in diverse urban settings. Such efforts can empower communities and policymakers with clear evidence to scale up practical greening solutions and maximise their long-term environmental benefits.

CRediT authorship contribution statement

Akash Biswal: Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Hao Sun:** Writing – review & editing, Formal analysis, Data curation. **Isabelle Bray:** Writing – review & editing. **Owen Cranshaw:** Writing – review & editing. **Thomas Rodding Kjeldsen:** Writing – review & editing. **Christopher C. Pain:** Writing – review & editing. **Thomas Roberts:** Writing – review & editing. **Danielle Sinnett:** Writing – review & editing. **Tom Wild:** Writing – review & editing. **Jannis Wenk:** Writing – review & editing. **Prashant Kumar:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

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