



Urban Greening Factor for England – Case Studies

Green Infrastructure Framework – Principles and
Standards for England

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Foreword

There is a clear and urgent need to make our urban environments greener, healthier and more attractive places to live. The 25 Year Environment Plan placed particular emphasis on the importance of greening our towns and cities with an aim to improve existing green infrastructure, encouraging more investment in the environment and supporting more sustainable forms of development. This aim is at the heart of Natural England's Green Infrastructure Framework that provides the principles, standards and planning tools to create more biodiverse and resilient urban districts and neighbourhoods as the impact of climate change becomes increasingly evident.

Our planning system already recognises the importance of urban greening as an essential component of sustainable development. Planning policy provides guidance at a national and local level to improve the provision of green infrastructure and better target investment where it is needed the most. To strengthen this approach, Urban Greening Factors are increasingly being used as a planning tool to improve green infrastructure delivery through the process of development and regeneration. They were first developed in Northern Europe in the late 1990s. First by Berlin to combat the growing densification of urban neighbourhoods and then through the experimental and creative planning of Malmö's Western Harbour in Sweden. Urban Greening Factors have since been adopted by cities in Europe, Asia, North America and Australia. They are increasingly being used in the UK by Local Planning Authorities in the revision of their local plans and have become a prominent policy tool for urban greening across Greater London through the recently adopted London Plan.

The following Case Studies provide examples of current practice in developing and applying Urban Greening Factors through the planning, design and development process. They include Southampton City Council and the London Borough of Sutton that were the first local planning authorities to develop Urban Greening Factors that were initially referred to as Green Space Factors. They also feature the City of London and the Greater London Authority that illustrate the application of Urban Greening Factors in a high-density urban district and across a strategic regional authority. The case studies describe the initial development of the policy, their content and structure and each provide examples of how Urban Greening Factors are included and applied in recent planning applications.

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1.0 Introduction

- 1.1. Natural England has developed an Urban Greening Factor for England, as one of a suite of five Headline Green Infrastructure Standards within the [Green Infrastructure Framework – Principles and Standards for England](#). This Report provides case examples of current practice in developing and applying Urban Greening Factors (UGFs) through the planning, design and development process. It contributes to the final stage of the project to develop the draft UGF for England and was led by Natural England on behalf of Defra. Further information about the Urban Greening Factor for England is available on the [Green Infrastructure Framework website](#), including a User Guide and User Guide Spreadsheet to support stakeholders in calculating Urban Greening Factor scores. Appendix 2 of this report sets out other work that has contributed to developing the Model Urban Greening Factor for England.

- 1.2. The early development and application of Green Space Factors or Urban Greening Factors (UGF) in the UK was initially led by research from two European Union funded green and blue infrastructure programmes - GRaBS (2008-2011 / Green and Blue Space Adaptation for Urban Areas and Eco-towns) and PERFECT (2017-2021 / Planning for Environment and Resource eEfficiency in European Cities and Towns). These focused on planning and development mechanisms to improve the greening and environmental resilience of towns and cities across Europe and drew on the pioneering work of Berlin and Malmö in developing their Green Space Factors. UK councils associated with these programmes that were the first to introduce greening factors include Southampton City Council in 2015 and the London Borough of Sutton in 2018. The use of UGF in planning policy has expanded over the past five years with Greater London being the main focus.

Table 1 - Chronological development of Urban Greening Factors in the UK

Year	Description
2015	Southampton City Council - Green Space Factor included in City Centre Area Action Plan, adopted in March 2015
2017	Greater London Authority - Urban Greening Factor first included in the draft New London Plan, Policy G5 Urban Greening, Draft for public Consultation, December 2017
2018	London Borough of Sutton - Green Space Factor adopted in Local Plan Policy 33, February 2018 and Technical Guidance Note, April 2018

2018	City of London - Urban Greening Factor included in the draft City Plan 2036 under Policy OS2, Proposed Submission Draft, November 2018
2018	London Borough of Islington - Urban Greening Factor included in Policy G1 of the Development Management Policies, Regulation 18 Draft, November 2018
2019	Portsmouth City Council - Urban Greening Factor introduced in Green Infrastructure Background Paper, February 2019
2019	London Borough of Hounslow - Urban Greening Factor introduced in West of Borough Local Plan Review, Volume 3 Pre-Submission Consultation, July 2019
2019	Swansea City Council - Green Space Factor first introduced in the Central Area Green Infrastructure Strategy, Consultation Draft, August 2019
2020	London Borough of Hackney - Urban Greening Factor included in Policy LP48 of the Hackney Local Plan 2033 Strategic Planning, adopted in July 2020
2020	London Borough of Waltham Forest - Urban Greening Factor introduced by reference to London Plan Policy G5 in the Local Plan 2020 -2035, Regulation 19, October 2020
2021	Greater Manchester - Proposals to develop a Green Factor included in Policy JP-G8 of the Joint Development Plan Document, Publication Stage, August 2021

1.3. To review the application and effectiveness of current UGF planning practice detailed research and structured interviews were held by Peter Neal during September 2021 with five planning authorities.

- Southampton City Council
- London Borough of Sutton
- The Greater London Authority
- The City of London
- Swansea City Council

1.4. The selection took account of the chronological development of UGF, their application at different planning scales and the use of different policy tools. For example, Southampton applies a Green Space Factor through a City Centre Area Action Plan; The City of London applies an Urban Greening Factor through the draft Local Plan (City Plan); and Swansea applies a Green Space Factor within a Green Infrastructure Strategy for its Central Area.

- 1.5. The interviews followed a semi-structured approach providing interviewees with the opportunity to explain the planning context and application of their UGF. The questions covered:
- a) Development of the Green Space Factor / Urban Greening Factor
 - When was it initially developed
 - When was it formally adopted
 - What supporting guidance is provided
 - What examples of other practice informed its development
 - b) What are the circumstances and regulations for the application of the UGF
 - How regularly has it been used
 - c) What are the headline factors used in the UGF
 - Confirm these from the research
 - d) How successful has the UGF policy been in increasing GI / urban green space
 - e) Has any formal evaluation of the UGF policy been undertaken
 - If yes, has the evaluation been published / is it available
 - f) Are there areas where the UGF policy could be improved

2.0 Southampton Green Space Factor Case Study

- 2.1 Southampton City Council (SCC) was the first UK local authority to develop and adopt a Green Space Factor (GSF). This followed from a European urban greening research programme and subsequent analysis undertaken with the University of Southampton. The GSF has become a requirement for all planning submissions within the city centre through the [City Centre Action Plan](#) (CCAP) which was adopted in 2015. Its application is described in CCAP Policy AP12 Green Infrastructure and Open Space (para 2.2 below) and the technique for using the GSF tool is set out in a companion guide - [Green Space Factor Guidance Notes](#) (SCC/2015).
- 2.2 Excerpt of Policy AP12, Open Space, [Southampton City Centre Action Plan](#) (SCC/2015, page 53-54):

'The Council will increase the quantity and improve the quality and accessibility of open space in the city centre by:

1. Protecting and enhancing existing designated open spaces listed in Appendix 6 [of the city centre action plan] including specifically the key spaces of the Central Parks, Mayflower Park, Queens Park, and other Civic spaces (see map 8 [in the city centre action plan]);
2. Designating additional existing open spaces listed in Appendix 6 (see map 8);
-
6. Require all developments (and especially the key sites set out in chapter 5) to assess the potential of the site for appropriate green infrastructure improvements by using the Council's Green Space Factor, and to improve the score for the site.'

2.3 Outside London, Southampton is one of the densest urban centres in England and the aim of the policy is to establish a 'Green Grid' of routes and spaces throughout the centre linking existing neighbourhoods, destinations, open spaces and the waterfront. A key objective for the GSF is to improve the greenness of the city centre and to accelerate urban greening across the whole of Southampton. Southampton City Council has recently published a [Green City Charter](#) and a [Greener City Plan 2030](#) to strengthen this objective and 'create a cleaner, greener, healthier and more sustainable city' that includes the use of the GSF as a means to:

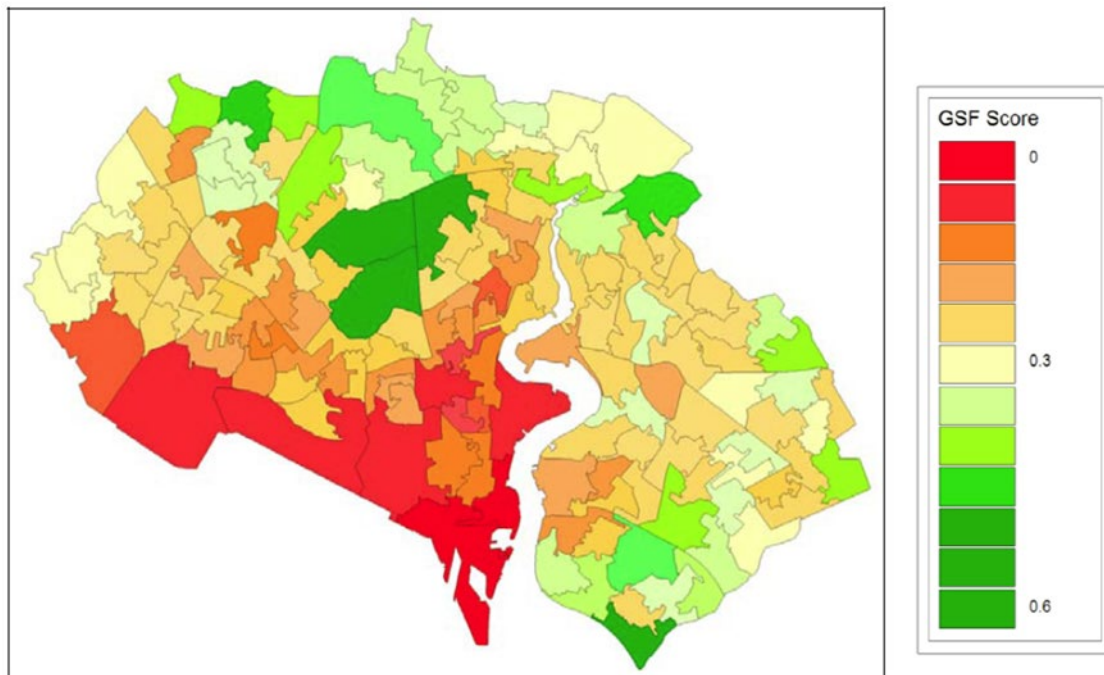
'adopt a broader approach to green infrastructure by trying to green up built development through the use of landscape planting, street trees, green roofs and green walls. This has been incorporated into the City Centre Action Plan which requires all developments, and especially the key sites, to assess the potential of the site for appropriate green infrastructure and provide suitable qualitative improvements' (Greener City Plan, page 19).'

- 2.4 The early development of the GSF tool drew on research and good practice from the European funded [Green and Blue Space Adaptation for Urban Areas and Eco Towns \(GRaBS\) programme](#). This looked at ways to develop and increase the use of green infrastructure as a tool to adapt urban areas to the effects of climate change.
- 2.5 Following the GRaBS programme Southampton City Council commissioned a Green Space Factor Tool Report (2012) that provided a more detailed appraisal of the GSF tool including a quantitative system that allocated scores to different surface types reflecting how many Green Infrastructure (GI) benefits they deliver. This was based on modified versions of the Berlin Biotope Area Factor, the Malmö Green Space Factor and work undertaken by the Northwest Development Agency.
- 2.6 The study acknowledged the difficulty in increasing the traditional GI provision of the central parks and improving access to the waterfront, concluding that green roofs are likely to have a great impact on greening the city centre in the future. Such measures would more than double the GSF score for the city centre if placed

on half the buildings, whilst green walls would be particularly beneficial in providing a net gain for the GSF without a subsequent increase in surface area.

- 2.7 The evidence base supporting the development of the CCAP included an [Open Space and Green Infrastructure Background Paper](#) (SCC/2013) that provided an additional assessment of the benefits of a GSF tool for Southampton. This provided a technical analysis of existing GSF scores for Lower Super Output Areas across the city (Figure 1) demonstrating 'how sites in the city centre, central and waterfront areas of the city are much lower in green provision. By utilising GSF maps like these for individual sites and localities the city council aims to provide a way to measure qualitative improvements in green infrastructure across the city centre' (SCC/2013, para 6.1.4).

Figure 1 - Analysis of GFS Scores across the City of Southampton



Source - [Southampton City Council \(2013\) City Centre Action Plan, Open Space & Green Infrastructure, Background Paper](#), August 2013, page 13.

- 2.8 The GSF policy has ensured the CCAP retains and protects the existing level of GI and open space and delivers an incremental improvement in green infrastructure on a site by site basis as development schemes come forward. Qualitative improvements in GI are measured through the GSF which provides an 'objective assessment of the quality and functionality of GI to produce a score for any site or area in the city centre'. The policy helps to target investment 'in a particular area or plot and provide examples of GI interventions that can deliver such benefits' (CCAP, para 4.117).

2.9 The [Green Space Factor Guidance Notes](#) (SCC/2015) explain the application of the tool that includes a simple set of 13 different surface cover types and associated scores. The weighting for different types of surfaces reflects their infiltration potential which is used as a proxy for ecosystem services that are provided by different surfaces. These include evaporative cooling, improved air quality and enhanced biodiversity (Table 2).

Table 2 – Southampton City Council Green Space Factor Tool

No	Surface Type (detailed descriptions given)	Score
1	Primary (Ground Level) Layers	
1.01	Building surface area with no green roof	0.0
1.02	Extensive greenroofs - minimal planting depth / mineral substrate	0.6
1.03	Intensive greenroofs - wide variety of plan species requiring deeper substrate	0.7
1.04	Non-permeable surfaces	0.0
1.05	Permeable paving - with joints for infiltration	0.2
1.06	Semi-permeable surfaces e.g. sand and gravel	0.4
1.07	Grassland (short, amenity) - generally mown regularly and high degree of soil compaction	0.4
1.08	Grassland (long, rough) - cut seasonally, predominantly grass and include other species	0.5
1.09	Shrubs - vegetation with soil depth > 60 cm but no contact to subsoil	0.6
1.10	Trees on shallow soil/ tree pits - planting on or adjacent to hard surfaces	0.6

No	Surface Type (detailed descriptions given)	Score
1.11	Woodland/ Trees on deeper soil - planting that has direct contact with subsoil	1.0
1.12	Open Water – including ponds and ditches covered by water for at least 6 months / year	1.0
2	Secondary Layers	
2.01	Green walls with a height limit of 10 metres (area of)	0.6

Source - Southampton City Council (2015) [Green Space Factor Guidance Notes](#), page 2

- 2.10 The GSF sets a simple target and ‘the aim is to increase the Green Space Factor as much as possible’. The guidance notes that the factor can also assist in achieving other mandatory requirements such as BREEAM including:
- Green infrastructure water attenuation - achieving 1 credit (BREEAM Pol 03)
 - Green roof with a storage tank - achieving additional credits (BREEAM Wat 01/ Wat 04)
 - Credits can also be gained for both ecological enhancement and a change of ecological value of the site as approved by a suitably qualified ecologist (BREEAM LE 02-05)
 - Green roofs will improve a building’s thermal performance and reduce the predicted Dwelling Emission Rate (DER), with lower DER gaining an extra credit (BREEAM Ene 01)
- 2.11 Southampton City Council provides an Excel Spreadsheet template that can be downloaded from the web for calculating the GSF, including more detailed definitions for each cover type (Table 3).

Table 3 - Southampton City Council Green Space Factor Tool Definitions

No	Surface Type	Detailed Descriptions
1.01	Building surface area with no green roof	Building surface area with no green roof

No	Surface Type	Detailed Descriptions
1.02	Extensive greenroofs - minimal planting depth / mineral substrate	<p>Extensive green roofs have minimal planting depths (as shallow as 2.0 cm) and sometimes only a mineral substrate. They are limited to flowers, grasses, mosses, and drought tolerant succulents such as Sedum, chosen for their ability to regenerate and maintain themselves over long periods of time, in addition to being able to withstand the harsh conditions of cold, heat, drought and wind. Native species are often preferred. Extensive green roofs require minimal maintenance and are generally not accessible to the public. They do not necessarily require irrigation, and they have fewer other requirements, such as guardrails. Extensive green roofs are the least expensive form of roof greening to implement and maintain.</p> <p>Extensive green roofs, certainly initially, have a lower proportion of grasses and therefore don't have the same dense root mat as grassland. A green roof is unlikely to experience the same degree of compaction because there is much lower human access. In addition, the mineral substrates have a more open structure so even with some compaction there are still pores available to hold water. Vegetation management is generally less intense on green roofs so there is a higher level of humidity at root level plus the substrates are coarser and therefore less likely to become baked hard.</p>
1.03	Intensive greenroofs - wide variety of plan	Intensive green roofs use a wide variety of plant species that may include trees and shrubs, require deeper substrate

No	Surface Type	Detailed Descriptions
	species requiring deeper substrate	layers, are generally limited to flat roofs, require 'intense' maintenance, and are often park-like areas accessible to the general public. They are often built in high density areas where green space is limited. Intensive green roofs are more costly than extensive green roofs to build and maintain.
1.04	Non-permeable surfaces	e.g., tarmac
1.05	Permeable paving - with joints for infiltration	Stone paving with joints where water can infiltrate
1.06	Semi-permeable surfaces e.g. sand and gravel	e.g. Sand and gravel
1.07	Grassland (short, amenity) - generally mown regularly and high degree of soil compaction	Where the majority of vegetation is grasses, generally short mown, e.g. for amenity space, Grasslands, particularly amenity grasslands found in urban areas, have a higher degree of soil compaction than woodlands and scrub. This results in a loss of soil pores which further impedes water infiltration and reduces the amount of water that can be held. Short mown grasslands have lower water attenuation ability than longer grass because the lack of aerial vegetation means there is little protection for the soil and it consequently dries out very quickly. This results in a hard surface which water simply runs off.
1.08	Grassland (long, rough) - cut seasonally,	Rough grassland that is not being cut regularly. Predominantly grasses but may contain other plants. Natural and amenity grasslands can be found on

No	Surface Type	Detailed Descriptions
	predominantly grass and include other species	deep soils, however this likely to be of little use for surface water management as the water's path into the soil is blocked by a dense root mat occurring within the top 5-10cm of soil.
1.09	Shrubs - vegetation with soil depth > 60 cm but no contact to subsoil	Vegetation where soil depth is more than 60cm and there is no direct contact with deeper soil e.g. roof of underground parking
1.10	Trees on shallow soil/ tree pits - planting on or adjacent to hard surfaces	Individual landscaping trees in built up spaces e.g., car parks, highway
1.11	Woodland/ Trees on deeper soil - planting that has direct contact with subsoil	Vegetation where plants have direct contact with deeper soil. Trees and shrubs, have a more open network of surface roots plus bigger, deeper roots which channel water into the soil. Water can therefore percolate into the ground more easily and run down the stem and roots; in this case deep soil is useful because it can hold more water than shallow soil.
1.12	Open Water – including ponds and ditches covered by water for at least 6 months / year	Areas of open water including ponds and ditches/swales covered by water for at least 6 months

Source - Southampton City Council (2015) Green Space Factor Tool (Excel) Detailed Definitions

2.12 The role of the GSF in improving surface water management and flood control was also analysed in an MSc Environmental Monitoring and Assessment study undertaken by the University of Southampton (2011) and subsequently published as Farrugia, S. et al (2013). The study involved the combination of various GIS maps and Ordnance Survey data at the city and site scale to gauge the infiltration

capacities of various surface layers. These were then used to quantify the flood water regulation services offered by different ecosystems in a city.

- 2.13 The study proposed that ecosystem services could be given a single Green Space Score (GSS) between 0 and 1 for each service, the average of which could provide a combined GSS for all the chosen ecosystem services. Target GSFs could then be incorporated into development policy to make informed planning decisions. The research concluded that whilst no single surrogate could completely represent any ecosystem service, it has shown that they could provide a user-friendly tool to aid policy makers and developers in making better informed judgements. It suggested that a GSF system would allow development to be directly linked with improvements in ecosystem services leading to a better environment and the study contributed to the preliminary development of the tool for Southampton.

GSF Application in Recent Planning Applications

- 2.14 Southampton City Council considers a key benefit of the tool is in facilitating early discussions and negotiations on the quantity and quality of GI investment during the pre-application stage of development. There have been few objections to the current target although this may be reviewed during the consultation for the next Local Plan. The practical process of applying and approving GSF calculations can be reviewed through specific planning applications. As the GSF is only applied to the city centre there are limited examples of their use although several of the larger development schemes have submitted a worked calculation as part of their planning submission documents.

Bargate Shopping Centre

- 2.15 Bargate Shopping Centre, Southampton (20/01629/FUL) - Planning approval was granted in July 2021 for the Redevelopment of the former Bargate Shopping Centre and multi-storey car park with new buildings ranging in height from 4-storeys to 13-storeys and associated parking, servicing, landscaping and public realm (Figure 2). The submission included a full landscape strategy and a separate table (submitted 03/12/20) that calculated a GSF score of 0.08 (table 4).

Figure 2 - Landscape Masterplan and GSF Score for Bargate Shopping Centre, Southampton



Source - Macgregor Smith Landscape Architecture (2020) Landscape & Public Realm Strategy

Table 4 - GSF Score calculations for Bargate Shopping Centre, Southampton

Surface Type	Factor	Current Area m ²	Proposed Surface Area m ²
Primary (Ground Level) Layers			
Building surface area with no green roof	0.0	0.00	0.00
Extensive greenroofs	0.6	0.00	400.00
Intensive greenroofs	0.7	0.00	0.00
Non-permeable surfaces	0.0	14336.00	12266.00
Permeable paving	0.2	0.00	0.00

Semi-permeable surfaces e.g. sand and gravel	0.4		0.00
Grassland (short, amenity)	0.4	0.00	150.00
Grassland (long, rough)	0.5	0.00	150.00
Shrubs	0.6		1370.00
Trees on shallow soil / Tree pits	0.6	0.00	0.00
Woodland / Trees on deeper soil	1.0	0.00	0.00
Open water	1.0		0.00
Development Area Total m²		14,336.00	14,336.00
			Spare capacity
Secondary layers			
Greenwalls with a height limit of 10 metres (area of)	0.6	0.00	0.00
	GI SCORE	0.00	0.08
	Results		Fail

- 2.16 A report on the planning application to the Planning and Rights of Way Panel (16/03/21) noted that 'Whilst there are biodiverse green roofs shown on two of the buildings, there is potential to have green roofs on a greater number of buildings which can be used in combination with photovoltaics to help to regulate temperature which optimizes the functioning of the solar panels. This could help improve the green space factor to achieve a pass'.

- 2.17 The requirement to improve the GSF score was then included in the Conditional Approval for the scheme (21/07/21). This required a detailed study for the provision of green roofs should be submitted and agreed prior to commencement. Proposals 'should be to an approved specification, installed and fully operational prior to occupation to ensure the development increases its Green Space Factor in accordance with Policy AP 12 of City Centre Action Plan'.

Targus House

- 2.18 Car Park adjacent to Tagus House, Ocean Village, Southampton (19/01145/FUL) Redevelopment of the site. Erection of a building ranging from 9 to 24-storeys to provide 199 flats with associated access, parking, cycle storage, substation and landscaping. The planning application included a GSF calculation demonstrating an increase in the predevelopment score of 0.05 to 0.16 for the proposed scheme. This included two landscaped roof terraces, a cycle store with biodiverse green roof, tree planting along the boundary to the site and adjacent planted public realm.
- 2.19 The planning application report to the Planning and Rights of Way Panel (03/11/20) noted that the green space factor demonstrates an acceptable level in GI improvement whilst a green roof condition is recommended to ensure that these elements of the scheme are delivered and maintained. However, the scheme was refused on more strategic townscape grounds due to the bulk, excessive scale and massing of the development and the impact the towers would have on the surrounding area.

References

- Carter, J. (2011) Green and Blue Space Adaptation for Urban Areas and Eco Towns (GRaBS). <https://joinup.ec.europa.eu/collection/environment/document/green-and-blue-space-adaptation-urban-areas-and-eco-towns-grabs> [accessed 01/12/2022]
- Farrugia, S. (2011) A quantitative evaluation of urban ecosystem services using flood control and urban cooling. ENVS 6012 MSc Environmental Monitoring and Assessment September 2011
- Green City Charter for Southampton
https://www.southampton.gov.uk/media/ewvjaoao/green-city-charter_tcm63-412448.pdf
[accessed 01/12/2022]
- Phillips, A. and Moore, N. (2012) Southampton's Green Space Factor Tool Report 2012
- Southampton City Council (2013) City Centre Action Plan. Open Space and Green Infrastructure Background Paper:

https://www.southampton.gov.uk/media/54ib4csf/open-space-and-green-infrastructure-background-paper_tcm63-368346.pdf [accessed 01/12/2022]

Southampton City Council (2015) Green Space Factor Guidance Notes.

https://www.southampton.gov.uk/media/kajkr23v/green-space-factor-guidance-notes-2015_tcm63-371696.pdf [accessed 01/12/2022]

Southampton City Council (2015) Planning Southampton City Centre, City Centre Action Plan, adopted 18 March 2015. https://www.southampton.gov.uk/media/3bidvj1w/ccap-18-march-2015_tcm63-371356.pdf [accessed 01/12/2022]

Southampton City Council (2020) Greener City Plan 2020/30:

<https://www.southampton.gov.uk/environmental-issues/pollution/green-city/plan-2030/> [accessed 01/12/2022]

3.0 London Borough of Sutton Green Space Factor Case Study

- 3.1 The London Borough of Sutton is considered to be the first council in London to develop and adopt a Green Space Factor (GSF) through Local Plan policy. This was a direct outcome from the European funded GRaBS programme and evolved through discussion and collaboration with Southampton City Council, North West Regional Development Authority, Manchester University and the Town and Country Planning Association (TCPA). A key driver for the GSF has been the need for practical measures to adapt and mitigate the impact of climate change.
- 3.2 One of the main aims of the [Local Plan](#) (2016-2031) adopted in 2018 has been a desire to maintain and enhance the “leafy” character of the borough and improve its environmental performance and resilience. The Plan included three new measures to assess and mitigate the environmental impact of new development across the borough - the carbon offset fund; the biodiversity calculator; and, the Green Space Factor (GSF). These were introduced through Policy 33: Climate Change Adaptation (para 3.3 below) to tackle the Urban Heat Island Effect and minimise overheating and improve surface water drainage. This is achieved by increasing blue and green spaces and incorporating a range of natural cooling and drainage measures. The key requirement of this policy is for major developments to achieve a minimum improvement to the GSF score of at least + 0.2 for brownfield sites or an absolute score of 0.5 for greenfield sites.
- 3.3 Excerpt of Policy 33, [Sutton Local Plan 2016-2031](#) page 114:

Policy 33: Climate Change Adaptation

Proposed developments should minimise vulnerability of people and property and be fully adapted and resilient to the future impacts of climate change by:

b. Minimising overheating and contribution to the urban heat island effect by permeating the development with blue and green spaces and by incorporating a range of natural cooling measures as part of the design and layout, including passive design measures (e.g. building orientation), shading, planting and soft landscaping, trees, ponds, SuDS measures and other surface water features. All major developments should:

- comply with the Mayor's cooling hierarchy as set out in [London Plan](#) Policy 5.9.
- incorporate and manage green roofs or green walls where feasible.
- for previously developed sites - aim to achieve an increase in overall green space coverage of at least 10% compared to baseline conditions prior to development.
- for previously developed sites - aim to achieve an improved Green Space Factor (GSF) score of at least +0.2 compared to the baseline GSF score prior to redevelopment.
- greenfield sites - aim to achieve a GSF score of at least 0.5

3.4 The Local Plan policy for Climate Change Adaptation emphasises the importance of green infrastructure to facilitate urban cooling through the specific use of green roofs and tree planting. [The Green Space Guidelines for Sutton](#) referenced in the Local Plan recommend that 'all residential and major non-residential developments on previously developed sites should aim to achieve at least a 10% increase in green coverage, particularly in built-up areas deficient in open space and therefore at greatest risk of overheating during summer heatwaves' (para P33.10).

3.5 [Sutton's Environment Strategy](#) (2019) sets a vision for a greener borough where 'more than half of Sutton's space will be green space' (page 16). This also includes a target for planting 2,000 trees each year across council, community, and developer-led schemes. The Strategy aims to use GSF scores to measure the increase of overall green space coverage with improvements in habitats, landscape, tree planting and sustainable drainage.

3.6 The GSF tool provides the mechanism to increase urban greening and green cover within development sites by incorporating different types of GI at the planning and design stage of development schemes. It places particular weight on the use of ground level vegetation with direct contact to the soil, open water, green roofs and walls. The process of calculating and applying the GSF is described in the [Local Plan Technical Guidance Note - Building a Sustainable Sutton](#) (2018) that provides a detailed description of the GSF, its purpose and implementation.

3.7 The GSF should be used by developers and their agents for all major building proposals in the borough and in most cases should be considered in conjunction with the biodiversity.

3.8 Accounting methodology that is included in the guidance. The guidance has a list of 14 categories of land cover that are included in the factor (Table 5). These are

described and weightings are assigned for their effectiveness in promoting urban cooling, sustainable drainage and other climate change adaptation functions.

Table 5 - Sutton Green Space Factor list of surface cover types and score sheet

Category		Factor
Primary (Ground Level) Layers		
A1	Buildings	0.0
A2	Non-permeable driveway/parking surfaces	0.0
A3	Non-permeable road surfaces	0.0
A4	Non-permeable footpath surfaces	0.0
B	Stone paving with joints where water can infiltrate	0.2
C	Semi-permeable surfaces e.g. sand and gravel	0.4
D1	Vegetation where soil depth is less than 60cm and there is no direct contact with deeper soil e.g. roof of underground parking	0.4
D2	Vegetation where soil depth is more than 60cm and there is no direct contact with deeper soil e.g. roof of underground parking	0.6
D3	Vegetation where plants have direct contact with deeper soil	1.0
E	Areas of open water including ponds and ditches/swales covered by water for at least 6 months	1.0
Secondary layers		
F	Shrubs and hedges (cover m ²)	0.3
G	Trees (canopy cover m ²)	0.4
H	Green walls with a height limit of 10m (area in m ²)	0.6
Tertiary layers		
I	Green roofs, brown roofs and eco-roofs calculated by the area covered by plants (m ²)	0.7

Source - [London Borough of Sutton \(2018\) Building A Sustainable Sutton: Technical Guidance Note](#), page 24

3.9 The calculation of the GSF follows in a similar manner to other European UGF models by:

- multiplying the area of each type of land cover with the relevant weighting factor;
- summing the weighted scores; and

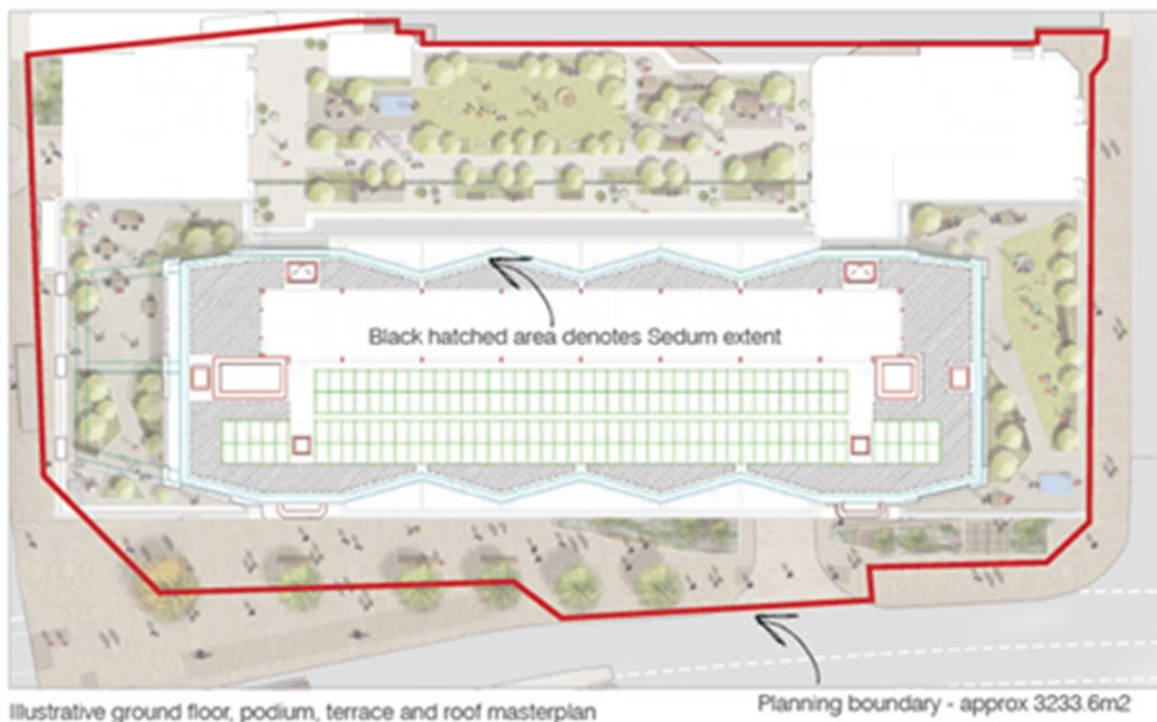
- dividing the result by the total land area of the site.
- 3.10 A print version of the GSF Score sheet or calculator is included in the [Technical Guidance Note](#) and it is understood an Excel spreadsheet is made available to applicants on request. This is accompanied by an Urban Greening Good Practice Checklist.
- 3.11 Developers are requested to provide a completed score sheet both for the existing condition and at post-development within Sustainable Design and Construction Statements submitted with the planning application. Applicants are also encouraged to provide initial calculations as part of pre-application discussions.
- 3.12 Developments should seek to increase overall on-site green space coverage compared to the baseline conditions. The guidance provides a flow chart for developing the GSF proposals at each stage of the development process from pre-application, full submission and on to the post construction operational stage. The guidance also includes a good practice checklist for each GI element.

GSF Application in Recent Planning Applications

- 3.13 The practical process of applying and approving GSF/UGF calculations can be reviewed through specific planning applications. Sutton has seen increasing success with the application of the tool and the calculation forms part of the validation checklist when applications are submitted. The UGF often forms part of the conditions attached to planning approvals, as illustrated by the following example in figure 3 and table 6. In due course Sutton considers it would be beneficial to assess the extent the GSF/UGF has improved greening before target scores and weighting could be reviewed and possibly changed. It should be noted that whilst planning approval may be given this may not lead to the construction of development schemes as they may be deferred or changed through a variety of circumstances.

Sutton Park House

Figure 3 – Sutton Park House Planning Application Masterplan



Source - Townshend Landscape Architects

Table 6 - Sutton Park House Planning Application Urban Greening Factor Calculation

Surface cover type	Factor	Proposed m ²	Proposed Factor
Semi-natural vegetation (e.g. woodland, flower rich grassland) created on site	1	0	0
Wetland or open water (semi-natural; not chlorinated) created on site	1	0	0
Intensive green roof of vegetation over structure. Vegetated sections only. Substrate minimum settled depth of 150mm	0.8	235	188
Standard trees planted in natural soils or in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree	0.8	48	38.4

Surface cover type	Factor	Proposed m ²	Proposed Factor
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket)	0.7	255	178.5
Flower-rich perennial planting	0.7	82.45	57.715
Rain gardens and other vegetated sustainable drainage elements	0.7	0	0
Hedges (line of mature shrubs on or two shrubs wide)	0.6	32.8	19.68
Standard trees planted in puts with soil volumes less than two thirds of the projected canopy area of the mature trees	0.3	174	104.4
Green wall – modular system or dimisers roosted in soil	0.6	74	44.4
Ground cover planting –	0.5	0	0
Amenity grassland (species-poor, regularly mown lawn)	0.4	127.78	51.112
Extensive green roof of sedums mat or other lightweight systems that do not meet GRO Code 2014	0.3	0	0
Water features (Chlorinated) or unplanted detention basins	0.2	0	0
Permeable paving	0.1	0	0
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stones)	0	596	0
Total urban factor			682.257

Surface cover type	Factor	Proposed m ²	Proposed Factor
Total site footprint			3233.6
Urban Green Factor			0.21

Source - Townshend Landscape Architects

- 3.14 Sutton Park House 15 Carshalton Road Sutton SM1 4LD (DM2020/00754) - Planning approval was granted for the Erection of an additional three storeys and change of use from office to residential comprising 149 self-contained residential units along with flexible ground floor commercial uses, changes to basement parking layout, cycle and bin storage and associated landscaping. This included a condition that related to the Green Space Factor:

‘Prior to commencement of development, the applicant shall notify the Council as to which landscape proposal they wish to implement, Option 1 or Option 2. Reason: In the interest of clarity and to ensure the provision of a reasonable standard of landscaping and to ensure a Policy compliant increase in the Green Space Factor of the development is delivered in accordance with Policies 26 and 28 of the Sutton Local Plan 2018.’

- 3.15 In response to the condition the Landscape Architect for the scheme set out the basis of the landscape scheme, its content and calculation of the GSF (or UGF) by letter (11/11/20):

‘The Urban Green Factor for Sutton Park House scheme has been analysed and has an Urban Greening Factor of 0.21 (Figure 7). The scheme has densely planted roof terraces on level 8 and a large podium landscape on level 1. Within the roofscape an area of sedum planting is proposed across the roof providing biodiverse and visual benefits. The street level greening includes a series of mature trees and areas of raised planting, providing a visual green connection to the adjacent park. The street level design has been reviewed throughout the pre-application and DRP process and it has been considered that a hard landscape with a more civic approach would be preferable at the ground floor level.’

Bishops Place

Figure 4 - Bishops Place, Sutton, Planning Application



Source - Eight Associates 09/09/20

Table 7 - Bishops Place, Sutton, Planning Application Green Space Factor Calculation

Surface type	Factor	Current surface area m ²	Proposed surface area m ²
Total surface areas	-	1900	1900
Buildings and hardstanding	0	300	1000
Non-permeable surfaces	0	1400	100
Permeable paving	0.2	0.00	500
Vegetation where plants have direct contact with deeper soil	1.0	0.00	300
Shrubs and hedges (cover m ²)		200	0.0
GSF calculation			0.21

Result	Pass
% increase in greenspace	50%

Source - Eight Associates 09/09/20

3.16 Development Land North Side And Adjoining 1 To 12 Bishops Place, Sutton (DM2020/01062) - Planning approval is pending for the demolition of existing buildings onsite and erection of a three storey terrace comprising a mix of dwellings and self-contained flats totalling 9 units, including car parking and cycle parking, refuse storage and private amenity space (Figure 4).

3.17 The planning application included a 12 page report on the calculation of the Green Space Factor for the scheme:

This report outlines the contribution of greening at the development, in line with the Sutton Local Plan Policy 33 on Climate Change Adaptation and Policy 31 Carbon and Energy. It includes the overall GSF value of the site in comparison to the London Borough of Sutton GSF score of +0.2 for previously developed sites.

The GSF calculation involves assigning a factor between 0 and 1 to different surface cover types. The lowest score of zero is given to impermeable surfaces such as asphalt and buildings, and the highest score of 1 is given to natural vegetation on deep soils and ponds. The factor for a particular surface cover is multiplied by its area. The resulting figures for each factor are added together and then divided by the overall site area. This gives an overall GSF score for the site of between 0 and 1.

The calculated GSF score is 0.21 and therefore meets the GSF target in Policy 31 of +0.2 and above for previously developed sites.'

References

Building A Sustainable Sutton: Technical Guidance Note for Developers (2018)

Sutton.gov.uk.

<https://modern.gov.sutton.gov.uk/documents/s59852/9%20Local%20Plan%20Technical%20Guidance%20Note%20-%20Appendix%20A.pdf> [accessed 01/12/2022]

GLA (2021) The London Plan - The Spatial Development Strategy for Greater London, March 2021, Greater London Authority.

https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf [accessed 01/12/2022]

London Borough of Sutton (2018) Sutton Local Plan 2016-2031, February 2018.
<https://drive.google.com/file/d/1Rhwp79G2mPu6dm3npgPVwug9QkNCFodSS/view>
[accessed 01/12/2022]

4.0 City of London Urban Greening Factor Case Study

- 4.1 Proposals to introduce an UGF followed on from an [Urban Greening Factor Study research project](#) that was undertaken for the City of London in 2018. This study had similar content to the GLA UGF research report published a year earlier (Grant, 2017, Urban Greening Factor for London). A subsequent Planning and Transportation Committee paper on [Green Initiatives in the City](#) (October 2018) provided information and a set of recommendations from the UGF study as a means to deliver additional greening across the city. It explained the rationale behind the UGF and how it could be used to increase green infrastructure investment through the Local Plan and [London Plan](#) (GLA/2021).
- 4.2 City of London Urban Greening Factor Policy, from the [City of London \(2018\) City Plan 2036, Shaping the Future City](#):

Policy OS2: City Greening

1. The provision of urban greening should be integral to the design and layout of buildings and the public realm.
 - All development proposals will be required to demonstrate the highest feasible levels of greening consistent with good design and the local context;
 - The installation of biodiverse extensive or intensive green roofs, terraces and green walls will be sought, where appropriate, and new development should not compromise these elements on existing buildings located nearby; and
 - The loss of green walls and roofs, in whole or in part, will only be permitted in exceptional circumstances.
2. Major development proposals will be required to:
 - Include an Urban Greening Factor (UGF) calculation demonstrating how the development will meet the City's target UGF score of 0.3 as a minimum; and

- Submit an operation and maintenance plan to demonstrate that the green features will remain successful throughout the life of the building.

4.3 The UGF planning policy is now included in Policy OS2 of the [City of London Local Plan](#). Whilst the City has responsibility for areas of land beyond the Square Mile, such as Hampstead Heath and Epping Forest, UGF application is only within the Local Plan Boundary. The wording of the Policy is given in paragraph 4.2 and follows the recommendation in the UGF study (2018) that ‘the draft London Plan target of 0.3 would be a challenging and appropriate target for both commercial and residential developments in the City and would result in an increase in greening compared with recent developments. To achieve this increase, the provision of additional greenery and landscaping will need to be factored into the early stage of scheme design’.

4.4 Further guidance on the application of the UGF is provided at the end of the [Local Plan](#), Appendix 1 -Technical note on applying the Urban Greening Factor. This explains how the factor is calculated and provides a table of factors for 16 Surface Cover Types which reflects those provided in the [London Plan](#) (Table 8.2, page 325, GLA, 2021).

Table 8 - City of London Technical note on applying the Urban Greening Factor

	Surface Cover Type	GLA	CoL
01	Semi-natural vegetation (e.g. woodland, flower-rich grassland) created on site.	1.0	1.0
02	Wetland or open water (semi-natural; not chlorinated) created on site.	1.0	1.0
03	Intensive green roof or vegetation over structure. Vegetated sections only. Substrate minimum settled depth of 150mm - See livingroofs.org for descriptions.	0.8	0.9
04	Standard trees planted in natural soils or in connected tree pits with a minimum soil volume equivalent to at least two-thirds of the projected canopy area of the mature tree - See Trees in Hard landscapes for overview.	0.8	0.9
05	Extensive green roof with substrate of minimum settled depth 80mm (or 60mm beneath vegetation blanket) - meets the requirements of GRO Code 2014.	0.7	0.8
06	Flower-rich perennial planting - see Centre for Designed Ecology.	0.7	0.7

07	Rain gardens and other vegetated sustainable drainage elements -See CIRIA for case studies.'	0.7	0.7
08	Hedges (line of mature shrubs one or two shrubs wide) - See RHS for guidance.	0.6	0.6
09	Standard trees planted in pits with soil volumes less than two thirds less than the projected canopy area of the mature tree.	0.6	0.7
10	Green wall - modular system or climbers rooted in soil - See NBS Guide to Façade Greening for overview.	0.6	0.7
11	Groundcover planting - see RHS Groundcover Plants for overview.	0.5	0.5
12	Amenity grassland (species-poor, regularly mown lawns)	0.4	0.4
13	Extensive green roof of sedum mat or other lightweight systems that do not meet GRO Code 2014.	0.3	0.3
14	Open water (chlorinated) or unplanted detention basins.	0.2	0.2
15	Permeable paving - see CIRIA for overview.	0.1	0.1
16	Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone)	0.0	0.0

Source - Appendix 1, City Plan 2036, Shaping the Future City. [City of London Local Plan,, March 2021](#)).

4.5 Surface Cover factors for Green Roofs, Green Walls and Tree Planting are slightly increased in comparison to the [London Plan](#)**Error! Bookmark not defined.**. This is to encourage the particular use of these GI elements in response to the density of development in the City of London and the limited amount of space available at ground level for GI investment. It has been suggested by others that increasing the factors may be a self-limiting strategy as schemes can provide less greening for these elements but still gain the same overall score. The single minimum UGF target score of 0.3 for all types of development is used as the majority of development is predominately commercial land use and most residential schemes are generally high density and urban in character.

4.6 To inform the preparation of the Draft Local Plan, the City of London's Department of the Built Environment has published a series of Topic Papers and the UGF is discussed in [Paper 4 - Climate Change](#) (March 2021). This makes reference to the preceding Urban Greening Factor Study published in July 2018 that acknowledged the dense high-rise urban nature of the City and the similarities to Singapore's use of a Green Plot Ratio. The study also presented a summary assessment of nine building schemes in the City, either in development or completed, that were

selected to assess how UGFs may be applied and calculated across a variety of projects.

- 4.7 The Climate Change Topic Paper also notes that ‘the UGF will be applied as a separate consideration to other certification or benchmarking methods designed to measure the sustainability or environmental performance of developments, such as BREEAM’. It states that ‘major development proposals will be required to include a UGF calculation demonstrating how the development will meet the City’s target UGF score and provide justification for levels of greening which fall below the minimum target score’. In addition, ‘an operation and maintenance plan would be required to demonstrate that the green features will remain successful throughout the life of the building’.
- 4.8 [A Local Plan Viability Assessment](#) has been undertaken as part of the scrutiny of the draft Local Plan. This tested the provision of green roofs as a proxy for meeting the requirements of Policy OS2 and the minimum UGF target of 0.3. This considered ‘the impact of this requirement on the residual land values is marginal, with the impact clearly being lower on taller buildings’ (Table 6.27.1[in the local plan]). The percentage change in residual land values with the incorporation of green roofs was found to be between 0.03% and 1.33% for the development typologies tested.
- 4.9 The City of London also has a priority to increase biodiversity and achieve a net-gain through development. The current Biodiversity Action Plan (BAP) 2016-2020 is being revised and a [draft BAP](#) (2021-2026) has completed consultation and will soon be adopted. This makes reference to the UGF (para 3.4) and emphasises that urban greening measures should be included from the outset of the development design process. Biodiversity net-gain is prioritised by the highest surface cover factors being assigned to semi-natural vegetation and wetlands which follows the same scoring given by the GLA.
- 4.10 There has been some discussion on whether the target UGF factor of 0.3 should be set higher but the policy is clear that this should be considered a minimum target. Major developments are encouraged to submit a preliminary UGF calculation as part of pre-application discussions. The accuracy of calculations varies with some schemes omitting sealed surfaces which can disproportionately inflate scores and the detail and granularity of data provided in early discussions often needs improving. Applicants are encouraged to use the [GLA UGF Calculator](#) (Excel) to assess scores and the City of London is planning to prepare a GI Advice Note (similar to SPD / Supplementary Planning Document) to guide the application of UGF and the assessment of scores.
- 4.11 A key strength of the UGF is that it provides a tool and basis for negotiating the provision of GI and increasing urban greening measures through the development

management process. Specifically for the City of London it provides a mechanism to prioritise enhancing public realm, tree planting and the provision of green walls and intensive green roofs through the weighting of scores. Some developments are unable to achieve the minimum target so measures to offset provision elsewhere in the City have occasionally been considered, such as introducing green roofs on other buildings.

UGF Application in Recent Planning Applications

- 4.12 The practical process of applying and approving UGF calculations can be reviewed through specific planning applications. It should be noted that whilst planning approval may be given this may not lead to the construction of development schemes as they may be deferred or changed through a variety of circumstances.

Fenchurch Street

- 4.13 50 Fenchurch Street, London (19/01307/FULEIA) - Planning approval was granted for London's largest building. The report to the Planning and Transportation Committee (May 2020) noted:

'The development provides generous urban greening in the new public square, the roof garden and vertical planting in the recessed niche between the two tower elements. Urban greening provides the following benefits: mitigating air and noise pollution, capturing CO₂ while releasing O₂, combating the heat island effect, improving biodiversity, rainwater run-off management as well as making a place healthier, more attractive improving the wellbeing of people. The development achieves an Urban Greening Factor (UGF) of 0.34'.

55 Gracechurch Street

- 4.14 55 Gracechurch Street, London (20/00671/FULEIA) - Planning application is still under consideration whilst the committee report (January 2021) noted:

'The proposed development would incorporate a variety of urban greening measures, which provides the following benefits: mitigating air and noise pollution, capturing CO₂ while releasing O₂, combating the heat island effect, improving biodiversity, rainwater run-off management as well as making a place healthier and more attractive, improving the wellbeing of people. The development achieves an Urban Greening Factor (UGF) of 0.34'.

70 Gracechurch Street

- 4.15 470 Gracechurch Street, London (20/00816/FULEIA) - Planning application is still under consideration and the committee report (February 2021) repeats the list of GI benefits described in preceding applications and notes that:

'Across the entire application site, the development achieves an Urban Greening Factor (UGF) 0.31 which exceeds the draft London Plan policy G5(B) UGF target of 0.3. When taking only the actual site ownership area into consideration, excluding public highway on Lime Street, Philpot Lane and Rood Lane, the UGF score is 0.37 using the GLA calculation methodology and 0.42 using the City of London calculation methodology'.

References

City of London (2021) City of London Local Plan, City Plan 2036, Proposed Submission Draft: Topic Paper 4 - Climate Change, March 2021.

<https://www.cityoflondon.gov.uk/assets/Services-Environment/proposed-submission-draft-climate-change-topic-paper.pdf> [accessed 01/12/22]

City of London (2021) City Plan 2036, Shaping the Future City. City of London Local Plan, Proposed Submission Draft, March 2021:

<https://www.cityoflondon.gov.uk/assets/Services-Environment/cityplan-2036-march-2021.pdf> [Accessed 01/12/22]

City of London: Draft Biodiversity Action Plan 2021-2026.

<https://www.cityoflondon.gov.uk/assets/Green-Spaces/draft-city-of-london-biodiversity-action-plan-2021-2026.pdf> [accessed 01/10/22]

City of London: Local Plan Viability Assessment Prepared for City of London March 2020.

<https://www.cityoflondon.gov.uk/assets/Services-Environment/local-plan-viability-assessment-march-2020.pdf> [accessed 01/12/22].

GLA UGF Table Calculator (v1, 2021).

https://www.london.gov.uk/sites/default/files/ugf_calculator_version_1_march_2021.xlsx [accessed 01/10/22]

Grant, G. (2018) Urban Greening Factor Study, Green Infrastructure Consultancy / City of London, July 2018: <https://www.cityoflondon.gov.uk/assets/Services-Environment/planning-draft-local-plan-evidence-urban-greening-factor-study-2018.pdf>

[Accessed 01/12/22]

Harte, J. (2018) Green Initiatives in the City, Planning and Transportation Committee Paper, 8 October 2018:

5.0 Greater London Authority Urban Greening Factor Case Study

- 5.1 The Greater London Authority (GLA) first developed its UGF proposals through an [Urban Greening Factor for London Research Report \(2017\)](#) which explored the purpose, function, benefits and potential drawbacks of an UGF policy. The report included short descriptions of various international models from Berlin, Malmö, Seattle and Helsinki and feedback from a UGF Stakeholder Event held in May 2017.
- 5.2 Initial proposals for a UGF were included in the [London Environment Strategy \(2018\)](#) that set out the intention to include a new UGF in the London Plan to accelerate urban greening across the capital. It recognised that ‘a number of cities have developed ‘Green Space Factor’ policies that provide a methodology and metric for urban greening. These can be used to determine how much urban greening ought to be incorporated into all new high-density development’ (page 164). The method of calculating the UGF was illustrated using the example of the Green Space Factor and Green Points System developed by the city of Malmö.
- 5.3 UGF Policy for London is now described in Policy G5 Urban Greening in the adopted [London Plan \(March 2021\)](#) and has become a material consideration in planning decisions. This requires that ‘all major development proposals contribute to the greening of London by including urban greening as a fundamental element of site and building design’.

Policy G5 Urban Greening (page 322 [The London Plan 2021](#))

- A. Major development proposals should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as high-quality landscaping (including trees), green roofs, green walls and nature-based sustainable drainage.
- B. Boroughs should develop an Urban Greening Factor (UGF) to identify the appropriate amount of urban greening required in new developments. The UGF should be based on the factors set out in Table 8.2 [in the London Plan] but tailored to local circumstances. In the interim, the Mayor recommends a target score of 0.4 for developments that are predominately residential, and a target score of 0.3 for predominately commercial development (excluding B2 and B8 uses).

- C. Existing green cover retained on site should count towards developments meeting the interim target scores set out in (B) based on the factors set out in Table 8.2 [in the London Plan].

- 5.4 Target scores of 0.4 for predominantly residential development are higher than the target score of 0.3 for predominantly commercial development to ensure residential neighbourhoods have a good level of GI provision. Following the Examination in Public for the London Plan the policy was amended to omit Land Uses B2 and B8 that include general industry, storage, and distribution. This was at the direction of the Planning Inspector who felt there was not sufficient evidence that the UGF target was achievable or viable in these locations. This is a consequence of the particular plot layout, servicing needs, scale of building and structural costs in incorporating green roofs in extensive warehouses. The London Plan does direct B2 and B8 uses to submit a UGF calculation to show how greening has been maximised even though the target does not apply.
- 5.5 The policy includes a table of surface cover types and descriptions (Table 9). Each has a factor weighting providing a 'simplified measure of various benefits provided by soils, vegetation and water based on their potential for rainwater infiltration as a proxy to provide a range of benefits such as improved health, climate change adaption and biodiversity conservation' (para 8.5.3). Most surface covers are cross-referenced to recognised industry standards, specifications, and good practice. For example, Extensive Green Roofs that have a factor weighting of 0.7 should meet the Green Roof Code of Best Practice for the UK 2014.

Table 9 - The London Plan Table of UGF Surface Cover Types

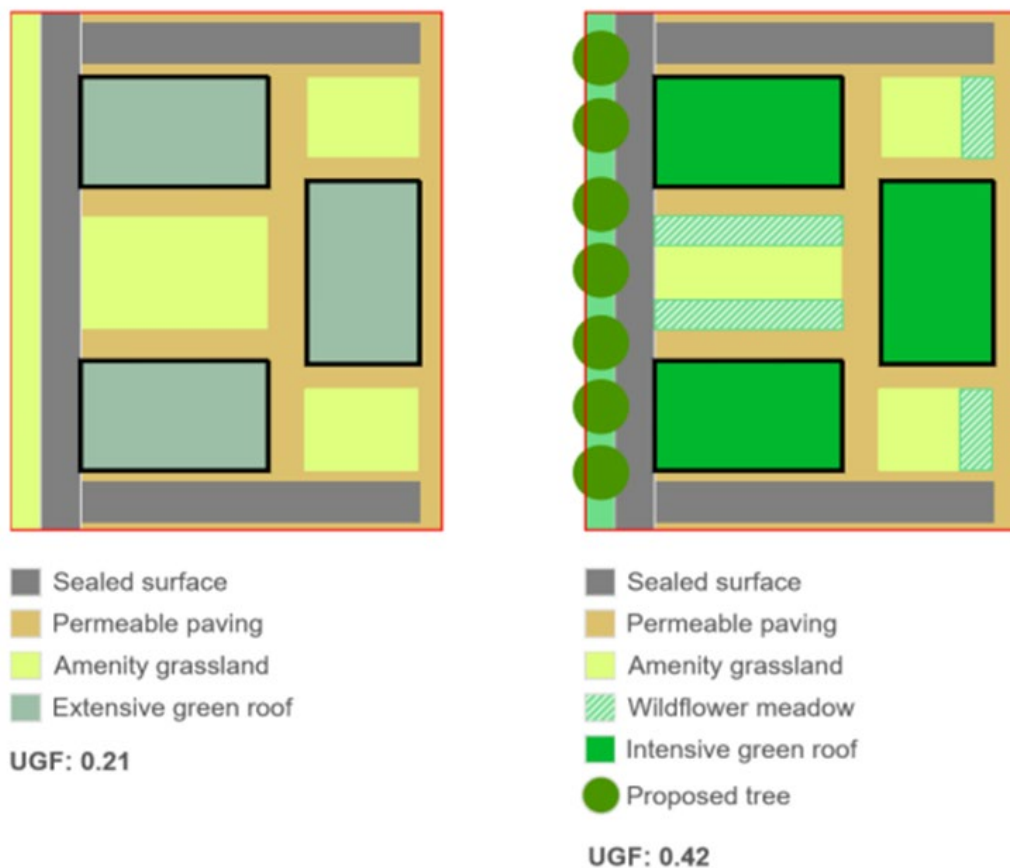
No	Surface Cover Type	Factor
01	Semi-natural vegetation (e.g. trees, woodland, species-rich grassland) maintained or established on site.	1.0
02	Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	1.0
03	Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm [see livingroofs.org for descriptions].	0.8
04	Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree [see TDAG - Trees in Hard Landscapes for overview].	0.8

05	Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) [meets the requirements of GRO Code 2014].	0.7
06	Flower-rich perennial planting [see RHS perennial plants for guidance].	0.7
07	Rain gardens and other vegetated sustainable drainage elements [see CIRIA for case-studies]	0.7
08	Hedges (line of mature shrubs one or two shrubs wide) [see RHS for guidance].	0.6
09	Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.	0.6
10	Green wall - modular system or climbers rooted in soil [see NBS Guide to Façade Greening].	0.6
11	Groundcover planting [see RHS Groundcover Plants for overview].	0.5
12	Amenity grassland (species-poor, regularly mown lawn).	0.4
13	Extensive green roof of sedum mat / other lightweight systems not meeting GRO Code 2014 .	0.3
14	Water features (chlorinated) or unplanted detention basins.	0.2
15	Permeable paving [see CIRIA for overview].	0.1
16	Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone).	0.0

Source - GLA (2021) [The London Plan](#) - The Spatial Development Strategy for Greater London, Table 8.2, page 324.

5.6 [The London Plan Guidance – Urban Greening Factor \(2021\)](#) includes a simple diagram demonstrating the process of calculating a UGF score for a theoretical site (Figure 5).

Figure 5 – Theoretical calculations of the UGF for a simplified development site



Source - [The London Plan Guidance – Urban Greening Factor \(2021\)](#), figure 3.1 page 9

5.7 Currently the UGF is only applied to ‘Major Developments’ which is defined in [the London Plan](#) (GLA, 2021, p512) as:

- Development of dwellings where 10 or more dwellings are to be provided, or the site area is 0.5 hectares or more;
- Development of other uses, where the floor space is 1,000 square metres or more, or the site area is 1 hectare or more.

A fuller definition of a Major Development is available in Part 1 of [The Town and Country Planning \(Development Management Procedure\) \(England\) Order 2015](#).

5.8 The UGF may eventually be applied to smaller developments as individual boroughs can adopt and refine the London Plan framework to meet their own needs for GI. The GLA recommends that boroughs use the surface covers and factor weightings in the London Plan but may choose to vary the target scores to reflect local circumstances. Potentially outer boroughs could set higher targets in response to a greener context when compared to more dense inner boroughs that may find it harder to achieve the target recommended in the London Plan.

5.9 The GLA has published a Consultation draft [London Plan Guidance for the Urban Greening Factor \(GLA/2021\)](#) that provides further detail on the purpose of the tool,

its application and process of calculation. This is accompanied by a positive [Equalities Impact Assessment](#) (GLA/2021). The Guidance emphasises the requirement to consider GI needs and objectives at the outset of the design process, ensuring that constraints are considered, on-site greening opportunities are exploited, and connections are made to surrounding GI networks where feasible.

- 5.10 The guidance states that a suitably qualified landscape architect and/or ecologist are part of a project design team from the outset and that early evaluation of greening opportunities and preliminary UGF scores should directly contribute to wider design development decisions. For example, this may require engineering and structural design input to accommodate green roofs and green walls.
- 5.11 The guidance recommends that a Landscape Masterplan and an UGF Masterplan and calculation table are submitted as part of the planning application. The UGF table should provide sufficient detail of the type of greening to allow interpretation and checking of the UGF types. This ensures that UGF proposals can be formally referenced and accepted within the process of granting planning approvals and conditions.
- 5.12 The GLA provides an Excel UGF Calculator that can be downloaded from the web to help applicants determine the score of a scheme and present the relevant information as part of their application. This includes instructions on how the UGF score should be calculated using the total site area, equivalent to the red line boundary, and retained surface cover types, such as roads and footpaths that should be included in the calculation.
- 5.13 The Guidance also explains how local boroughs should establish their own targets 'based on evidence relating to the need and opportunity for new green infrastructure' (para 4.1.1). The GLA recommends that local targets are set in Development Plan Documents (DPDs), which include Local Plans, Area Action Plans and Planning Guidance, and boroughs should retain the method of calculation, surface cover types and factor scores in London Plan Policy G5.
- 5.14 Boroughs could state a preference for specific surface cover types by prioritising these in DPDs and UGF policies. GI Strategies could also provide a useful basis and evidence for setting local UGFs and the Guidance recommends a five-stage process for developing these:
1. Define a green infrastructure baseline including identification of need
 2. Identify opportunities for new greening through development
 3. Retain London Plan UGF target scores or propose a change
 4. Test and implement
 5. Monitor and review

- 5.15 The GLA has also provided data and tools to assist boroughs in planning and setting targets for GI including a Green Infrastructure Focus Map. That collates various GI, strategic planning, and socio-economic data sets to identify areas of particular GI need.
- 5.16 The Guidance considers the use of UGF to deliver biodiversity net gain alongside other GI benefits. In locations with a low biodiversity baseline an 'ecologically informed approach can create new areas for wildlife to deliver biodiversity gains' (para 2.4.1). Specific biodiversity policies can be used with UGF policies. In London where there are protected or priority species and habitats on development sites then London Plan Policy G6 Biodiversity should be met in addition to Policy G5 Urban Greening.
- 5.17 Project Design Briefs for major development site should highlight opportunities for urban greening that can also deliver biodiversity gains. These can be developed through the planning and design stages of a project and during pre-application discussions. The GLA has published specific guidance on improving opportunities for biodiversity through urban greening, Urban Greening for [Biodiversity Net Gain: A Design Guide \(2021\)](#).
- 5.18 A Viability Study was prepared as part of the scrutiny of the [London Plan](#). The [Addendum Report](#) (GLA/2018, p12) made an assessment of the potential costs associated with the new UGF policy noting that 'this provides additional scope to achieve the UGF targets and will reduce the costs of additional green infrastructure provision'. Any cost impact was considered to be marginal as the proposed green cover and GI elements were common landscape design features and incorporated in the benchmarked costs that included a premium uplift for GI within the viability testing. Appendix D of the report includes an annotated table on the cost implications of each UGF element.
- 5.19 During scrutiny of the [London Plan](#) (2019) the Planning Inspector's report referred to the proposed UGF Policy. 'The concept of the application of an Urban Greening Factor is based on the use of similar devices in other cities around the globe and is supported by the evidence'. The inspector also referenced the [Urban Greening Factor Research Report](#) (Grant/ 2017) and noted that 'whilst none of the measures listed in Table 8.2 [of proposed Surface Cover Types] as contributing to urban greening are new, the policy "raises the bar" and provides a clear framework for major developments in addition to other expectations for open space' (Planning Inspectorate/2019, para 449)
- 5.20 The GLA and the Planning Authorities across London are monitoring the application of the UGF through the [Planning Data Hub](#). This will record and monitor how the UGF policy is being applied by recording the UGF score for each development where planning permission is granted. In time this will build an evidence base on

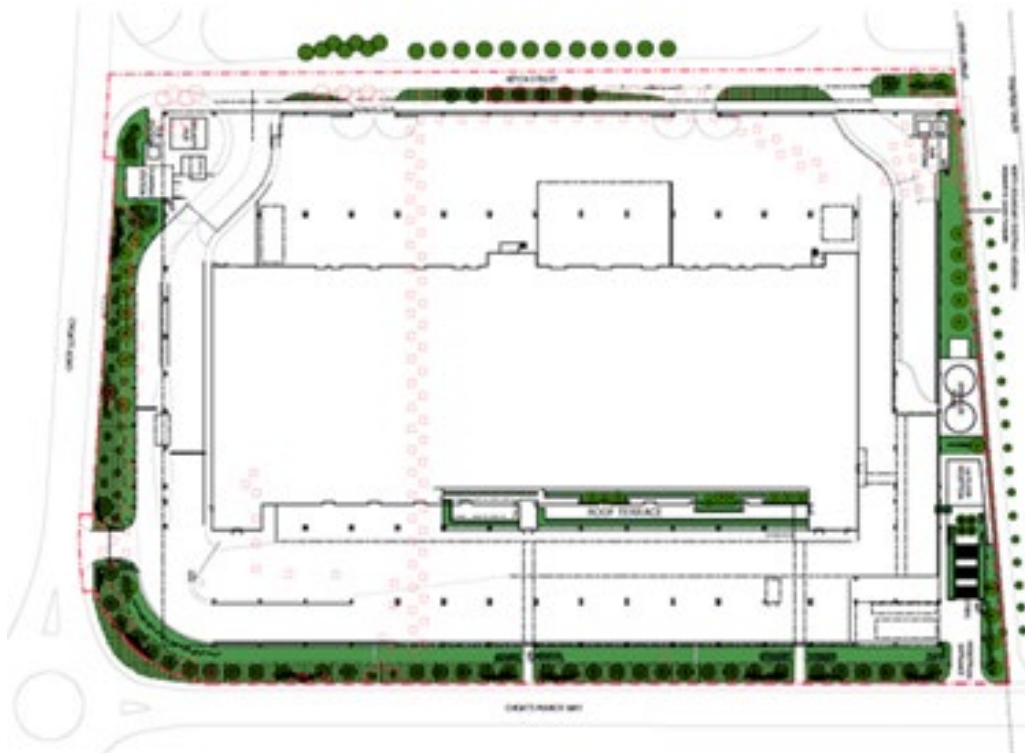
the application and effectiveness of the policy that will be a useful point of reference when reviewing and updating Local Plans.

UGF Application in Recent Planning Applications

- 5.21 The GLA does not consider the UGF policy an academic or valuation tool but ranks land covers comparatively and offers a means to set expectations on greening. It provides the basis for discussing urban greening proposals early in the development process to build confidence and certainty in planning applications.
- 5.22 The practical application of the UGF policy can be seen in specific planning applications. It should be noted that whilst planning approval may be given this may not lead to the construction of development schemes as they may be deferred or changed through a variety of circumstances.

Plot 2, Segro Park Dagenham, Barking

Figure 6 - Segro Park Landscape Masterplan



Source - Terry Anderson Landscape Architects (2020) Landscape Layout

Table 10 - Segro Park Landscape Masterplan calculations

Surface cover Type	Description	Factor	Area	Factor Total
Woodland & Wetland	Semi-natural vegetation created on site	1.0	n/a	
Wetland and open water	Wetland or open water (not chlorinated) created on site	1.0	n/a	
Intensive green roof	Intensive green roof or vegetation over structure. Vegetated sections only. Minimum 150mm depth of substrate.	0.8	372.0	297.60
Trees in open ground	Standard trees planted in natural soils or in connected tree pits with a minimum soil volume equivalent or at least two thirds of the projected canopy area of the mature tree	0.8	5,300.0	4,240.00
Extensive green roof	Extensive green roof with minimum 80mm depth of substrate	0.7	n/a	
Perennial planting	Flower-rich perennial planting	0.7	1,736.0	1,215.20
Sustainable drainage systems	Rain gardens or other vegetated sustainable drainage elements	0.7	n/a	
Hedges	Hedges	0.6	632.0	379.20
Trees in pits	Standard trees planted in pits with soil volumes less than two thirds of the projected canopy of the tree	0.6	n/a	

Surface cover Type	Description	Factor	Area	Factor Total
Green walls & climber systems	Green wall – modular system or climbers rooted in soil.	0.6	n/a	
Plant beds	Groundcover planting – plant beds	0.5	1,500.8	750.40
Grass areas	Amenity grass areas	0.4	336.0	134.40
Sedum green roofs	Extensive green roof of sedum mat or other lightweight systems	0.3	n/a	
Unplanted water bodies	Water features (chlorinated) or unplanted detention basins	0.2	n/a	
Permeable paving	Permeable paving	0.1	n/a	
Sealed paving	Sealed surfaces	0.0		0.00
		TOTALS	9,876.80	7,016.80
	Assumed projected tree canopy areas:			
	Tree in open ground = 50 sqm		TOTAL SITE AREA	36,732.00
	Tree in paved area = 30 sqm			
	Overall site area excludes existing planted areas to be retained		FACTOR	0.19

Source - Terry Anderson Landscape Architects (2020)

5.23 Plot 2, Segro Park Dagenham, Barking (21/00023/FULL - Barking & Dagenham) - Planning permission is yet to be determined for the demolition of an existing

research building and the construction of a new industrial building with HGV parking, hard-standing and circulation areas, landscaping, drainage and boundary treatment works.

- 5.24 The landscape design proposal, figure 6 and table 10 makes a commitment to provide a high quality landscape separating the public realm from the development. Whilst there is a net loss of trees on site the proposals state that 'all the trees will be supplied as semi-mature specimens with a backdrop of shrub planting to enhance the street view'. A roof terrace that includes a series of raised planters is included in the proposals for the benefit of employees.
- 5.25 The design proposals include a UGF calculation for the industrial storage development (B2 & B8 uses¹) even though these uses are exempt from the UGF Policy (see 5.4 above). The scheme achieves a target score of 0.19 which is considered reasonable for the location and proposed land use. Improvements to the GI design and UGF score could be achieved by changing areas of amenity grassland (weighting 0.4 / area 336 sqm) to wildflower meadow categorised as semi-natural vegetation (weighting 1.0 / area 336 sqm). It is calculated that this would achieve a modest increase in UGF score to 0.20.

¹ For current Land Use Classes used in planning see the Planning Portal:
<https://www.planningportal.co.uk/permission/common-projects/change-of-use/use-classes>

Watercress Island, Christchurch Road, Colliers Wood, Merton

Figure 7 - Watercress Island Landscape Masterplan



Source - Exterior Architecture (2020) Landscape Scheme and Statement

Table 3 - Watercress Island UGF calculation

Surface Cover Type	Factor	Area(M ²)	Surface Cover Factor
Semi-natural vegetation(e.g. woodland, flower rich grassland created on site)	1.00	266.00	266.00
Wetland or open water (semi-natural not chlorinated) created on site	1.00	-	-
Intensive green roof or vegetation over structure, Vegetated sections only. Substrate minimum settled depth of 150mm.	0.80	-	-
Standard trees planted in natural soils or with a minimum of 25 cubic meters soil volume per tree	0.80	897.90	718.32

Surface Cover Type	Factor	Area(M ²)	Surface Cover Factor
(preferably with load-bearing substrates and connected pits)			
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) which meets the requirements of GRO code (2014)	0.70	353.00	247.10
Flower-rich perennial planting	0.70	508.00	355.60
Rain gardens and other vegetated sustainable drainage elements	0.70	71.00	49.70
Hedges (line of mature shrubs one or two shrubs wide)	0.60	-	-
Standard trees planted in individual pits with less than 25 cubic metres of soil	0.60	797.96	478.78
Green wall-modular system or climbers rooted in soil	0.60	-	-
Groundcover planting	0.50	-	-
Amenity grassland (species-poor regularly mown lawn)	0.40	-	-
Extensive green roof or sedum mat without substrate or other systems that do not meet GRO code (2014)	0.30	-	-
Water features (chlorinated) or unplanted detention basins	0.20	-	-
Permeable paving	0.10	1,901.20	190.12
Sealed surfaces (e.g. concrete, asphalt waterproofing, stone)	-	501.06	-
TOTAL SITE AREA (m²)		4,294.00	
URBAN GREEN FACTOR SCORE			0.54

- 5.26 Watercress Island, Christchurch Road, Colliers Wood, Merton (21/Poo82 - Merton) - Planning permission is yet to be determined for the redevelopment of the site including the of two 16 and 26 storey mixed use residential buildings together with public open space and landscaping, car parking and cycle parking.
- 5.27 The Design and Access Statement for the scheme states an ambitious commitment to deliver 65% of the site as open space. The Landscape Statement includes a calculation of the UGF score of 0.54 (table 11) which exceeds the London Plan target of 0.4 for predominately residential schemes. The extent of tree planting in connected pits with natural soils and individual pits makes the most significant contribution to the UGF score.
- 5.28 The GLA Planning Report (Ref 2021/0146/01 - 08/03/21) comments on the proposed tree planting strategy. 'A significant number of trees are proposed at the southern part of the site, which whilst welcomed in urban greening terms present some design concerns. These appear uniformly to be Scots Pines and heavily clustered together to provide wind mitigation.
- 5.29 Combined with the tall hedges proposed, this is likely to obscure access to the development from the south and the applicant should consider whether fewer more mature trees could instead provide the wind mitigation required' (para 69). Whilst the UGF score can directly influence the quantity of urban greening, this illustrates the benefit of a qualitative review of the design proposals to test the practicality and resilience of a scheme.

Lambeth Hospital

Figure 8- Lambeth Hospital Landscape Masterplan



Source - GL Hearn (2021) Landscape Design Statement, page 47

Table 4 – Lambeth Hospital UGF Calculations

Surface Type	Factor	Area m ²	Total
Semi-natural vegetation (e.g. woodland, species rich grassland) maintained or established on site	1	1363	1363
Wetland or open water	1	62	62
Standard trees planted in connected tree pits with tree pit volume > at least 2/3 mature canopy	0.8	1000	800
Extensive green roof with substrate min. 80mm	0.7	5927	4148.9
Flower-rich perennial planting	0.7	1575	1102.5
Rich gardens & vegetated drainage elements	0.7	413	289.1
Hedges	0.6	275	225
Standard trees with medium tree pit volume with <2/3 of mature canopy area	0.6	3880	2328
Ground cover planting & shrub planting	0.5	1490	745
Amenity grassland	0.4	1767	706.8
Extensive green roof over cycle stores	0.3	243	72.9
Permeable paving	0.1	1804	180.4
Total			12023.6
Site area m²			25435
Urban Green Factor (UGF)			0.47

Source - GL Hearn (2021) Landscape Design Statement, page 47

5.30 Lambeth Hospital, 108 Landor Road, London (20/04194/EIAFUL - Lambeth) - Planning permission is yet to be determined for the demolition of all existing buildings and comprehensive redevelopment of the site for residential, flexible community and

commercial uses including open space, garden areas, play areas for children and car parking.

- 5.31 The [Lambeth Local Plan \(2021\)](#) (LBL/2021) makes reference to Policy G5 Urban Greening in the [London Plan](#) (GLA/2021), recognising that urban greening measures in new development provide a variety of ecosystem services and community benefit. The plan currently applies the London Plan UGF target scores and notes the council 'may in future develop its own urban greening factor for new developments through a supplementary planning document' (para 9.13). The Local Plan also includes the delivery of the UGF target as an indicator in its monitoring framework that will measure the 'number of major application approvals that meet or exceed the London Plan Urban Greening Factor target score' (Indicator 21, page 491).
- 5.32 The Landscape Design Statement for the scheme includes an UGF calculation (table 12) and masterplan (Figure 8) that illustrates the location of the various land cover types. These include semi-natural vegetation, extensive green roofs and flower-rich perennial planting that make the greatest contribution to the UGF score of 0.47. This exceeds the London Plan target of 0.4 for predominately residential schemes.
- 5.33 The GLA Planning Report (Ref 2021/0051/S1 - 12/04/21) considers the scheme presents a well-considered approach to integrating green infrastructure and urban greening across the masterplan. 'The commitment to maximising green roof provision, inclusion of a diverse range of vegetation typologies including wetland planting, and the creation of an ecological corridor are considered particularly positive features' (para 74). In exceeding the UGF target, the GLA considers the scheme compliant with Policy G5.

References

Grant, G. (2017) Urban Greening Factor for London Research Report, Ecology Consultancy / Greater London Authority:
https://www.london.gov.uk/sites/default/files/urban_greening_factor_for_london_final_report.pdf

GLA (2021) London Plan Guidance for the Urban Greening Factor, Consultation draft, September 2021. https://www.london.gov.uk/sites/default/files/ugf_-_consultation_version_sept_2021.pdf [accessed 01/12/22]

HMG (2015) The Town and Country Planning (Development Management Procedure) (England) Order 2015. <https://www.legislation.gov.uk/ukxi/2015/595/article/2/made>

HMG (2015) The Town and Country Planning (Development Management Procedure) (England) Order 2015. <https://www.legislation.gov.uk/ukxi/2015/595/article/2/made>

GLA (2021) London Plan Guidance for the Urban Greening Factor, Consultation draft, September 2021. https://www.london.gov.uk/sites/default/files/ugf_-_consultation_version_sept_2021.pdf [accessed 01/12/22]

GLA (2021) Equality Impact Assessment (EqIA) for London Plan Guidance, Urban Greening Factor, September 2021. https://www.london.gov.uk/sites/default/files/eqia_ugf_-_consultation_sept_2021.pdf [accessed 01/10/22]

London Wildlife Trust / Mayor of London (2021) Urban Greening for Biodiversity Net Gain: A Design Guide, March 2021, Greater London Authority.
https://www.london.gov.uk/sites/default/files/urban_greening_and_bng_design_guide_march_2021.pdf

GLA (2018) London Plan Viability Study Addendum Report, November 2018.
https://www.london.gov.uk/sites/default/files/london_plan_viability_study_addendum_report_1.pdf

Grant, G. (2017) Urban Greening Factor for London Research Report, Ecology Consultancy / Greater London Authority:
https://www.london.gov.uk/sites/default/files/urban_greening_factor_for_london_fin

GLA Planning London Datahub - <https://www.london.gov.uk/what-we-do/planning/digital-planning/planning-london-datahub>

Mayor of London (2018) The London Environment Strategy, May 2018, Greater London Authority.
https://www.london.gov.uk/sites/default/files/london_environment_strategy_o.pdf

6.0 Swansea Central Area Green Space Factor Case Study

- 6.1 Natural Resources Wales and Swansea Council, working with Green Infrastructure Consultancy, have developed a Green Space Factor Tool as part of a [Green Infrastructure Strategy \(2021\)](#) for the Central Area of Swansea. This focuses on the main retail and commercial heart of the city leading south to the basin of the River Tawe and the Eastern Docks. The area is a strategic focus for development and regeneration described in the [Swansea Central Area Regeneration Framework \(SCARF\)](#). Substantial investment in green infrastructure is considered a key element of the framework to enhance the quality and content of the public realm, improve the adaptation to and mitigation of climate change and increase dwell-time in the city centre for economic benefit.

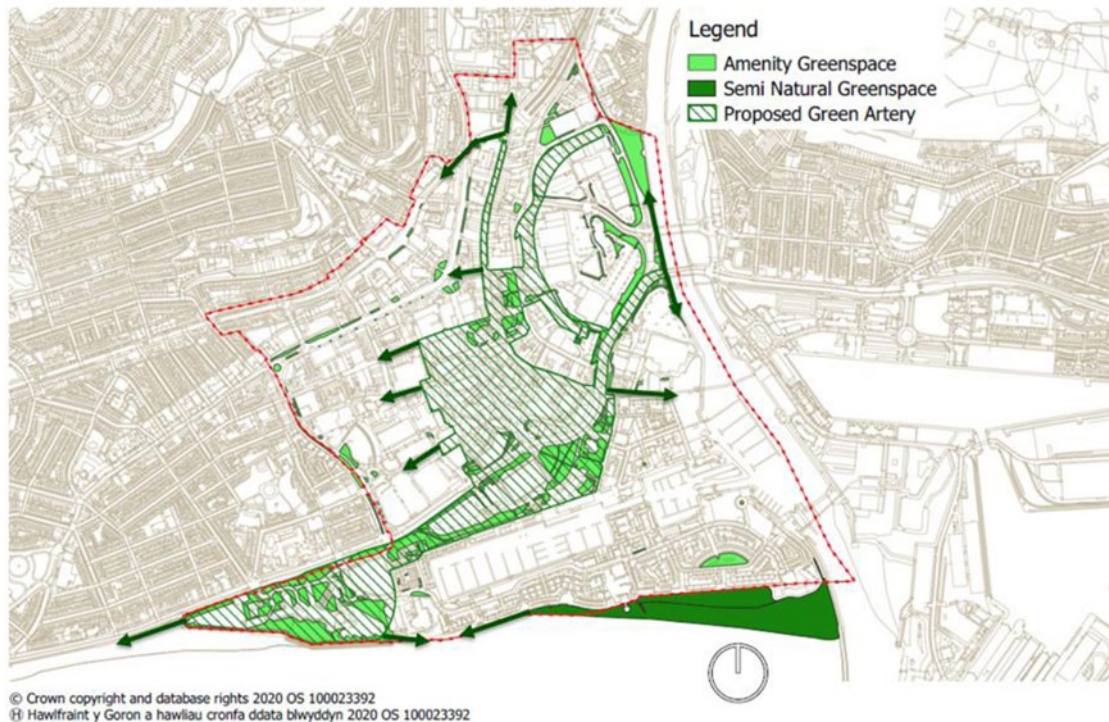
6.2 [The Swansea Central Area Green Infrastructure Strategy \(2021\)](#) was jointly prepared to fulfil the sustainable development principles of the [Well-being of Future Generation \(Wales\) Act 2015](#) and support both the delivery of the SCARF and wider policies of the [Local Development Plan \(2019\)](#). The Strategy went through extensive stakeholder engagement, development, and consultation in 2019-20 and, following delays caused by the Covid-19 pandemic, was adopted in early 2021. It leads with a Strategic Vision to establish 'a city with high quality multifunctional green infrastructure, which delivers resilience, prosperity, nature, health, wellbeing and happiness to the citizens and visitors of Swansea' (para 3.1). Five guiding principles for green infrastructure have been set to achieve this vision [in the Swansea Central Area Green Infrastructure Strategy \(2021\)](#) page 21 – 26 / para 3.10 – 3.22.

6.3 The five guiding principles of Green Infrastructure:

1. **Multifunctional** - making sure that all GI in the city centre provides as many benefits as possible. For example, it may reduce pollution and/or flooding, offer shelter and/or food for native animals (birds, insects and/or small mammals), provide shade during hot summer days, and create attractive pleasant and/or calming spaces for people to meet, relax and play.
2. **Adapted for climate change** - absorbing water to reduce flooding, providing summer cooling and accommodating wildlife. GI also helps mitigate climate change by capturing and locking up carbon.
3. **Healthy** - helping our physical and mental health by absorbing pollution, providing clean air, clean water, food and space to exercise, socialise and play and space to have contact with nature.
4. **Biodiverse** – recognising that all life depends on biodiversity and the maintenance of healthy resilient ecosystems supporting a wide variety of native species providing shelter and food and creating green corridors across the city centre linking to existing strategic wildlife corridors.
5. **Smart and Sustainable** - providing nature-based solutions, techniques and technologies that are low maintenance and reduce pollution and waste and maximise the use of recycled or sustainably sourced materials.

6.4 The Strategy is aligned with specific legislation and policy supporting the application of the [Sustainable Drainage \(SuDS\) Statutory Guidance 2019](#), and delivering the Natural Resources Wales and Swansea Council's duties under the [Well-being of Future Generations \(Wales\) Act 2015](#) and [Environment \(Wales\) Act 2016](#). Specifically, it takes account of the Council's Well-being Objective to maintain and enhance Swansea's natural resources and biodiversity and the Swansea Public Service Board's Objective for Working with Nature. Spatially the Strategy also seeks to deliver a Green Artery (Figure 9) that is a central planning component of the SCARF.

Figure 9 - Swansea Central Area and Green Artery that is the focus for GI investment.



Source – [Natural Resources Wales and Swansea Council \(2021\) Swansea Central Area; Regenerating Our City for Wellbeing and Wildlife](#), February 2021, p41

- 6.5 The Strategy includes a Green Space Factor (GSF) Tool to increase the quantity and functionality of GI schemes including the permeability of surfaces and spaces which is seen to drive functionality and the delivery of wider ecosystem services. Swansea Council is committed to using the tool to influence and measure design and development proposals across the Central Area including the green artery. The city centre lies in an attractive coastal location and is boarded by three wildlife corridors. However, it was badly damaged by bombing in 1941 and saw significant post war reconstruction in the mid 1900's which left a legacy of spaces dominated by sealed surfaces.
- 6.6 The use of the tool is not mandatory as it has been introduced through a GI strategy rather than being formally adopted in planning policy. This approach gives added flexibility as the Strategy and parameters of the GSF can be updated as needed to reflect changing objectives and incorporate new practice. 'The GSF scheme will help translate policy objectives into practice. It will not replace policies, strategies, plans or codes, but will help planners, and those involved in the development process to better understand how GI can be designed into schemes' (para 1.6). The GSF tool supports the application of the SUDs requirements and has been positively received which is attributed in part to the extensive stakeholder engagement in developing the Strategy and the subsequent training programme. It also benefitted from a broad inter-departmental steering group that was directly involved in the co-

creation of the Strategy and built a wide base of support for the principles and objectives.

- 6.7 The factor is calculated in the same way to other urban greening factors where the sum of factors for specific surface types are multiplied by the areas covered and then divided by the total site area. The tool is simple to use and does not require any formal accreditation. Whilst its application is not compulsory, all planning submissions are expected to demonstrate how master planning and design proposals will contribute to the principles and objectives of the Green Infrastructure Strategy. Minimum target scores are currently set as:
- 0.3 for predominantly commercial developments
 - 0.4 for predominantly residential developments

These target scores reflect those proposed for London and have initially been set to improve the provision of GI and may be increased in the future if there is support to expand the application of the tool and accelerate the delivery of GI.

- 6.8 Success will be measured via a number of performance indicators that include doubling the amount of terrestrial GI to 26% by 2030 and increasing tree canopy cover to 20-25% by 2044. The tree canopy target is based on collaborative research led by Forest Research and presented at the Urban Trees Research Conference (2017). The Strategy emphasises the intention of these targets is to 'increase resilience, prosperity, health, wellbeing and happiness for citizens and visitors and to ensure that the GI network complements and improves the existing natural and built environment' (para 3.9).
- 6.9 This will be achieved by maintaining and developing a partnership approach, the publication of [Supplementary Planning Guidance for Green Infrastructure](#) and the application of a Green Space Factor tool to increase the quantity and functionality of GI schemes. The monitoring of construction and enforcement of planning conditions will also be important mechanisms to safeguard delivery and achieve the set targets for GI.
- 6.10 Appendix 2 of the GI Strategy provides a detailed description of urban green infrastructure typologies and a useful diagrammatic illustration of their functionality including water regulation and cleansing, climate regulation, air quality, pollination, and carbon sequestration.
- 6.11 Appendix 3 of the GI Strategy provides detail on the function, use and calculation of the Green Space Factor tool, examples of similar applications in other cities and a set of factors to be applied to different surface cover types that is reproduced in Table 13. Individual factors are supported by a variety of technical references to aid the specification and design of GI.

Table 13 - Swansea Central Area Proposed GSF Scores

No	Surface Cover Type	Factor
o1	Semi-natural vegetation (e.g. woodland, flower-rich grassland) created on site	1.0
o2	Wetland or open water (semi-natural; not chlorinated) created on site	1.0
o3	Biodiverse intensive green roof or vegetation over structure. Vegetated sections only. Substrate minimum settled depth of 150mm. Planting to be with native species and/or species with documented value for biodiversity	0.9
o4	Intensive green roof or vegetation over structure. Vegetated sections only. Substrate minimum settled depth of 150mm	0.8
o5	Standard trees planted in natural soils or in connected tree pits with a minimum soil volume equivalent to at least two-thirds of the projected canopy area of the mature tree	0.8
o6	Biodiverse extensive green roof with substrate of minimum settled depth 80mm (or 60mm beneath vegetation blanket) - meets the requirements of GRO Code 2014	0.8
o7	Biodiverse rain gardens and other vegetated sustainable drainage elements. Planting to be with native species and/or species with documented value for biodiversity	0.8
o8	Extensive green roof with substrate of minimum settled depth 80mm (or 60mm beneath vegetation blanket) - meets the requirements of GRO Code 2014	0.7
o9	Flower-rich perennial planting	0.7
10	Rain gardens and other vegetated sustainable drainage elements	0.7
11	Biodiverse green wall - modular system or climbers rooted in soil	0.7
12	Native hedges (line of mature native shrubs one or two shrubs wide)	0.7

No	Surface Cover Type	Factor
13	Hedges (line of mature shrubs one or two shrubs wide)	0.6
14	Standard trees planted in pits with soil volumes less than two thirds less than the projected canopy area of the mature tree	0.6
15	Green wall - modular system or climbers rooted in soil	0.6
16	Native groundcover planting	0.6
17	Groundcover planting	0.5
18	Species-rich lawns (species-rich - with at least 5 species of low-growing wildflowers - regularly mown lawns)	0.5
19	Allotments or raised beds for food growing (exclude paved areas)	0.5
20	Amenity grassland (species-poor, regularly mown lawns)	0.4
21	Extensive green roof of sedum mat /other lightweight systems not meeting GRO Code 2014	0.3
22	Open water (chlorinated)	0.2
23	Unplanted detention basins	0.2
24	Permeable paving	0.1
25	Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone)	0.0

Source - [Natural Resources Wales and Swansea Council \(2021\) Swansea Central Area; Regenerating Our City for Wellbeing and Wildlife, February 2021](#), Appendix 3, p76-77

6.12 Higher scores are assigned to more ecologically beneficial surfaces to promote greater net gain and biodiversity benefit. The guidance notes that if a particular surface cover proposed for a scheme is not included in the table, then it should be assigned the same factor of a surface listed in the table that it is most similar in function to. This avoids a very long list of GI elements and encourages constructive interpretation.

- 6.13 An Action Plan to accompany the GI Strategy, leads the delivery and a more extensive county-wide green infrastructure strategy is under development. It is unlikely this will solely rely on the GSF tool as it is predominately considered to be tool for urban areas and would be less appropriate in peri-urban and rural locations.
- 6.14 As a planning tool the GSF makes a valuable contribution to pre-application discussions and negotiations and is seen as a means to an end rather than an end in itself. It will also be used in combination with future versions of Swansea’s Local Development Plan, the recently adopted [Supplementary Planning Guidance \(SPG\) for Biodiversity and Development \(2021\)](#) and forthcoming SPGs for open space and green infrastructure. The GSF will also help to improve surface water management and ensure development proposals include SuDS in their schemes.

GSF Application in Recent Planning Applications

- 6.15 The practical process of applying and approving GSF calculations can be seen in specific planning applications. It should be noted that whilst planning approval may be given this may not lead to the construction of development schemes as they may be deferred or changed through a variety of circumstances.

Picton Yard

Figure 10 - Proposed Biophilic Living scheme at Picton Yard, Swansea



Source - Powell Dobson Architects (2019) Design and Access Statement

- 6.16 Picton Yard 242-246 Oxford Street, Swansea (2019/2846/FUL) - Planning approval was granted for the redevelopment, extension and enhancement of the existing building, retaining shops at ground floor. The construction of a new tower in Picton Yard comprising ground and first floor educational uses, residential apartments, on the upper floors and associated works and public realm improvements (Figure 10). The planning committee report for the scheme noted that:

'The [Green Infrastructure] strategy recommends the use of the Green Space Factor Score [which] ... sets a minimum score of 0.3 for commercial projects and 0.4 for residential projects.... The proposal far exceeds the minimum target with a score of 0.49 for the building and Picton Yard area and 0.64 for the building only. It is imperative that the proposed green/ GI aspects are realised; it is recognised that some aspects may be experimental but they must be protected if there is any future delivery or value engineering issues'.

The Kingsway

- 6.17 71 - 72 The Kingsway, Swansea (2020/0490/FUL) - Planning approval was granted for the construction of a mixed use five storey building providing flexible office space, workspace with ancillary communal and commercial uses at basement. A public event and meeting space is incorporated at roof level with creation of new pedestrian link, public realm, landscape and green infrastructure works. The Design and Access Statement (2020) for the submission provides a summary calculation for the Green Space Factor and states a full spreadsheet calculation is provided in an appendix. The planning policy review of the submission (06/04/20) made note of the Green Space Factor assessment in the submission:

'Section 9.2 of the Design and Access Statement provides an analysis of the proposed green infrastructure using this tool, having regard to the various elements of the scheme including a green / brown roof, trees and planting, green walls and wildlife boxes. The analysis undertaken by the applicant concludes that the proposed green infrastructure achieves the 0.3 target score expected in the Green Infrastructure Strategy for commercial developments, which is welcomed. It is important the green infrastructure across the development maximises the developments contribution to enhancing biodiversity and ecosystem services by applying the (draft) Strategy's 5 principles'.

Ty Nant

- 6.18 Ty Nant, 180 High Street, Swansea (2021/1415/FUL) - Planning approval was granted for the construction of a new building and up to 11 storeys comprising purpose-built managed student accommodation; associated amenity space; cycle and car parking; landscaping; and access from Powell Street. Section 5 of the Design and Access Statement (20/05/21) on landscape design included a calculation of the

Green Space Factor (page 68-69). Adjustments to the design of the scheme took account of the preliminary calculations to improve the score, achieving 0.49, exceeding the 0.4 target for residential development and stating that:

‘The final design now includes permeable paving, green roof, rain garden, tree planting and podium landscaping that all provide enhancements towards the overall score.

The illustrative layout indicates the calculated break down of areas and other contributors towards the Green Space score. This has been developed through an on-going dialogue with the Local Authorities GSF officer and other members of the LPA planning team. With a projected score of over 0.4 the design represents a successful response and one which is capable of delivering a strong Green Infrastructure contribution to Swansea City’.

References

Doick, K.J, et al (2017) The Canopy Cover of England’s towns and Cities: Baselineing and setting targets to improve human health and wellbeing Conference Proceedings of TPBEIII. Urban Trees Research Conference 5-6th April 2017, Institute of Chartered Foresters, Edinburgh.

https://www.researchgate.net/publication/322337570_The_Canopy_Cover_of_England's_Towns_and_Cities_baselineing_and_setting_targets_to_improve_human_health_and_well-being

Environment (Wales) Act 2016 <https://gov.wales/sites/default/files/publications/2019-05/environment-wales-act-2016-overview.pdf>

Natural Resources Wales and Swansea Council (2021) Swansea Central Area; Regenerating Our City for Wellbeing and Wildlife, February 2021:

<https://www.swansea.gov.uk/greeninfrastructurestrategy>

Swansea Council (2011) Swansea Local Development Plan 2010 – 2025

<https://www.swansea.gov.uk/ldp>

Swansea Council (2019), Supplementary Planning Guidance (SPG)

<https://www.swansea.gov.uk/spg>

Wellbeing of Future Generations (Wales) Act 2015 <https://gov.wales/well-being-future-generations-act-essentials-html>

Welsh Government (2019) Sustainable Drainage (SuDS) Statutory Guidance, 2019:

<https://gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf>

Appendix 1 - Green Infrastructure Framework Advisory Group Members

Organisations in the Green Infrastructure Framework Advisory Group:

1. Activity Alliance
2. AECOM
3. Berkeley Homes
4. Birmingham City Council
5. Birmingham City University
6. Brillianto
7. Buckinghamshire County Council
8. Building Research Establishment
9. Building with Nature
10. Cambridge City Council
11. Canal and River Trust
12. Chartered Institute of Ecology and Environmental Management (CIEEM)
13. Chartered Institute of Water and Environmental Management (CIWEM)
14. Chilterns Area of Outstanding Natural Beauty Unit
15. Construction Industry Research and Information Association (CIRIA)
16. Core Cities Group,
17. Country Land and Business Association
18. Cycling UK
19. Department for Food and Rural Affairs
20. Ecosystems Knowledge Network
21. Eden Project
22. Environment Agency
23. Essex County Council
24. Field Studies Council
25. Fields In Trust
26. Forestry Commission
27. Friends of the Earth
28. Future Parks
29. Gloucestershire Wildlife Trust
30. Greater Manchester Combined Authorities
31. Groundwork
32. Historic England
33. Home Builders Federation
34. Homes England
35. Keep Britain Tidy

36. Land Trust
37. Landscape Institute
38. Lendlease
39. Local Government Association
40. Lockhart Garratt
41. Manchester City Council
42. Mind
43. Mott MacDonald
44. National Federation of Parks and Greenspaces
45. National Grid
46. National Infrastructure Commission
47. National Trust
48. Natural England
49. Nene Park Trust
50. Nottingham City Council
51. Office for Health Improvement and Disparities, Department for Health and Social Care
52. Open Spaces Society
53. Ordnance Survey
54. Parks Alliance
55. Peel Land and Property Group Management Limited
56. Royal Society of Protection of Birds
57. Sport England
58. Sustrans
59. The Association of Directors of Environment, Economy, Planning and Transport
60. The Ramblers
61. The Rivers Trust
62. The Wildlife Trust
63. Town and Country Planning Association
64. UK Green Building Council
65. University of Manchester
66. University of Northumbria
67. University of Oxford
68. University of the West of England
69. Urban Nature Ltd
70. Urban&Civic
71. Wildlife and Countryside Link
72. WSP Global Inc

Appendix 2 – Stages of Urban Greening Factor Research

The development of the UGF described in this report was commissioned and led by Natural England on behalf of Defra, and was undertaken between September 2021 and March 2022.

It builds on research undertaken during earlier stages of the development of the GI Framework between 2019 and 2020, and contributes to a set of eight papers on UGF applications:

Stage 1 2018-19

This work was contracted to LDA Design and led by Frazer Osment. Peter Neal was the lead author of the papers below.

1.1 Summary Report (unpublished): GI Standards Framework Interim Report, 2019

Stage 2 (2020)

This work was contracted to the University of Manchester. Dr Ian Mell led the delivery of the contract. Peter Neal was the lead author of the papers below.

Briefing Papers (unpublished, 2020)

2.1 - A Review of UGF Applications

This paper introduces the concept and describes the chronological development of Urban Greening Factors using a structured review of the academic and grey literature. It provides a description of both international practice and UK applications and includes a summary of existing policies, guidance and the process of application and implementation. It assesses the extent of the evidence base that has been used to develop specific Urban Greening Factors and provides a review of surveys, assessments and evaluations that gauge the effectiveness of the planning tool.

2.2 - An Assessment of UGF and Ecosystem Services

This paper provides a review of the approach and effectiveness of Urban Greening Factors in delivering ecosystem services (ESS). It uses a familiar evaluative framework of supporting, regulating, provisioning and cultural service headings. Particular attention is given to factors that prioritise the water-holding capacity of vegetated surface covers and soils that have commonly been used as a proxy for delivering wider ESS benefits.

2.3 - An Analysis of UGF Metrics, Net Gain and Scale of Application

This paper provides an analysis of the metrics commonly used in Urban Greening Factors that incorporate specific socio-cultural, economic and ecological parameters. It assesses the role that Urban Greening Factors can play in spatial planning and their potential use in analysing the nature of green infrastructure provision, demonstrating net gain and their ability to work alongside other net gain metrics including the Biodiversity Metric and Eco-metric.

2.4 - A Review of the use of UGF to meet Local Needs and Inform Targets

This paper considers the flexibility of Urban Greening Factors in meeting particular local needs and how inclusive and collaborative approaches including stakeholder consultation and public engagement can inform their development. This may help to prioritise the delivery of specific ESS alongside other cultural, recreational and placemaking objectives and describes how the use of Urban Greening Factors can inform national and local targets for ESS and green infrastructure provision.

Stage 3 (2021-22)

This work was led by Peter Neal on behalf of Natural England. Peter Neal was the author of the papers below.

Technical Papers (published 2023)

- 3.1 - Urban Greening Factor for England - Current Practice and Case Studies
- 3.2 - Urban Greening Factor for England - Development and Technical Analysis
- 3.3 - Urban Greening Factor for England - User Guide
- 3.4 - Urban Greening Factor for England - Summary Report

All the Stage 3 papers and User Guide Spreadsheet form part of the Green Infrastructure Framework - Principles and Standards for England.

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