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• Special Issue: Mainstreaming Green Infrastructure in the Planning System

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Special Issue: Mainstreaming Green Infrastructure in the Planning System

regulars

Cover illustration by Clifford Harper. chcliffordharper@gmail.com

time for a healthy homes act

The quality of the homes and neighbourhoods people live in has profound impacts on their health, safety and wellbeing

The opening lines of the Final Report of the Raynsford Review of Planning England[1] state:

> *'How we organise and design our communities makes a profound difference to people's long-term health and wellbeing. Sometimes the impacts are immediate, personal and tragic, as at Grenfell Tower. In other cases the impacts are less direct but still important to people's lives, as in how we deal with flooding, or the benefit that access to parks and gardens can have for people's mental health.'*

Hopefully, most of the readers of this journal will know that one of the TCPA's key objectives is to secure a decent home for everyone. And while the quality of each individual home is important, the quality of the place within which that home is built is a critical part of what defines whether or not a home should be considered 'decent'. Sadly, we know that some of the homes being built today are not of a high enough quality, and risk undermining people's health, safety, wellbeing and life chances.

The evidence-gathering phase of the Raynsford Review found a number of case studies that highlighted poor-quality development. In collaboration with University College London, the TCPA has also continued to invite the submission of case studies since the Final Report was published. Most of the examples sent to us have been delivered through permitted development rights. Examples have included flats converted from industrial buildings where the only place for children to play nearby is the car park; two-bedroom flats with incredibly limited access to natural light because the entire flat has just one window, which is in one of the bedrooms; and new blocks of flats where the vast majority do not meet national space standards.

The quality of some of the homes being built today is even more shameful when you consider that we seem to have gone backwards over the last century. In 1918, the Tudor Walters Committee published its recommendations on design standards for council housing.[2] These standards were about space and design, but also covered energy, transport and green space. The standards were then enshrined in the Planning and Housing Act 1919, which was the origin of council housing in the UK.

The design standards were transformational. They shaped the quality of hundreds of thousands of council homes built between the wars and marked

a seismic step-change in space and quality. They created the classic three-bedroomed council houses with front and back gardens, green space and communal facilities. In 1963, these design guides evolved into the Parker Morris standards, which survived until 1980, when all mandatory standards were abolished.

Not everyone was supportive of the national design standards, even back then. Concerns were raised because, for example, big London County Council estates applied the design guide and principles so inflexibly that the houses all looked the same. Shortly before his death in 1940, Raymond Unwin, who was very influential on the Tudor Walters Committee, made clear that he had hoped the guide would be applied with imagination, but in practice it had become a default template for public housing. Nonetheless, the positive transformation of housing quality enabled by the setting of national standards should not be forgotten.

Despite these extraordinary times in Parliament, there remains cross-party consensus on the need for more homes. I have written before about the current rhetoric from parliamentarians about the importance of place-making and homes that are well designed. To help achieve more and better homes, and to prevent the development of unacceptably poor-quality homes, the TCPA has launched a campaign for a Healthy Homes Act, which seeks to raise the bar in terms of the minimum quality of homes that are being built or delivered through conversion or change of use.

The Act aims to articulate what constitutes a 'decent' home through ten high-level principles. The principles cover a range of issues around fire safety, adequate liveable space, access to natural light, the need for resilience to climate change, and being free from noise pollution. But they also aim to tackle the neighbourhood within which the home is situated – so the principles include issues around walkability, access to the public realm, and green and play space. While we recognise the complexity of some of these themes, we do not believe that the quality of a home can be considered without reference to the community it is within.

The principles would be implemented through changes to Building Regulations and national planning policy and would apply to all new homes. And while there may be much debate about the principles, we hope that nobody could argue with the premise that the new homes that are being built must be decent. Setting out principles in this way would also give consistency and certainty to housebuilders and local authorities and make sure that all new homes meet basic, minimum standards.

In light of our concerns about the quality of homes being delivered via permitted development rights, we strongly welcomed the announcement from the Labour Party last month that the next Labour government will scrap permitted development rights for the conversion of commercial spaces into housing.[3]

As well as highlighting the issue of the poor quality of new homes, the Labour Party also pointed to research by the Local Government Association which has estimated that over 10,000 affordable homes have been lost as a result of permitted development in the last three years, because developers do not have to meet policies around social housing obligations.[4] The TCPA shares these concerns, as well as concern about the hugely negative impact on place-making.

Responding to the Labour Party announcement, a Conservative spokesperson criticised the position and argued that the current policy was important in terms of delivering more homes. But the Housing Minister, Kit Malthouse, has also spoken repeatedly about the need for not only more, but also better homes. Part of the government's commitment to that was setting up the Building Better, Building Beautiful Commission. While, at the time of writing, we await an announcement about a new chair for the Commission, civil servants have stated that the government remains committed to both the Commission and the timetable of it reporting by the end of the year. The TCPA has engaged with the Commission and, if it continues its work under a new chair, will continue to do so. We see the proposed Healthy Homes Act as a key part of achieving decent, well designed homes in high-quality places, and hope that the Commission will be interested in our recommendations.

Much as the TCPA would like to be able to do so, we of course cannot create legislation! So this may well be a long-term campaign. But we believe that a Healthy Homes Act is necessary to make sure that homes being built today enhance, rather than undermine, people's health, safety, wellbeing and life chances. A copy of the proposed Healthy Homes Act is available from the TCPA website,[5] and anyone interested in the Association's campaign to institute such an Act is invited to register their interest and receive updates, including details on how to offer support, by emailing the TCPA on healthyhomesact@tcpa.org.uk.

● ***Fiona Howie*** *is Chief Executive of the TCPA.*

Notes

1 *Planning 2020 – Final Report of the Raynsford Review of Planning in England.* TCPA, Nov. 2018. www.tcpa.org.uk/raynsford-review

2 *Report of the Committee on Questions of Building Construction in Connection with the Provision of Dwellings for the Working Classes*. Tudor Walters Report. Cd 9191. HMSO, 1918

3 'Labour pledges to end 'slum' office housing'. *BBC News*, 24 Apr. 2019. www.bbc.co.uk/news/business-48031661

4 '10,000 affordable homes potentially lost through office conversions'. News Release. Local Government Association, 27 Nov. 2018. www.local.gov.uk/about/news/10000-affordable-homes-potentially-lost-through-office-conversions

5 The TCPA's proposed Healthy Homes Act is available from the TCPA website, at www.tcpa.org.uk/room-to-breathe-the-campaign-for-basic-national-housing-standards

TCPA Annual General Meeting

Date: **Wednesday 10 July 2019, 6 pm**
Venue: **TCPA, 17 Carlton House Terrace, London SW1Y 5AS**

The Town and Country Planning Association will hold its Annual General Meeting (AGM), followed by drinks and nibbles, on **Wednesday 10 July at 6 pm** at the TCPA Office, 17 Carlton House Terrace, London SW1Y 5AS. All TCPA members are invited to attend.

There are **five vacancies on the TCPA Board of Trustees** and **nine vacancies on the TCPA Policy Council for 2019**. These places are for election by the membership of the TCPA, and any individual member of the TCPA or representative of a member organisation of the TCPA may stand for election. Existing elected members due to retire after having served three years on either body have been informed and are eligible to stand for re-election.

Nomination forms are available on the TCPA website under the AGM section. All applicants require the nominating signature of another member of the Association. Further information on the respective roles of the Board and the Policy Council is set out in the TCPA Articles of Association and in the TCPA Handbook.

Completed nomination forms must be received at the TCPA Office by Friday 17 May 2019. The results of the Trustee and Policy Council elections will be announced at the 2019 TCPA AGM on 10 July. We hope you can join us.

- **we are:** independent and open to all who want better places
- **we have achieved:** greener cities, new towns, better homes, and stronger communities
- **we create:** ideas, knowledge, publications, campaigns, and independent policies
- **we aim to:** secure homes, empower communities, and deliver a sustainable future

...through planning

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- Garden Cities campaign
- New Communities Group
- #Planning4People
- Making planning work
- Planning & Climate Change Coalition
- European projects
- Reuniting health and planning
- Green Infrastructure Partnership

mainstreaming green infrastructure in the planning system

Guest Editor Alister Scott introduces the Special Issue on mainstreaming green infrastructure in the planning system

Photo courtesy of GCV Green Network Partnership

This Special Issue of *Town & Country Planning* focuses on improving the mainstreaming of green infrastructure in the planning system. It comprises an exciting mix of academic, policy and practice articles that collectively signpost how green infrastructure can be better configured, communicated and employed to deliver better place-making and place-keeping processes and outcomes, moving outside its traditional environmental silo to infiltrate economic, social and health agendas.

It is here that the 'mainstreaming' concept needs to be unpacked as all too often it is a term that is loosely used and falsely claimed. Mainstreaming is about taking a concept that is accepted and used in one policy domain and embedding it across other policy domains to become accepted and used as a matter of course.[1] For green infrastructure, this means securing improved traction and subsequent adoption in the business, housing, growth, health and community sectors, for example, where the

planning system is a key driver. This necessarily involves a cyclical process of knowledge generation, communication, persuasion, acceptance and reinforcement[2] before mainstreaming can be said to have been effected.

However, green infrastructure is not yet mainstreamed in the planning system as it remains rooted in the persuasion phase. We still see research and policy investigations presenting evidence of the value and multiple benefits of green infrastructure for mental health and wellbeing, the economy, climate change mitigation and biodiversity; but often in separate claims. Indeed, there is much evidence from the research councils[3] that green infrastructure is delivering on all these aspects, but there remains widespread resistance to making things happen on the ground. In many ways, green infrastructure is still being treated as a desirable piece of infrastructure but is not yet seen as critical infrastructure in the built environment jigsaw.

Consequently, there is a need for a change in culture in which everyone gets out of their disciplinary and sectoral silos and embraces more unifying concepts such as place-making, place-keeping and multiple benefits, while being mindful of the risks of fetishising green infrastructure itself within its own silo.

'In many ways, green infrastructure is still being treated as a desirable piece of infrastructure but is not yet seen as critical infrastructure in the built environment jigsaw'

Thus the articles in this Special Issue highlight where and how we might start to address these fundamental weaknesses, illuminating successes and challenges in equal measure, with a focus on tools, policy, delivery and evaluation, and unpacking the key lessons that might lead to improved mainstreaming, moving beyond the persuasion phase.

This Special Issue is structured in three sections to aid a better understanding of green infrastructure's opportunities and challenges for mainstreaming. The first explores international perspectives using examples from Australia and Ireland, with a focus on green infrastructure case study exemplars for city growth and the development of improved health frameworks for spatial planning, respectively.

The second section of four articles assesses the efficacy of different tools developed as part of the recent Natural Environment Research Council (NERC) research funding initiatives,[4] together with one core strand of my own NERC fellowship work, which all highlight the opportunity to make green infrastructure work harder in built environment developments, raising the green infrastructure standards bar. The focus here is on co-developing tools in conjunction with the built environment professions to make them 'oven ready'.

Finally, there are three articles assessing how well plans, policies and programmes are mainstreaming green infrastructure to improve place-making processes and outcomes using examples of neighbourhood masterplanning in the delivery phase, a GI design code, and the use of planning obligations.

The articles collectively highlight exciting new mainstreaming pathways, and the key to unlocking them perhaps lies in bold new research programmes that build upon some of the insights and lessons emerging here:

- Develop a place-based and place-keeping approach.
- Better incorporate the multiple functions and benefits of green infrastructure in ***all*** policy, plans, projects, and programmes
- Use existing planning tools more effectively rather than invent new ones.
- Carry out research that involves end users from the outset and then throughout the research process.
- Focus on the delivery of green infrastructure in funding and long-term maintenance schemes.
- Secure an improved communication strategy that enables green infrastructure to be embedded in wider infrastructure arguments.

● ***Professor Alister J Scott*** *is with the Department of Geography & Environmental Sciences at Northumbria University, and currently leads the NERC-funded Mainstreaming Green Infrastructure knowledge exchange project (award NE/R00398X/1). The views expressed are personal.*

Notes

1 AJ Scott, C Carter, M Hardman, N Grayson and T Slaney: 'Mainstreaming ecosystem science in spatial planning practice: exploiting a hybrid opportunity space'. *Land Use Policy*, 2018, Vol. 70, 232-46

2 EM Rogers: *Diffusion of Innovations*. Free Press, 2003, Fifth Edition

3 A list of current NERC protects is provided at https://mainstreaminggreeninfrastructure.com/project-page.php?NERC-science-GI

4 A critical review of the 13 NERC green infrastructure innovation projects is set out in M Grace and D Proverbs: *A Review of the Natural Environment Research Council Green Infrastructure Innovation Programme*. Birmingham City University/NERC, Dec. 2017. https://mainstreaminggreeninfrastructure.com/reports/NERC%20-%20Final%20Report%20v6pdf.pdf

mainstreaming green infrastructure in australia

Barbara Norman and Jason Alexandra look at three cases of recent Australian experience with green infrastructure, drawing out some challenges, opportunities and future directions

City f Melbourne

Greening techniques demonstrated through the City of Melbourne's greening laneways programme

The transformation of cities is one of the great global imperatives of the 21st century, with worldwide interest in green infrastructure as part of the climate-responsive and biophilic cities movement.[1,2] This movement uses green infrastructure's transformative potential and capacity for generating multiple benefits to enhance the form and function of urban systems.[2,3] However, there are big challenges in managing urban growth while also growing green cities.[4]

Green infrastructure is both a movement and a suite of functional, ecological and social strategies for reconnecting urban systems to the biosphere.[5] Systemic integration and management of biological elements and ecological processes – for example trees and plants, waterways and wetlands – can deliver ecosystem services, including climate modification, carbon sequestration, water and wastewater filtration, and habitat provision.[5] These elements can be incorporated with built infrastructure at a range of scales, from individual buildings – green walls and roofs, for example – through to city-wide water-sensitive urban design and urban forestry strategies and broader bioregional spatial planning – for example green belts and the protection of water catchment areas.[2]

For several generations, Australia's sprawling car-based cities have been seen as environmentally destructive, but this is changing with the adoption of green infrastructure strategies, as profiled in the next section.

City of Melbourne

Melbourne is Australia's second-largest city, with a legacy of significant urban parks from preceding centuries. These provide a strong foundation for

a new wave of urban greening based on an integrated approach to green infrastructure that aims to deliver critical action on climate change, biodiversity, and the health and wellbeing of communities. It is the multiple co-benefits that makes green infrastructure a powerful investment in liveability.

The City of Melbourne's plans for green infrastructure involve education and community involvement, demonstration projects, and long-term investment in green infrastructure.[6] Key elements are:

- The *Growing Green Guide* provides practical advice to community and business groups on the planning, design and maintenance of green infrastructure.[7] This collaboration between sub-national government, the community and a leading university is designed to build capacity within the community in greening the city.
- The greening laneways programme[8] builds on the transformational revitalisation of laneways (narrow roads, or lanes) in Central Melbourne over the last three decades. The City of Melbourne mapped laneways with greening potential given their physical attributes and sponsored four laneway projects that demonstrate greening techniques and the benefits of vibrant cool green spaces for business, tourists and locals to enjoy.
- The City of Melbourne's *Urban Forest Strategy* is a critical plank in the greening of Melbourne. The overall target of 40% canopy cover by 2040 is supported by local urban forest precinct plans developed with neighbourhood communities. For the greater metropolis, the strategy focuses on expanding tree populations from 5 million to 8 million trees over coming decades. Other major objectives include a target to improve tree health, with the aim that '90% of the City of Melbourne's tree population will be healthy by 2040'.[9]

Australian Capital Territory

Canberra, the national capital, lies inland within the Australian Capital Territory (ACT). Its higher altitude, hot dry summers and cold winters bring special considerations for green infrastructure.

The ACT Government has committed to action on climate change, legislating targets of 100% renewable electricity by 2020 (which it is on track to meet) and carbon neutrality by 2045. As part of these commitments, the ACT is developing a 'living infrastructure' (LI) plan. Canberra, often described as 'a city within a landscape' and the 'bush capital', has unique environmental qualities. However, as in many cities its tree canopy is ageing, and city managers are facing the prospect of managing this asset into a hotter and drier climate. Wildfire represents a significant risk, with Canberra experiencing a tragic event in 2003.[10] Within this context, 'living infrastructure' needs to 'cool the city' in warmer months while not escalating wildfire risk.[2]

The first step to developing an LI plan has been the release of an LI 'information paper',[11] outlining its attributes and the broader planning context, including climate plans. Key messages for the community and decision-makers in this formative step include the following:

- Living infrastructure applies to both public and private lands.
- Four basic components are proposed – plants, open spaces, lakes, ponds and waterways, and soils and surfaces.
- Living infrastructure provides multiple benefits.

Clear targets and action on climate change frame the ACT Government's approaches. The legacy of a bush capital is highlighted by the fact that there are 800,000 trees in the ACT – twice as many as there are residents – but caring for these key landscape features requires appropriate responses to the increased risks of drought and wildfire.[11]

Smaller local councils

At local levels the development of green infrastructure appears more formative. While the term 'green or living infrastructure' is not widely used, action on waterway and landscape restoration in urban and rural areas is widespread.[12]

In many regions a major challenge is protecting coastal areas from urban development and the impacts of climate change (storms, sea level rise and coastal erosion). The Peron Naturaliste Partnership is an innovative approach to coastal protection in South West Australia, with nine councils collaborating on climate change action.[13] In this award-winning example, these largely rural councils are using green infrastructure to protect small towns and coastal villages from coastal flooding. The use of soft barriers, such as beach and dune restoration using the native flora of the coastal landscapes, is a key strategy, although in some parts coastal retreat and buyback of coastal lands is also recognised as required in the longer term.[14] As Australia is a dry continent, water-sensitive urban design strategies, including community involvement, are common within green infrastructure plans.[15]

Challenges and opportunities

Green infrastructure initiatives may be constrained by technical and institutional complexities and the embedded institutionalised procedures and rationalities of agencies with responsibilities for different elements within urban systems, such as water, housing, energy, parks, and planning.[16] Importantly, the examples profiled above demonstrate commitment to transforming the form and functions of urban systems by combining

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Canberra – 'a city within a landscape'
Source: Sustainable Pathways for Our Cities and Regions: Planning within Planetary Boundaries[4]

technical and social innovations. Usefully they illustrate:

- the integration of urban planning and development with climate mitigation and/or adaptation strategies;
- institutional and professional capacity building, political commitment, and active community participation; and
- strong policy and resourcing commitments that ensure continued support for programmes and strategies with multiple diffuse benefits.

These examples demonstrate that the introduction of green infrastructure requires integration of the technical, social and governance dimensions, and the bringing together of different theoretical and practical traditions from 'new urbanism', urban spatial planning, energy, transport and water systems, and biodiversity conservation. Importantly, green infrastructure offers material and symbolic expression of commitments to address climate change, contributing to climate adaptation and mitigation strategies.

While the implementation of much green infrastructure is technically feasible, its wider application confronts many traditional and established practices within the techno-social regimes of urban systems.[2] Social and institutional dimensions and governance arrangements enable or constrain transformative techniques and technologies.[17] For example, stormwater can be reconceived as a resource for enhancing amenity through wetlands and urban forests, and while a wide range of viable and proven technologies enable stormwater to be redirected towards biologically productive uses – ponds, dams, water gardens, wetlands and soakage pits – their wider adoption requires institutionalisation and socialisation of green infrastructure thinking, learning and governance.[16,18] Therefore the transformation of urban systems requires action research focused on understanding:

- adoption processes, including the cultural aspects of transformative innovations and their social involvement and social learning strategies;
- the catalytic impacts of transformative urban strategies that concurrently address climate adaptation and mitigation; and
- the multiple synergistic benefits and ecosystem services of green infrastructure.

Given the intrinsic uncertainty about urban socio-ecological processes and the fuzziness of valuation metrics, we suggest outcome-focused guidelines or guiding design principles, because the promise that detailed ecosystem services valuation studies lead to better policy decisions appears doubtful, owing to the types of decision-making processes involved.[19]

The most important benefits of green infrastructure accrue to community wellbeing and economic gains arising from the vibrancy, attractiveness and competitiveness of 'liveable' cities. However, attempts to monetise benefits can weaken the case for green infrastructure, especially if there is a focus on narrow costs at the expense of broader benefits for individuals, the community, and the environment.

Finally, in order to overcome the frequently stated constraints on green infrastructure, we propose that it is important to learn from and scale up success stories, even if these are small in scale and local in their initial impact. From each of the Australian examples provided above, we distilled the following factors critical for success:

- leadership and champions in both the political and professional arms of governments involved, leading to high-level commitments;
- longer-term partnering with diverse stakeholders, including residents, industries and universities;
- the tying together of green infrastructure with wider programmes of urban renewal, climate adaptation and urban greening;
- a willingness to learn about and explore innovative methods of addressing core urban infrastructure responsibilities, including through pilot programmes and research and development partnerships; and
- networking with other cities and agencies with similar responsibilities.

● ***Barbara Norman*** *is the Foundation Chair and Professor of Urban and Regional Planning and Director of Canberra Urban and Regional Futures (CURF) at the University of Canberra, Australia, and* ***Jason Alexandra*** *is Managing Director at Alexandra and Associates, Melbourne, Australia, and an adjunct fellow at Charles Darwin University, Australia. The views expressed are personal.*

Notes

1 T Beatley: *Biophilic Cities: Integrating Nature into Urban Design and Planning*. Island Press, 2011

2 J Alexandra, B Norman, W Steffen and W Maher: *Planning and Implementing Living Infrastructure in the Australian Capital Territory. Final Report*. Canberra Urban and Regional Futures, University of Canberra, May 2017. www.curf.com.au/storage/1-final-living-infrastructure-curf.pdf

3 R J Standish, R J Hobbs and J R Miller: 'Improving city life: options for ecological restoration in urban landscapes and how these might influence interactions between people and nature'. *Landscape Ecology*, 2013, Vol. 28 (6), 1213-21. http://millerlab.nres.illinois.edu/pdfs/Standish_2012_Improving%20city%20life%20-%20options%20for%20ecological%20restoration%20in%20urban%20landscapes.pdf

4 B Norman: *Sustainable Pathways for our Cities and Regions: Planning within Planetary Boundaries*. Routledge, 2018

5 E Andersson, S Barthel, S Borgström, J Colding, T Elmqvist, C Folke and Å Gren: 'Reconnecting cities to the biosphere: stewardship of green infrastructure and urban ecosystem services'. *Ambio*, 2014, Vol. 43 (4), 445-53

6 See the City of Melbourne's 'Green infrastructure' webpages, at www.melbourne.vic.gov.au/community/greening-the-city/green-infrastructure/Pages/green-infrastructure.aspx

7 *Growing Green Guide: A Guide to Green Roofs, Walls and Facades in Melbourne and Victoria, Australia*. State of Victoria, through the Department of Environment and Primary Industries, Feb. 2014. www.growinggreenguide.org/

8 See the City of Melbourne's 'Greening laneways' webpages, at www.melbourne.vic.gov.au/community/greening-the-city/green-infrastructure/Pages/greening-laneways.aspx

9 *Urban Forest Strategy: Making a Great City Greener 2012-2032*. City of Melbourne, 2012. www.melbourne.vic.gov.au/community/parks-open-spaces/urban-forest/Pages/urban-forest-strategy.aspx

10 G Winkworth, C Healy, M Woodward and P Camilleri: 'Community capacity building: learning from the 2003 Canberra bushfires'. *Australian Journal of Emergency Management*, 2009, Vol. 24 (2), 5-12

11 *Canberra's Living Infrastructure Information Paper*. Australian Capital Territory, Canberra, 2018. www.environment.act.gov.au/__data/assets/pdf_file/0011/1170965/Canberra-Living-Infrastructure-Information-paper-2018.pdf

12 A Campbell, J Alexandra and D Curtis: 'Reflections on four decades of land restoration in Australia'. *The Rangeland Journal*, 2018, Vol. 39 (6), 405-16

13 See the Peron Naturaliste Partnership website, at www.peronnaturaliste.org.au/

14 'Developing Flexible Adaptation Options for the Peron Naturaliste Coastal Region of Western Australia'. Project webpage. Peron Naturaliste Partnership. www.peronnaturaliste.org.au/projects/caps-project/

15 See, for example, T H Wong: 'An overview of water sensitive urban design practices in Australia'. *Water Practice & Technology*, 2006, Vol. 1 (1), p.wpt2006018; B C Ferguson, R R Brown, N Frantzeskaki, F J de Haan and A Deletic: 'The enabling institutional context for integrated water management: lessons from Melbourne'. *Water Research*, 2013, Vol. 47 (20), 7300-14

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18 C Pahl-Wostl, E Mostert and D Tàbara: 'The growing importance of social learning in water resources management and sustainability science'. *Ecology & Society*, 2008, Vol. 13 (1), 24

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mainstreaming green infrastructure as a health-promoting asset

Drawing on recent policy and practice in Ireland, particularly as promoted by the National Planning Framework, Mark Scott, Mick Lennon and Owen Douglas look at green infrastructure's potential as a health-promoting framework

Áit Urbanism + Landscape

Balbriggan Public Realm Plan – sketch proposal for Mill Park in Balbriggan, Ireland, showing a range of user activities and incorporating additional tree planting and greening, with attractive waterside uses catered for in and around a newly formed weir pool. Formal paved terraces and a playground create opportunities for events and children's play, respectively

Since the mid-2000s, green infrastructure (GI) has emerged as an important concept underpinning the preparation of spatial plans in Ireland, providing a means to operationalise an ecosystem approach within the built environment. The purpose of integrating GI into spatial planning has evolved from its initial use in reimagining green belts and greenways towards a more sophisticated tool for the sustainable management of land use. This has enabled planning authorities to meet multiple planning objectives and environmental obligations through multi-functional GI strategies.

However, a neglected aspect of practice has been the maximisation of health benefits from GI. This

article examines GI as a potential health-promoting framework, drawing on recent policy and practice in Ireland. First, we examine the introduction and evolution of green infrastructure in Irish spatial planning and explore the growing recognition within health policy of the environmental determinants of health. Secondly, we critically appraise the Irish National Planning Framework,[1] in terms of both its centralising of healthy communities as a key planning goal and its promotion of GI for multi-functional health benefits – including enhancing physical activity and mental wellbeing, mitigating noise and air pollution, and future-proofing cities against health risks associated with climate change (heat stress and flood risks). Finally, we reflect on the prospects of advancing GI and health within a traditionally pro-development planning system.

Irish spatial planning and GI approaches

The Irish planning system closely resembles the British system, as various comparative studies highlight.[2] The original planning system was introduced only in 1963, establishing at a local authority level land use regulatory instruments based on the formulation of land use development plans and discretionary development control.

The current system has been largely shaped by the Planning and Development Act 2000, which modernised the original system of planning in the face of rapid economic and physical development during the so-called 'Celtic Tiger' era. The 2000 Act put in place a system based on the ethos of sustainable development (broadly conceived)[3] that was more strategic in scope, covering national, regional and local levels,[4] and that increasingly adopted a European vocabulary of *spatial* planning.[5]

The current system involves a three-tiered system of plan-making:

- a National Planning Framework, published in 2018 (replacing the National Spatial Strategy of 2002);
- Regional Spatial and Economic Strategies, currently under preparation (replacing regional planning guidelines); and
- development plans at local authority level.

Over the last decade, spatial plans and policy have increasingly adopted a green infrastructure approach for the sustainable management of land use. Such a GI approach to spatial planning attempts to move beyond traditional site-based 'protect and preserve' approaches to landscapes and green spaces and towards a more holistic approach that acknowledges the complexities of social-ecological interactions.[6] In this context, Scott *et al.*[7] define GI as:

> *'an interconnected network of multi-functional green space, urban and rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities and wildlife.'*

Therefore, in contrast to traditional planning approaches, GI planning includes not only protecting landscapes and green spaces but also enhancing, restoring, creating and designing new ecological networks based on maximising the capture of ecosystem services and benefits. Fundamental to this perspective is the idea that GI provides multi-functional benefits, suggesting that GI networks should be *designed and managed* as multi-functional spaces: for example, an urban green space may be designed to aid local drainage management, provide a habitat for wildlife and biodiversity, mitigate the urban heat island effect, mitigate local noise and air pollution, and provide a space for recreation and social interaction.[8]

In a review of the evolving interpretation of GI within Irish planning strategies, Lennon *et al.*[6] identify three broad phases (as summarised in Table 1 on the next page). The first phase of GI thinking within spatial planning in Ireland (early-mid 2000s) is associated with *networked approaches*. This included the emergence in 2002 of an 'ecological network' approach that prioritised the conservation of habitats and green mapping exercises in some local authorities. The popularity of this approach appears to have persisted until 2005, when it was overtaken by a 'green network' concept, which emphasised multi-functionality in the planning and management of natural heritage. Discernible between 2005 and 2008 was a continued and increased focus on land use multi-functionality, while also extending the established 'green network' policy discourse to dissolve traditional perspectives on the incommensurability of ecological conservation and anthropocentric land use.

The second phase, in the late 2000s (2008-2009), marked *GI's emergence* as a multi-functional planning approach. By early 2008, new planning policy initiatives concerning green space management had sought to integrate biodiversity conservation with recreational space provision. Coinciding with this was the rising popularity of the ecosystem services paradigm, which helped to promote and establish new perspectives on conservation policy that increasingly viewed elements of the natural and semi-natural environment as 'ecological assets'.[9]

The third phase, 2010s to the present, signals the *institutionalisation and ongoing evolution of GI* within spatial planning practice. The period from 2009 to the present has seen a considerable expansion in the spatial and functional applicability of a GI approach. Almost all spatial typographies, including brownfield sites and cultural heritage locations, are now considered as potential elements of GI. Simultaneously, the functions of GI have been expanded to include economic development and to align with smart-economy objectives.

By the end of 2011, GI had achieved representation in guidance at national, regional and local levels,

Table 1
Evolution of GI in Irish spatial planning practice

Timeframe	Green infrastructure as …	Key focus
Early 2000s	*… ecological networks*	• Ecological corridors • Linking habitats
	… green structure	• Urban growth management • Strategic green belts
Mid 2000s	*… green linkages*	• Amenity purposes
	… a green network or greenways	• Protection of natural heritage areas • Provision of green space for recreation
	… green chains or networks	• Multi-functionality • Proactive biodiversity enhancement
Late 2000s	*… multi-functional networks;* *… spatial connectivity*	• Network of multi-functional land uses serving social and ecological requirements • Landscape-scale perspective • Multi-scalar
2010s	*… essential infrastructure*	Incorporating the above, plus: • Promoting resilience and adaptation • Environmental risk management (for example flood risk)

while also enjoying reference in many non-statutory planning policy documents. However, with the exception of the approach taken by Galway City Council, the most comprehensive representation of GI was in the Greater Dublin Area, and more specifically within the local authorities comprising the Dublin metropolitan region. This eastern and urban bias continued through 2012 and into 2013. Although a number of rural local authorities now seek to promote GI, much of this represents an extension of traditional modes of ecological conservation via 'ecological networks', rather than a focus on enhancing the multi-functional potential of land. Nevertheless, recent initiatives by an increasing array of local authorities exemplify proactive and pioneering GI approaches that sensitively cater for urban growth while concurrently enhancing ecological integrity.

The various phases in the evolution of GI in Irish spatial planning practice and the implications for integrating an ecosystem approach into spatial planning are outlined in Table 1 above.

So while initially the GI approach emerged in Ireland from attempts to plan for the provision of green space and to develop multi-functional networks of green spaces, more recently GI has been framed as a means of mainstreaming an ecosystem approach within spatial plans.[10] Specifically, GI approaches have been championed within spatial plans as a multi-functional means of addressing environmental obligations and EU Directives within the planning system, notably relating to biodiversity (the Birds and Habitats Directives), the Strategic Environmental Assessment Directive, and climate action (specifically the use of GI in flood risk mitigation as outlined in the Floods Directive).[10]

Health, wellbeing and GI

While GI has been positioned to meet multiple environmental obligations within the planning system, more recently attention has also been given to the salutogenic potential of GI. This has resulted in a two-way recognition from within both the health and environmental planning sectors that environmental quality has an intrinsic relationship with health and wellbeing.

This integration of health and environmentally orientated planning policy was first stimulated by the adoption of a 'health in all policies' (HiAP) approach promoted by a government strategy document, *Healthy Ireland: A Framework for Improved Health and Wellbeing 2013-2025*.[11] Overseen by the Department of Health and the Health Service Executive (Ireland's National Health Service), the Healthy Ireland strategy marks a sea-change in approach which recognises that promoting and supporting a healthier society requires moving beyond a one-dimensional focus on health service provision (i.e. treating people in ill-health), towards health promotion and addressing the wider social and environmental determinants of health, and therefore emphasising wellbeing, quality of life and pathways towards a healthier lifestyle.

Áit Urbanism + Landscape

Integrating green infrastructure into Local Area Plans – this example is from Dublin City Council's Naas Road Lands Local Area Plan, illustrating the connections between green spaces through additional GI elements

This multi-dimensional approach towards health and wellbeing in turn implies a *whole-system approach* which recognises that an individual's health is affected by all aspects of their life – economic status, educational attainment, housing, and the physical environment in which they live and work. The *Healthy Ireland* strategy identifies the protection of human health as a fundamental aspect of environmental protection, but moves beyond a narrow focus on the direct pathological effects of pollution or chemical/biological agents to advance the potential effects on health of the physical and social environment, including urban development, land use and transportation, and in turn their impacts on entrenching health inequalities.

Furthermore, a supplementary document, *Healthy Ireland: Get Ireland Active*,[12] published in 2016, specifically calls on national and local government to ensure that the planning, development and design of towns and cities promote and encourage physical activity – for example through recreational amenities, green spaces, cycleways, and walkable neighbourhoods.

The influence of this HiAP approach is evident in the recent publication of Ireland's National Planning Framework (NPF),[1] launched in February 2018 and setting out Ireland's spatial planning strategy for the next 22 years, up to 2040. The NPF outlines how the quality of people's immediate environment plays a significant role in enhancing or influencing wellbeing. This theme is elaborated in Section 6.2: 'Healthy communities', which is underpinned by an understanding of the environmental and social determinants of health. Mirroring *Healthy Ireland*, the NPF states (on page 82):

'*Our health and our environment are inextricably linked. Specific health risks that can be influenced by spatial planning include heart disease, respiratory disease, mental health, obesity and injuries.* ***By taking a whole-system approach*** *to addressing the many factors that impact on health and wellbeing and which contribute to health inequalities, and by empowering and enabling individuals and communities to make healthier choices, it will be possible to improve health outcomes, particularly for the next generation of citizens.*'
[Emphasis added]

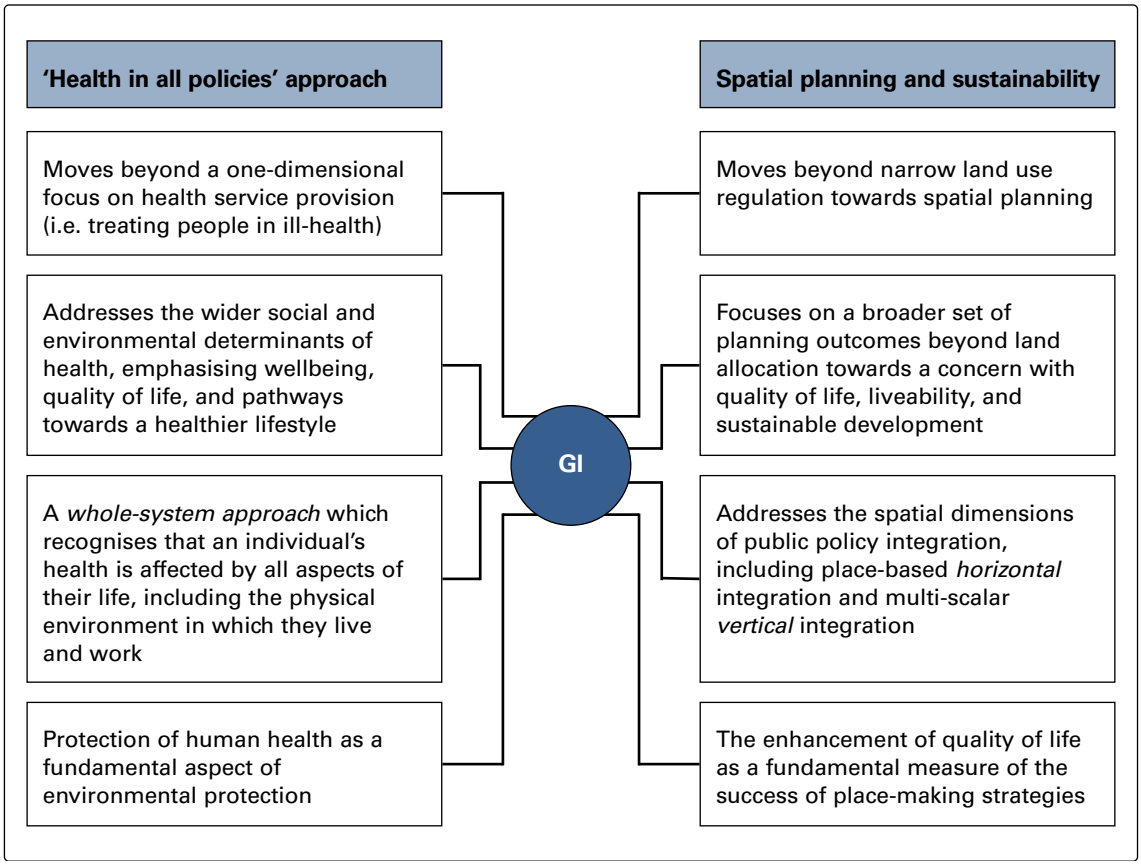

Fig. 1 Emerging narratives within Irish health and spatial planning policies that are connected via a green infrastructure approach

Source: Adapted from *Ecosystem Benefits of Greenspace for Health*[13]

Consolidating such explicit recognition of the central role played by planning in delivering on health and wellbeing, Chapter 9 outlines the NPF's environmental and sustainability objectives, which clearly identify the relationship between healthy ecosystems and human health. A notable development here is the NPF's promotion of nature-based solutions as a response to challenges faced by planning at the intersection of environmental protection and public health, illustrated by the prominence given to a GI approach in achieving more sustainable development, which notably identifies health issues as residing at the heart of this perspective. The thematic areas addressed include:

- ***climate action and health risks*** – encouraging a green adaptation strategy approach that seeks to use ecological services to enhance resilience in the face of climate change, such as the creation of green spaces and parks to enable better management of urban microclimates to counter the urban heat island effect (page 120);
- ***flood risk management*** – through a GI approach to sustainable drainage schemes (SuDS), to create safe places (page 124) that mitigate flood risks through nature-based solutions;
- ***recreation and amenity*** – green spaces as essential to community recreation and amenity (page 128), including green spaces that encourage physical activity and the benefits of exposure to nature on mental wellbeing;
- ***air pollution*** – the careful planning of green infrastructure as important for mitigating air pollution in a nature-based solution to remove pollutants from the air and better manage urban microclimates (page 128); and
- ***noise pollution*** – green spaces as an element of Noise Action Plans (for example green spaces as 'noise barriers'), and valuing and protecting green spaces as providing essential 'quiet areas' in cities that enhance local quality of life (page 129).

Conclusion

Green infrastructure has been increasingly applied within spatial planning in Ireland, from national to local level, as a means of enhancing the (often neglected) ecological dimension of planning practice. GI has been mainstreamed into a variety of planning practices, including as a cross-cutting mechanism within statutory developments, a design

concept within local masterplans, and within development management as a problem-solving device to mitigate environmental impacts at the site scale. GI has also been widely viewed as a means for spatial planning to meet wider EU environmental obligations, including the Strategic Environmental Assessment, Birds, Habitats and Floods Directives.

Moreover, GI has cut across traditional urban and rural boundaries, providing a focus on sustainable land use based on ecosystem services rather than on urban and rural separation. The inclusion of specific GI objectives within the recently published National Planning Framework will further advance the institutionalisation of GI within planning guidance and development plans, providing a supportive policy environment for GI as a core planning practice.

Importantly, a GI approach has implications for how spatial plans connect with other policy domains. Policy integration across sectoral domains has been an enduring challenge for policy-makers faced with wicked problems marked by complexity that require a multi-actor response. In the Irish context, both health policy and planning practice have moved beyond their traditional narrow concerns to explore and attempt to embed integrative frameworks across health/wellbeing and place-based environmental quality considerations.

Within this emerging agenda, GI has been identified as supplying a concept bridge that can connect and mainstream actions across health and planning policy silos, thereby advancing the health dimensions of ecosystem services in a holistic manner across a broad spectrum of policy and practice (see Fig. 1 on the preceding page). First, GI approaches have been mainstreamed into planning frameworks as a means to meet environmental obligations (set out in EU Directives) and mobilise an ecosystem approach towards sustainable land use management. This process emerged from within local authorities, but has subsequently been institutionalised into national planning policy. This recognition at national level has the potential to open up new agendas for spatial planning practice as the NPF's objectives cascade downwards to regional and local spatial plans.

Secondly, and in parallel, health policy has sought to integrate health into a range of public policies, including policy streams across the natural and built environments. Spatial planning policy has responded to this agenda-setting approach by centralising health and wellbeing in the new National Planning Framework, while emphasising the potential of GI as both a conceptual and a physical shared space in which to maximise health benefits from land use management and mitigate health-related environmental risks.

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Notes

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building with nature – improving the standards of GI across the UK

Gemma Jerome and Danielle Sinnett explain how the Building with Nature framework was developed as an aid to specifying what is meant by, and consequently delivering, high-quality green infrastructure

Green infrastructure (GI) provides multiple benefits to people and society, as evidenced in research and practice. These benefits span a range of built environment and civil society interests, including delivering health and wellbeing outcomes, enhancing provision for urban biodiversity, reducing the urban heat island effect, and supporting environmental quality and adaptation to climate change.

Academic knowledge, planning policy and good practice guidance promote GI as a priority mechanism to deliver these benefits through the planning and development system. GI is commonly defined by three critical characteristics: it is *multi-functional*, it is *connected,* and it forms part of a coherent *network*.

Much has been written about the requirements for GI features to be multi-functional, to deliver multiple benefits; for features to be accessible to optimise these benefits for people and wildlife; and for features, taken together, to form a continuous network to optimise the potential for GI to positively contribute to ecosystem services and to benefit urban environments. For example, SuDS (sustainable drainage system) features such as ponds and swales attenuate water, enhance water quality, and make provision for biodiversity and recreation.

Although the literature, policy and guidance clearly state that GI needs to be multi-functional and contribute to a connected network to be of benefit, there is less emphasis given to the fact that, to deliver these multi-functional benefits, GI has to be of high quality. Moreover, what constitutes high quality at each stage of design, implementation and maintenance is even less clear.

This article describes the steps taken to establish a framework for more effectively specifying what is meant by high-quality green infrastructure. Ultimately, the purpose of the framework is to help those engaged in design and delivery in the built environment to more consistently secure high-quality GI in new and existing places. In the following sections, we describe how we developed the framework, and go into more detail about how we tested the Building with Nature benchmark on a number of case studies.

Framework development

The Building with Nature benchmark is underpinned by a set of 23 standards which, taken together, describe high-quality green infrastructure. The standards extend across the range of challenges and opportunities associated with the design, delivery and maintenance of GI features, particularly in the context of planning and developing sustainable, healthy and liveable places.

Within the framework, the standards are organised around thematic areas relating to optimising the functionality of individual features (for example securing the long-term management and maintenance of GI features) and relating to specific ecosystem services, including nature conservation, water management and health and wellbeing.[1] Underpinning the Building with Nature standards is a framework of principles which relates back to the

original literature, guidance or policy evidence that describes and defines high-quality GI (see Table 1).

The Building with Nature benchmark has been developed to be flexible enough for use across different types of development, different spatial scales, and different stages of the development process.[2] In order to develop the standards, we worked iteratively with a range of case studies

Table 1
Building with Nature – principles

Core principles	Health and wellbeing principles	Water management principles	Wildlife principles
1 Multi-functional network Ensure that individual features form and contribute to a multi-functional network of green infrastructure operating at a landscape scale.	***1 Accessible*** Ensure that all people can use, enjoy and positively contribute to green infrastructure.	***1 Quantity*** Ensure that green infrastructure supports the management of flood risk, and maintains and protects the natural water cycle by managing and using rainwater close to where it falls.	***1 Bigger and better*** Ensure that over time green infrastructure contributes positively to reversing the long-term decline in biodiversity.
2 Contextual Ensure that the green infrastructure reflects the character of the local environment and positively contributes to local identity, landscape character and vernacular, and a sense of place.	***2 Inclusive*** Ensure that green infrastructure is designed to recognise the needs and strengths of local people, and how these may change over time.	***2 Quality*** Ensure that green infrastructure positively contributes to surface water management and associated components to deliver a controlled flow of clean water.	***2 More joined up*** Ensure connectivity between habitats within the boundary of the scheme.
3 Policy-responsive Ensure that green infrastructure effectively meets local priorities and needs as articulated in local policy or through consultation with local stakeholders.	***3 Seasonal enjoyment*** Ensure that green infrastructure features can be used and enjoyed at all times of year.	***3 Amenity and biodiversity*** Ensure that green infrastructure is integrated with SuDS to enhance benefits for people and nature.	***3 Locally relevant*** Ensure that habitat creation provides optimal conditions to reverse the long-term decline in biodiversity.
4 Climate-resilient Ensure that green infrastructure is resilient to climate change, and that opportunities for shade provision, carbon storage, improved soil and air quality, and reduced noise and light pollution are maximised.	***4 Locally relevant*** Ensure that green infrastructure features are designed and located to reduce and/or prevent health inequalities in existing and new communities.	***4 Innovative*** Ensure that green infrastructure within the boundary of the development is used to enhance the water storage capacity of land adjacent to, or downstream from, the development.	***4 Nature-rich development*** Ensure that space is provided for wildlife to flourish throughout the built environment.
5 Future-proofed Ensure that adequate provision is made for how green infrastructure will be managed and maintained, including the responsibility for these activities and their funding.	***5 Socially sustainable*** Ensure that green infrastructure creates a sense of social cohesion and inclusion, thereby improving community wellbeing and increasing the likelihood of social sustainability.	***5 Resilient*** Use a diversity of green infrastructure features to enhance water quality through more and better treatment stages, thereby maximising resilience and the efficiency of pollution reduction.	***5 Ecological networks*** Ensure that green infrastructure creates and restores linkages from the development to the wider landscape.
	6 Distinctive Ensure that green infrastructure contributes to place distinctiveness, with the aim of creating a place where people feel a sense of belonging and pride in their neighbourhood.	***6 Locally distinctive*** Use water management features to create a distinct sense of place.	***6 Sensitive construction*** Ensure that opportunities to protect and enhance biodiversity are taken during the planning and construction of new development.

Case study 1
Elderberry Walk

A Green Street
connecting Lannercost Road and Elderberry Walk

A Loop Street
allowing good access for deliveries and bin collection

An intimately scaled Mews Street
better east to west links

Traditional terraced and semi-detached houses along the streets

An architecf's sketch of the proposed scheme. It's quite early in the design process and things like the roof shapes and the exact positions of all the buildings might change

The Elderberry Walk HAB Housing development is located on a former school site in Bristol. It includes 161 homes in a mix of tenures, including social and ethical rent. The green infrastructure of the development has been designed to fit with the local area, retaining existing trees along the boundary and integrating with the surrounding neighbourhood by providing connectivity through a spine of green space.

The design has been informed by local stakeholders and communities. A detailed management plan has been provided to ensure that benefits are secured over time. The landscaping has been designed to be low maintenance, with options for management company or community involvement.
The GI has been designed to provide a high level of connectivity between the individual features, providing multiple functions for people and wildlife. The development includes a SuDS system, with rain gardens, a swale combined with wildlife garden, and wildflower green roofs on bin and bikes stores. A mosaic of habitats is being provided: grassland habitats; trees, shrubs and hedges (with over 200 new trees); climbing plants on front elevations; edible planting in communal areas; and spaces for informal play.

To deliver on the principles for nature, lighting has been designed to be sensitive to bats and to avoid light spill into woodland areas, and gaps in fences allow hedgehog movement through the site. The design incorporates habitat creation, including for species that reflect the local context, and foraging opportunities for wildlife, and the provision of bat boxes and hedgehog shelters, along with guidance for householders. In addition, stepping stones of habitat are created with a mix of native species to increase resilience to climate change.

representing different development types and sizes, and worked with end-users to test and refine a set of principles to ensure that they are realistic.

Creating a framework of principles

The framework of principles is shown in Table 1 on the preceding page.

Once we had a draft framework, it was tested on a suite of developments in Gloucestershire and the West of England, and has just been further tested in Scotland. The case studies set out above and on the next pages provide examples of how these developments fulfilled the principles in the framework, with each example focusing on a particular theme.

Case study 2
Gloucester Services

Glenn Howells Architects

Gloucester Services is a motorway service station, completed in 2014 and designed to have a minimal impact on the surrounding landscape. The green infrastructure includes an extensive green roof, integrated SuDS with wildlife-friendly planting, and areas for play. Water quantity is controlled and managed through the integration of an interconnected system of individual SuDS components within the boundary of the services. These SuDS features have been designed to contribute to a high-quality environment for people by providing amenity value, including a children's play area and outdoor seating and paths in an attractive setting. The SuDS arrangement has also created new habitats and linkages, thereby enhancing ecological connectivity across the site.

During testing Gloucester Services developed management plans to ensure that the GI continues to support wildlife, and Building with Nature is currently being used to meet some of the desirable principles in the framework.

Case study 3
Forth Valley Royal Hospital and Larbert Woods

The partnership between NHS Forth Valley and Forestry Commission Scotland has resulted in the delivery of an exceptional medical facility within a high-quality landscape setting. Prior to redevelopment, the hospital grounds, adjacent woodland and Larbert Loch were missing opportunities to deliver multiple benefits to patients and visitors, through neglect and poor management. The site is characterised by extensive colonisation of rhododendron, prevalence of non-native species and plantation conifers, and inadequate provision for public access and water management.

The masterplan set out a sensitive renovation of the woodland, with progressive planting of native trees and under-storey shrubs to control access and highlight the footpath system and improve biodiversity. Similarly, at Larbert Loch the margins have been reinstated to wet woodland and damp meadow, providing benefits to the biodiversity and 'bio-abundance' on site, with high numbers of species now recorded.

There is an emphasis on 'little and often' in the access to smaller green courtyards and the patient and visitor gardens, with clear signage and accessible paths throughout the facility. This is coupled with a planting scheme which concentrates design principles around 'lushly-planted green spaces, each with distinctive character, seasonal interest and vertical features'. The inclusion of high-quality landscaping as a frontage to the facility encourages as many people as possible to take advantage of the opportunity to take a break and walk in the grounds. The amenity value of the woodland for a new range of beneficiaries is promoted via the Access, Health and Recreation Advisor at Larbert Woods and initiatives such as 'Branching Out', an outdoor mental health programme, and the Green Exercise Partnership.

The advantages of using principles

Based on feedback from early adopters of the Building with Nature benchmark, applying a common framework of principles early in the planning process can help to reduce planning uncertainty. This provides reassurance across the development process: by defining how development can deliver high-quality outcomes which meet local need, the framework supports planners; and by reducing the length of time spent negotiating acceptable parameters for a

Case study 4
Chesterton Farm

Chesterton Farm is a proposed urban extension to Cirencester of 2,350 new homes and 9 hectares of employment land to be used for commercial and community facilities. The proposal includes provision for large areas of green infrastructure, including the retention of sensitive habitats and hedges to ensure that the development reflects the character of the nearby Cotswolds Area of Outstanding Natural Beauty. A detailed construction plan also sets out how impacts on these sensitive habitats will be mitigated at all stages of construction.

Health and wellbeing principles have been incorporated through a range of GI features close to homes, including formal sports and play areas and informal open space. There is a strong emphasis on access to GI for active living, and the design includes a variety of short circular routes between homes and key services, with planting selected to maintain interest all year round. The facilities, seating and other furniture, lighting and play equipment provided as part of the GI facilitate access by people with differing needs and abilities. There is a particular focus on safe access, and dementia-friendly design. Natural and conventional play areas and spaces meet European standards, and children's play areas include equipment for wheelchair users.

proposal, using the framework could represent significant cost savings for developers.

Users of the principles of Building with Nature have suggested that the framework can helpfully shape conversations on GI. It provides clarity on expectations for GI, thus helping to deliver better outcomes from the planning and design process. It also ensures the high quality of features delivered through implementation, management, maintenance and monitoring of GI as a result of residential and commercial development.

What is happening at the moment?

By clearly defining what characteristics underpin high-quality GI, Building with Nature is making a significant difference to the quality of outcomes at each subsequent stage of the GI project lifecycle. The principles are being used in planning and development to remove barriers to the delivery of high quality; from plan-making and design, through to implementation and the long-term management and maintenance of GI features.

In one example, Building with Nature is being used in parallel by a local planning authority and a planning applicant. The forward planning team are using the principles set out in the framework to shape their GI strategy, a document that will guide applicants (and other stakeholders) and which, in conjunction with the relevant Local Plan policies, will give clear guidance on expectations for GI delivery and, in particular, on the quality of that GI. Meanwhile, the team responsible for preparing the planning application are working with the principles to secure Building with Nature accreditation. This involves demonstrating that the Building with Nature standards have been achieved at each stage of the application, from the outline planning application to reserved matters applications.

In this case, the local planning authority is aware of the applicant's ambitions to achieve accreditation, and, although this outcome is not a planning condition for the scheme, the content of the Building with Nature evaluation report is being used to guide the level of detail included within design codes and to inform planning conditions that will further secure the quality of GI outlined within the scheme.

Building with Nature accreditation is being used by developers to differentiate their schemes, and to highlight to both customers and stakeholders that they are committed to delivering and maintaining high-quality liveable places. By using an independent verification scheme for GI, the developer is able to clearly demonstrate their commitment to providing a network of natural and semi-natural features to contribute to good outcomes on health and wellbeing, water management, health and safety, nature conservation, and distinctiveness of place.

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Notes

1 For a full account of how the principles were developed, see D Sinnett, G Jerome, S Burgess, N Smith and R Mortlock: 'Building with Nature – a new benchmark for green infrastructure'. *Town & Country Planning*, 2017, Vol. 87, Oct, 427-31

2 For further information on how Building with Nature works in practice, see the Building with Nature website, at www.buildingwithnature.org.uk

NCPT – managing environmental gains and losses

Oliver Hölzinger, Jonathan Sadler, Alister Scott, Nick Grayson and Andrew Marsh **explain how a new practical tool enables non-specialists to systematically assess and manage planning and development impacts on natural capital**

The Natural Capital Planning Tool (NCPT) is a new site assessment tool developed specifically for the planning context. The NCPT allows the indicative but systematic assessment of the likely impact of proposed plans and developments on green infrastructure (GI) and the ecosystem services it provides to people. The NCPT was designed as a fit-for-purpose Excel tool which can be applied by non-specialists and in a comparatively short period of time; balancing the need for translating complex ecosystem science into meaningful metrics and the time and resource constraints that planning practitioners face in everyday practice.

The tool developers believe that the NCPT will help to create more sustainable places for people and wildlife, while at the same time delivering the housing and infrastructure that the country needs. It also has great potential for operationalising the government's ambition for 'net environmental gains' from the planning system.[1]

Green infrastructure, natural capital and planning

Balancing the need for additional housing, and the infrastructure that comes with it, with the need to create sustainable places that satisfy the needs of people and wildlife for decades to come is a major strategic planning challenge. Planning authorities have to deal with diverse and often competing demands, such as affordable housing, biodiversity, climate change, and economic growth.[2] Planning officers and councillors are expected to balance and satisfy these demands based on incomplete information, and often face a 'document overload' that makes it almost impossible to identify and systematically assess all relevant information related to GI benefits.

One key component of infrastructure, namely GI, often gets eroded in this process. This is partially due to the cross-cutting character of GI as it both affects and is affected by diverse demands from separate sectoral silos, leading to policy inefficiency.[3]

GI has been championed as a spatial planning tool under the generic heading of nature-based solutions with the potential to integrate these major planning challenges within more holistic social-ecological systems thinking. But this approach is only recently being crystallised into a rapidly developing policy arena. GI provides us with a wide range of ecosystem services, including opportunities for outdoor recreation and its attached health benefits, as well as air quality, water quality, flood risk and climate regulation, to name just a few. Here, we define GI as natural capital (NC) to highlight its asset character.

Information about the impact of new development on NC and ecosystem services is usually not systematically assessed in the planning context. While some of the services and benefits of NC, such as flood risk regulation and biodiversity, are commonly assessed, relevant information is often spread across different planning documents rather than being available in one place. Information on other ecosystem services such as air quality and climate regulation are commonly neglected altogether. Furthermore, assessment is usually approached as a 'tick-box' exercise to achieve minimum standards and requirements, and does not identify the full scope of impacts. This means that being compliant with planning regulations does not necessarily translate into 'net environmental gains' as promoted in the revised National Planning Policy Framework (NPPF).[4]

While more and more planning authorities and developers recognise the importance of systematic

Development Impact Score
Average Per-Hectare

Ecosystem Services Impact Scores	Max Possible	Impact Score	Min Possible
1. Harvested Products	+0.13	−3.04	−3.67
2. Biodiversity	+4.44	+1.24	−0.56
3. Aesthetic Values	+2.09	+0.58	−1.91
4. Recreation	+4.00	+0.78	−0.00
5. Water Quality Regulation	+1.30	+0.37	−1.00
6. Flood Risk Regulation	+0.95	+0.20	−0.05
7. Air Quality Regulation	+0.61	−0.08	−0.30
8. Local Climate Regulation	+2.43	+0.62	−1.19
9. Global Climate Regulation	+4.22	−0.15	−0.78
10. Soil Contamination		+0.00	
Development Impact Score	+20.17	+0.51	−9.46

Fig. 1 Example of an NCPT results table

NC management, they often lack the time, resources and expertise to undertake it. Ecosystem science is very complex, and the systematic assessment of ecosystem services provides a challenge even for specialists.[5] Hence planning practitioners cannot be expected to assess NC impact without assistance. This is why we developed the NCPT – to give planners and developers a tool to enable them to systematically assess and manage the impact of land use changes on ecosystem services.

The NCPT, and how it works

The development of the NCPT was a direct response to the (now revised) NPPF. The original 2012 version stated (in para. 109) that 'The planning system should contribute to and enhance the natural and local environment by […] recognising the wider benefits of ecosystem services.'[6] The aim of the NCPT is to translate complex ecosystem science into a tool that can be applied by planning practitioners without requiring extensive expertise, resources or time.

Essentially, the NCPT automatically calculates an impact score for ten ecosystem services, indicating both the direction and magnitude of the impact of a (proposed) plan or development (see Fig. 1). The NCPT indicates, through a simple score, if the change from the existing to the new land uses provides a net gain for each assessed service. Furthermore, the NCPT indicates the minimum/maximum possible scores that the site is capable of providing for each service.

The impact scores are based on a set of habitat scores (for example the air quality regulation potential of a certain land use) as well as a range of multipliers that take into account the local context (for example, is air quality an issue in the location?) and demand (how many people benefit?). The land use scores and multipliers were informed by expert and stakeholder groups. Impacts are indicated over a timescale of 25 years post-development.

The development of the NCPT was driven by the end-user community from the very beginning – acknowledging the real-world circumstances in which planning practitioners operate. A wide range of project partners were engaged in the development and testing of the NCPT, including academics, government agencies, planning authorities, industry partners, and NGOs. Here, it was essential to balance the need for a quick and simple tool that can be applied by planning practitioners with the need for a robust assessment of complex ecosystem services performance.[7] How the NCPT works from a user perspective is outlined in Fig. 2 on the next page.

Case studies and impact

The NCPT was tested in different contexts and at different stages of live projects before it was released in 2018. Here, we highlight two case studies, from Birmingham and Central Bedfordshire.[8]

Birmingham City Council tested the NCPT on a masterplan for a new housing development for 5,000-6,000 new homes in the north-east of Birmingham – the Langley Urban Sustainable Extension. The aim was to assess the impact of the design against the ambition to achieve overall NC net gain over a 25-year timeline.

The significance of the Birmingham case study site lay in its acute political sensitivity, as it was the first portion of approved Green Belt release land in the city to come forward. The Birmingham Development Plan had been called in by the

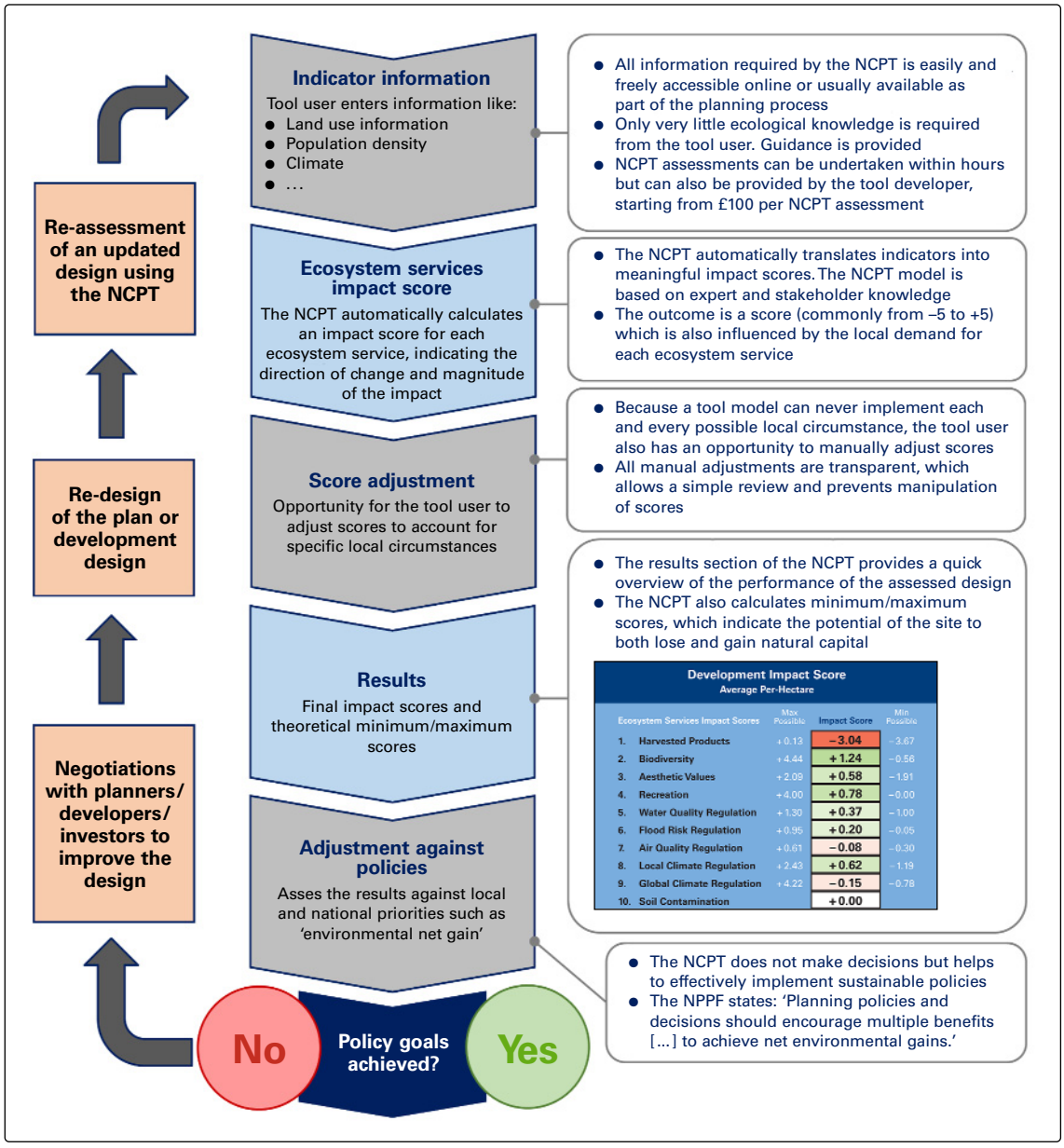

Fig. 2 How the NCPT works, in practical steps

Secretary of State, mainly due to this element of de-designation of Green Belt. So right from the start the public pressure and expectation was for a visually green scheme. The original masterplan certainly delivered on that aim. Ten years ago, it would have been highly likely that this would have met with approval. The interesting difference that the NCPT brought was to fully examine the functionality of the GI involved. Its approach does not necessarily aim to create more GI, but seeks to create GI that can demonstrate that it works harder – delivering multiple benefits from the same land parcel.

The process of assessing this scheme with the NCPT totally shifted both the local planners' and the applicants' view of the GI potential for the site. The influence that the NCPT test has had on the approach can be seen in the draft SPD (Supplementary Planning Document) for the site.[9] The original green scheme actually failed to demonstrate a net gain across the ten ecosystem services, but the draft SPD now outlines multiple centres inter-linked and permeated by GI (as shown in Fig. 3 on the next page), in recognition of the learning from the NCPT exercise. The NCPT also helped to appraise the cross-boundary connections – which again are now set out in the draft SPD.

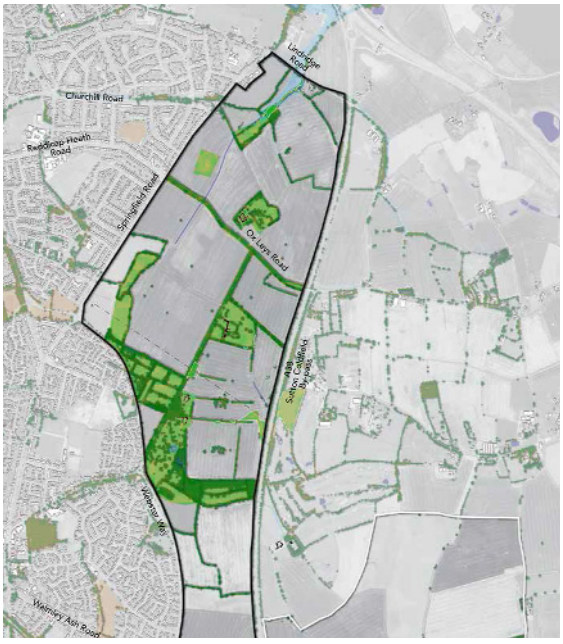

Fig. 3 Green infrastructure and assets at the Langley Sustainable Urban Extension, as set out in the draft SPD
Source: Birmingham City Council

From a broader city perspective, the learning from the case study can be seen spilling into other major developments through increased promotion of the integrated benefits of GI – addressing multiple agendas, and not drawn up in isolation from the desired outcomes from the overall vision of any scheme.

Central Bedfordshire Council used the NCPT to assess eight potential growth locations – predominantly housing developments on greenfield sites. An NCPT assessment was undertaken for all sites proposed for development where at least an initial sketch masterplan was available. The aims of the assessments were:

- To test whether the proposed growth locations were suitable for development.
- To test whether the proposed designs were acceptable.

For the first test, the focus was on the minimum/maximum possible NC performance. Less negative minimum possible scores indicate that a site has less NC (to lose) in the first place. On the other hand, higher positive maximum possible scores indicate that there is greater potential to improve NC. The NCPT outcomes indicated that, in principle, all the assessed sites were suitable for development from an NC point of view, as all sites offered opportunities for enhancement.

The impact scores were the focus of the second test. They indicate whether the proposed design would enhance or degrade NC. Here, the outcomes were mixed, with most designs having a negative impact score at this stage, even if the sites would generally be suitable to provide a positive outcome.

Central Bedfordshire Council is using the NCPT outcomes to negotiate better designs to achieve 'additional environmental enhancement' for the proposed sites, and asked developers to improve their designs towards more positive NC creation. The council is in the process of re-assessing the updated designs with the NCPT; updated outcomes will then inform the final site allocations. The council is keen to continue mainstreaming the value of GI, and implementing the NCPT into its everyday planning practice is an important step towards this goal.

The benefits of the NCPT

Drawing on case study experiences and discussions with stakeholders and practitioners, we can identify a range of (potential) benefits of using the NCPT:

- In its recently published 25 Year Environment Plan, the government makes (on page 32) a commitment 'to put the environment at the heart of planning and development'.[10] The NCPT puts 'flesh on the bones' when implementing national and local planning policies because 'what gets measured gets managed'.
- NC can be used to tackle many policy priorities, such as air quality, public health, climate change, etc., in one go. But so far, success has been difficult to measure and communicate – the NCPT makes this much easier.
- The NCPT provides a tangible basis for discussion and negotiation between planning authorities and developers/investors with respect to GI delivery. The quantitative and systematic character of the NCPT helps to clarify exactly what is expected from the developer at the earliest possible stage (outline application), which in turn has the potential to significantly speed up the planning process, benefiting both the planning authority and the developer.
- One problem often articulated by planning practitioners is that what was initially promised in terms of GI provision at the outline application stage is eroded as the planning process proceeds. With the NCPT, developers can be better held to account for delivering what was promised, since any watering down of GI investment further down the line can be objectively measured.
- New development is often opposed by local communities. The impact on the environment is seen as an important issue. The NCPT can help to generate acceptance because it provides a new means to easily communicate positive NC improvements in a tangible and transparent way.
- One can argue that, besides economic viability, development also needs to be socially and environmentally viable. The NCPT allows developers to easily communicate good practice to stakeholders,

shareholders, customers and regulators, which can give them a competitive advantage.

We believe that the NCPT will help not only to better mitigate negative effects of planning and development on the environment, but also to enable planning and development to play a more positive role in the provision and enhancement of multi-functional GI that works hard for people and wildlife alike.

Net environmental gains and the way ahead

The revised NPPF states (in para. 118) that 'Planning policies and decisions should encourage multiple benefits [...] to achieve net environmental gains'.[4] While this is welcome, it also creates an implementation void – how can 'net environmental gains' be meaningfully operationalised? A particular challenge is measuring success – what do 'net environmental gains' look like, and how can they be measured in practice?

While the government has yet to define exactly what 'net environmental gains' means, it will likely be related to the NC performance of new development. This will require some kind of quantification system. Hence the NCPT is already well positioned to operationalise and implement 'net environmental gains'. This, in turn, would be a big step towards mainstreaming GI in the planning system, through the lens of NC, highlighting its valuable asset character.

The NCPT is a work in progress and will be updated to acknowledge any relevant policy changes such as emerging 'net gains' policies. The project team is keen to establish the NCPT as 'net environmental gains' tool. Here, we will pursue a standardised approach for implementing net gains while at the same time keeping the NCPT flexible enough to incorporate local differences and policies.

We have received a lot of feedback since the release of the NCPT and are keen to further improve this innovative tool to best suit practitioners. Our intention for the future is to make the NCPT more user-friendly, linked to policy priorities and other tools, and more flexible, to include standards for what good GI delivery looks like and encourage improvements above and beyond what is legally required and even 'minimum' net environmental gains. We believe that this will be a significant contribution towards truly mainstreaming the asset value of GI into planning policy – in the UK and possibly beyond.

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Notes

1 Further information about the NCPT is available from the Natural Capital Planning Tool website, at http://ncptool.com/
Anyone interested in trying out the tool is welcome to contact the tool developer, Oliver Hölzinger, on oliver.h.ceep@live.com

2 See, for example, I C Mell: 'Aligning fragmented planning structures through a green infrastructure approach to urban development in the UK and USA'. *Urban Forestry & Urban Greening*, 2014, Vol. 13 (4), 612-206. https://doi.org/10.1016/j.ufug.2014.07.007; and J Wilker, K Rusche and C Rymsa-Fitschen: 'Improving participation in green infrastructure planning'. *Planning Practice & Research*, 2016, Vol. 31 (3), 229-49. https://doi.org/10.1080/02697459.2016.1158065

3 See, for example, M Lennon and M Scott: 'Delivering ecosystems services via spatial planning: reviewing the possibilities and implications of a green infrastructure approach'. *Town Planning Review*, 2014, Vol. 85 (5), 563-87. doi.org/10.3828/tpr.2014.35; and A J Scott, C Carter, M R Reed, *et al.*: 'Disintegrated development at the rural–urban fringe: Re-connecting spatial planning theory and practice'. *Progress in Planning*, 2013, Vol. 83, Jul., 1-52. https://doi.org/10.1016/j.progress.2012.09.001

4 *National Planning Policy Framework*. CP 48. Ministry of Housing, Communities and Local Government, Feb. 2019 (updated version of the revised NPPF of Jul. 2018). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf

5 See *UK National Ecosystem Assessment: Technical Report*. UNEP-WCMC, Jan. 2011. http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=m%2BvhAV3c9uk%3D&tabid=82

6 *National Planning Policy Framework*. Department for Communities and Local Government, Mar. 2012. https://webarchive.nationalarchives.gov.uk/20180608213715tf_/https://www.gov.uk/guidance/national-planning-policy-framework

7 O Hölzinger, P Laughlin and N Grayson: *Planning for Sustainable Land-Use: The Natural Capital Planning Tool (NCPT) Project*. Royal Institution of Chartered Surveyors, Nov. 2015. http://ncptool.com/Downloads/Planning%20for%20Sustainable%20Land-Use%20-%20The%20NCPT%20Project.pdf

8 Further information on these and other case studies is available from the Natural Capital Planning Tool website, at http://ncptool.com/case-studies/

9 *Langley Sustainable Urban Extension. Draft Supplementary Planning Document*. Birmingham City Council, Sept. 2018. www.birminghambeheard.org.uk/economy/langley-and-peddimore-spds/

10 *A Green Future: Our 25 Year Plan to Improve the Environment*. HM Government, Jan. 2018. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

a toolkit for planning and evaluating urban GI – in bicester and beyond

Alison Smith, Pam Berry, Jenny Barker and Nicole Lazarus **explain how Cherwell District Council set about compiling a set of tools to help integrate green infrastructure into the planning process for development in Bicester**

Photos: Alison Smith

Fig. 1 Langford Meadows cycle path and 'Bicester Henge' – high-quality GI delivered through planning gain

Bicester is a rapidly expanding town in Oxfordshire – it will almost double in size from 2016 to 2031, as over 10,000 new homes are added in urban extensions around the town. Cherwell District Council has long-standing ambitions that this growth should be sustainable, with high-quality green infrastructure (GI) built into new developments. Bicester hosts the UK's only eco-town development, and it is also a Garden Town and a Healthy New Town.

In earlier phases of development, planning gains were used to secure high-quality green spaces in the heart of Bicester, including a wide strip of urban meadow alongside the Langford Brook, with SuDS (sustainable drainage system) ponds, sports pitches, playgrounds, cycle paths, and even a stone circle (see Fig. 1). Local people are enthusiastic about their green spaces,[1] and volunteers run a Green Gym and are restoring an overgrown orchard for community use.

Despite these ambitions for sustainable development, Bicester faces the same challenges as many towns in South East England: high housing delivery targets, a shortage of land for development, and intense pressure on local authority planning resources. A steady stream of development proposals,

driven by high housing prices, brings opportunities to create new high-quality GI but also threatens the integrity and connectivity of existing green spaces.

The need to protect and enhance GI is particularly urgent, as the Cambridge-Milton Keynes-Oxford growth arc could bring a million new homes to a region dominated by intensive farming, where semi-natural habitats are already scarce and highly fragmented. High-quality GI can help to cost effectively deliver a range of services that are essential to protect quality of life for the people who live and work in the area – providing attractive walking and cycling routes to improve health and reduce congestion; reducing flood risk; recharging groundwater supplies; buffering air, water and noise pollution; protecting biodiversity; and enhancing 'sense of place'.

There are many potential tools for planning and evaluating GI, but often they are not suitable for use by planners with limited time and resources. Cherwell District Council therefore approached the University of Oxford to help in identifying a set of simple and freely available tools that could be used to integrate GI into the planning process.

A toolkit for local planners

Working with a group of local stakeholders, with funding from NERC, we tested a range of tools for different applications: mapping existing GI assets, assessing site design (for example planning applications), identifying opportunities for new or improved GI, and valuing the costs and benefits of alternative GI options. We included GIS mapping and modelling tools, spreadsheet tools, and participatory mapping with local communities (see Fig. 2). However, the list of tools we tested is not exhaustive, and other tools are available or emerging.

Mapping existing assets

Working with local stakeholders, we identified a list of GI priorities for the Bicester area, in terms of the demand for different services that GI can provide ('ecosystem services'). Top priority was GI for recreation, followed by water quality regulation, flood protection, urban food, habitat for wildlife, aesthetic value, and a 'sense of place'.

The first step was to produce a base map of the existing GI. Good data sources were available: an open space survey and a Phase 1 habitat survey for

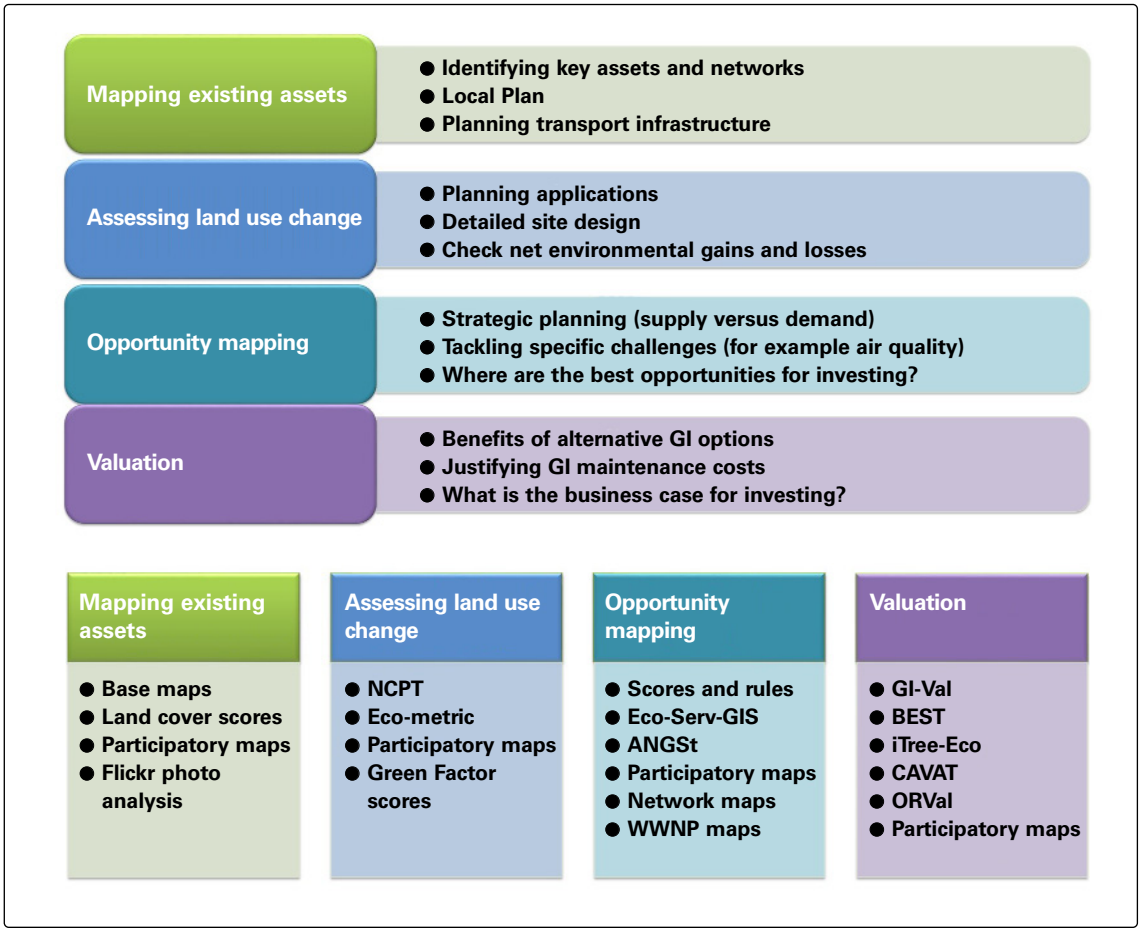

Fig. 2 A toolkit for planning green infrastructure

Fig. 3 High-value green infrastructure in and around Bicester, based on land cover scores

the whole district, and a detailed map of all the public green space and urban trees in Bicester. We combined these with OS MasterMap (useful to map gardens). The combined map was able to show all types of urban GI and how this links to habitats in the wider countryside.

We combined this base map with a matrix of scores for the ability of different types of land cover to deliver different ecosystem services.[2] The scores were initially derived by a group of expert stakeholders in Warwickshire, and subsequently refined using a major literature review of over 700 papers.[3] This is a relatively quick and simple method of mapping a wide range of ecosystem services, and requires only basic GIS capability. We produced maps for individual services, and also one showing the average score for all the cultural and regulating services in shades of green, with low-scoring areas omitted for clarity (see Fig. 3). This revealed that there are relatively few areas in and around Bicester that have good potential to deliver cultural services (such as recreation and sense of place) and regulating services (such as carbon storage and flood protection).

This map is practically the inverse of the map for the service of food production, as the arable fields and improved grassland surrounding Bicester have a maximum score for food production but a low score for most other services (again, see Fig. 3). However, while food products have a market value, the regulating and cultural services provided by GI are generally not valued. It is these 'invisible' services that need to be protected through the planning system. The maps show development areas outlined in purple, revealing that several of the remaining high-value areas are scheduled for development. This simple mapping exercise therefore highlights the need to be aware of the role of these areas in delivering services to people, so that any adverse impacts can be avoided or mitigated.

Adding local knowledge to the generic maps

While this mapping method is relatively simple to apply, it does rely on a generic matrix of scores. For example, all broadleaved semi-natural woodland will receive the same score, regardless of condition or location. It is therefore important to supplement this type of approach with local knowledge. Workshops with local stakeholders helped to refine and sense-check the maps. Planners felt that involving a wider group of stakeholders in deriving the scores and checking the maps added value to this method, compared with using 'black box' tools developed by external experts.

We also held a series of public participatory mapping events – at a street event (the Bicester Big Lunch), via an online survey, a drop-in session at the library, and a small focus group workshop. At these events we gathered data on what green spaces people use, what benefits they gain from these spaces, and what they would like to see improved.

Additional mapping layers can also be applied – for example we used a map of archaeological constraints to identify areas with additional cultural value. Mapping publicly available Flickr photos can help to show places where people take photos of nature or of attractive views, demonstrating delivery of 'aesthetic value', 'interaction with nature', and possibly 'sense of place'. In the Bicester area, for

example, there are hot-spots of nature-related photos along riverside paths and at the RSPB (Royal Society for the Protection of Birds) reserve at Otmoor.

Assessing site design

For assessing the impact of land use change at a specific site, we tested the Natural Capital Planning Tool (NCPT),[4] a freely available spreadsheet tool which uses a matrix of scores to estimate the impact of development on a range of ecosystem services. The scores are simply multiplied by the area of each habitat before and after development. Additional multipliers are applied to take account of certain local factors, such as whether the area is in a flood zone, and whether there is public access for recreation.

We applied the NCPT to the plans for the second phase of eco-town development at North West Bicester.[5] First we looked at a minimum GI case, where all the green space in the development was just amenity grassland. This showed a large loss in harvested products, as expected for a development on farmland, and losses in all the other services except for recreation, where there was a gain because previously there was no public access.

We compared this with the masterplan, which was carefully designed to deliver biodiversity net gain by preserving all the pre-existing hedgerows, with wide buffer strips of species-rich grassland, a country park with a mosaic of semi-natural grassland and shrubland, allotments, and a wetland area. The masterplan turned most of the ecosystem service losses into gains, demonstrating the value of investing in a high-quality design that delivers biodiversity net gain (see Fig. 4 on the next page). With a few further adjustments to the plans, it would be possible to deliver gains in all services except for harvested products.

Natural England is developing a similar 'Eco-metric' tool that is designed to be used as an add-on to the revised Defra (Department for Environment, Food and Rural Affairs) biodiversity metric, for exploring the wider benefits of biodiversity net gain projects.[6] This will include a wide range of multipliers to adjust for habitat condition and spatial location. It is currently being tested in a range of pilot projects.

A simpler approach for site assessment is to use a green factor scoring system, such as the new Urban Green Factor (UGF)[7] adopted by the City of London.[8] This generates a single score between 0 and 1, based on the surface area of each type of land cover, weighted by scores for the type of cover. Woodland, species-rich grassland or wetland areas score 1 and sealed surfaces score 0, with intermediate scores for other surfaces, such as green roofs and walls, amenity grass, or permeable paving. Local authorities can set their own targets – for example for a minimum score of 0.4. These simple systems are ideal for assessing small to medium-sized urban developments, and should encourage installation of options such as street trees and green roofs, with benefits for biodiversity, flood mitigation, and urban cooling.

Opportunity mapping

We did not find any simple and freely available tools that can automate the process of identifying opportunities for improving GI. We trialled the use of EcoServ-GIS, a tool developed by the Wildlife Trusts, but this is no longer supported and the software has become outdated so it is only suitable for use by experts.[9] Instead, we used participatory workshops to identify opportunities for investing in improved GI. For example, our participatory mapping exercise found that people would like more woodland areas and better links to footpaths in the countryside outside Bicester. Planners found that one of the strengths of this project lay in getting a range of relevant stakeholders round the table to discuss different options.

We also performed an ANGSt (Accessible Natural Green Space Standard) analysis, which showed that only 13% of properties in Bicester are within 300 metres of natural green space of over 2 hectares in area, and no properties are currently within 2 kilometres of a large (20 hectare+) natural green space. Although options for creating new green space in the town centre are limited, this highlighted both the need to protect and enhance existing small areas of green space and the benefits of a planned new community woodland to the south.

There are also some useful online opportunity maps. The Working with Natural Processes (WWNP) website[10] provides an interactive map that identifies good places for planting trees, reconnecting floodplains or installing run-off attenuation features, such as flood storage ponds or woody dams, in order to reduce flood risk. Several areas have developed opportunity maps that identify the best places to focus on habitat creation to support local species, usually led by the local Wildlife Trust or Local Nature Partnership, and Natural England is also developing a set of habitat network maps for England. Finally, tools such as SENCE and Viridian are available on a consultancy basis.[11]

Valuation

We tested a range of valuation tools, including two spreadsheet frameworks (GI-Val and BEST), iTree and ORVal. The spreadsheet tools are a very useful way of structuring a valuation assessment, although they do require the user to collect a lot of input data, which can be challenging. The iTree valuation, using data from the database of public trees, estimated that the value of the trees for air pollution regulation, carbon sequestration and avoided stormwater run-off treatment costs was around £26,000 per year,[12] considerably less than the cost of maintaining the trees. However, the GI-Val and

Development Impact Score
Average Per-Hectare

Ecosystem Service	Max Possible	Minimum GI	Min Possible	Masterplan
1. Harvested Products	+0.16	−2.59	−2.71	−2.10
2. Biodiversity	+4.42	−0.04	−0.58	+0.37
3. Aesthetic Values	+2.49	−0.75	−2.51	+0.11
4. Recreation	+4.99	+1.54	−0.01	+1.26
5. Water Quality Regulation	+3.07	−0.43	−4.39	−0.15
6. Flood Risk Regulation	+6.50	−0.48	−1.50	−0.21
7. Air Quality Regulation	+3.03	−0.06	−1.65	+0.39
8. Local Climate Regulation	+3.85	−0.59	−2.14	−0.13
9. Global Climate Regulation	+4.41	−0.15	−0.59	+0.00
10. Soil Contamination		+0.00		+0.00
Development Impact Score	+32.93	−3.54	−16.07	−0.46

Fig. 4 Output of the NCPT tool – changes in ecosystem service scores due to development, comparing a minimum-GI case with a high-quality GI masterplan (white figures show maximum and minimum possible changes in scores for each service; colour shading indicates potential for the score to be improved towards the maximum)

BEST analyses showed that this is only a small part of the total value of the trees and other GI in Bicester, with much higher benefits from the health impacts of increased walking and cycling, and the value of living close to a green space (as indicated through increased property prices).

The free online ORVal tool[13] for instantly assessing the recreational value of any green space in England showed that the green spaces in Bicester were worth around £2.6 million per year, based on the estimated number of visits and the time and cost of travelling to the sites. This tool is being expanded into a new tool called NEVO,[14] which will include additional ecosystem services.

The participatory mapping work demonstrated the wide range of benefits that local people receive from green spaces, including health and wellbeing benefits from recreation, interaction with wildlife, increased social cohesion, and a sense of local identity.[1] The local councils were surprised to find that people valued all types and sizes of green space, even small areas of amenity grass and trees outside houses.

Mainstreaming GI planning tools into practice

Each of the tools described above has different strengths and limitations. The generic scoring tools are fairly simple to apply and cover a wide range of ecosystem services, but the scores are based largely on literature values and expert opinion. Because scores for different services are not like for like, different services cannot be compared. Economic valuation allows different services to be compared, but comes with its own set of caveats and conceptual difficulties, such as how to place a value on a view of green space, or a life saved. Local knowledge is essential to sense-check and refine the outputs of tools like these. Applying a wide range of different tools will allow a more robust analysis, and will highlight areas of agreement or uncertainty.

However, this brings its own problems in terms of the resources needed for a multi-pronged approach. Even though local planners initiated this project and were keen to co-develop the toolkit, pressure on their time increased to the extent that they were not able to apply the tools themselves. Some tools have onerous data requirements, especially the spreadsheet valuation tools, and GIS expertise is often needed. To mainstream these tools into practice requires GI champions at councils with adequate time and resources to either apply tools themselves or commission third parties such as Local Environmental Record Centres or consultants who have the necessary mapping and modelling expertise.

Users are still often confused by the wide range of tools on offer. One issue is that research funding is geared towards developing new and innovative methods, rather than improving and consolidating existing tools. This has resulted in a confusing array of half-finished tools that are often not quite robust enough for widespread uptake, or tools that fall into disuse because there is no funding for maintenance. As well as more funding for maintenance and development of existing tools, better signposting is needed to help users find the right tool for each context. Many tools are profiled on the Ecosystems Knowledge Network's Tool Assessor webpages,[15] and there is good potential to add a signposting facility here.

Quick and simple online maps are an ideal resource to save time for planners. For example, it would be possible to use the land cover scoring method to develop national maps of high-value natural capital

assets and networks. The forthcoming NEVO tool[14] should be a useful addition to the online mapping toolkit.

Supporting regulation can drive wider uptake of tools. The recent consultation[16] and subsequent announcement in the Chancellor's Spring Statement[17] that biodiversity net gain would become mandatory for all development could encourage consideration of wider environmental gains via tools such as the NCPT or Natural England's Eco-metric. Similarly, strengthening the requirements for SuDS, or for a minimum percentage of accessible green space, will help to mainstream GI planning using tools such as the Urban Green Factor. Planners appreciated the clear standards for eco-towns that guided the North West Bicester masterplan, and similar quantitative standards would help to mainstream GI into other developments such as 'Garden Towns'.

Although tools such as the NCPT are excellent for assessing change at a single site, a more strategic approach is needed at district or county level. Planners would like to move away from viewing individual high-value green spaces as constraints, to start to identify opportunities to connect them into networks that deliver multiple health, economic and environmental benefits, providing attractive walking and cycling routes and wildlife corridors between towns to tackle traffic congestion, air pollution, climate change, and biodiversity loss.

Finally, this project identified a major gap around green space management, with even good-quality GI being undermined through incorrect management, such as cutting grass at the wrong time. The growing trend for new GI to be passed on to management companies can exacerbate this problem. However, the enthusiasm of local volunteers offers potential to improve management and monitoring, as well as increase the use of green space by local people. Tools to facilitate better co-ordination of GI management across an area (such as not cutting all the flower-rich meadows at the same time) and sharing of best practice could have major benefits.

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what does good GI policy look like?

Alister Scott and Max Hislop use a hybridised policy analysis tool to assess the breadth and depth of green infrastructure policy in the revised National Planning Policy Framework for England

This article develops and tests a hybridised policy tool to assess the efficacy and strength of green infrastructure (GI) in plans and policies across multiple scales. We use the example of the recently revised English National Planning Policy Framework (NPPF)[1] to illuminate the potential of the tool and reveal how well planning policy in England is addressing GI. The tool builds upon a successful pilot involving 19 local authorities within the Central Scotland Green Network (CSGN) area,[2] Building with Nature[3] and the Integrated Green Infrastructure (IGI) Approach,[4] as well as recent work from the NERC-funded Mainstreaming Green Infrastructure knowledge exchange project.[5]

The article proceeds with a review of GI character and functions before then detailing the methodology leading to the assessment framework. We then subject the NPPF to the tool assessment and consider the implications of the results for the design and delivery of good spatial planning and place-making.

Green infrastructure – identity and function in spatial planning theory and practice

The English planning system faces significant strategic challenges, including reconciling different agendas and priorities, such as those relating to public health, water management, housing, economic growth, biodiversity, and climate change.[6] However, these challenges are often diagnosed and treated within separate sectoral silos, leading to disintegrated development amid competing visions of what success looks like.[7] GI has the potential to address these major planning challenges when positioned within more holistic social-ecological systems thinking and nature-based solutions.[8]

However, GI is an elusive and often carelessly used concept, lacking definitional clarity and consistent application across planning theory, policy and practice.[9,10] Indeed, Matthews, Low and Byrne[11] suggest that confusion of GI with green space and the use of the terms interchangeably have diluted the value of GI as a strategic spatial planning tool. This highlights the need for a clearer differentiation between green space and green infrastructure and the functions and outcomes that they deliver (see Fig. 1 on the next page).

The European Commission has defined the contribution of a GI approach as:

> *'a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services … This network of green (land) and blue (water) spaces can improve environmental conditions and therefore citizen's health and quality of life. It also supports a green economy, creates job opportunities and enhances biodiversity.'*[12]

However, the demand for GI is not always easy to define and assess against quantifiable metrics and indicators, which are compounded by tension between the political desire to secure short-term financial gains from development and the environmental desire to secure long-term benefits delivered by GI. Such tensions are somewhat skewed, however, by the way that conventional accounting methods treat GI as a liability, largely ignoring the wider benefits to society (including health, flood risk regulation, biodiversity, etc.) because they are not readily accounted for, while the associated costs of green space management are.[13] Hence we tend to value what is measurable rather than simply measure what we value.

Nevertheless, considerable progress has been made in natural capital accounting,[14] and recent revisions to the Treasury Green Book[15] incorporate some costings for social and environmental benefits, allowing GI to then become a net asset rather than a liability.

Planning policy also plays a critical role in the delivery of GI. For example, the Natural Capital Committee, an independent advisory committee to the UK Government, has stated that: 'Building GI

into long-term development plans will not only ensure its benefits from the outset, but will also avoid costly retrofitting in the future.'[16]

This provides the rationale for our work and its testing on the NPPF, given its influence on Local Plan preparation.

Methodology

A multi-criteria analysis was used to build an assessment framework by fusing the Building with Nature GI benchmark developed by the Gloucester Wildlife Trust and the Centre of Sustainable Planning and Environments at the University of the West of England,[3] the IGI Approach developed and promoted in Scotland by the Glasgow and Clyde Valley Green Network Partnership (GCVGNP)[4] and the emerging evidence from the NERC-funded Mainstreaming Green Infrastructure knowledge exchange project.[5] Our focus is on accounting for the main functions of GI for planning and not the outcomes or benefits of GI, and their neglect here does not in any way reflect their wider importance in the GI debate.

The Building with Nature GI benchmark seeks to raise the standard of GI over time and improve the quality of GI throughout the development pipeline via a series of themes co-developed with planning stakeholders. The themes cover the planning, design and management of GI, together with the nature

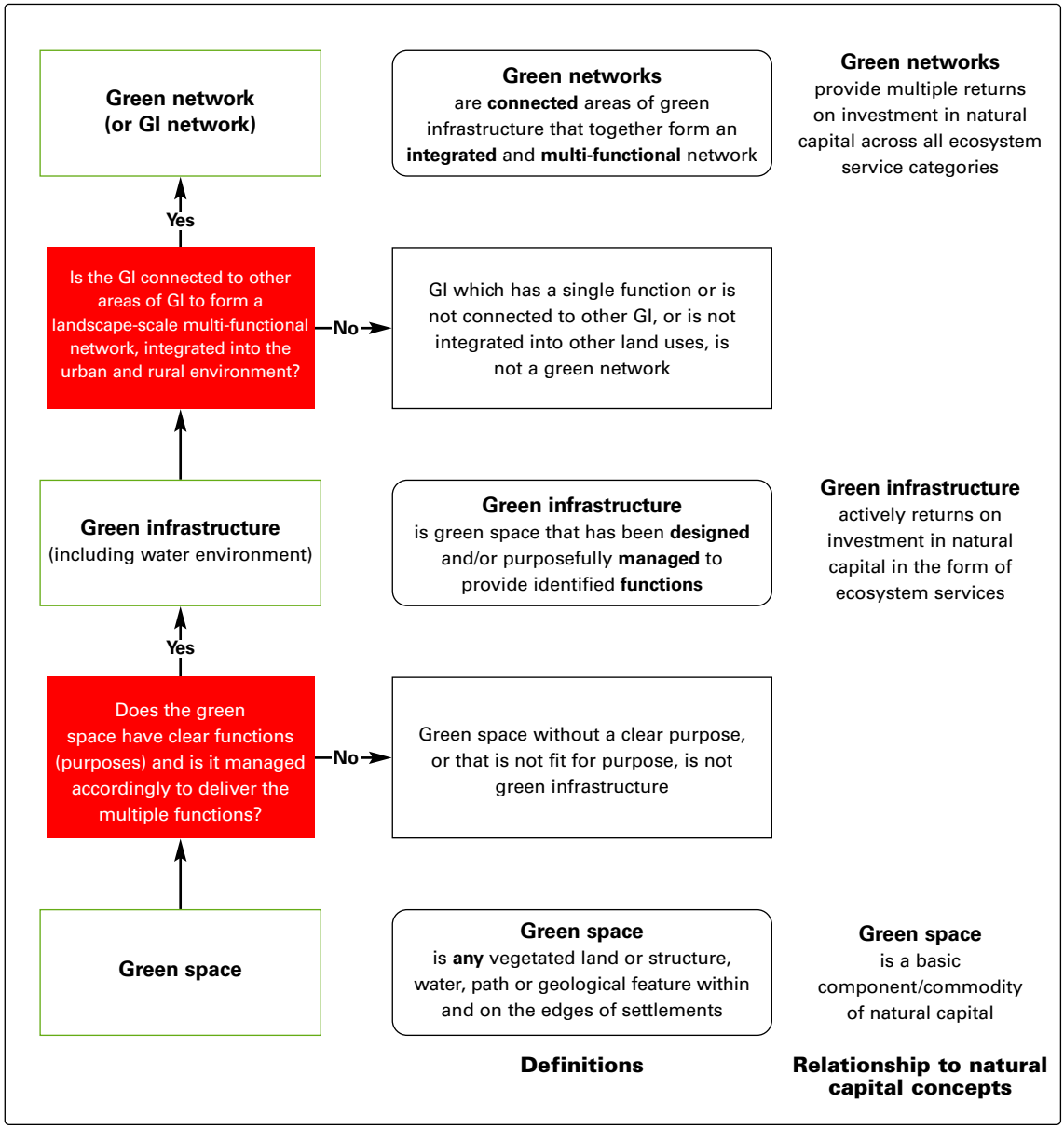

Fig. 1 The relationship between green space, green infrastructure and green networks

conservation, water management, and health and wellbeing functions that GI provides.

The IGI Approach is based on lessons learned from a series of GI design studies that the GCVGNP commissioned across the Glasgow and Clyde Valley region. The IGI Approach requires that GI within development must be designed, multi-functional (water management, access network, habitat network, green and open space) and managed.

The Mainstreaming Green Infrastructure project has sought, through a series of workshops and dedicated projects, to identify the current opportunities presented by, and barriers facing, the wider mainstreaming aspects of GI in the planning system using intelligence gained from the research, policy and practice communities.

The resultant framework is a hybrid, built upon the fusion of these different but complementary approaches, culminating in a policy assessment framework based on three themes – integration, functions, and aftercare – within which seven main GI subject areas are identified that planning policy(ies) should cover. For each subject area, associated assessment criteria were developed using academic and grey literature and author experience, culminating in the A-Z assessment framework shown in Fig. 2 on the next page.

Key to the assessment process is a content analysis of the plan under scrutiny based on keyword searches involving the assessment criteria and relevant proxies. The 'plan' considered here is the NPPF. The assessment criteria are used within an Excel spreadsheet with two key assessments undertaken. First, for each of the 26 assessment criteria the extent of GI coverage on that assessment criterion was assessed, and, second, the strength of the associated policy wording was also assessed (see Table 1).

Regarding GI coverage, scoring criteria D-Z (see Fig. 2) involved capturing a single example policy and any justification text within the NPPF, which was assessed individually. However, for criteria A-C a different approach was employed, based on the extent to which the mainstreaming criteria were covered by ***all*** the relevant examples in other chapters of the NPPF (i.e. excluding Chapter 15: 'Conserving and enhancing the natural environment'). A more subjective collective assessment was then needed to capture the combined influence of all the relevant examples together; scored individually against the number of chapters involved, including the introduction and the appendices. Typically, at least three examples that addressed the criteria across at least three NPPF chapters were needed to score higher values ('orange/green coverage' as shown in Table 1), and thus a single 'orange' score could result in a lower overall score as a result of the number of chapters involved.

The scoring for strength of policy wording was similarly assigned on an individual basis for criteria D-Z and collectively for A-C, reflecting the impetus for action.

Table 2 provides an annotated example of the scoring process on assessment criterion K. The two concepts that are required to fully cover criterion K ('GI delivers on site habitat enhancements resulting biodiversity net gain') are that planning policies should expect ***enhancement of habitats*** (not just protection) and ***biodiversity net gain*** from

Table 1
Key for scoring based on policy coverage and strength of policy wording

Coverage of criteria	Score	Strength of policy wording	Score
Some coverage	1	Weak phrasing	1
Most coverage	2	Medium phrasing	2
Full coverage	3	Strong phrasing	3

Table 2
An example of the assessment of NPPF paragraphs against a GI assessment criterion

NPPF paragraph text relevant to assessment criterion K	Comment
Para. 170: Planning policies and decisions **should** contribute to and enhance the natural and local environment by: a) protecting and enhancing valued landscapes, sites of biodiversity ... d) minimising impacts on and providing net gains for biodiversity ... ***Para. 174:*** To protect and enhance biodiversity and geodiversity, plans **should**: b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.	• ***Coverage score:*** 3 – Good coverage of 'enhancement' and 'net gain' • ***Policy wording score:*** 2 – 'Should' weakens the policy because it can be trumped by other policies expressed as 'must', 'required' or 'expected'

Source: Adapted from *Green Infrastructure Policies in the CSGN*[2]

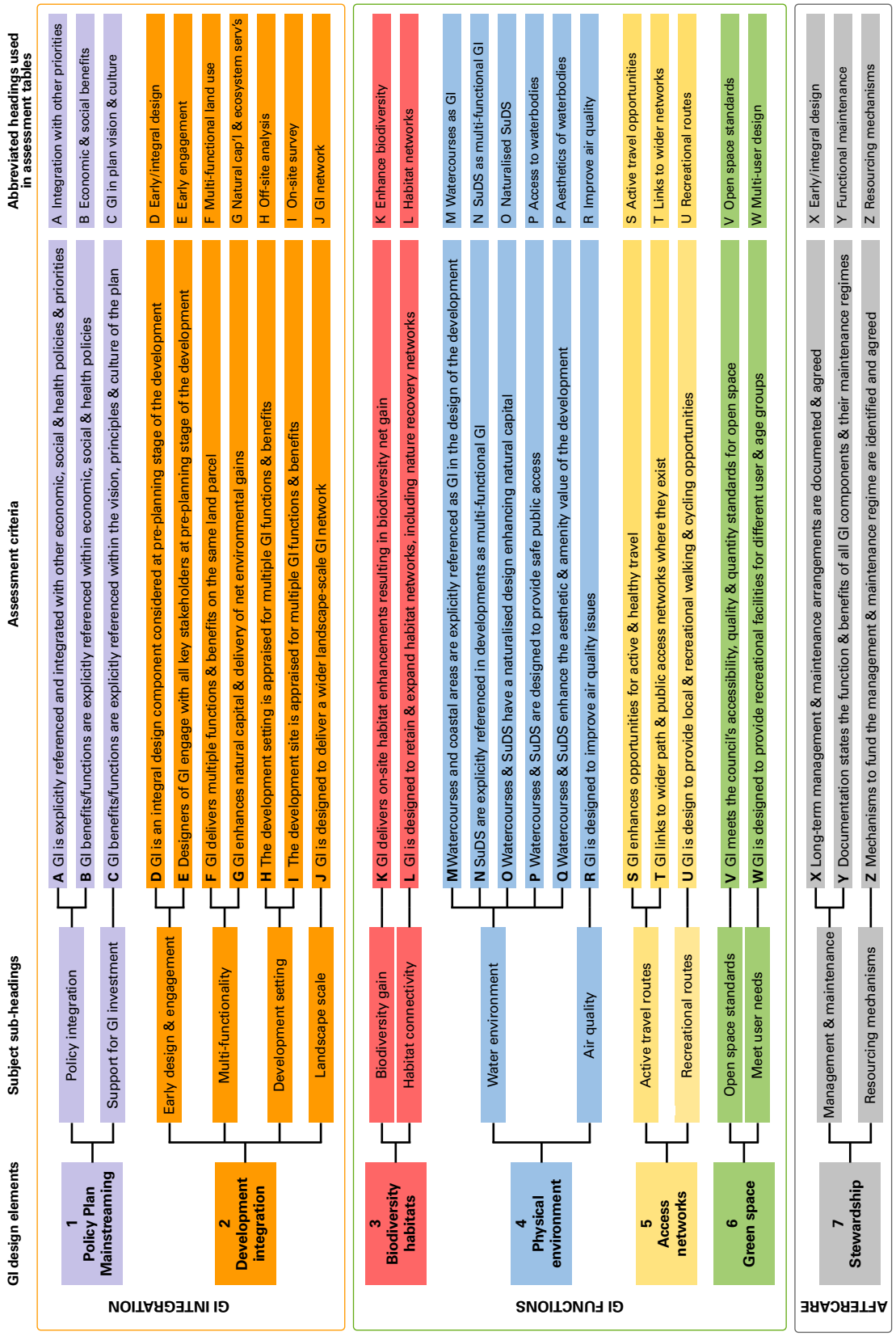

Fig. 2 GI policy assessment framework

Table 3
Summary of the assessment of GI policy coverage and the strength of NPPF wording

		Green infrastructure design elements																												
		Policy plan mainstr'g			Development integration									Biodiv/ habitats		Physical environment						Access networks			Green space		St'w'ship			
		A Integration with other priorities	B Economic & social benefits	C GI in plan vision & culture	D Early/integral design	E Early engagement	F Multi-functional land use	G Natural capital & ecosystem services	H Off-site analysis	I On-site survey	J GI network	K Enhance biodiversity	L Habitat networks	M Watercourses as GI	N SuDS as multi-functional GI	O Naturalised SuDS	P Access to waterbodies	Q Aesthetic of waterbodies	R Improve air quality	S Active travel opportunities	T Links to wider networks	U Recreational routes	V Open space standards	W Multi-user design	X Agreed management	Y Functional maintenance	Z Resourcing mechanisms
Chapter 2 Achieving sustainable development Paras 8 & 9	Coverage											■												■					
	Strength											■												■					
Chapter 3 Plan-making Paras 20d & 34	Coverage			■																									
	Strength			■																									
Chapter 4 Decision-making Paras 39, 41, 42 & 43	Coverage				■	■				■																			
	Strength				■	■				■																			
Chapter 8 Promoting healthy & safe communities Paras 91a, 92a/e, 96 & 98	Coverage				■															■	■		■	■					
	Strength				■															■	■		■	■					
Chapter 9 Promoting sustainable transport Paras 102c, 104d & 110c	Coverage				■															■									
	Strength				■															■									
Chapter 11 Making effective use of land Paras 117 & 118a/b	Coverage	■					■					■											■						
	Strength	■					■					■											■						
Chapter 12 Achieving well-designed places Paras 127b/c/e & 128	Coverage				■	■			■																				
	Strength				■	■			■																				
Chapter 14 Climate change, flooding & coastal change Paras 150a, 163 & 165d	Coverage							■	■	■					■														
	Strength							■	■	■					■														
Chapter 15 Conserving & enhancing the natural env't Paras 170a/b/d, 171, 174a/b, 175b & 181	Coverage							■		■	■	■	■						■										
	Strength							■		■	■	■	■						■										
Annex 2 Glossary Green infrastructure	Coverage		■																										
	Strength		■																										
Highest scores	Coverage	■	■	■	■	■	■	■	■	■	■	■	■		■				■	■	■		■	■					
	Strength	■	■	■	■	■	■	■	■	■	■	■	■		■				■	■	■		■	■					

development. The text relating to the strength of wording is shown in red in Table 2.

The whole scoring process was undertaken independently by two assessors and then compared, with any disparity discussed and reconciled by them together. We recommend this step when planning authorities use the tool for assessing Local Plan policies, ideally with forward planning and development management staff involved.

Results

Assessment of GI policy in the NPPF

Table 3 provides a summary of both the extent of coverage of GI-relevant policies and the strength of wording of those policies across all the NPPF chapters and annexes. The scores are presented on the colour-coded scale set out in Table 1 to ease visual interpretation.

Table 4
Comments on selected NPPF paragraphs and the policy 'hooks' they provide for Local Plans

GI policy criterion	NPPF paragraphs	Commentary and potential policy 'hooks' for Local Plans
A: Integration with other priorities	8 b) and c); 9; 20 d); 117	***Comment:*** Just one explicit reference to GI (para. 20 d)), and only in relation to the climate change benefits of GI. ***Hook:*** To explicitly reference GI as supportive of economic objectives (particularly in relation to active travel and flood and pollution amelioration), as well as social and environmental objectives, and therefore an integral part of what the planning system is expected to deliver.
D: Early/integral design	42; 92 e); 102 c); 127 b) and e)	***Comment:*** Only tangential reference to the need to consider GI as an integral design component, considered from the pre-planning stage. Para. 102 provides explicit reference for transport issues – GI should be afforded the same priority. ***Hook:*** To make explicit the need to integrate GI into all development design from the outset.
F: Multi-functional land use	118 a) and b)	***Comment:*** Mentions the functions of GI but does not explicitly refer to GI, or recognise that GI is an essential component of all developments, or that well designed and delivered GI is multi-functional. ***Hook:*** To expect that developments are designed to deliver multi-functional GI benefits from the same land parcel.
N: SuDS as multi-functional GI	165 d)	***Comment:*** Weak reference to the multi-functionality of SuDS. ***Hook:*** To include more detail on the benefits of naturalised SuDS, and for SuDS to be integrated as aesthetic and accessible features within the GI of all developments.

GI coverage

Unsurprisingly, the chapter of the NPPF that provides the most coverage of the GI policy criteria is Chapter 15: 'Conserving and enhancing the natural environment'. However, some coverage is evident within eight of the other 17 chapters, indicating that GI is mainstreamed across the document to some extent. Table 3 shows that there is weak coverage against criteria A-C, due, in part, to the lack of explicit mention of GI and its coverage only in single chapters. Table 3 also shows a marked absence of green scores outside Chapter 15, with the exception of Chapter 12: 'Achieving well-designed places', where there is a comprehensive statement on the need for early engagement of the planning authority and the local community on design proposals.

Although there are many blanks in the matrix against criteria D-Z in individual chapters, not all chapters need, or indeed should, cover all these criteria. What is important is that the document as a whole should provide full GI policy coverage. The bottom two rows of Table 3 show the highest scores for each of the D-Z criteria, while the A-C scores reflect the cumulative-impact scores. These 'highest scores' rows reveal that six out of 26 criteria have the highest score in GI coverage and, significantly, eight criteria have no coverage at all. The biodiversity and air quality criteria are fully covered and the development integration and green space criteria are reasonably covered. However, the mainstreaming and access network criteria are poorly covered, and there is a marked absence of coverage across the stewardship and water/SuDS (sustainable drainage systems) criteria.

Policy strength

While the GI criteria have varying extents of coverage, there are no 'highest scores' for the strength of policy wording – i.e. no 'green scores' in Table 3. Stewardship, SuDS, mainstreaming and access are deficient here; and the six highest-scoring GI coverage criteria are weakened by not having strong policy wording for their implementation.

Discussion and recommendations

The NPPF – making GI policy vulnerable?

The results reveal that GI policy across the NPPF overall is incomplete, inconsistent and relatively weak, creating a vulnerability in the way that GI might be treated in local-level and strategic plans and their associated planning policies and developments.

It is not surprising that the criteria relating to natural capital, a GI network, biodiversity enhancement and habitat networks (criteria G, J, K and L) are well covered in the NPPF, as they build upon the government's 25 Year Environment Plan[17] and reflect some good policy development in Chapter 15's focus on conserving the natural environment.

However, almost all GI-relevant policies and associated statements outside Chapter 15 fall short on coverage and strength of wording. Nevertheless,

Green infrastructure primary policy	
Green infrastructure is integral to place-making underpinned by the qualities of successful places, and therefore must be part of the design process from the outset, proving **water management**, **access networks**, **habitat enhancements** and **open space functions**.	
To achieve this, developments are expected to: ● discuss what green infrastructure is appropriate for the site at pre-application meetings with the planning authority and relevant stakeholders; ● appraise the site context for green infrastructure functions, undertake habitat and hydrological assessments of the site as requested through the pre-application discussions, and demonstrate how they have influenced the design; and ● take opportunities to achieve multi-functionality by bringing green infrastructure functions together.	
Green infrastructure functions	
Water management	**Access networks**
Development proposals will integrate naturalised SuDS into the design of green infrastructure, and where they are part of open space obligations will be safe and accessible, creating an attractive and distinctive setting for new developments.	Development proposals will maintain and enhance the quality and connectivity of access networks, integrating active travel routes (linking workplaces, schools, community facilities and public transport hubs) and recreation routes into green infrastructure.
Habitat enhancements	**Open space**
Development proposals will conserve and enhance on-site biodiversity, and habitat networks within and adjacent to the site.	Development proposals will meet local accessibility, quality and quantity standards for open space, and be designed to cater for the needs of the community.
Stewardship of green infrastructure	
Developers will provide details of the green infrastructure functions and maintenance requirements, and the party responsible for these, and demonstrate funding arrangements for their long-term delivery to the satisfaction of the local authority before construction starts.	

Fig. 3 A suite of 'exemplar' GI policies derived from the highest-scoring policies identified in the Central Scotland local authority GI policy review

Source: Adapted from *Green Infrastructure Policies in the CSGN*[2]

they provide key hooks on which to position and design more effective planning policies in Local Plans (see Table 4 on the preceding page). So rather than viewing the weaker coverage and policy wording in wholly negative terms (Tables 1 and 3), they should be seen as providing opportunity spaces to exploit. Table 4 identifies these hooks and how they might be strengthened both for the NPPF and future Local Plan policies.

Beware the dog that didn't bark

The assessment of NPPF set out in Table 3 reveals a 'Swiss cheese' like coverage of GI (with 'holes' for, for example, stewardship and SuDS). These gaps in coverage are like the 'dog that didn't bark in the night', and provide key priorities for action over and above the hooks identified in Table 4. In particular:

- To identify and reference existing tools to secure long-term maintenance and funding mechanisms as part of place-keeping requirements – for example payment for ecosystem service schemes, tax incremental financing, the Community Infrastructure Levy, the Building with Nature GI standards,[3] and the relatively new idea of environmental net gains.
- To make SuDS mandatory, as practised in Scotland, and now Wales, where there is a rich evidence base of positive outcomes.
- To emphasise the value and quality of life benefits of off-road paths located within GI to encourage walking and cycling for active travel and recreation.
- To identify GI as a mandatory strategic issue, crossing local authority boundaries and helping meet the duty to co-operate function,[18] and thus improving mainstreaming across boundaries.
- To identify Green Belts as GI assets to be managed positively, moving away from their separate policy treatment.
- To use the current attention given to health, air pollution and climate change as opportunity hooks for developing GI solutions.

Mainstreaming breadth and depth

When it comes to the mainstreaming of GI policy, it is really important that there is breadth as well as depth of policies in the NPPF; that policy provides full coverage of the criteria (depth) and is embedded across thematic chapters (breadth), and not just isolated in the 'Conserving and enhancing the natural environment' chapter. There are inherent dangers in trying to design an all-encompassing GI policy in one chapter alone, which then does not have connections across other chapters and crucially fails to connect with wider natural capital, ecosystem services, and net gain concepts.

Here, there is value in revisiting Hislop and Corbett's work in Scotland,[2] where, from their assessment of 19 Local Plans, they were able to design proposed model policies from the highest-scoring policies they encountered (as shown in Fig. 3). However, not all of these policies should reside within an environmental chapter (i.e. Chapter 15 of the NPPF 'Conserving and enhancing the natural environment'). For example, the GI functions policies are perhaps better located within the 'Meeting the challenge of climate change, flooding and coastal change', 'Promoting healthy and safe communities', 'Promoting sustainable transport', and 'Achieving well-designed places' chapters. And there needs to be much more explicit recognition of the value of place-making as a uniting concept for GI to further improve mainstreaming objectives.

Conclusion

This article has highlighted a policy tool to assess the efficacy and quality of green infrastructure (GI) mainstreaming in plans and policies across multiple scales and has demonstrated its use in an assessment of the English NPPF. The tool can also be used to help revise Local Plan policies or develop new strategic plans or Neighbourhood Plans. Crucially, it is a process-driven tool that enables participants to discuss and negotiate what good GI policy looks like, which then provides a platform for local decision-making.

Our findings reveal that overall GI policy is incomplete, inconsistent and relatively weak, creating a vulnerability towards the way that GI may be treated in local-level and strategic plans and their associated planning policies and developments. However, we make suggestions about how the weaknesses and gaps in GI policy might be addressed so that it is not trumped by other development priorities in Local Plans, and so that developers will consider integrated GI to be a critical part of their planning processes.

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lost in transition? examining GI evaluation in neighbourhood masterplanning

Rosalie Callway, Tim Dixon and Dragana Nikolic **discuss the findings of recent research on how green infrastructure was evaluated and what was constructed onsite following the adoption of the BREEAM Communities standard in six sample neighbourhood-scale development projects**

The potential benefits of green infrastructure (GI) to new neighbourhood developments are the focus of a growing body of research.[1] Such benefits include supporting wellbeing, raising property values, reducing flood risk, and improving biodiversity. There has been less research, however, examining how GI is evaluated by practitioners during large-scale masterplan processes, and whether formal GI evaluative practices affect what is ultimately designed and delivered. The Building Research Establishment Environmental Assessment Method for Communities (BREAM Communities) sustainable neighbourhood

Table 1
Case study site data

	Estate 1*	Estate 2	Infill 1*	Infill 2	Rural-urban extension 1*	Rural-urban extension 2
Masterplan type	Estate regeneration	Estate regeneration	Urban infill development	Urban infill development	Rural urban extension	Rural urban extension
Location	Central London	Outer London	North East England	Inner London	South West England	South West England
Area	28 hectares	25 hectares	12.1 hectares	1.85 hectares	47 hectares	73 hectares
Dwellings	3,575 units	2,517 units	800 units	257 units	1,400 units	4,000 units
Density	125 dwellings per hectare	101 dwellings per hectare	66 dwellings per hectare	138 dwellings per hectare	30 dwellings per hectare	55 dwellings per hectare
Affordable units	50%	50%	25%	35%	30%	35%
Client	Local authority and housing association	Local authority and housing association	Local authority and housing association	Local authority and housing association	Local authority	Homes England, local authority and housing association
Timeframe	2010-2032	2011-2027	2011-2032	2012-2020	2011-2035	2012-2037

* BREEAM Communities applied on site masterplan

standard assumes that if certain formal evaluative activities, including those relating to GI, occur at the pre-planning design stage, developers will take greater account of these issues in the transition to masterplan delivery. This article presents recent research findings on whether adopting BREEAM Communities (BC) affected how GI was evaluated and what was constructed onsite.

Six English neighbourhood-scale projects were studied between 2015 and 2017, reflecting three broad types of neighbourhood development projects – estate regeneration, urban infill, and rural-urban extension (see Table 1 on the preceding page). For each type of development project, two sites were studied, one which adopted the BC standard and one that did not. At each site, at least one development phase had been completed. Although each site had distinct geographical contexts and scales, they all sat within an English planning context, and the broad masterplan stages and technical evaluative processes were similar at each site. These similarities supported a degree of comparison of the formal evaluations relating to GI, such as Landscape Visual Impact Assessments (LVIAs) and ecology, tree and flood risk surveys. To understand the masterplan processes, 48 practitioners and local actors were interviewed, and public planning documents were reviewed for each site.

To examine the evaluative practice and outcomes relating to particular GI issues, 'Strategy as Practice' (SaP)[2] was used as an analytical framework to analyse 13 'evaluative episodes' across all sites. SaP considers the 'practitioners' or actor groups, 'practices' such as evaluation, design and construction practices involved in a strategic process, and the 'praxis' or real-time enactment of those practices. A visual SaP framework was plotted for each evaluative episode over time (see Fig. 1). In 11 episodes, GI recommendations that were established at the outline design stage were compromised or diluted during the subsequent detailed design and construction stages. Significantly, these compromises occurred *regardless* of the use of the BC standard (see Table 2 on the next page).

Four main findings emerged from the study which point to why GI was compromised in the majority of episodes:

- GI is still not commonly defined and understood by all masterplan practitioners.
- GI is principally treated as an object for anthropocentric intentions.
- There is a weak sense of responsibility for GI among dominant actors.
- There are limited opportunities for local engagement in formal GI evaluation.

These four findings are discussed in turn before considering the role of BC in the process.

Lack of a shared understanding of GI

Overall, key GI principles such as long-term ecosystem functioning, inclusive provision, multi-functionality and multi-scalar connectivity[3] did not seem to be commonly understood by practitioners, and few rules or policies clearly promoted this multi-faceted view of GI. Some interviewees were uncertain about the scope of what the term GI included:

'*When you're talking about green infrastructure, are you talking about sustainability – for example district heating networks or actual green?*'
Architect, Estate 2

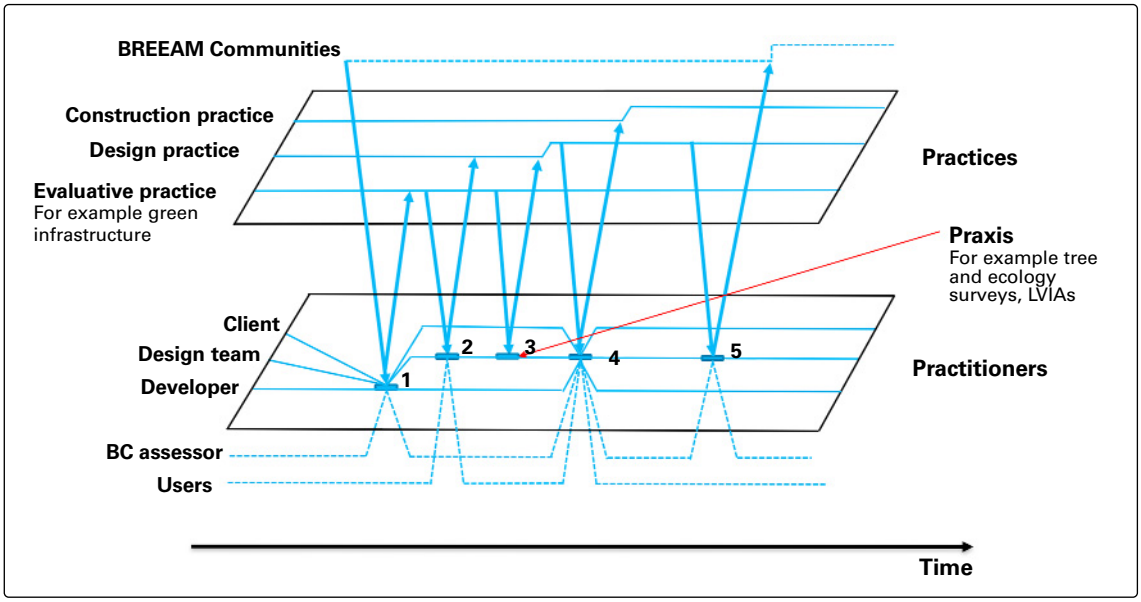

Fig. 1 An example masterplan evaluative episode, with numbered praxes (the enactment of practice by practitioners) and arrows indicating praxis influence (or lack of influence) on other practices

Table 2
Dominant actors and outcomes for GI evaluation and decision-making

Site	GI evaluative episode	Decision-making stage/s	Dominant actor	GI response
Estate 1*	***1 Inclusive view of park for social housing tenants***	Outline to detailed plan	Developer (local authority)	Compromised
	2 Neighbours' street view of GI	Outline plan Detailed plan	Design team Design team	Compromised Prioritised
	3 Overshadowing of gardens and public realm	Outline to detailed plan Detailed plan	Developer National regulator	Compromised Prioritised
Estate 2	***4 Promotion of courtyard block trees***	Outline to post-construction	Design team Developer (local authority)	Compromised
	5 Promotion of trees and allotment external to block	Detailed plan Construction	Design team Developer	Prioritised Compromised
Infill 1*	***6 Adoption of soft sustainable drainage systems***	Outline to detailed plan Construction	Design team Developer	Prioritised Compromised
	7 Promotion of street trees	Outline to construction	Developer	Compromised
Infill 2	***8 Link to local park (and Site of Importance for Nature Conservation – SINC)***	Outline plan Detailed plan to construction	Design team Developer	Prioritised Compromised
	9 Installation of biodiverse green roof	Outline to detailed plan Construction	Design team Developer	Prioritised Compromised
Rural-urban extension 1*	***10 Link to ancient woodland (and SINC)***	Outline to construction	Developer	Compromised
	11 Adoption of soft sustainable drainage systems	Outline to detailed plan Detailed plan	Local authority Developer (phase2)	Prioritised Compromised
Rural-urban extension 2	***12 Promotion of street trees***	Outline plan Detailed plan	Design team Developer	Prioritised Compromised
	13 Protection of wildlife corridor	Outline to detailed plan Construction	Developer (private) Developer (local authority)	Compromised Compromised

* BREEAM Communities applied on site masterplan

Several actors, including developers, housing associations, residents and some consultants, referred to just one or two specific GI functions (for example ecological conservation or flood relief). Others who worked more directly with GI (urban designers, landscape architects, and ecologists) presented a broader understanding, as did some local authority officers. Perhaps this variation in understanding is unsurprising, but it raises questions about who drives evaluative practice and how GI could be given greater priority by them. A narrow definition of GI used by developers meant that other masterplan intentions with clearly defined, more immediate benefits often took priority, such as time management, cost control and hard infrastructure:

> '*In truth trees are so insignificant they are often an afterthought... The biggest financial problem is not mitigating [for the loss of] the trees. It's the wrong trees affecting the site footprint. If that means a loss of units, that's going to hit the purse strings.*'
> Arboriculture assessor, Estate 2

The limited interpretation of GI and its potential functions, as well as norms and standards, by key decision-makers had direct implications for masterplan outcomes. For example, evaluative recommendations supporting ecological connectivity (i.e. biologically

Photo: R Callway

Fig. 2 Left: Proposed wildlife links for Rural-urban extension 1 at outline design stage. Right: Shrubs and ornamental hedges planted instead of natural hedges that were meant to link to woodland

linked ecological habitats that support humanity as well as other living organisms) were poorly supported by regulations and policies, resulting in compromises on three sites (Infill 2, Rural-urban extension 1 and Rural-urban extension 2). In the outline designs for Rural-urban extension 1, commitments to make ecological connections between a neighbouring ancient woodland and the site by using soft sustainable drainage systems (SuDS), natural hedgerows and tree planting were cut back in the detailed and construction stages. The developer increased car parking provision to meet minimum requirements, reduced tree planting, introduced more hard SuDS, and planted predominantly ornamental miniature hedges (see Fig. 2).

GI as merely an anthropocentric 'object' for people to use

In the research, a commonly held view is that GI is predominantly used for human-centred reasons, neglecting the living species and natural habitats that are essential for ecological functioning and that humanity ultimately depends upon (for example, woodland areas support climate mitigation and promote soil and air quality and water filtration). Furthermore, GI contains living organisms that have their own agency and functions, which arguably are intrinsically valuable in their own right;[4,5] i.e. all living things, not just humans, can impact and change their surroundings, shaping not just neighbourhoods but also the wider world.[6] As one local ecologist (at Rural-urban extension 2) commented, the GI concept feels framed against ecological agency:

> *'Green infrastructure is more for people… You can't make a wildlife site multi-use... you know the usual parlance – 'We'll put a road through the heathland. It won't matter if the badgers get run over. That's hard luck, you know.''*

In terms of evaluation, the arboriculture, noise, flood, energy, microclimate, overshadowing and transport surveys undertaken did not formally consider GI as living systems that can have agency – i.e. that GI can affect and be affected by a development. For example, arboriculture surveyors seemed more concerned with ensuring that trees were safe for humans rather than considering wider ecological benefits that trees might provide which are of importance to the long-term survival of both humans and other species.[7] Even where trees were classified as being of good ecological quality (A or B categories under BS 8537), they were often sacrificed to deliver other development priorities of more immediate and obvious functional benefit, such as highways, car parking, and underground utilities (this compromise occurred in evaluative episodes 7, 8, 10 and 12).

Other evaluations, such as energy models, flood surveys, overshadowing and microclimate surveys, also did not recognise that GI might be affected by or help to mitigate negative development impacts. For example, in evaluative episode 2 (Estate 1), trees and vegetation were not considered in a transport survey for their potential buffering role (i.e. protecting against visual, air, soil, water and noise pollution, and providing physical protection for pedestrians). As a result, GI was not proposed until neighbouring residents protested about their loss of visual amenity. This highlights a tension between the anthropocentric views that underpin terminology such as green *infrastructure*, ecological *services* and natural *capital*, and an eco-centric view that sees human needs and intentions as only part of a wider ecological context.[8,9]

Weak GI responsibility

Unlike financial and hard infrastructure evaluations, which were conducted regularly throughout the masterplan process, most GI-specific evaluations

Fig. 3 Pedestrian character area (Rural-urban extension 2) with trees (2014, left) and trees removed when utilities were redesigned (2015, right)

were heavily 'front-loaded', conducted early during the outline design stage and driven by planning rules and norms. During the later detailed design and construction stages, however, GI-related evaluations were conducted more intermittently. They were also often conducted by consultants peripheral to the core design team, which, in turn, weakened the evaluative accountability of central decision-makers at the latter stages. For example, a landscape architect (at Infill 2) described how the design team seemed unaware of the evaluative recommendations that had arisen from an earlier ecology survey:

'Sometimes you have information at the beginning of the project and it kind of gets lost and forgotten about… it's just quite surprising how architects aren't always very aware of these issues.'

This problem was demonstrated by the failures to plant the agreed number of trees (at Estate 2, Infill 1 and Rural-urban extension 2) (see Fig. 3), to construct functional soft SuDS (at Infill 1 and Rural-urban extension 1), or to establish a living green roof (at Infill 2).

It is clear that evaluative responsibility requires a definite *intention* by practitioners to respond to and track evaluative recommendations. This research reveals constrained, risk-averse and pragmatic evaluative behaviour by both developers and local authorities which undermined early intentions to incorporate GI. Local officials referred to conflicting policies and resource constraints (such as housing targets and budget cuts) that limited their sense of responsibility over GI intentions. For example, unless legal protections were involved, or the GI on site was substantial, desk-based reviews of GI data were more common when awarding planning consent than primary on-site checks. Even housing associations were constrained in terms of GI responsibility. As an urban designer (at Estate 1) put it:

'[Housing associations] are very heavily capped on costs so it just tends not to get done. They have the right aspiration but then they don't do it because […] finding the money to do it isn't always their priority.'

Exclusive GI evaluation

The research found that local actors (for example residents associations and park groups) were not expected to engage with most technical evaluations relating to GI, including Landscape Visual Impact Assessment, and microclimate, overshadowing, flooding, noise, arboriculture and ecology surveys. Instead, they were engaged through more generic design workshops and public exhibitions. Developers and their contracted consultants talked about wanting to avoid consultation overload and conflict. One arboriculture assessor (Estate 1) highlighted how technical consultants felt fearful when it comes to public engagement:

'It's very dangerous to talk to local residents. Things get reinterpreted very quickly: 'I spoke to the tree guy and he said…' You know… we tend to be robotic so that things don't get mispresented.'

Table 3
Barriers to embedding GI in neighbourhood masterplans, and recommendations for overcoming them

Barriers to embedded evaluation	Recommendations
1 ***Differing understanding:*** GI is not an established evaluative concept, in relation to key principles of long-term multi-functionality, multi-scalar connectivity, and inclusive GI provision.	• ***Clarifying GI intentions:*** Broad intentions, principles and potential measures for GI evaluation need to be better defined and further integrated into masterplan design, construction and in-use stages.
2 ***Anthropocentric dominance:*** The agency of GI is often missing in formal masterplan evaluations – for example, energy and microclimate surveys do not consider the impact of and/or on GI.	• ***Recognising GI agency:*** Further research is required to improve how different formal GI evaluations (finance, overshadowing, microclimate, noise, flood, transport surveys) account for the impacts of and on GI.
3 ***Weak responsibility:*** There is a lack of commitment to deliver and keep track of evaluative recommendations about GI, especially during the construction and in-use masterplan stages.	• ***Assigning responsibility:*** Masterplans should include a GI strategy that specifies how, when, by whom and with what resources evaluative recommendations will be enacted, monitored and responded to.
4 ***Exclusion:*** The weak conceptualisation of 'inclusive' GI means that the distributive impact of proposals and the knowledge of local actors are not considered in formal evaluative practice.	• ***Inclusive GI evaluation:*** The distributional impacts of GI decisions should be evaluated, including through more deliberative processes that engage local actors in formal evaluation (for example ecology, landscape, tree, overshadowing surveys).

At all six sites, although local actors displayed considerable knowledge and commitment to aspects of GI, they described experiencing limited opportunities to engage with formal surveys. This exclusion of local actors reduced developer commitment to GI, and damaged local trust and general engagement. As one local newspaper quoted:

> '*It's called a public consultation day… but they do not listen. They have made their plans. We have been ignored from day one.*'
> Resident, Rural-urban extension 2

A second aspect of inclusivity relates to the distributional impacts of design proposals.[10,11] The formal GI evaluations studied here did not consider *who* benefited or was disadvantaged by different design decisions. For example, the LVIA at Estate 1 and Infill 2 did not consider the visual impact for social housing tenants. They were not allocated flats overlooking neighbouring parks, so that those flats with a nice view could be sold at a higher price, privately. External rules and norms did not support a more inclusive or equitable distribution of GI functions, except in evaluative episode 3 (at Estate 1), where legislation relating to Compulsory Purchase Orders (CPOs) enabled the CPO inspector to evaluate the social sustainability impact of loss of light on publicly accessible GI.

There needs to more opportunities for early deliberative dialogue about masterplan intentions regarding GI, thereby increasing accountability about the distributional impacts of alternative options, with sufficient time and resources for two-way dialogue, learning and response.[11,12]

Discussion and conclusions

The study reported here suggests that BC played a limited role in shaping how GI was evaluated and responded to in the three sites that applied it. Instead, BC was used to legitimise the quality of the planning applications, but was barely referred to in documents after that point. Existing rules and accepted practice appeared to be more influential in shaping how practitioners addressed GI. To affect greater change, BC needs to be more closely aligned with how masterplans are actually put into practice. All masterplan stages need to be reviewed, but BC currently prioritises the design stage. Evaluative practices at key points where decisions are made – such as cost appraisal, and layout of highways and utilities – also need to be better targeted. BRE (the Building Research Establishment) is currently reviewing BC, which offers a potential opportunity to address some of the issues identified by this and other research.

In some ways it is perhaps understandable that the research showed that GI intentions were

compromised, given the narrow GI conceptualisation and a paucity of tools that evaluate GI in a broader way. More work is therefore needed to operationalise the definition and evaluation of GI intentions within masterplan processes, especially during construction and in-use stages, including clarifying who should take evaluative responsibility at the latter stages, and assessing the resources required to do this. There is also a need to consider how GI might be better reflected in formal evaluative practices, such as LVIAs, to help strategically plan for multi-functional, interconnected, multi-scalar GI systems, and to ensure that they are supported in the long term and delivered in a more inclusive way.[13-15] Table 3 on the preceding page summarises key barriers and recommendations to further embed GI in masterplan processes.

Although the findings of this research are specific to the six case study sites, other research has raised similar concerns about how GI is understood and incorporated in planning, design and construction.[5,14] Long-term trends of ecological decline in the UK are partly a consequence of habitat loss and disconnection through urbanisation.[7] HM Government's 25 Year Environment Plan calls for the creation of 'more green infrastructure' in our towns and cities.[16] There is a need, however, to be much more specific in planning and development policies about what GI is and what it is for, in order to encourage developers and authorities to take greater responsibility in the delivery of good-quality GI both for people and for a functioning natural environment. As Ellen Bernstein wrote in *The Green Bible*:[17]

> *'… habitat (air, water, earth) matters. Place matters. Place and habitat are words from two different domains – culture and biology – that refer to the same thing: the physical environment in which a creature (inhabitant) makes its home. Without habitat, without a home providing food, shelter and air, no creature can exist.'*

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Notes

1 See, for example, IC Mell: 'Green infrastructure: reflections on past, present and future praxis'. *Landscape Research*, 2017, Vol. 42 (2), 135-45; *Design and Masterplanning*. Guide 3. Practical Guides for Creating Successful New Communities. TCPA, Dec. 2017. www.tcpa.org.uk/guidance-for-delivering-new-garden-cities; and *The Multifunctionality of Green Infrastructure*. Science for Environment In-Depth Report. Environment Directorate-General, European Commission, Mar. 2012. http://ec.europa.eu/environment/nature/ecosystems/docs/Green_Infrastructure.pdf

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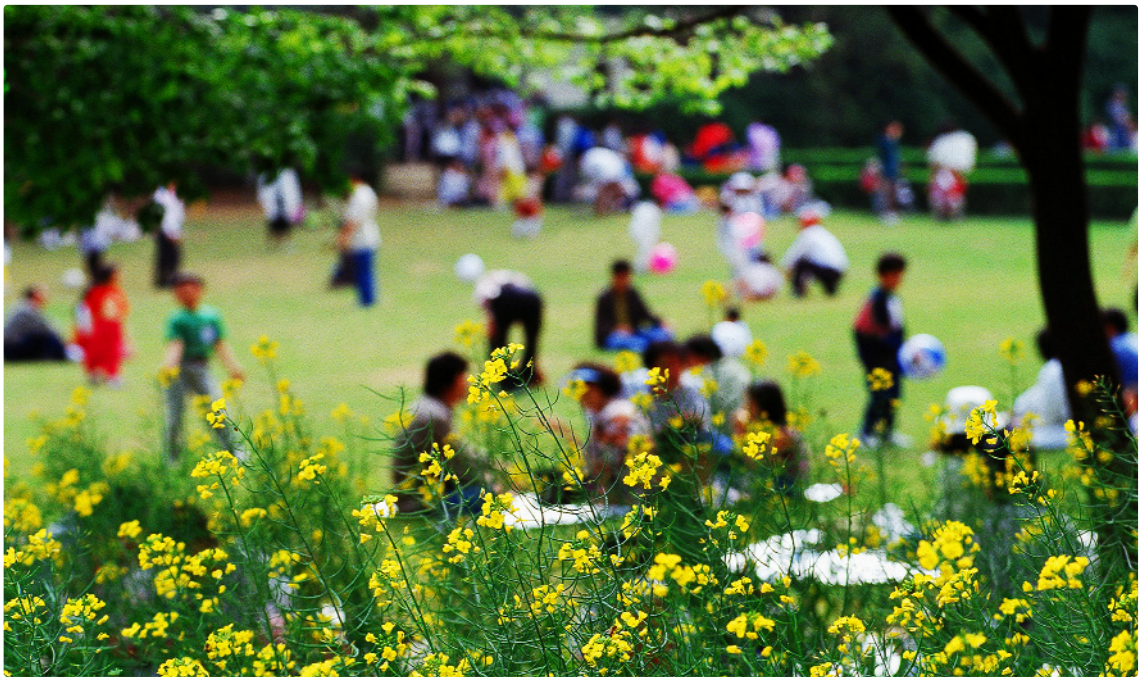
using site-specific guidance to enhance district-wide GI policy

Example, site-specific, green infrastructure guidelines have helped Cotswold District Council to develop district-wide green infrastructure policy, as Sophia Price, James Brain and Lesley Davies explain



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This article assesses how the preparation of site-specific green infrastructure (GI) guidelines has helped in the development of GI policy and an updated district-wide design code that incorporates GI issues. It also shows how other initiatives, policies and projects informed the evolution of the new GI policy framework for the district.

Background – the original policy components

Cotswold District Council's GI policy and guidance have been built upon the council's previous Cotswold Design Code and the Strategic Framework for Green Infrastructure in Gloucestershire, developed by the Gloucestershire Local Nature Partnership (GLNP).

Box 1
A Strategic Framework for GI in Gloucestershire 2015

Vision

'That Gloucestershire's green infrastructure is enhanced, extended, promoted and managed to maximise its contribution to our high quality natural and historic environment, our health and well-being, our economy, our resilience to climate change and to a better quality of life for all.

'And that sustainable economic growth in the county is strengthened by giving green infrastructure the same consideration as other key county-wide infrastructure issues.'

Source: A Strategic Framework for Green Infrastructure in Gloucestershire 2015[2]

Cotswold District Council adopted the first Cotswold Design Code as Supplementary Planning Guidance in 2000 to guide the design of new developments within the district. The Code focused on architectural design and, like most documents from that period, did not mention GI. This lack of reference to landscape design (in its widest sense) and GI issues was undoubtedly a weakness, and to address this shortcoming the Code was updated as part of the Cotswold District Local Plan (2011-2031) review. The new Cotswold Design Code (2018) was incorporated within the Local Plan 2011-2013[1] itself to ensure that it was as robust as possible, with the benefit of being subject to viability testing and examination in public. This gives the Code maximum strength as an integral part of delivering sustainable development through the Local Plan, which forms the starting point for the determination of planning applications.

The GLNP was established in 2011, and one of its first priorities was to consider how GI initiatives could be most profitably co-ordinated across the county (see Box 1). A GI working group was set up and produced *A Strategic Framework for Green Infrastructure in Gloucestershire*,[2] which was adopted by the LNP in 2015.

The strategic development site at Chesterton Farm

In parallel to the development of the Local Plan, pre-application discussions were under way about a strategic development site at Chesterton Farm, south of Cirencester, for 2,350 homes and 9.1 hectares of employment land, as well as community facilities such as a primary school, allotments and public open space.

The initial pre-application discussions with the site promoter, Bathurst Developments Ltd, highlighted the need for robust and high-quality landscape and GI design for the site – in part to respond to the sensitivity of the site's location adjacent to the Cotswolds Area of Outstanding Beauty and an important historic market town, as well as to provide a high-quality environment for existing and future residents.

This focus on green infrastructure was championed by Gloucestershire Wildlife Trust, with the support of colleagues from Worcestershire Wildlife Trust who had extensive experience of working on green infrastructure issues in strategic developments.

What is meant by 'good GI'?

There can be a lack of clarity and common understanding among developers, planners, environmental champions and others on what 'good GI' looks like. GI is, by its very nature, multi-functional, and this means that different stakeholders, even within a local authority, can have different ideas of what good GI might look like – from being focused on delivering drainage solutions to providing outdoor recreational space or habitat for priority species. Similarly, external partners and stakeholders, and the developers themselves, may also hold different views on how the GI on a development site should be designed.

Thus to help develop clarity and a shared understanding on defining good GI, the local authority planning team for the Chesterton Farm site brought together a range of relevant stakeholders across the public and voluntary sectors, including Gloucestershire Wildlife Trust, Natural England and local authorities (town, district and county councils – involving representatives from a range of departments). There was some debate over whether the developers and their agents and consultants should be included in this initial stakeholder work, but it was felt that the discussions would be more aspirational and less constrained if they were not present.

Box 2
Examples from the potential objectives for GI at Chesterton Farm

Examples resulting from the GI partner workshop held on 27 November 2014.

Objective 4: *Existing landscape features*
The GI distribution across the site will be informed by existing landscape, ecological and historical features, with important features (for example hedgerows, stone walls, ponds) being retained and successfully integrated into the GI network. It is acknowledged that there are only a limited number of significant landscape and ecological features currently on the site and no nationally or locally designated natural environment assets; however, there are a number of nationally designated heritage (historic environment) assets present.

Objective 6: *Interrelationship with off-site GI*
The on-site GI will be designed to ensure that it links physically with off-site GI features to maximise opportunities for ecological connections; footpath and cycle links; continuity of landscape features; etc.

Objective 12: *Sustainable drainage solutions*
The principal approach to the SuDS [sustainable drainage system] infrastructure will be to ensure that as much of it as possible is provided on the surface. The SuDS infrastructure will not only serve a drainage role, but will also contribute to the visual amenity and the wider environmental performance of the development (for example enhancements for biodiversity), and its management will be fully integrated with the management of other aspects of GI.

Objective 25: *Mechanism for long-term management*
The effective long-term management of the GI network at the site is key to its success in delivering all its multi-functional benefits. The means by which the GI will be managed and financed should be clearly laid out in the relevant documentation, for example the Section 106 agreement. The overall management could be controlled and undertaken through a variety of mechanisms, for example by the setting up of a community development trust; through the handover of the land to the town council or another third party; via a management company; etc.

A stakeholder workshop was held in November 2014, facilitated by two members of ATLAS (the Advisory Team for Large Applications, then funded by the Department for Communities and Local Government), who were already assisting with the development proposals. There was a diverse and interesting debate on GI issues in general, as well as on site-specific matters. The workshop generated a list of 33 draft GI objectives for the site covering a wide variety of issues, from site-specific matters, such as the design of the interface between the new and existing dwellings, to more general points, such as the long-term maintenance and management of GI (Box 2 sets out some example objectives). The draft objectives were the subject of further consultation among the workshop group to ensure that there was agreement and buy-in from all stakeholders. Stakeholders who were unable to attend the workshop were also given the opportunity to comment on the objectives.

Using the objectives to design the GI at Chesterton Farm

The next step was to share the objectives with the developers – who offered a very positive response. There were a few objectives from the stakeholder workshop that were highly aspirational and even at the workshop were not necessarily considered achievable through this development, but were considered worthy of inclusion as possible ways of delivering GI benefits. All the objectives (including the aspirational objectives) were fully considered by the site promoters, in partnership with the local authority, and the majority were incorporated into the GI strategy and the GI parameters plan for the development site, as part of the outline planning application submission.[3]

The application was approved by Cotswold District Council in April 2019.[4] The GI parameters plan is fixed as part of the outline planning permission, and provides a clear indication of where GI will be located within the development. The GI strategy is more flexible, but provides a baseline against which future reserved matters applications will be tested. The Section 106 agreement includes the arrangements for the future management of the GI by a community management trust, with appropriate funding, to ensure its long-term enduring success.

Cotswold District Council

Illustrative layout of GI at Chesterton Farm

In parallel – 'Building with Nature'

In parallel, a Knowledge Transfer Partnership between the University of the West of England and Gloucestershire Wildlife Trust set out to define high-quality GI at each stage of the planning and development process through the creation of a GI benchmark, building on the Gloucestershire LNP GI working group's original aspiration for a GI benchmark. From 2015 to 2017, with the support of a range of organisations, including Cotswold District Council, the team developed the 'Building with Nature' standard, ensuring its effectiveness and usability by testing it on a number of developments, including Chesterton, which was one of the frontrunner developments selected to help fine-tune the benchmark.[5]

This close working between Building with Nature and the developers played a key role in preparing the GI strategy for the site, alongside the stakeholder workshop draft GI objectives. In 2017 the development was awarded Building with Nature 'Candidate' status[6] in recognition of the quality of GI design in the outline planning application.

Progressing the Local Plan and the Cotswold Design Code

The review (in 2015/2016) of the Cotswold Design Code, as part of Cotswold District Council's Local Plan preparation, provided the opportunity to combine consideration of GI with other design issues. Rather than starting from scratch, the GI principles in the Design Code were based on the draft GI objectives that had been developed to inform the Chesterton Farm application. The objectives covered the full spectrum of GI issues and were the result of excellent collaborative work by a range of key GI stakeholders with extensive knowledge of GI in the area.

It was necessary to edit some of the Chesterton Farm draft GI objectives to make them more generic and district-wide and to cover some additional points that had not been relevant at the Chesterton Farm site before inclusion in the Cotswold Design Code. They were incorporated as 'key principles' under the heading 'Effective green infrastructure and high quality landscape' (see Box 3 on the next page). Some general points on landscape and GI are also included in the main text of the Code.

The Cotswold Design Code, and GI issues more generally, will be delivered through the implementation of a range of policies in the Cotswold District Local Plan – for example those related to the historic environment, biodiversity, green transport, etc. In addition to this integrated approach, there are two policies that refer specifically to the Cotswold Design Code – the 'Design of the built and natural environment' policy (EN2) and the 'Green

Box 3
Extract from the Cotswold Design Code

Effective green infrastructure and high quality landscape

D.66 High quality, well integrated and carefully designed green infrastructure (GI) and landscape provision is crucial to the long-term success of developments, ensuring that the maximum multi-functional benefits are achieved for those that live in, work at and visit new developments. The spaces in between new buildings, the surrounding areas, and the connections between a new development and the existing townscape or landscape, are equally important to the design of the structures themselves. The detail of the GI and landscape provided on a development site will be related to various factors, including the nature of the site itself, and the type, size and impact of the development. Improved GI and high quality landscape is also of great benefit when introduced into existing built areas. Key principles include the following:

a National and local standards and best practice	The amount, type and design of GI should be informed by the appropriate national and local standards, guidance and best practice, including the Accessible Natural Greenspace Standard from Natural England and the national allotment provision recommendations from the National Society of Allotment and Leisure Gardeners.
b Local character	The design of newly created elements of GI and landscape should be inspired by and enhance the character of the existing GI, landscape, biodiversity and built environment of the site and the wider area.
c Existing landscape features	GI design and distribution should be informed by existing landscape, ecological and historical features. For example, stone walls, hedgerows, trees and ponds should be retained and successfully integrated into the GI network.
d Heritage assets	A new development site may include or fall within the setting of historic buildings and structures, and archaeological sites. The GI network should be designed, used and managed in such a way as to protect and enhance the heritage assets and their settings, preserving key views and buffer areas.
e Interface with existing properties	The interface between a new development and any existing adjacent properties should be designed to respect the amenity of existing residents and to ensure that the existing and new developments are well integrated.
f On-site GI network	This should function as a network of interconnected green (and blue/aquatic) spaces, which fulfil various functions, including: formal sport; recreation; pedestrian and cyclist routes; accessible natural green space; structural landscaping; SuDS; and wildlife habitat. Most of the elements of the GI should be multi-functional.
g Distribution of GI across the site	The GI network should be designed to ensure that all residents, employees and visitors have convenient access to green spaces. This should be achieved through dispersal of meaningful and usable areas across the site. Elements of the GI should be of sufficient size to be functional and easily managed. The GI and landscape provision should be located so that it makes best use of and enhances important local views.
h GI and landscape provision on individual plots	The landscape design of individual plots and the areas immediately surrounding them (for example roadside verges) should be of high quality and should reflect the landscape, ecological and built character of the area. Private spaces such as gardens should be of an appropriate size for the dwelling provided, and should be designed to ensure privacy and adequate daylight. Private spaces should be clearly recognisable as such, through the use of suitable boundary treatments.
i Inter-relationship with off-site GI	The on-site GI should be designed to ensure that it links physically with off-site GI to maximise opportunities for ecological connections, footpath and cycle links, continuity of landscape features, etc.
j Off-site GI enhancements	Where possible, enhancements to off-site GI assets should be achieved, for example increasing public access to nearby land, and better management of wildlife sites in the locality.

Continued...

k Sustainable drainage solutions	The principal approach to the SuDS infrastructure should be to ensure that as much of it as possible is provided on the surface, mimicking the natural drainage of the site. This will reduce the burden on the existing sewerage system. The SuDS infrastructure should not only serve a drainage role, but also contribute to the visual amenity and the wider environmental performance of the development. Its management should be fully integrated with the management of other aspects of GI.
l Green features on buildings	Green features (living roofs and walls, bird or bat boxes, etc.) should be incorporated, where appropriate, into new and existing buildings.
m Biodiversity enhancements	Opportunities should be taken within all areas of GI (and the built environment) to enhance biodiversity through species choice, creation of new habitats, land management, etc. There should be linkages with existing biodiversity assets and networks, and increasing access to nature for people.
n Species choice	Within planting schemes, species choice should be guided by appropriateness to the local area (with an emphasis on native species); suitability for its function (for example winter screening); value for wildlife; and resilience to climate change.
o Street trees	Wherever possible, street trees should be planted to improve amenity and environmental performance. Street trees can also be used to help to define the character of different areas of a development and improve legibility.
p Road junctions	The landscape design of new or significantly altered road junctions, particularly at visually prominent locations, should be of high quality, reflect the landscape character of the area, help to give a sense of place, and ensure greater legibility.
q Pedestrian and cycle routes	The walking and cycling network, which will form part of the GI, should encourage 'active travel', in line with the highway user hierarchy principle. On-site routes should link to off-site non-vehicular routes, particularly those that lead to key destinations such as shops, schools and railway stations. These routes should be designed so that they are also available to the existing residents and businesses in the locality, and they should be implemented early in the delivery of the development.
r Healthy lifestyles	GI should be designed to encourage healthy lifestyles for all, including: encouraging walking and cycling; provision of formal and informal sports facilities; providing volunteering opportunities; and food production.
s Provision for all sectors of the community	The amount, distribution and type of GI across a site (and any off-site GI enhancements) should be based on an assessment of the needs of the new residents and other users of the site. Consideration should also be given to helping to meet any shortfall in existing provision.
t Accessibility	The majority of the GI should be accessible, both physically and socially, to all sectors of the community, providing safe, attractive, welcoming and engaging spaces for local people. It should meet the needs of all sectors of the community, including 'hard to reach' groups and those who may require specific provision (for example seating to assist those with limited mobility).
u Timing of 'construction' of GI	Where appropriate, elements of the GI network should be 'constructed' in advance of built development. Where this is not appropriate, the timing of their 'construction' should be tied to the relevant phase of built development.
v Long-term management	The management and monitoring of GI should usually be controlled by a management plan. The plan should clearly set out who will be responsible for the management of the GI and landscape provision. Management plans should be implemented in full and regularly reviewed. Where appropriate, the local community should be involved in the management of GI.

Source: Cotswold District Local Plan 2011-20311

Box 4
Extracts from the Cotswold District Local Plan 2011-2031

Policy EN2: Design of the built and natural environment

Development will be permitted which accords with the Cotswold Design Code (Appendix D). Proposals should be of design quality that respects the character and distinctive appearance of the locality.

Policy INF7: Green infrastructure

1 Development proposals must contribute, depending on their scale, use and location, to the protection and enhancement of existing Green Infrastructure and/or the delivery of new Green Infrastructure.
2 New Green Infrastructure provision will be expected to link to the wider Green Infrastructure network of the District and beyond.
3 Green Infrastructure will be designed in accordance with principles set out in the Cotswold Design Code (Appendix D).

Source: Cotswold District Local Plan 2011-2031

infrastructure' policy (INF7) (as set out in the Local Plan extracts shown in Box 4).

The future

The GI principles in the Cotswold Design Code are now being put into practice by developers designing new developments in the district. The Code is also being used by Cotswold District Council and other partners to assess whether new developments are acceptable and meet the requirements of Local Plan policy to achieve sustainable and high-quality developments.

The next review of the Local Plan will update the Cotswold Design Code GI principles, to reflect how well they have worked in practice and to include any new national or local guidance or legislation. In particular it will enable clearer reference to the Building with Nature benchmark, which was not sufficiently developed to be included in the 2018 Cotswold Design Code.

GI is clearly accepted by government, through the National Planning Policy Framework,[7] as a key component of creating good places for people to live; and that emphasis on GI is increasing and will be given greater priority in the next Local Plan.

In terms of the success of the current Cotswold Design Code principles and the Chesterton Farm draft GI objectives, it is too early to assess any impact on the ground in delivering high-quality GI, but the provision of these principles and objectives has and will continue to help mainstream GI at an earlier stage in the development process and secure additional multi-functional benefits.

The use of very site-specific objectives that were the result of partnership working across a wide range of stakeholders has undoubtedly ensured that the final GI principles in the Cotswold Design Code will be widely supported and effective. This model of bringing together partners and stakeholders to discuss site-based issues and then 'extrapolating' the outcomes to larger geographical areas has proved very effective in mainstreaming GI into policy and practice and should be considered for other similar issues, such as health and wellbeing.

● ***Sophia Price***, ***James Brain*** *and* ***Lesley Davies*** *are with Publica Group, working on behalf of Cotswold District Council. The views expressed are personal.*

Notes

1 Appendix D: 'Cotswold Design Code'. In *Cotswold District Local Plan 2011-2031*. Cotswold District Council. Aug. 2018. www.cotswold.gov.uk/residents/planning-building/planning-policy/local-plan-2011-2031/
2 *A Strategic Framework for Green Infrastructure in Gloucestershire 2015*. Gloucestershire Local Nature Partnership, Apr. 2015. www.gloucestershirenature.org.uk/green-infrastructure-framework
3 Application Ref. 16/00054/OUT. Submitted to Cotswold District Council, 8 Jan. 2016. https://publicaccess.cotswold.gov.uk/onlineapplications/simpleSearchResults.do?action=firstPage
4 Outline Planning Permission on Application Ref. 16/00054/OUT. Cotswold District Council, Apr. 2019. https://publicaccess.cotswold.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=O0MXJ7FIKAK00
5 G Jerome and D Sinnett: 'Building with Nature – principles defining high-quality green infrastructure'. *Town & Country Planning*, 2019, Vol. 88, May, 161-65
6 See the Building with Nature website, at www.buildingwithnature.org.uk/
7 *National Planning Policy Framework*. CP 48. Ministry of Housing, Communities and Local Government, Feb. 2019 (updated version of the revised NPPF of Jul. 2018). https://assets.publishing.service.gov.uk/government/ uploads/system/uploads/attachment_data/file/779764/ NPPF_Feb_2019_web.pdf

the use of planning obligations to secure and enhance green infrastructure

Stephen Wilkinson outlines findings revealed by three case studies of how planning obligations have been used to secure or enhance green infrastructure, and considers shortcomings in the planning approaches taken

The need to *actually* plan for 'growth' is intrinsic to sustainable development. While the major planning debates on providing infrastructure focus on the provision and location of hard infrastructure, debate on planning for new green infrastructure (GI) is often muted.

The three case studies presented in this article lie either within or adjacent to London: the Epping Forest Special Area of Conservation, Essex; the Lee Valley Regional Park in North and East London; and the proposed Lea River Park in London's East End. Each study identifies three approaches to the use of planning obligations to secure or enhance green infrastructure.

To assist in understanding, definitions are required for both GI and planning obligations. Firstly, drawing on a definition set out by Natural England,[1] GI can be defined as 'a network of multi-functional green space, both new and existing, both rural and urban, which supports the natural ecological processes and is integral to the health and quality of life of sustainable communities'. In short, GI is about networks of green spaces designed to serve more than a local catchment. Secondly, the recently revised National Planning Policy Framework (NPPF)[2] outlines the limits to the use of planning obligations as follows:

- 'necessary to make the development acceptable in planning terms';
- 'directly related to the development'; and
- 'fairly and reasonably related in scale and kind to the development'.

Supporting text within the NPPF states that local planning authorities should consider whether otherwise unacceptable development can be made more acceptable through the use of planning obligations. The principal tools of planning obligations are the powers contained with Section 106 of the Town and Country Planning Act 1990 (as amended) and the Community Infrastructure Levy (CIL) Regulations.[3]

Epping Forest Special Area of Conservation

The Epping Forest Special Area of Conservation (EFSAC) is an area of ancient woodland, classed within the top tier of nature conservation designations. The NPPF recognises the important role of such sites, and they are afforded the highest levels of protection through the Natura 2000 Habitats Regulations. Epping Forest covers an area of 2,400 hectares, 1,728 hectares of which lie within the SAC. It is wholly owned by the City of London Corporation and is managed through its 'Conservators'. It attracts 4.2 million visits per annum.[4]

As a result of concerns over increasing recreational pressures on the EFSAC and the adverse impacts of air pollution, Natural England has encouraged neighbouring local planning authorities to enter into a memorandum of understanding to ensure that they work together to:

- collect and analyse data and evidence related to the impacts of proposed development and growth identified through the area's emerging Local Plans, on which to base a strategy to protect the EFSAC; and

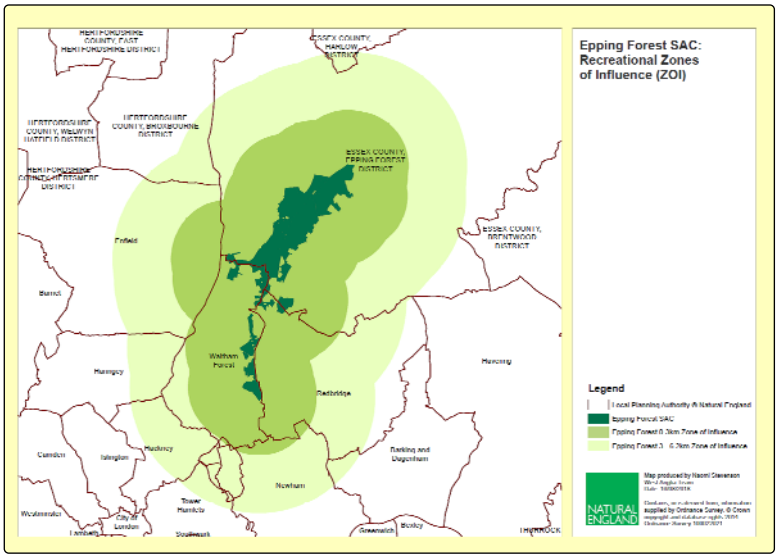

Fig. 1 The Epping Forest Special Area of Conservation zones of influence, derived from visitor surveys

Source: Natural England, 2018

- commit to prepare a joint strategy based on relevant available data and evidence to an agreed timetable.

The joint strategy is intended to address requirements to both avoid adverse impacts and effectively mitigate impacts derived from Local Plan led development. The memorandum of understanding will also include approaches to mitigating impacts on the health of Epping Forest from air pollution caused by increases in traffic on roads that run through it.

Visitor tracking surveys commissioned by the City of London Corporation and Harlow, East Herts, Uttlesford and Waltham Forest Councils have been used to identify a 'zone of influence' from which visitors to the forest currently travel. The zone extends 6.2 kilometres from the SAC boundary, with a median extent of 3 kilometres, as shown in Fig. 1. The zone includes significant areas of North and East London.

To provide a base for mitigation the Conservators have developed an interim strategy which identifies a range of schemes designed to reduce the impacts from visitors, at a cost of £2.7 million for the period 2019-2033. A form of planning obligation or 'roof tax' of between £100 and £420 per dwelling, depending on location within the zone, will be used to fund the strategy. It is understood that Natural England has adopted the same approach in partnership with Wealden District Council regarding the protection of Ashdown Forest.

In recent advice sent to the councils concerned, Natural England has suggested that mitigation for recreational pressures would vary, depending on the scale of development proposals. While a request for funding may be required to support investment in GI projects, for sites exceeding 100 dwellings the advice seeks the creation of suitable alternative natural green space (SANGS) within new development, designed to ease pressures on the EFSAC. Guidance from Natural England suggests that this open space should, in the main, comprise varied semi-natural landscape of sufficient scale to afford genuine alternative space for recreation outside the 'protected sites'.

While this approach is designed to adequately mitigate the recreational pressures derived from new housing, issues relating to poor air quality in the EFSAC arising from vehicles travelling through the area will be assessed through the Habitat Regulations Assessment of Epping Forest District Council's Local Plan, which will be 'tested' through its Examination in Public. This will provide action points to be addressed by the bodies that are party to the memorandum of understanding. Although this approach has to be fully 'tested', it demonstrates that, where protected sites are under threat, planning obligations can be used to effectively mitigate against adverse impacts arising from development.

Lee Valley Regional Park

Abercrombie's Greater London Plan of 1944 identified a strategic vision for the creation of a new park along the course of the River Lea,[5] which led eventually to the creation of the Lee Valley Regional Park through the Lee Valley Regional Park Act 1966. The Lee Valley Regional Park Authority, which oversees and manages the Regional Park, has a dedicated remit that focuses on nature conservation, recreation, leisure, sport and entertainments of any kind.

Extending north from East India Dock Basin for 26 miles, and broadly aligned with the natural course of the River Lea through East London, Essex and Hertfordshire to Ware, the Regional Park presents a rich tapestry of award-winning international sports venues, including the Lee Valley VeloPark and the

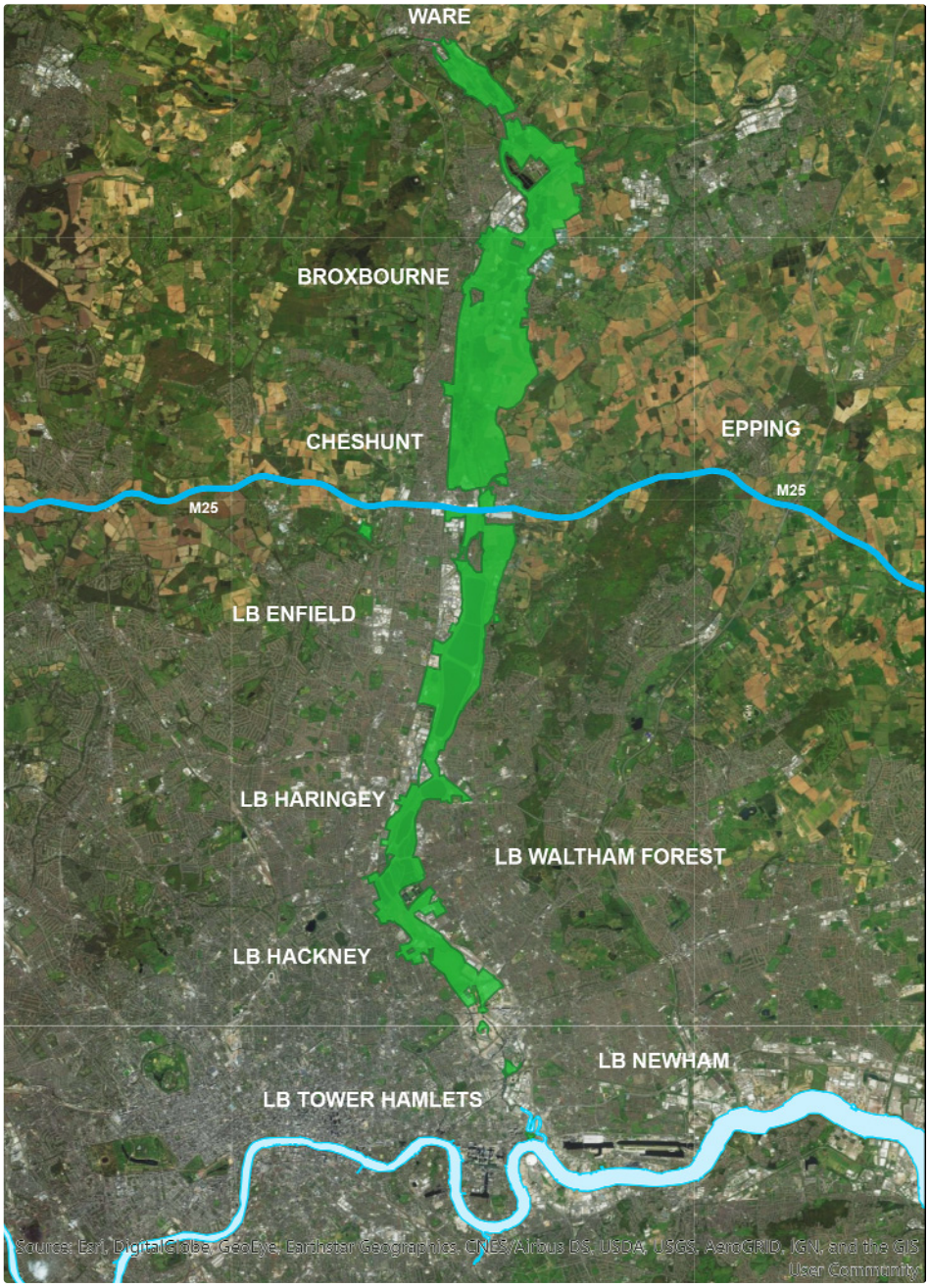

Fig. 2 The Lee Valley Regional Park

Source: Lee Valley Regional Park Authority

Lee Valley White Water Centre, surrounded by 4,000 hectares of attractive parklands. Although its boundary overlies the administrative boundaries of its riparian boroughs, it is conceived as a special place where recreation, leisure and nature conservation should prevail. Across the parklands are eight Sites of Special Scientific Interest and a Special Protection Area and Ramsar site. It currently attracts around 7 million visits per annum, a growth in visitor numbers of 40% since 2006. Fig. 2 shows the location of the Regional Park.

The Act included a funding formula (the 'levy') which requires contributions from each resident of Greater London and the two counties of Essex and Hertfordshire. This has placed the Regional Park in a unique and advantageous position of having its own dedicated funding stream, free from the funding constraints imposed by central and local government. However, the Authority has reduced the levy for the last decade broadly in line with reductions to local authority budgets. This has posed challenges for the Authority, similar to those experienced by local

authority parks' services, regarding budgets for capital projects and asset management.

The Regional Park Authority is not a planning authority but has limited planning powers, largely confined to its role as a statutory consultee. The application of the three 'tests' included in the NPPF on the use of obligations has provided a legitimate break on the Authority's ability to secure large amounts of additional moneys through planning obligations. Given its location in the centre of a 'growth area' which runs the entire length of the Lea Valley, the Authority has managed to secure around £1.2 million of moneys through planning obligations in the last decade. At the time of writing most of this has been secured for habitat improvements, with the remainder directed towards investment in either new or existing visitor infrastructure. The identification within planning agreements of moneys for existing infrastructure raises the issue of the 'test' of 'necessity' identified in the NPPF. This is a challenge common to many local authority parks' services.

Furthermore, the NPPF's 'tests' do not enable the Authority to secure obligations from developments which sit some way from its boundary but may nevertheless generate large numbers of visitors, placing demands on both the Regional Park's biodiversity and its infrastructure. A further complication arises from developments which may sit within one local authority area but whose effects may be felt within a part of the Regional Park which lies within a different local planning authority area. In this way the operation of the NPPF 'tests' undermine the Regional Park's green infrastructure role.

To date, the Authority has not been able to access funds secured through CIL. This reflects in part few references to the Regional Park's role as strategic green infrastructure in the Regulation 123 lists of the riparian boroughs

Lea River Park

In contrast to the other two established areas of green infrastructure, the Lea River Park does not yet exist as a cohesive integrated area of open space. Proposed for the Lower Lea Valley in the boroughs of Tower Hamlets and Newham in East London, its genus reflects a failure of decision-makers to fully embrace Abercrombie's vision when the statutory boundary of the Lee Valley Regional Park was agreed in the 1960s. Fig. 3, on the next page, shows the location of the Lea River Park.

In 2004 the delivery of the Abercrombie vision by creating a cohesive park through the Lower Lea Valley to the Thames became the responsibility of the London Thames Gateway Development Corporation (LTGDC), which pursued the provision of GI as part of a strategic regeneration programme. The Greater London Authority's Lower Lea Valley Opportunity Area Framework,[6] published in 2007, identified the need for the proposed park to offset the anticipated housing growth. Continuing growth has occurred during the last decade, and the draft London Plan (2017) sets targets for a further 73,600 additional housing units in Tower Hamlets and Newham in the period from 2019/20 to 2028/29.[7]

Working with partners, the LTGDC was empowered to deliver a new linear park throughout the Lower Lea Valley, designed to link (via a new pedestrian and cycle route – originally called the 'Fat Walk' and now referred to as the Lea River Path) to existing spaces at Three Mills Green and East India Dock Basin and to new parks proposed for four other sites, including former gasworks at Twelve Trees and Leven Road. The LTGDC prepared numerous design frameworks and feasibility documents, but on its cessation in 2013 work on this project also ceased.

Following the abolition of the Development Corporation, critical work on securing the Compulsory Purchase Orders and planning permissions required to secure the route of the pathway and bridge piers and the completion of a primer and design manual was supported by the London Legacy Development Corporation. However, since 2015 the management of this project has been passed to a joint officer-led steering group with member support managed by the London Boroughs of Newham and Tower Hamlets.

Policy support for the Lea River Park and Lea River Path is now included in the emerging Local Plans of both Newham and Tower Hamlets. Both councils have a shared aspiration to deliver the new park and pathway. However, it is unclear how management arrangements for a future park in this area would work in practice.

As the planning of the new park is being 'retro-fitted' into a dense urban fabric, its creation faces significant challenges. These relate to the limited opportunities for large areas of land to be transformed into large areas of parklands, and instead new GI would have to developed as a series of medium-sized spaces with connections, often bridges across the River Lea, to create a contiguous area which would address the historic challenges of limited legibility and permeability.

Although to date significant progress has been made, the first real 'test' of Lea River Park's delivery has recently emerged on the site of the former Poplar Gas Works at Leven Road, Bow. Originally conceived by the LTGDC as the site of a park of 7.35 hectares, with bridge connections over the Lea to other areas within the proposed park, the brief included in the Regulation 19 draft Local Plan for the site now refers to 'infrastructure requirements' of 1.0 hectares of 'strategic open space' with a requirement to 'safeguard' land for the delivery of a new bridge.

However, a recently submitted application for the site includes a mixed-used scheme comprising 2,800 new dwellings, a primary school and other related infrastructure, with a local park of 1.0 hectares. At

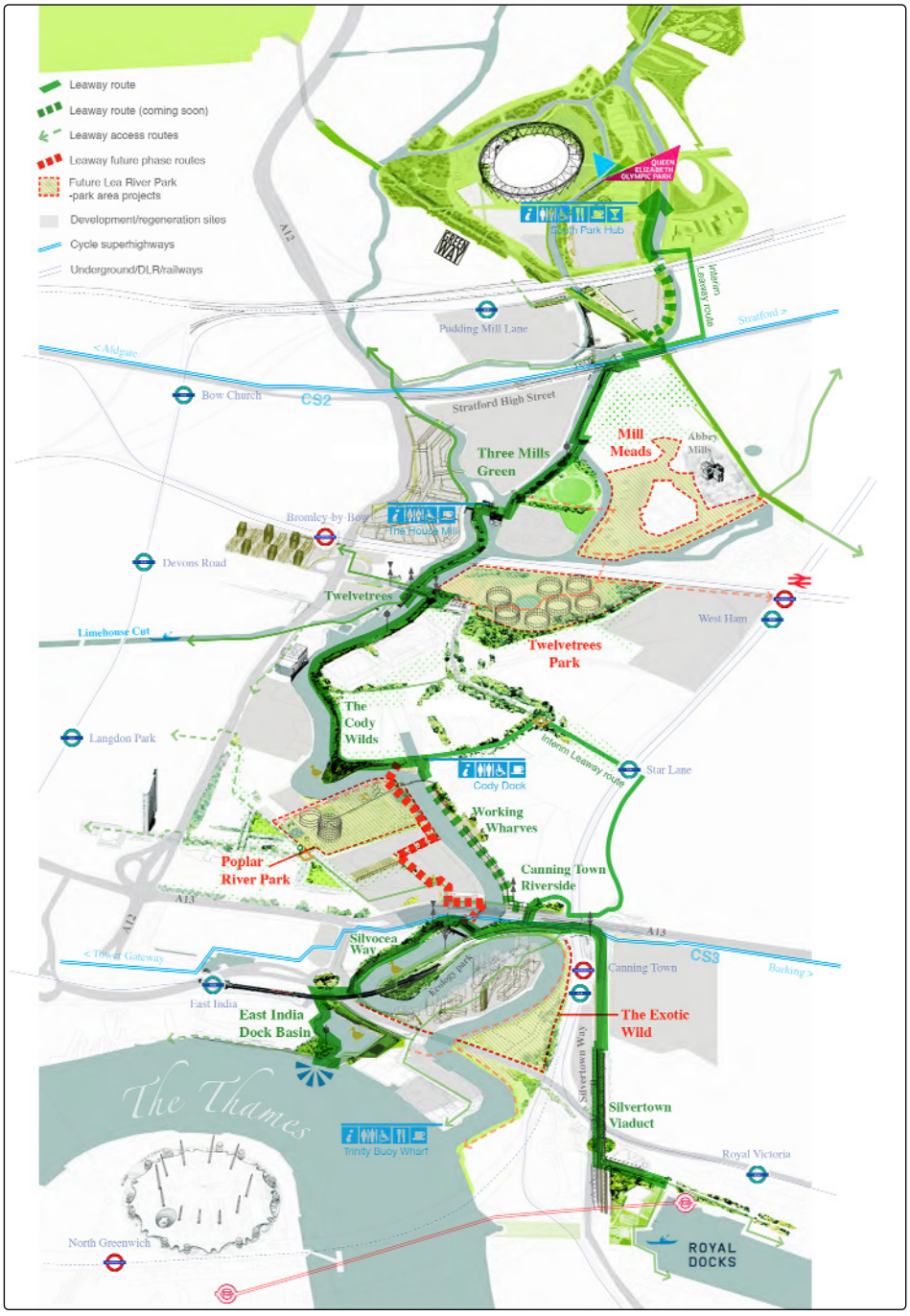

Fig. 3 The proposed Lea River Park

Source: Lea River Park Design Manual. Revision D. London Legacy Development Corporation, Oct. 2016. www.towerhamlets.gov.uk/Documents/Planning-and-building-control/Strategic-Planning/Local-Plan/Evidence_base_2016_ Local_Plan/DRAFT_LRP_ Design_Manual_Nov_2016.pdf

the time of writing, the application does not include any reference to the possibilities of a commuted sum for a river crossing, although it does include wayfinding maps indicating the site's connections to transport nodes and local services. However, the small size of the proposed park, together with the absence of a firm commitment to a bridge crossing, means that it will serve only the needs of the new housing scheme and cannot be considered as a component of GI. The whole premise of the Lea River Park was to ensure the provision of new GI designed to act both as an ecological and a recreational resource for the whole of the Lower Lea Valley.

While it is acknowledged that the initial ambitions for a large strategic open space on this site have been reduced by the realities of the development process, involving the costs of developing on a

contaminated site and the provision of a new school, it would seem that, in the absence of a firm commitment, the opportunities for this site to form part of an important area of GI have been lost.

While the final outcome of the application has yet to be determined, this case reveals the extreme difficulties in securing adequate new infrastructure through the planning process, despite there being a wealth of policy support and guidance designed to secure delivery.

Conclusions and implications for mainstreaming GI

Several lessons can be drawn from each of these case studies that demonstrate the marginalisation of GI in the planning and development process.

Firstly, reductions in public funding for GI have meant that local planning authorities are increasingly reliant on making the case to demonstrate its value. While natural capital accounts and ecosystem services are increasingly discussed by practitioners, it has proved very difficult to ascribe values to GI's multiple attributes that enable it to 'compete' for planning obligations against other priorities, such as affordable housing or school places.

Secondly, the Epping Forest SAC and Lee Valley Regional Park case studies demonstrate that, while planning obligations can be used to preserve 'protected sites', it is more difficult to secure funding for visitor infrastructure from developments which fail the NPPF 'test' of being 'directly related' to the proposed development even though they are likely to result in increased recreational pressures.

Thirdly, a thread common to the negotiation of planning obligations for new or improved infrastructure is one of playing 'catch up' as housing growth continues apace. This is despite the increasingly held view that networks of connected public open space define places and contribute significantly to people's lives through enhancing their mental and physical wellbeing, as well as providing a haven for biodiversity and contributing significantly to the resilience of cities. While individual applications for planning permission include areas of open space – in themselves a form of 'obligation' delivered 'in kind', in line with adopted Local Plan standards – these rarely form elements of GI and as a result have only a 'local' value. The case of the Lea River Park is instructive in this regard.

Fourthly, it is a 'moot' point whether moneys secured through planning obligations to support the asset management budgets of local authority parks' services meet all the 'tests' included within the NPPF, as the infrastructure is already in place. It is questionable whether the 'test' of necessity is being met, as no additional infrastructure is being provided to 'accommodate' the new pressures arising from housing development.

Finally, the government has recently consulted on lifting the restrictions on pooling planning obligations,[8] and on proposals for a Strategic Infrastructure Tariff[9] designed to enable groups of charging authorities or 'combined authorities' to use existing powers to deliver strategic infrastructure. If adopted, these measures would be welcome in potentially harnessing large pots of funding to deliver GI, and could address some of the issues faced by the Regional Park Authority in securing moneys for significant investment commensurate with its role. However, it remains the case that the funding of GI, like all areas of infrastructure, requires government to be proactive and lead, to address deficits that currently hinder the delivery of sustainable development.

● ***Stephen Wilkinson*** *is a Past-President of the Royal Town Planning Institute. The views expressed are personal.*

Notes

1 *Green Infrastructure Guidance*. NE176. Natural England, Jan. 2009. http://publications.naturalengland.org.uk/publication/35033

2 *National Planning Policy Framework*. CP 48. Ministry of Housing, Communities and Local Government, Feb. 2019 (updated version of the revised NPPF of Jul. 2018). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf

3 *The Community Infrastructure Levy Regulations 2010*. SI 2010 No. 948. www.legislation.gov.uk/uksi/2010/948/contents/made

4 *Epping Forest Visitor Survey 2014. Results Report*. City of London Corporation, 2014. Available at www.redbridge.gov.uk/media/3659/ced116-epping-forest-visitor-survey-2014.pdf

5 The spelling of Lea or Lee is a moot point. The 1966 Act refers to 'Lee', but the actual river name is spelt as 'Lea'

6 *Lower Lea Valley Opportunity Area Planning Framework*. Strategic Planning Guidance. Mayor of London. Greater London Authority, Jan 2007. www.london.gov.uk/what-we-do/planning/implementing-london-plan/opportunity-areas/opportunity-areas/lower-lea-valley

7 *The London Plan. The Spatial Development Strategy for Greater London*. Draft for Public Consultation. Mayor of London. Greater London Authority, Dec. 2017. www.london.gov.uk/sites/default/files/new_london_plan_december_2017.pdf
The latest version of the plan including the Mayor's minor suggested changes (Aug. 2018) is available at www.london.gov.uk/what-wedo/planning/london-plan/new-london-plan/downloaddraft-london-plan-0

8 *Reforming Developer Contributions. Technical Consultation on Draft Regulations*. Ministry of Housing, Communities and Local Government, Dec. 2018. www.gov.uk/government/consultations/developer-contributions-reform-technical-consultation

9 *Government Response to Supporting Housing Delivery through Developer Contributions: A Summary of Consultation Responses and the Government's View on the Way Forward*. Ministry of Housing, Communities and Local Government, Oct. 2018. www.gov.uk/government/consultations/supporting-housing-delivery-through-developer-contributions

TCPA/CURDS Conference

inclusive england – regions for all

Friday 21 June 2019, 12.00-16.00
Bamburgh Room, Hadrian Building, Newcastle University NE1 7RU

This focused half-day conference at Newcastle University will examine the challenges and opportunities facing towns and places away from big cities – the so-called 'left-behind' places – and the policies needed to inspire renewal. Speakers include:

- Lisa Nandy MP, *Founder of the Centre for Towns*
- Fiona Howie, *Chief Executive, TCPA*
- Carol Matthews, *Chair, Homes for the North*
- Jennifer Wallace, *Joint Interim Chief Executive, Carnegie UK Trust*
- Plus inspiring speakers from 'turnaround towns', and a panel discussion on the new North of Tyne Combined Authority
- Chaired by Peter Hetherington, *Past-Chair, TCPA*

Attendance at the event is free of charge, but registration is required through the TCPA website (where further details can be found – see below). The event is timed specifically to accommodate attendees from outside North East England, and will appeal to senior staff in local and national government, housing professionals, community groups, the voluntary and third sector, academics and students, as well as TCPA members.

Supported by CURDS, Newcastle University Institute for Renewal, and Homes for the North

For further information and to book tickets, see www.tcpa.org.uk/Event/inclusive-england-regions-for-all

Ecosystems Knowledge Network Training Course

incorporating natural capital and ecosystem services into environmental assessments

Wednesday 26 June 2019
Cloth Hall Court, Leeds LS21 2HA

Wednesday 27 November 2019
Cotton Centre, London SE1 2QG

The concepts of natural capital and ecosystem services are gaining prominence across Europe, alongside growing interest in nature-based solutions. There is a need to integrate these ideas into the Environmental Assessment, Strategic Environmental Impact Assessment and Sustainability Appraisal process.

By popular demand the Ecosystems Knowledge Network is offering this unique training course, delivered by Dr Bill Sheate and Spela Kolaric of Collingwood Environmental Planning. The course will include presentations with time for group discussion, as well as case studies and practical exercises. There will be flexibility to accommodate the interests of participants.

Early-bird rates are available, but for a limited time.

Explore the training description and book your place at https://ecosystemsknowledge.net/events/training-environmental-assessment

TCPA & Green Infrastructure Partnership Conference

achieving better green infrastructure

Wednesday 10 July 2019
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It is now widely understood that high-quality green infrastructure brings multiple benefits to individual people and society as a whole. But what does 'high quality' mean in practice? How can it be defined and measured? What does 'good' green infrastructure policy look like? How can councils, developers, public health teams, landscape architects, community groups, businesses and others collaborate effectively to maximise the benefits of the green infrastructure they create and maintain? This timely conference will bring together leading policy-makers, practitioners, academics and political leaders to explain the emerging new frameworks for assessing and improving the quality of green infrastructure – and how to put them into practice across the UK.

Discount rates for TCPA and Green Infrastructure Partnership members
For further information and to book a place, see
www.tcpa.org.uk/Pages/Events/Category/all-events?Take=14

Join the Green Infrastructure Partnership

The Green Infrastructure Partnership (GIP) is a network of more than 2,000 people and organisations that support the creation, enhancement and promotion of green infrastructure in the UK.

Sign up for free. Members receive a monthly GIP newsletter, which includes the latest green infrastructure news and information on events, publications and funding opportunities. Other membership benefits include invitations to key meetings, events and presentations, opportunities to network and influence green infrastructure at a strategic level, and access to the *Green Infrastructure Resource Library (GIRL)*, a unique database of documents, case studies, videos, tools and other information about green infrastructure and its benefits. To join the Green Infrastructure Partnership, visit www.gip-uk.org

The GIP is supported by the Landscape Institute as a professional standards partner and sponsored by Arup, the Canal & River Trust, GreenBlue Urban, the Land Trust, and Sport England.