

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 Nature³ 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 Byrne¹¹ 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 Book¹⁵ 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

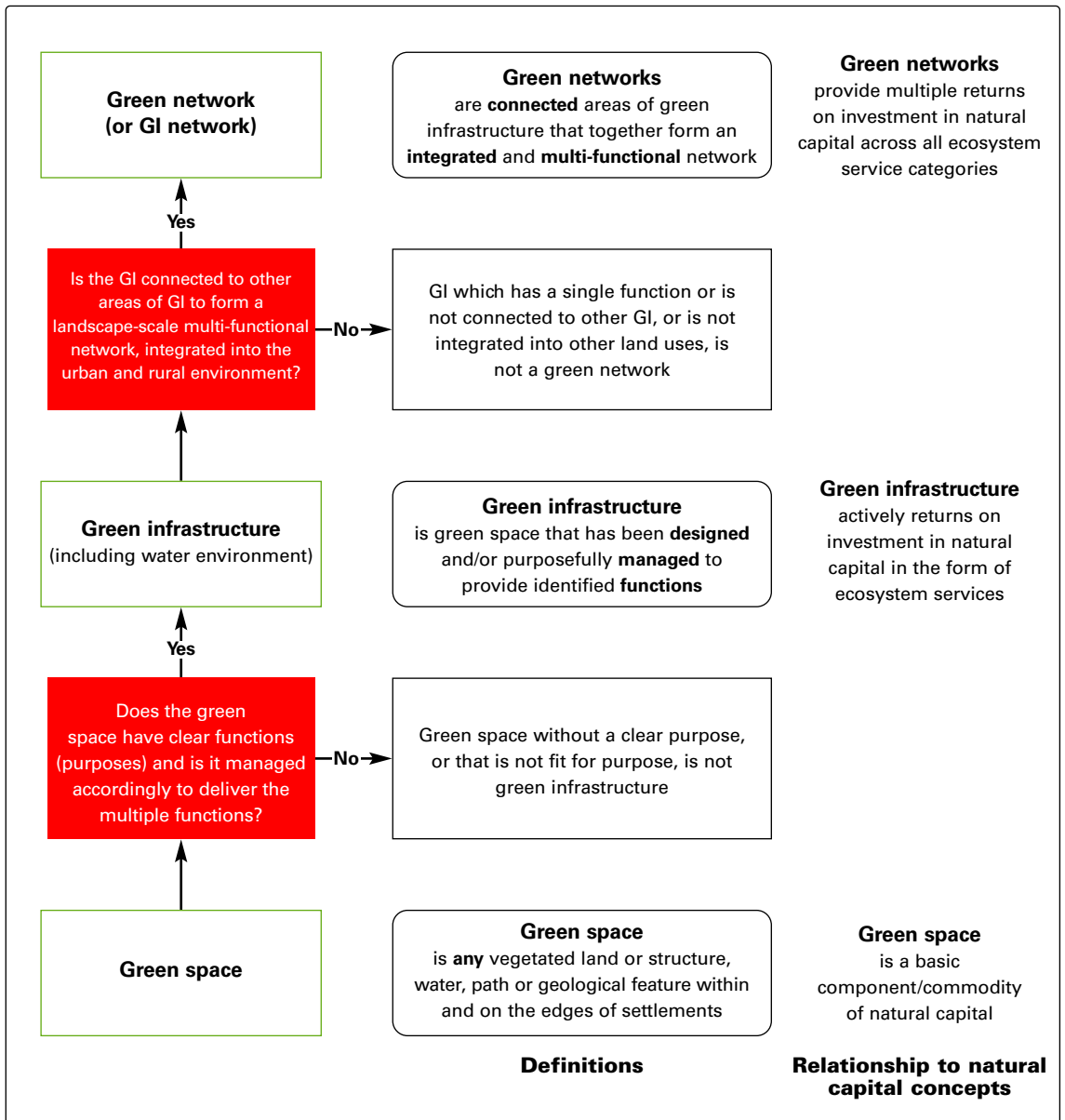


Fig. 1 The relationship between green space, green infrastructure and green networks

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

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

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

NPPF paragraph text relevant to assessment criterion K	Comment
<p>Para. 170: Planning policies and decisions should contribute to and enhance the natural and local environment by:</p> <p>a) protecting and enhancing valued landscapes, sites of biodiversity ...</p> <p>d) minimising impacts on and providing net gains for biodiversity ...</p>	<ul style="list-style-type: none"> ● Coverage score: 3 – Good coverage of ‘enhancement’ and ‘net gain’
<p>Para. 174: To protect and enhance biodiversity and geodiversity, plans should:</p> <p>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.</p>	<ul style="list-style-type: none"> ● 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'wship							
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	
		Integration with other priorities	Economic & social benefits	GI in plan vision & culture	Early/integral design	Early engagement	Multi-functional land use	Natural capital & ecosystem services	Off-site analysis	On-site survey	GI network	Enhance biodiversity	Habitat networks	Watercourses as GI	SuDS as multi-functional GI	Naturalised SuDS	Access to waterbodies	Aesthetic of waterbodies	Improve air quality	Active travel opportunities	Links to wider networks	Recreational routes	Open space standards	Multi-user design	Agreed management	Functional maintenance	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 Plan¹⁷ 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: <ul style="list-style-type: none"> ● 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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Notes

- 1 *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
- 2 M Hislop and A Corbett: *Green Infrastructure Policies in the CSGN – A Review of Local Authority Policies on Green Infrastructure in Built Development*. Glasgow and Clyde Valley Green Network Partnership. Apr. 2018. www.gcvgreennetwork.gov.uk/publications/790-gi-policies-in-the-csgn
- 3 See the Building with Nature website, at www.buildingwithnature.org.uk/; and D Sinnett,

G Jerome, N Smith, S Burgess and R Mortlock: 'Raising the standard: developing a benchmark for green infrastructure'. *International Journal of Sustainable Development & Planning*, 2018, Vol. 13 (2), 226-36

- 4 See the Glasgow and Clyde Valley Green Network Partnership's 'Delivering green infrastructure' webpages, at www.gcvgreennetwork.gov.uk/what-we-do/delivering-green-infrastructure
- 5 See the Mainstreaming Green Infrastructure website, at <https://mainstreaminggreeninfrastructure.com/>
- 6 J Wilker, K Rusche and C Ryma-Fitschen: 'Improving participation in green infrastructure planning'. *Planning Practice & Research*, 2016, Vol. 31 (3), 229-49
- 7 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, 1-52
- 8 S Connop, P Vandergerta, B Eisenberg, *et al.*: 'Renaturing cities using a regionally-focused biodiversity-led multifunctional benefits approach to urban green infrastructure'. *Environmental Science & Policy*, 2016, Vol. 62, 99-111
- 9 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), 612-20
- 10 A Scott, O Hölzinger and J Sadler: *Making Plans for Green Infrastructure in England: Review of National Planning and Environmental Policies and Project Partners' Plans*. Northumbria University & University of Birmingham, May 2017. <http://ncptool.com/Downloads/Making%20Plans%20for%20Green%20Infrastructure%20in%20England%202017.pdf>
- 11 T Matthews, A Y Low and J A Byrne: 'Reconceptualizing green infrastructure for climate change adaptation: Barriers to adoption and drivers for uptake by spatial planners'. *Landscape & Urban Planning*, 2015, Vol. 138, 155-63
- 12 See the European Commission's 'Green infrastructure' webpages, at http://ec.europa.eu/environment/nature/ecosystems/index_en.htm
- 13 K Horwood: 'Green infrastructure: reconciling urban green space and regional economic development: lessons learnt from experience in England's north-west region'. *Local Environment – the International Journal of Justice & Sustainability*, 2011, Vol. 16 (10), 37-41
- 14 See, for example, *Principles of Natural Capital Accounting*. Background Paper. Office for National Statistics, Feb. 2017 www.ons.gov.uk/economy/environmentalaccounts/methodologies/principlesofnaturalcapitalaccounting
- 15 *The Green Book: Central Government Guidance on Appraisal and Evaluation*. HM Treasury, 2018. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf
- 16 *The State of Natural Capital: Protecting and Improving Natural Capital for Prosperity and Wellbeing*. Third Report to the Economic Affairs Committee. Natural Capital Committee, Jan. 2015, Box 5.4, pp.43-44. www.gov.uk/government/publications/natural-capital-committees-third-state-of-natural-capital-report
- 17 *A Green Future: Our 25 Year Plan to Improve the Environment*. HM Government, Jan. 2018. www.gov.uk/government/publications/25-year-environment-plan
- 18 'Plan-making'. *Planning Practice Guidance*. Ministry of Housing, Communities and Local Government, Sept. 2018 (updated Mar. 2019). www.gov.uk/guidance/plan-making