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Negotiating value and priorities: evaluating the demands of green infrastructure development

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Negotiating value and priorities: evaluating the demands of green infrastructure development

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The potential of green infrastructure (GI) development has been recognised in a number of countries. In the UK, planning policy has identified GI and brought it into the legislative framework. It is assumed that it has a value for landscape enhancement for multifunctional aims: for increasing the adaptive capacity of the environment for climate change and long-term sustainability whilst protecting its ecological and social values. This paper uses an evaluative tool developed from a plan of action proposed in the early stages of GI thinking by applying it to a contemporary case study in England. This assessment reveals a mismatch between policy aims and the potential on the ground for creating GI. The study reveals ‘institutional schizophrenia’, a fragmented approach to the delivery of GI that affects stakeholder collaboration and confidence. The findings suggest a possible decrease in the level of GI creation because of restrictions placed upon local authorities and important repercussions for GI development and potential ecosystem services.

Keywords: Green infrastructure; multifunctionality; green space; landscape planning; stakeholders

1. The green infrastructure planning context

The focus upon green infrastructure (GI) planning in research and practice has increased in the past decade in a number of countries (Mell 2010). This is the result of a growing realisation that such an approach may have considerable potential in addressing the desire for more sustainable and multifunctional landscapes. The concept of GI appeals to a wide range of academic discipline areas, politicians and practitioners because its principles, first explicitly articulated by Benedict and McMahon (2002, 2006), provide a way of seeing solutions to problems at a variety of scales and landscape situations including urban, rural and natural conditions. A GI perspective provides primarily a people-based focus to landscape planning, but its roots lie within landscape ecological theory and its concerns are the interaction between land use patterns and ecological processes, wildlife movement and human communities at a range of scales (Forman 1995, Farina 2000).

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The emergence of the GI concept can be traced to the USA and the greenway movement (Benedict and Mahon 2002), which has had considerable influence on the development of a network-based approach to greenspace management to achieve diverse aims and multiple functions. In North America the first proposals for GI implementation were based on conservationist goals (Meffe and Carroll 1997, McKinney 2002). In the European context it has evolved a holistic and cross-disciplinary character. In the UK, GI ideas have now permeated into landscape planning practice and have prompted responses from national, regional and local government in the form of policy, guidelines and other documents (Llausas and Roe 2012). However, turning such enthusiasm into landscape solutions on the ground is proving difficult (Gale 2010). The UK has a strong planning system where protection and conservation is the primary consideration of much legislation and policy interpretation, with planning control focused predominantly on urban growth and grey infrastructure networks. Consideration of green planning in the city has been restricted to a narrow, often complementary role (Hall 1992). The emergence of GI is seen as a way to produce more coherent urban green space systems and sustainable urban landscapes (Handley *et al.* 2007, Tzoulas *et al.* 2007, Madureira *et al.* 2011), although examples of integrated and comprehensive thinking with regard to landscape as infrastructure are still rare (Beatley 2000, Landscape Institute 2009). The pressures placed upon landscapes are often contradictory and there has been much discussion about the aim of achieving a 'balance' between conservation, restoration and innovation in the development of landscape strategies (Warnock and Brown 1998). While erring on the protectionist stance has in many cases helped prevent damage to valuable sites, there is now a need to consider whether the present restrictive policy and legislation is preventing the development of GI solutions that would provide more flexibility and achieve beneficial change in line with the desire to achieve greater landscape sustainability.

The main argument of this paper is that there is now a need to devise and use evaluation approaches that act as decision-support tools to help resolve the problems relating to GI development, particularly in relation to the issue of landscape protection. The next section establishes how the development of theory and practice has led to the realisation of the potential values of GI. Using the example of GI planning in England, the paper then employs a simple theoretical tool developed from communicative research carried in the early development of GI thinking. This tool is used to evaluate a recent GI case study to assess the present state of development of GI practice in the UK. The findings of this study discuss the compromises and negotiations needed to develop GI and in response to the overall objective of the study, which was to examine the transferability of the evaluative tool and its usefulness in revealing what issues arise when designing and implementing GI.

2. The development and principles of green infrastructure (GI) planning

Various definitions of GI are now in circulation (e.g. Sandström 2002, Benedict and McMahon 2006, Davies *et al.* 2006, Sandström *et al.* 2006, Walmsley 2006, Ahern 2007, Tzoulas *et al.* 2007, Forestry Research 2010, Madureira *et al.* 2011). The term 'green infrastructure' was first coined by Benedict and McMahon (2002) and it can be conceived as "an interconnected network of protected land and

water that supports native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life for ... communities and people” (Williamson 2003, p. 4). There is no single theory of GI planning; rather it is based on a number of theories which can be sourced from the social and natural sciences. At a conceptual level it is possible to identify eight key principles of GI (Table 1), predominantly guided by those of geography, ecology and landscape ecology with reference most commonly made to a GI ‘concept’ and an ‘approach’ in the literature. Close links to sustainability thinking bring together social, ecological and economic concerns and the importance of participatory and stakeholder involvement in decision-making during the implementation process.

The consideration of quality is important in GI planning. For example, in physical terms connectivity or linkage is the most understandable principle. The derivation of thinking here relates to four key theoretical view points (Table 2) which are brought together in GI to suggest that while the discernment of single relationships is significant, wider interactions, contingencies and consequences need to be established, and these types of wider and more complex relationships, which determine the impacts of planning and land management decisions, can sometimes be unclear. For example, the loss of a small linear area of lower quality green space may have further reaching implications than the loss of a larger and higher quality area if the former represents a vulnerable link in a continuous network of publicly accessible land in an area of relative deprivation. The concept of linkages, and of a hierarchy of links, is similar to ideas derived from urban engineering infrastructure networks. Here the usefulness of the term ‘infrastructure’, generally applied to engineering or ‘grey’ infrastructure, can be seen. The quality of an infrastructure system is a critical part of its efficient functioning. The concept of ecosystem services (Moll and Petit 1994, Costanza *et al.* 1997, Harman and Choy 2011) is also useful because it requires that enough potential land is available to support quality ecosystems and viable connections between them, or a critical and robust green infrastructure (Ahern 2010).

In landscape planning it has long been recognised that the development of strategic policy options is not rigid between, for example, the creation and conservation of landscape, but that there is a continuum of possible choices leading to strategic options (Warnock and Brown, 1998, Wood and Handley 2001). This concept can be adapted for GI planning (Figure 1) so that a desired state objective can be identified. Protection/conservation and creation of GI are not mutually exclusive activities and the consideration of quality and function are important and overlapping areas of consideration (Weber *et al.* 2006) often now expressed in terms of ‘liveability’ (Shafer *et al.* 2000, Lindsey *et al.* 2001) and multifunctionality (James *et al.* 2009). Thus it is possible to see that GI development is not just about green spaces to fly kites and walk dogs; it is far broader in concept and practice, embracing a wide range and quality of environmental services such as heat and flood mitigation, safe journeys to schools and health and well-being (ODPM 2004, Ellaway *et al.* 2005, Maas *et al.* 2009).

Examples from around the world provide evidence of interest in the characteristics of GI and activities that have been identified as GI planning (e.g. Sandström 2002, Robinson 2006, Walmsley 2006, Yu *et al.* 2006, Ahern 2007, Handley *et al.* 2007, Madureira *et al.* 2011). The last decade has seen advances in GI thinking and planning through a number of practical projects influenced by

Table 1. Characteristics of a green infrastructure planning approach.

Principle	Example sources
<i>Holistic, comprehensive, flexible and integrated approach</i> to the treatment of planning environments (urban, urban fringe and countryside) and targets (nature conservation, social welfare and economic prosperity). GI may include 'green' parks, gardens, woodland and water bodies, but also linear features and routes such as footpaths, streams and rivers, cycle routes, roadside verges and linear woodlands.	Gallant <i>et al.</i> 2004, Countryside Agency 2005, Benedict and McMahon 2006, Thomas and Littlewood 2010.
<i>Primary importance of green infrastructure</i> : GI is the first step in a development process; GI should be identified, protected and planned before development takes place. GI is thus considered the fundamental infrastructure in landscape development and consideration of the quality and criticality of such infrastructure is important.	Beatley 2000, Davies <i>et al.</i> 2006, Landscape Institute 2009, Natural England 2009.
<i>Evidence-based approach</i> : GI planning is based on robust scientific knowledge gained from a number of fields including landscape ecology, land use planning theory and practice and landscape psychology.	Weber <i>et al.</i> 2006, Ahern 2007, Kambites and Owen 2007.
<i>Importance of scale</i> : In practice and procedure GI crosses administrative boundaries. It primarily uses theories of landscape scale in relation to natural and cultural processes (e.g. species movement; cultural identity) for landscape planning. Timescale as well as physical scale is important and embedded within both is hierarchical thinking, which has emerged from infrastructure theory and filtered into greenway development. Essentially strategic in nature, the 'parts' of the infrastructure system can be considered at a neighbourhood and site-based level as well as in terms of the strategic regional significance.	Little 1990, Fabos 1995 and 2004, CABA Space 2005, Tzoulas <i>et al.</i> 2007, Benton-Short and Short 2008, Farr 2008, Mell 2010.
<i>Multifunctionality</i> : the overall structure can fulfil a wide range of functions and diverse benefits to both human populations and nature encompassing human and ecological values, aesthetic gains and an enhanced quality of place, which in turn has links to economic viability and quality of life. Importantly, the potential for interactions between functions is emphasised. Each of these characteristics though can also be identified as primary objectives of GI, as well as providing multifunctional benefits. This links to sustainability thinking and long held views that multiple-use landscapes are generally held to be more robust than those with single-uses. This does not necessarily mean a 'more is better' principle should be adopted and there are instances where desirable functions are mutually exclusive.	Burgess <i>et al.</i> 1988, Soini 2001, Brandt and Vejre 2003, Gallent <i>et al.</i> 2004, Kaplan and Austin 2004, TCPA 2004, CABA Space 2005, Dijst <i>et al.</i> 2005, GONE 2005, MacFarlane 2007, James <i>et al.</i> 2009.
<i>Connectivity/Linkage</i> : GI can provide a series of 'nodes' and 'hubs' and corridors which provide physical linkage in the landscape and the opportunity for interactions between different actors in the landscape and within the landscape itself. Connectivity aims to combat fragmentation of habitats and isolation of species to reduce biodiversity losses.	Forman 1995, Nassauer 1995, Farina 2000, Jongman and Pungetti 2004, Countryside Agency 2006, Ahern 2007.

(continued)

Table 1. (Continued).

Principle	Example sources
<i>Participatory and Partnership approach:</i> A cross-disciplinary approach in practice and theory; achieving GI planning in practice demands the involvement of numerous stakeholders. Many other benefits are seen as accruing from such an approach including empowerment, social capital building, tapping into local knowledge, ownership and consensus building.	Healey 1997, Fischer 2003, TEP 2005, Davis <i>et al.</i> 2006, Roe 2007.
<i>Long-term approach:</i> GI planning requires a long-tem commitment, with public investment to achieve the potential for addressing sustainability issues through landscape planning, design and maintenance. Timescale is significant because change is considered an integral part of landscape which is seen as an ever-changing mosaic and thus management over time for future generations is practically and conceptually important and influenced by sustainability principles.	ODPM 2004, Williamson 2003, Natural England 2009.

Table 2. Linkage theories and approaches relevant to green infrastructure planning.

Commoner's First Law of Ecology: "Everything is connected to everything else" (Commoner 1972, p. 33).
Tobler's First Law of Geography (TFL) of spatial autocorrelation relates the principles of physics to geography to predict city growth by using classical diffusion equations. He indicated that different processes operate on different spatial scales and that everything is related to everything else, but near things are more related than distant things (Tobler 1969).
Forman and Godron in relation to Landscape Ecology: "Past functioning has produced today's structure; today's structure produces today's functioning; today's functioning will produce future structure" (Forman and Godron 1986, p. 3).
Nassauer (1995) observed, "culture changes landscapes and culture is embodied by landscapes" (p. 229). The symbiotic relationship that people have with the land over time creates what we term 'landscape' (Roe 2012a). Thus the landscape is moulded by the use and the modification of natural processes that day-to-day activities entail. The cultural/ social-natural linkage (or interaction) is described through a number of theories including 'sense of place', traditional knowledge, biophilia (love of living things), Tuan's (1974) topophilia (love of land), human ecology (relationships with the environment and interactions with natural processes) and liveability.

environmental agencies such as Natural England in the UK (Natural England 2009, Countryside Agency 2006) and the Conservation Fund in the USA (Benedict and McMahon 2006, Weber *et al.* 2006). GI planning has developed considerable momentum compared to other green planning theories (Benedict and McMahon 2006). Evaluations so far highlight GI in creating a holistic and multifunctional approach to planning at a number of scales (Williamson 2003, Blackman and Thackray 2007, Kambites and Owen 2007, Beatley 2009, Landscape Institute 2009). The GI principle of multifunctionality is a concept

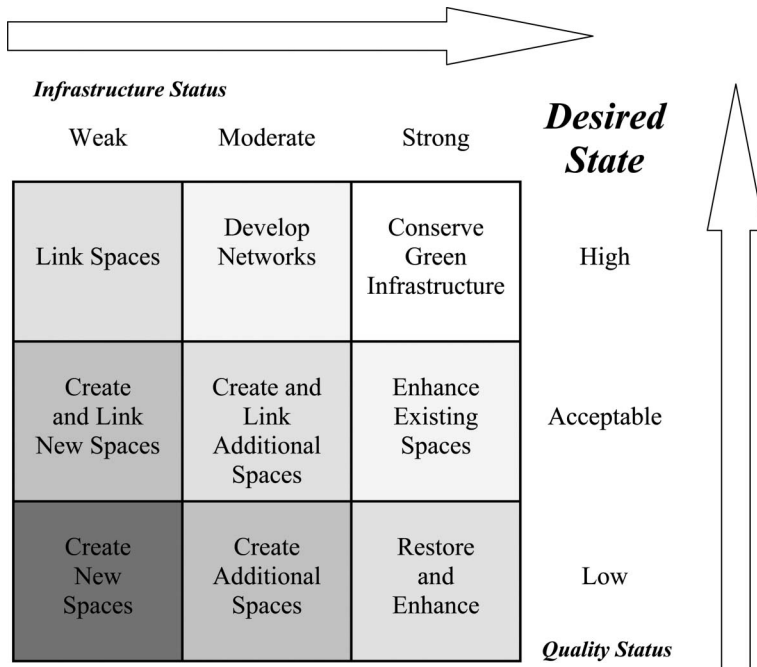


Figure 1. Green infrastructure strategy development options and desirable direction of change (based on Warnock and Brown 1998 and developed from Davies *et al.* 2006)

that is often contested at a practical level because of the difficulties of accommodating competing priorities of stakeholders (Natural England, 2009, Mell 2010). In this respect the important distinction between multifunctionality and the roles of integration and interaction in planning needs to be established. Integration concerns the spatial patterning of land-uses and activities (and, where appropriate, their integration through time). Interaction concerns the “beneficial interaction between these functions and components to serve the requirements of local economics, the environment and social objectives” (Gallent *et al.* 2004, p. 100). Multifunctionality is therefore an integration of and interaction between functions. Spatial integration is a prerequisite for multifunctionality and the way that functions (social, cultural and environmental) are understood to interact thus needs to inform GI planning.

Positive assessments relating to urban greening projects (Akiki and Kunihiro 2005), strategic and holistic urban planning models (TEP 2005), sustainable transport networks (DCLG 2009), promotion of biodiversity enhancement as a primary action not just as a multifunctional objective (Farr 2008), and a more in-depth understanding of the interaction of human behaviour, climate change and ecosystem process (Gill *et al.* 2007) have all been used as evidence that GI planning can help to meet long-term sustainability targets (Mell 2009). The potential functions of GI (Table 3) and advantages of a GI planning approach are thus becoming clearer.

Research related to GI suggests that addressing human-environmental impacts on climate change is likely to be the primary objective of the future development of GI planning (Dunn and Stoner 2007, Beatley 2009, Dunn 2010, Weber and

Table 3. Potential functions of green infrastructure (based on Williamson, 2003, Benedict and McMahon, 2006, Cambridgeshire Horizons, 2006, Ahern, 2007, Blackman and Thackray, 2007, Gill *et al.* 2007, Tzoulas *et al.* 2007, Landscape Institute, 2009, Mell, 2010; Natural England, 2010, Thomas and Littlewood 2010).

-
- Climate change adaptation (flood alleviation and cooling urban heat islands) and climate change mitigation (carbon capture).
 - Climatic control (microclimate cooling, energy savings, atmospheric purification and particle control).
 - Water cleansing and control (filtration, absorption, transpiration).
 - Economic development (providing the setting for attracting business, tourism, improved quality of life, raising house prices).
 - Sustainable movement (improved access and circulation).
 - Improved community cohesion (creation of social spaces, opportunities in the public realm, for engagement and empowerment through involvement in implementation decisions).
 - Providing leisure and recreation opportunities (outdoor relaxation and play).
 - Reconnecting people with nature (space and habitat for wildlife with access for people on the 'doorstep').
 - Learning opportunities (environmental education, involvement and training).
 - Local food production (in allotments, gardens and through urban agriculture).
 - Improved health and well-being (lowering stress levels, psychological wellness and providing opportunities for green exercise).
 - Protection of cultural and historic features and associations (ancient trees and woodlands, building contexts).
 - Enhancing local identity and sense of place (participation in landscape).
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Allen 2010). How this objective is supported by forward thinking landscape planning policy is more difficult to identify because of planning restrictions in countries such as the UK, including restrictive land prices, opposition to development and the prioritisation of large-scale grey infrastructure development over GI projects (Tzoulas *et al.* 2007). Further constraints are also created by the way that each landscape is also subject to processes and limits of its own (European Communities 2008). Finding the appropriate balance between policy focus and implementing adaptation and mitigation measures to combat climate change is a long-term challenge for those trying to implement GI (see Handley and Carter 2006, Gill *et al.* 2007).

3. Integrating green infrastructure theory into policy and practice in the UK

Over the last 10 years in the UK the recognition of the value of GI for landscape enhancement has been widespread by government strategies, initiatives and by agencies and professional bodies (DETR 2000, DTLR 2002, ODPM 2005, DCLG 2009, Landscape Institute 2009, Natural England 2009). These echoed views in the literature that have shown descriptions of GI as a life support system (Williamson 2003, Benedict and McMahon 2006) and fed into revisions to English planning policies.¹ Since taking over government in 2010, the centre-right coalition in the UK has begun a systematic evaluation of planning policy in England. It seems that GI may now gain the support of central government as an umbrella concept for landscape planning (Thomas and Littlewood 2010). The revocation of the regional planning system (RSS) and the emphasis on localism and the so-called 'Big Society',²

which emphasises community engagement in decision making, suggests that a more spatially restricted agenda of landscape management and decision making may be developed. GI objectives at the community level may be able to sit within this framework but the overall conceptual approach relating to scales, the potential of transferability across landscapes and for creating greater connectivity over the larger landscape scale may be lost.

4. Green infrastructure stakeholders and implementation

In England, Natural England has positioned itself as the main organisation and stakeholder driving the development of GI and is helping to refocus policy towards a greener and more sustainable agenda. Thus acting as a co-ordinating and guiding body, Natural England, along with other agencies including the Forestry Commission, has used GI research findings over the last 10 years to develop a policy framework that aims to implement GI (Natural England 2010). At all levels there are potentially numerous stakeholders in GI planning because of the complexity of the issues that GI covers (social, economic and ecological), plus the range of possible landscape scales covered by a GI planning approach.

This issue of stakeholder involvement in planning is becoming increasingly important. There are a number of definitions of the term 'stakeholder', i.e. local residents, businesses or special interest groups, and many different theories have been developed from management and business understandings of the term (Healey 2002). In collaborative and participatory planning approaches the term is broadly used to identify those parties (individuals and/or groups) who have an interest in a particular issue/site/policy (Healey 1997). Such stakeholders may hold influence over or may be those influenced by any potential decision. Stakeholders are generally attributed with particular interests and viewpoints that they wish to uphold, so the term 'interest group' is also often used interchangeably with 'stakeholder group' (Selin and Chavez 1995).

In recent years the literature has tended to focus on ways for stakeholders to achieve decisions through collaborative activities and theoretical analysis of the characteristics of stakeholders, suitable methods and approaches and why difficulties in such activities exist (e.g. Mayer *et al.* 2005, Ritchie and Ellis, 2010). There is much focus upon stakeholder conflict (Healey 1997). Much of the literature touches on communicative theory (Enyati 2001), and suggests that in multi-stakeholder groups communication performance can be improved if there are a number of rules, identified goals, a task strategy, high tolerance for conflicts and good feedback (Maznevski 1994). Stakeholder theory also relates to participatory theory and group theory, indicating that good stakeholder working with a diverse stakeholder group can provide considerable potential for innovative decision making and improved learning (Enayati 2002). However, as in participatory and conflict resolution theories, disagreement is seen as both a positive and negative aspect of such working; that is it can help reveal problems and issues that need to be addressed (Roe 2007, 2012b), but it may also lead to entrenched positions if the tolerance for argument and the associated emotional reactions is low (Margerum 2002, Nemeth and Staw 1989). A key issue in such collaborative stakeholder processes is the importance of the way in which stakeholders can reflect on the discussion as a way to solve problems that arise. Here theories such as Dewey's (1954 orig.1927) ideas on face-to-face communication, methods of reflective thinking and Schön's work (e.g. Schön

1983) reflecting on and thinking-in-action relating to professional working are relevant and provide the basis for good practice that gives equal consideration to the views of all stakeholders and a shared understanding of problems and how potential solutions are gained.

As an agent of change in GI Planning, Natural England has had considerable influence on the way GI is becoming established in policy and practice. Natural England can be seen both as an agent of change, and also a stakeholder because of the regulatory role this agency plays in relation to managing the landscape. The organisation can be seen as a 'super agency' with a variety of national and local roles relating to landscape enhancement, protection and development. The growth in GI interest has also coincided with the development of more visible and directed government policies that aim to tackle issues of climate change and to produce guidance on mitigation and alleviation measures with the intention of creating policy that is more integrated, active and cross-sectoral and less preservationist and based on separate sectors (Natural England 2009, Defra 2010).

However, increasing numbers of designated areas and more planning legislation in England has meant that planning has become a very prescriptive process, reinforcing the need to meet policies rather than the needs of the particular locations affected (Cullingworth and Nadin 2006). In turn, this has meant that those involved in planning have found difficulty in implementing their objectives. An example of this can be seen in planning for climate change. The availability of relevant data is overwhelming but responses in planning legislation have been relatively slow to come forward because of the difficulties in interpreting the science, in public perception of the issues and in achieving agreement by stakeholders as to appropriate action (Healey 1997). Local authorities have become cautious when identifying opportunities for GI development due to procedural difficulties and because they are unsure whether such proposals will gain legislative and political support even though general stakeholder endorsement may exist (Natural England 2009). Nevertheless, GI planning seems to offer an approach to mitigation and adaptation at a number of scales for stakeholders who need to re-think the way we plan and design the built environment in response to predicted climate change (TCPA 2004, Goode 2006, DCLG 2009).

This provides a picture of a situation where there are a number of difficulties presently being experienced by those wishing to implement GI planning and in relation to potential GI stakeholders. In the past Natural England and a number of regional and local authorities led the development of evaluation models and decision-making tools in England (Cambridgeshire Horizons 2006, Davies *et al.* 2006), whilst state and county authorities, e.g. the Maryland Department of Natural Resources, have done likewise in the USA (Weber *et al.* 2006). Each set of guidance produced has synthesised information in the public domain with the intention of aiding the implementation of GI without really questioning the issues of focus or addressing the need for clarity, appropriateness and deliverability which have been identified as problems with GI planning (Beatley 2009). Such organisations have also enabled the production of toolkits and information exchange (Kambites and Owen 2007). However, given the speed at which green infrastructure has developed within policy, it does in some cases lack clarity. There is also still confusion amongst stakeholders concerning the potential and nature of GI planning (Mell 2010), which is to be expected as planners are themselves also attempting to rationalise how they assess and communicate GI. Indeed, policy makers themselves seem unsure whether

action for implementation should be at national, regional or local level (Thomas and Littlewood 2010).

5. Methodology discussion: evaluating the development of green infrastructure planning

As suggested by Laurian *et al.* (2010), the outcomes of land use and environmental plans are rarely monitored or assessed *ex post facto* and thus it is difficult for practitioners and policy makers to learn from mistakes or pass on the benefits from learning what actually works. Similarly, academics cannot improve theoretical frameworks that have a practical application unless evaluation is carried out. However, the indication from the review outlined above is that further research is needed to provide evidence to aid the development of decision-support tools for GI planning. The *Magenta Book* (Government Social Research Unit 2000) describes policy evaluation as using a range of research methods to systematically examine the effectiveness of policy interventions, implementation and processes, to determine their value in terms of improving the social and economic conditions of different stakeholders. Summative evaluation assesses the effects of a policy or programme (whether it has worked) and formative (or process) evaluation of policy intervention assesses how, why and under what conditions a programme or project works or fails to work (Government Social Research Unit 2000). As in other areas of planning policy and because of the relative novelty of GI planning, there are few evaluations of programmes or projects (Benedict and McMahon 2006). In particular, there is a need to evaluate why there seems to be a considerable institutional desire to push forward GI planning, but much less success in achieving GI on the ground over the last decade. This highlights the temporal issue of translating policy into practice; change often takes some time, in this case despite considerable support for further development in GI (e.g. European Commission 2010).

In 2006 Davies *et al.* developed a collaborative Geographical Information System (GIS) scenario model approach to test the appropriateness of GI development and provide a '*Green Infrastructure Planning Guide*' for planners and other professionals. Using example areas in the North East of England, potential GI stakeholders were asked to identify the challenges for GI planning. These were developed into a series of scenario questions to ascertain what elements are possibly tradable to achieve net environmental gains in both an infrastructure and qualitative sense relating to the resource base of the physical landscape, policy context, funding, location and availability of data, all of which were used to identify whether a GI project would meet the ecological, economic and social needs of an area (Figure 1).³ By outlining the broad spatial vision, delivery focus, the landscape context, the scale of development, location and the planning regulation or restrictions, the approach provided a systematic basis for discussion by stakeholders of the possibilities of GI. Since a primary focus of the study had been to gain the views of a range of stakeholders involved in GI delivery, the questions developed were felt to provide a useful basis for the evaluation of present GI implementation.⁴ It should be acknowledged that although the creation of a hierarchy of GI characteristics was not the primary aim of this process, where commonalities between responses were seen, specific GI principles were identified for further examination. A retrospective examination of the development of Ely Country Park, Cambridgeshire, UK was assessed as a case study with the following two objectives:

- (1) To evaluate the political, social, ecological and financial demands of green infrastructure planning by assessing the success of the process carried out in the Cambridgeshire case.
- (2) To consider whether the evaluative questions developed in the North East would provide a useful basis helping to understand the difficulties of GI planning in other case studies or locations.

The methodology used during the original North East study was collaborative landscape planning structured around participatory stakeholder workshops as the main tool (Margerum 2002). The GIS model was developed from the findings in workshops with a large stakeholder group and used interactively during sessions with a smaller stakeholder group or Research Steering Group; the main objective was to consider the findings of the stakeholder workshops and investigate the potential for GI. An iterative approach was used to concentrate the views of the larger group into a smaller number of objectives and principles. These were then related to smaller group of GI policy and implementation practitioners for further comment and debate. A number of evaluative questions emerged during the participatory research process (Table 4). Collaborative workshops were used where roundtable discussion and break-out groups with researchers as facilitators teased out and agreed the key issues which became the basis for the development of a smaller list of six key questions (Table 5). In order to ensure that participants were informed about the current context for the study and the objectives for the initiative, short summary papers that reviewed existing literature, initiatives, policies relevant to GI planning, and the conceptual development and basis for GI thinking were

Table 4. Initial evaluative questions developed during collaborative workshops intended to encourage consideration of the local detail while appreciating the bigger picture of GI network development.

Overall understanding of a GI network:

- What is the current level of provision of different kinds of green space, and how well does a given area meet the various standards referred to above?
- Where are the gaps in the current level of provision?
- Of the identified gaps, which are the most significant in respect of the characteristics of surrounding areas?
- How do the gaps relate to a strategic sense of where multi-functional links and connections should be made?
- How might the gaps in provision and the strategic network be addressed in a spatial sense?
- Where are the opportunities that might be explored to address those gaps?

Additional considerations at a more local level:

- Where should new spaces (green spaces of different types) be created?
 - Where could new spaces (green spaces of different types) be created?
 - Where should consideration be given to transforming the character of existing green spaces?
 - Along which routes and areas should, and could, existing green spaces be linked?
 - Which are the most vulnerable elements and links in the network?
 - Which green spaces may potentially be 'traded' in a planning gain context to allow development on green or 'brownfield' sites?
-

Table 5. Questions identified for use in GI plan development.

-
1. What green infrastructure elements must be protected?
 2. What elements should be changed in character or enhanced?
 3. Where is there a need to create new elements and what type should they be?
 4. Where should the development of grey infrastructure be integrated with GI?
 5. Which elements should be linked together?
 6. Which elements are possibly tradable to achieve net environmental gains in both an infrastructure and qualitative sense?
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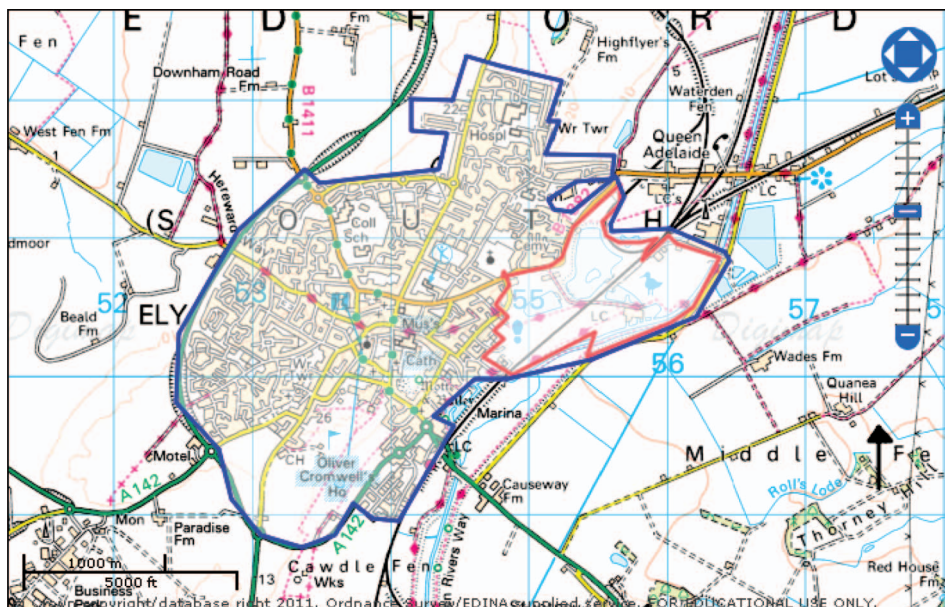
(Source: Davies *et al.* 2006)

produced by the researchers and circulated to participants prior to the workshops. The second round of debate included representatives of the Countryside Agency and English Nature (both now Natural England) as key delivery agents whose knowledge of policy formation and delivery were considered valuable in translating the conceptual ideas into a useable GIS programme for implementation. Other than the researchers, 31 individuals took part, and apart from one PhD student, these were representatives of stakeholders including the local authorities, Community Forests, sustainable transport organisations, government environment agencies and environmental NGOs. Eighteen of the participants were based with local authorities with responsibility for planning, transport and/or environmental matters. The major benefit of consulting such a broad ranging group was to bring together social scientists, ecologists, planning and civil engineers with a breadth of experience and evaluative capacity relating to GI and landscape planning. A GIS based model was developed using two exemplar sites in the North East region.⁵ This model was used interactively during Research Steering Group sessions in order to develop a GIS-based Green Infrastructure Planning Guide which included six evaluative questions. This guide was placed on the Internet for open access.⁶ The key questions that emerged from this research formed the basis of the assessment of the Cambridgeshire case study (Table 5).

6. Case study: Ely Country Park, Cambridgeshire

The 2006 *Cambridgeshire Green Infrastructure Strategy* identified Ely Country Park as an important site within a potential regional GI network (Cambridgeshire Horizons, 2006). The Park is located at a strategic point in Cambridgeshire relating to the Great River Ouse, the River Cam, and to other important large-scale landscape sites such as Wicken Fen (Figure 2). The Park is ecologically and socially important and covers 78-hectares of the urban-fringe of the City of Ely (Cambridgeshire Horizons 2011). The lead agent for implementation of the GI project was East Cambridgeshire District Council (ECDC), supported by a number of stakeholders including the Bedfordshire, Cambridgeshire, Northamptonshire and Peterborough Wildlife Trust, the Environment Agency, Natural England, local businesses and landowners.

The Park consists of six individual land and water parcels owned by a range of local landowners, the Environment Agency, a local conservation group and ECDC. These six areas include open agricultural land with public access, a semi-formal park, a large lake, a public common/wildflower meadow, a small area of woodland and flood fields. Open public access is available to 80% of the site which is known as Ely



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City of Ely boundary



Ely Country Park boundary



Figure 2. Ely Country Park location (1:20,000). (Colour version online.)

Country Park (ECDC 2008).⁷ One section is designated a nationally important geological and biological Site of Special Scientific Interest (SSSI). It is also one of the few identifiably transitional landscapes between the urban fabric of Cambridge and the wider fenland landscape of the region. Public consultation exercises identified the main objectives and visions relating to three key subjects: biodiversity and conservation, movement/connectivity/circulation and access, amenities and multi-functionality (Sheils Flynn/Ursus Consulting 2009) (Figure 3).

Much of the area is wetland and it helps to alleviate flooding in this flat landscape where the water table is high. The concept for developing the area was to create a fen island landscape with permanent wetland areas to help provide a clear barrier between Ely and the surrounding countryside and provide potential as a sink area related to the impacts of climate change (Sheils Flynn/Ursus Consulting 2009). The plan was analysed to show how the proposals would achieve key GI principles found in the literature (Table 1).

Despite obtaining political and financial support, those within the local community and local authority promoting the proposals for the Park faced a number of difficult planning issues. These related to the predicted population rise and economic growth and the restrictions placed upon development by Natural England and local environmental groups in light of the SSSI. The discussions in 2008–2010 between the various stakeholders concerning implementation were fraught with disagreement played out in the local media (*Ely Standard* and *Ely Weekly News*) and council committee meetings. A qualitative evaluation was carried

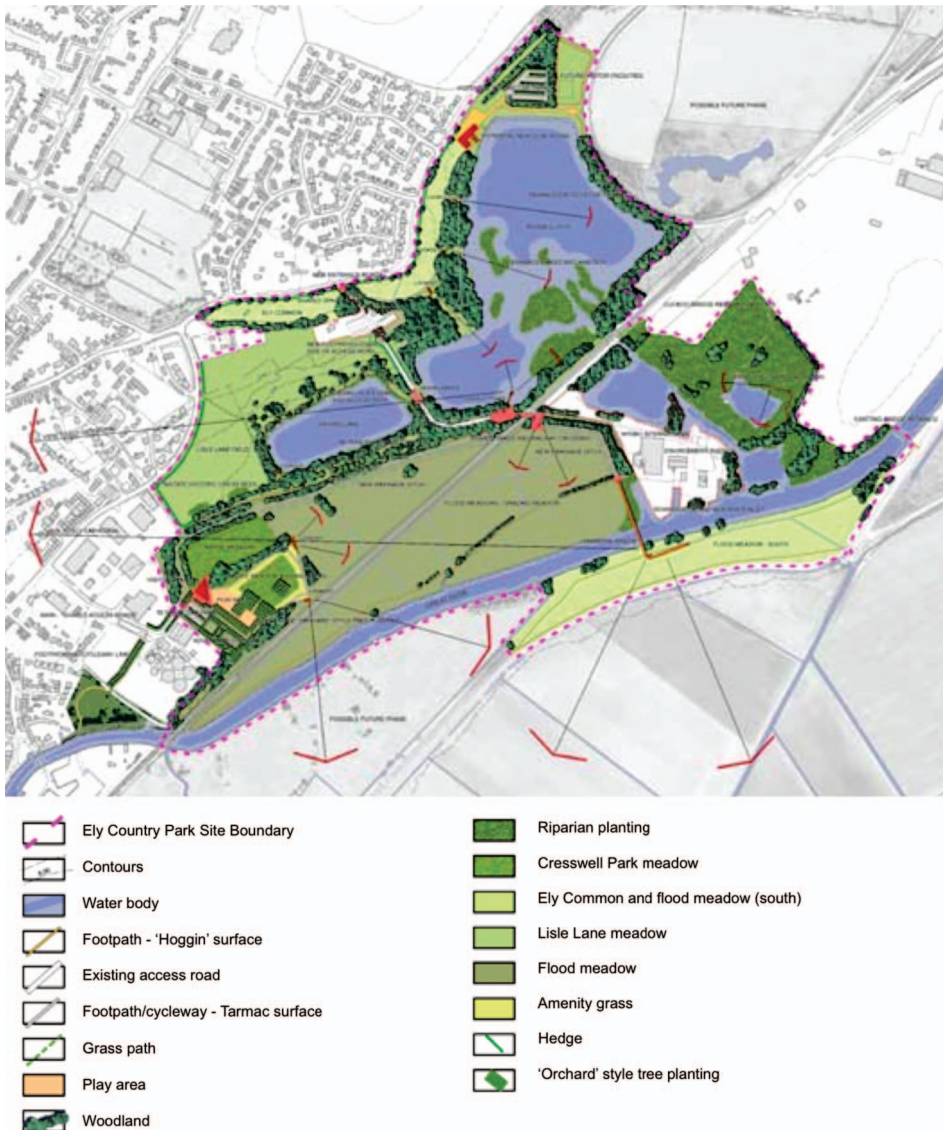


Figure 3. Ely Country Park Development site (scale 1:2,500). (Colour version online.)
Source: Sheils Flynn/Ursus Consulting 2009.

out on the Ely project using the questions developed in the North East study described above. The research was based on collaborative review and evaluative inquiry using the expert knowledge and experience gained by the evaluators of both the original North East study and the Ely case. Source material used was the overall documentation relating to the project, plus a literature review to develop the methodology and place the study in context. Analysis of the findings in relation to Ely revealed issues relating to both the substantive outcomes and the process characteristics (Margerum and Born 1995, Healey 1997) of the case study project. Thus both outputs and process issues are discussed in the following section.

Table 6. Detail of visions and proposals for Ely Country Park.

Public objectives and visions:

- To identify nature conservation and strategic management zones.
- To improve circulation and movement of people within and around the Park, Ely and the wider fenland landscape.
- To develop facilities that promote local interaction with the site and provide the basis for a long-term and sustainable use of the site by local people and visitors to Ely.
- To protect and enhance the historic nature of Ely and develop more direct links between the social and ecological history of the Park area and the Fens.
- To increase access to a range of high quality GI resources.
- To promote connectivity within and around Ely and the Park.
- To protect the existing ecological resources.

Detailed planned physical outputs:

- Ely Common – creation and management of a species-rich wildflower meadow.
- Roswell Pits – maintenance of the geomorphological exposure of Kimmeridge Clay, maintenance and protection of the wetland habitat supporting the rare *Botaurus stellaris* (Great or Booming Bittern) population, maintenance of habitat for other rare wildfowl including Bearded Tit, Cetti's Warbler, Marsh Harrier, Little Plover and Osprey (25ha or a wider 85ha complex).
- Cresswells Pocket Park – in terms of biodiversity, provision of improved habitat at the site's margins, installation and appropriate management of fenland plant species, protection of existing sites for bird and bat nesting. Provision of play, recreation, and leisure facilities (and associated amenities) for visitors including a visitors centre, play equipment, cycle track, car and cycle parking, catering and toilet facilities.
- Flood meadows – maintenance of existing habitats encouraging protected amphibian populations, continued support of the stewardship management scheme providing public access and grazing areas; provide flooding sink.
- Fishing lake – improved access around the lake and construction of new fishing platforms.

7. Discussion

7.1. Findings and analysis

The main results are summarised in Table 7. The assessment reveals a number of overlapping themes, which are identified in the following discussion.

Ely has a deficit of accessible natural green space and the Park proposals were seen as a key strategic project to provide better health and well-being (ECDC 2005) plus educational and recreational opportunities to get close to nature. The analysis showed that key GI principles could be achieved by the proposed plan. Ely Country Park comprises a number of land units, some of which have national and county designations where nationally and internationally important plant, bird and animal species are found, nest or breed. Natural England is the statutory body charged with monitoring the area and can take legal action to delay or fine anyone undertaking restricted activities without due permission. Natural England joined local conservationists who lobbied to limit the level of development undertaken at the Park.⁸ This campaign became one where the primary objective was to stop the proposals based on concerns over the impact on the SSSI designation. Thus objections were based on a perception that it was more important to protect particular species in specific areas of the Park rather than achieve multifunctional aims through the proposed access

Table 7. Summary of the green infrastructure principles utilised at Ely Country Park.

Principle	Examples of how GI principles were met by the Ely Country Park Plan
Holistic, comprehensive, flexible and integrated approach	<p>The process of developing the area required a high level of integrated thinking and management in creating the Cresswells Park area in particular.</p> <p>The management of the flood meadows and Roswell Pits required a comprehensive approach.</p> <p>A suitable management regime for the Roswell Pits area required an integrated approach using scientific/ecological data as the basis for discussion between partners.</p>
Primary importance of green infrastructure	The proposal responded to extensive calls within Ely to develop outdoor locations that addressed the deficiency in open space and facilitated greater interaction and understanding of the landscape.
Evidence-based approach	Extensive scientific/ecological surveying was carried out and the findings used to inform the discussion between partners and development of the Park plan.
Importance of scale	The proposal responded to a variety of scales: it provided access and facilities at a neighbourhood level; was a major feature in relation to the landscape structure of the city of Ely and the functionality of the greenspaces of the city; and, as the largest urban fringe public greenspace in the area, was regarded as an important county-scale investment.
Multifunctionality	The character and features of the Park plan aimed to provide a range of integrated, complementary and stand-alone functions and benefits (see Table 1).
Connectivity/Linkage	Linkage was evident through the planned improvement in access within the Park, externally to the city of Ely and in relation to its role as an important County recreational facility and wildlife site.
Participatory and Partnership approach	The project was based on partnership working, funding and management.
Long-term approach	The proposed management regime highlighted the long term aspirations to manage the resource sustainably.

controls, participatory and educational activities. Legally Natural England was discharging its role but placed additional restrictions on the location and proximity of development to the SSSI. However, within the project plans any development was considered against a number of specific criteria, including the potential impacts on specific species. Any negative impacts that may have occurred due to the scale or location of development were assessed and in many cases proposals changed to meet the requirements of Natural England. Such actions of this nature included relocating paths, the use of specific materials for access routes and the removal of bird hides and viewing platforms overlooking sensitive locations.

However, the actions of specific stakeholders who emphasised the importance of the role of ecological conservation over other interests led to an entrenched conservationist view becoming normalised within discussions about the Park. Agreement was not achieved because of the conflicts raised as a result of individual

and organisational priorities, land ownerships and the restrictions imposed by landscape designations. The more strategic view of the wider significance of the area as part of a GI network was lost and although the area had already been transformed from a landfill site, further change to achieve multifunctional aims was being questioned. Furthermore, although negotiations were held that reflected the concerns of Natural England, adaptation of the Park plans were deemed inappropriate despite modifications. ECDC were mindful of the potential impacts on the SSSI designation and proposed changes that would isolate impact to one specific area to minimise the influence of additional users. However, this was not considered an adequate method to achieve protection despite reassurances from ECDC that access would not be actively pursued in the most sensitive areas.

The difficulties here appear to have been twofold: an imbalance in stakeholder power (although all stakeholders were discharging their legal obligations correctly) and, associated with this, the fact that a major stakeholder was acting in more than one role. Natural England was acting in apparently conflicting roles: as both a major stakeholder and a regulatory body. The key point here is that the organisation's view carried particular weight and was of major significance. The regulatory role was to apply SSSI legislation correctly, whilst the role of stakeholder was meant to provide a wider platform to engage and promote best use of the wider Park site. The plans aimed to extend the range of user groups and stakeholders through participatory activities and improved facilities, which would open up the area to a wider public. However, these stakeholders do not appear to have had an equal voice in the decisions taken. The relationship of influence between Natural England and ECDC primarily reflected the regulatory role of Natural England. This also superseded the local calls for improved green infrastructure resources to meet a citywide deficiency.

The Park opportunities had been identified in a number of local policy documents (ECDC 2005). This had been reported in strategic county and district documentation and thus it was possible for ECDC to negotiate Section 106 financing⁹ from developments to fund the proposed footpaths, cycleways and visitor centre. However, the designations put those controlling the statutory designations within the Park in a position of greater power than, and in this case at odds with, the local government and planning body, which represented the local community interests at neighbourhood and strategic level.

Overall environmental losses were regarded by all stakeholders as unacceptable in developing proposals for the Park, although the added value that the proposals would bring was considered central to its continued development and the elected council members voted to continue developing the site after being provided with ecological reports and assessments of the proposed impacts of the development. However, tradability in order to achieve net environmental gains in relation to the area was not well explored because of the lack of flexibility in the restrictions of the designated areas. Such limits meant that its full GI potential for connectivity, access, multifunctionality and the provision of amenities could not be achieved, even though the need for such provision was readily apparent and recognised by stakeholders. Thus the consideration of need, in the case of Ely for additional multifunctional GI, was not viewed by all stakeholders as being as important as maintaining the ecological integrity of the site.

The analysis of the data revealed planning and implementation difficulties, a number of which were also identified within the Park's scoping study. Despite an acknowledgement of the value of GI by those interested in promoting GI planning,

the full potential of this Park could not be realised. In spite of consultation at every stage of the visioning and programme development, there appears to have been a failure by a number of parties to achieve a full understanding of the potential provided by the landscape in this context, particularly in relation to the value that this site had for strategic GI planning.

7.2. *The usefulness of this evaluative tool*

The evaluation showed that while the proposals in the East Cambridgeshire case study could potentially provide benefits in relation to site-based issues, the real difficulties did not lie in the planning of the features of the landscape but primarily in the process of achieving multiple aims with the input of numerous stakeholders with unequal power. Although, some stakeholders held concerns over the site proposals and expressed their opposition in relation to their legislative roles, the majority of stakeholders and users identified the proposals to have functional benefits. Thus the problem was not just about an imbalance of power, but also about the conflicting roles which lay behind the stakeholder power imbalance. The evaluative tool used to identify this situation emerged from a successful collaborative project and perhaps this is why it was helpful in trying to understand the particular areas of difficulty where the collaborative process in the Cambridgeshire case had apparently failed.

There are still issues that remain unclear in relation to the translation of GI principles and theory into practice generally. In this case there was a failure in building a joint vision and strategic thinking in spite of a collaborative process. The local planning authority has been thwarted by those with responsibilities for upholding nationally-significant site-based landscape restrictions. This situation is perhaps particularly interesting because it might be expected that a national agency would be more concerned with the wider strategic thinking than the local body, whereas the opposite appears to be true. It shows some of the potential difficulties in implementing GI development which aims to achieve a range of landscape objectives where there is strongly protectionist legislation relating to biodiversity at the site level, and also where the decision-making system of planning implemented at the local level requires the involvement of many different stakeholders.

While the stakeholder process that occurred in the North East case to develop a decision-support tool was successful in examining and producing 'in principle' approaches to GI planning, the stakeholder process that occurred in the Cambridgeshire case study was marred by many of the problems commonly highlighted in the literature for participatory and stakeholder working. The evaluative questions used helped to identify the key issues, not only in relation to stakeholder working, but more specifically, stakeholder interests in this context of GI. We conclude that while stakeholder literature is useful to provide guidance on theoretical approaches to stakeholder processes, it is important to consider the specific context of the process – in this case GI planning – and the considerable difficulties for stakeholders in working where there is a range of scales to consider.

This evaluation tool identified in particular the process difficulties related to this case study. The evaluation highlighted the difficulties where a key stakeholder has dual roles (promoter of GI and statutory protector of special landscapes), and therefore is encouraged to exhibit what could be labelled as 'institutional schizophrenia' based on the notion that policy directed to increase the proportion of GI does not merge

successfully with the protectionist conservation agenda that limits GI development. These objectives do not necessarily negate each other, but as the case study suggests, there is a disjuncture between the policy being produced and the manner in which it is implemented. Policy needs to be clearer on how protection can be attained in more innovative ways while allowing for achievement of multiple aims.

8. Insights and conclusions

The possible conclusions from this study are wide ranging and indicate many areas for further discussion and examination. There are difficult and sometimes sensitive decisions to be made in GI planning but it could provide a way to bring in a new and more positive approach to strategic landscape development that protects through enhancement (e.g. Kambites and Owen 2007, Natural England 2010). In particular, the issue of tradability needs to be considered more carefully.

The scenario model (Davies *et al.* 2006) highlighted the importance of bringing together stakeholders to discuss the issues and benefits related to a particular GI project at an early stage, supporting the general literature conclusions. The failure of collaborative processes, as noted in the research literature, can be highly frustrating to the parties involved, and the literature supports the notion that a well-planned collaborative planning process is important if the interests of all groups are to be upheld and successful GI plans negotiated (Benedict and McMahon 2006, Natural England 2009).

It seems that it is the criticality of the relationship between stakeholders and their roles that emerges as a key conclusion. In the past the literature has suggested that stakeholders can hold a variety of roles in successful collaborative planning (Healey 1997, Cullingworth and Nadin 2006), but this was clearly a problem in the development of Ely Country Park examined here. A better alignment is therefore needed between policy makers and the roles of government organisations and statutory consultees. It has also been suggested that through a more extensive process of consultation reflecting local needs and statutory designation, development proposals may gain increased support. The rise in the influence of environmental agencies, through their role as statutory agencies but also as engaged stakeholders, may also lower the power of planning authorities to make decisions regarding landscape development. The analysis of Ely Country Park shows that this may decrease the level of GI creation because of the restrictions placed upon developers/local planning authorities. This unsatisfactory situation would seem to support a promotion of the localism agenda (Gale 2010), but in GI planning this is not necessarily so because a key principle is that development needs to function at all scales, not just at the local level. A clearer and more joined up approach to policy and consultation, as noted by Blackman and Thackray (2007), is needed to ensure that the implementation of policy actually reflects the objectives of the relevant policies through policy enablers/stakeholders. More attention is also needed to ensure that lessons learned in the implementation of GI policy at a strategic, and at a local scale, are disseminated to all stakeholders (Ahern 2007). This study indicated that information gained from the experiences of GI planning in different parts of England has so far been poorly assimilated by those with responsibility for policy and decision making.

Balancing the potential benefits of GI enhancement or creation with the constraints of legislation proved difficult in Ely. Although negotiations between local

authorities, environmental agencies and the public are commonplace in planning, it has been suggested that the added value that may be gained from landscape development is often overlooked. We believe that there is presently a mismatch between policies that promote GI and the focus of policy implementers that needs further examination. In particular, in the UK there appears to be a mismatch between the policy aims and the potential on the ground for creating GI through collaborative stakeholder decision making. At present the restrictions, whether motivated by legislative or other reasons, placed on local planning authorities (GI developers) may be decreasing the potential for GI creation. However, GI implementation is now progressing in England with projects such as those in the North West and Midlands that tackle water management, create new urban forestry and greenways, and conserve nature. Although the development of GI thinking is an exciting and innovative story, it is one where there appears to be no clear leader so far. Thus, although there are a number of organisations putting themselves forward as GI champions, the frustrations of actual implementation inherent in the process, as shown in the Ely case study, indicate that the full potential of GI may never be reached in the UK under the present policy framework and implementation responsibilities. Translating the theoretical and policy agenda that has developed around GI is proving to be a long-term and adaptive process, as is common to much planning policy, and as identified at the start of this paper. However, the use of evaluative assessments such as the one applied in this study may provide support to those seeking to develop more innovative and collaborative approaches to landscape management.

Notes

1. Planning Policy Statement (PPS) 1: Delivering Sustainable Communities, and Planning Policy Statement (PPS) 12: Local Strategic Planning.
2. The 'Big Society' is presently not mandated in the UK, but this idea of the coalition Conservative-Liberal Democrat government has however influenced the development of policy and practice in 2010–11 to a large extent and there are suggestions that this process will continue.
3. See also work carried out by the North-West Green Infrastructure Think-Tank, Cambridgeshire Horizons and LDA Design (2009/10), Maryland Department of Natural Resources, and the Conservation Fund.
4. Stakeholder involvement had been identified in the GI literature as a key issue in the identification of GI projects and their successful delivery.
5. The GIS model was based on available land use data, ecological assessment publicly available and access information. The model ascribed value to areas of multiple function (i.e. ecological, access, social or economic) and areas where opportunities existed for future GI development. Specific elements were allocated values based on existing legal frameworks and management regimes, e.g. landscape designations.
6. This guide remained open to public access until 2010.
7. Gaining consent and support from each landowner placed a number of time constraints on the project, which delayed consultation, design and implementation of the project.
8. Natural England and other advocates opposed to the overall or partial development of Ely Country Park made personal representations to ECDC staff over the course of the project. Statutory responses were also filed when planning applications for works on the Ely Country Park site were made. All planning conditions associated with the development works between 2009–2011 were met and discharged.
9. This arrangement allows local planning authorities to achieve agreements where public gains are made in exchange for allowing developments to go ahead. The use of S106 agreements is being gradually phased out and will be replaced by Community Infrastructure Levy (CIL) assessments.

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