
Green Infrastructure: concepts and planning

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Abstract Green infrastructure planning has grown in prominence since it was first discussed in the late 1990's. Since the President's Council on Sustainable Development discussed the concept researchers and academics from across the globe, though predominantly the UK, Western Europe and North America, have championed the process. Acknowledging its ability to deliver a number of diverse benefits in different urban and urban-fringe landscapes, green infrastructure has been discussed as enabling planners to develop multi-functional, innovative and sustainable places.

The aim of this paper is to examine a number of diverse research areas that have attributed value to the ideas underpinning green infrastructure planning. Using the subjects of urban regeneration and health, and climate change green infrastructure will be discussed as a multi-faceted planning approach for constantly changing landscapes. A review will also be made assessing the antecedents of the concept and how historical exemplar projects are still prominent to the green infrastructure concept. Finally, this paper will conclude by suggesting that with further funding and development green infrastructure planning can develop a more mainstream profile. Through this, an evidence base and a set of criteria can be developed to provide planning solutions for health, climate change, regeneration or environmental sustainability.

Keywords Green space, adaptive planning, climate change, health, SUDS

The rise in green infrastructure research has coincided with a reassessment of what landscapes should be in terms of form and function. Green infrastructure as a term relates to the connective matrices of greenspaces that can be found in and around urban and urban-fringe landscapes. They provide a number of complimentary benefits for ecological, economic and social spheres and have been increasingly viewed as concept that both planners and practitioners can draw on. Policy and planning integration, landscape multi-functionality and organisational cooperation are all ideas that underpin the growth of green infrastructure, but are also important developments in planning policy as a whole. What needs to be addressed now though is how green infrastructure as a concept and as landscape management process can become a mainstream planning practice. This discussion paper will set out some of the debates relating to green infrastructures development using examples from the UK, North America and the rest of Europe. It will outline the way in which environmental quality and social values are being embedded into green infrastructure research before proposing areas into which green infrastructure could develop in the future.

Several recent discussion papers have been published discussing the current state of green infrastructure research including work by the US Environmental Protection Agency (EPA) and England's Community Forest Network. An EPA paper presented by Daplito Dunn and Stoner (2007) confidently noted that the green light is on for green infrastructure proposing that it offers a way of harmonising the environment costs of human activities. This was seen as a major progression in the EPA's thinking as previously green infrastructure has solely been described in terms of strategic

conservation goals. Consequently the reassessment made by the EPA presented a more holistic approach to green infrastructure development which discussed social and ecological activities with equal value. England's Community Forests present a similar argument highlighting how the UK government's 'growth areas' in the South-East of England are being designed to bridge the historical 'green gaps' in UK urban and urban-fringe landscape (Blackman and Thackray, 2007). Both of these documents have been influenced by the overarching themes outlined in previous green infrastructure work but locate their debates in contemporary planning situations. They have achieved this by promoting the ideas of spatial connectivity, accessibility, integration, multi-functionality and scale as integral to what green infrastructure should deliver in the real world. These ideas have a long association with green infrastructure research dating back to its initial use in the President's Council on Sustainable Development (PCSD) who noted that green infrastructure should:

'promote place-based approaches to conserve, protect, restore, and manage local and regional networks of natural living, and environmental resources and amenities.'
President's Council on Sustainable Development (1998:141)

The term green infrastructure first came to prominence in the UK following the work of the PCSD in the work of the Urban Task Force (DETR, 1999) and the Department for Environment, Transport and the Region's (DETR, 2000) proposals for the Urban Renaissance. Within these documents the benefits of a strategic network of green infrastructure was proposed as a method of providing wider access to green spaces and allowing a greater proportion of the public to benefit from them. From the initial uses of green infrastructure numerous authors have written widely on the benefits that the concept may deliver. These benefits include providing access to green spaces for health (Mell, 2007), promoting environmental education (Fjørtoft and Sageie, 2000) or developing links between social and environmental histories (Bennett, Beynon and Hudson, 2000; Dennis, Henriques and Slaughter, 1969). However, other benefits have also been proposed and a review of the Conservation Fund website (www.conservationfund.org) or the work of Benedict and McMahon (2002; 2006) highlights these.

What these authors and researchers have been able to achieve is a synthesis between a number of planning and researcher agendas promoting what is now viewed as green infrastructure research. They have brought together elements of the landscape ecology, human geography and planning disciplines galvanising a number of diverse ideas into the green infrastructure concept, and by allowing it to be used by a broad range of organisations and researchers. The promotion of landscape connectivity is one of the basic principals underpinning of landscape ecology thinking. The role of connecting different landscape features regardless of size, composition or shape through connective matrices provides landscape ecology with a system that promotes diversity, access and mobility across boundaries in the landscape (Fanina, 1998; Jongman et al., 2004; Jongman and Pungetti, 2004). Issues of landscape scale, multi-functionality and the complex interactions of social, economic and ecological actors have been developed in Geography and Development Studies, are also embedded in the green infrastructure concept (Valentine, 2001; Sibley, 1995; Pect and Watts, 1996). More contemporary issues including the role of sustainable development and subsequent long-term landscape sustainability also underlie the green infrastructure concept and can be found in the planning and geography literatures (Cullingworth and Nadin, 2006; RTPI, 2005; ODPM, 2005). It can therefore be stated that there is a clear progression in the development of green infrastructure research in the UK, North America and Europe using these theoretical ideas. However, to fully appreciate the current state of green infrastructure research its historical antecedents must also be reviewed to highlight the historical lineages that underpin the concept.

The Antecedents of Green Infrastructure

It has been suggested that the exemplar designs of Frederick Law Olmsted and Ebenezer Howard were fundamental to the development of green infrastructure thinking (Davies et al., 2006). The ideas of linking the ecological capacity and social opportunities of an area have now been taken as a given in landscape planning but the work of Olmsted and Howard was some of the first to explore this relationship. Olmsted's work in New York and Boston is still discussed by many green infrastructure researchers as early examples that promoted the integration of form and function that leads to landscape multi-functionality (Little, 1990; Fábos, 2004; Williamson, 2003). These are themes that are now considered fundamental in green infrastructure thinking. In the UK, Howard's work promoted similar values to Olmsted's. Through his designs he suggested that placing green spaces in close proximity to residential zones would improve both the psychological and physical health of local population (Howard, 1985). More recently the Commission for Architecture and the Built Environment's (CABE) division Space, the UK government's green space research arm, has discussed both the work of Olmsted and Howard as good practice examples of green infrastructure providing diverse and multi-functional benefits, within and across, the urban and urban-fringe interface (2003; 2005a). Green infrastructure thus offers what Davis calls for in a return to the 'Olmstedian values' of innovative and connective planning (Davis, 2006:27).

The relevance of Olmsted and Howard cannot be underestimated when discussing green infrastructure. Boston's Emerald Necklace provides as an example of how a network can provide ecological (flood mitigation, habitats), economic (tourism, employment) and social (health, social cohesion) benefits for both the residents of metropolitan Boston and visitors to the city. The Emerald Necklace system was initially developed by Olmsted in response to flooding from the Charles River. The system was designed to link a number of metropolitan parks in central Boston with a flood defence fen system aiding the control of excess water flow and surges across the city's boundaries (Fábos, 2004). The layering of benefits provided by Olmsted's plan has provided the city of Boston with a historical green space matrix that has allowed the city to plan for diversity in both landscape form and function.

In comparison to Olmsted's Boston work, Tony Hiss describes Olmsted's work in Prospect Park, Brooklyn of New York with similar vigour. Hiss suggests that the design and location of Prospect Park has been one of the biggest factors in promoting social cohesion and interaction in the greater Brooklyn area (Hiss, 1990). What Hiss suggests is the idea that green infrastructure, in this case Prospect Park, acts as a meeting point where ecological and social functions can interact simultaneously. This is a view that Fábos (2004) supports in his descriptions of Olmsted's work in Boston stating that the Emerald Necklace symbolises how multiple policy directives (i.e. ecological and social well being) can be designed to work symbiotically. However, Howard's work in the UK varied from Olmsted's, as Howard's vision was to control the spread of urban form in cities to avoid the continued urbanisation of rural land. Howard thus promoted the idea of creating and maintaining spaces that provide a steady state of green and service infrastructures to support the communities that resided there, thus lowering continued urban expansion and conversion of green belt lands to housing or industry.

Howard's ideal shows a number of similarities to the current values attributed to the 'Smart Growth' agenda in the United States. Howard's Garden Cities idea promoted the use of sustainable housing, employment and transport systems all of which are heavily promoted in Smart Growth literature. Geller (2003) and Minton (2002) have both recently written on Smart Growth and outline these links between developing what are now termed 'sustainable communities' and the ideas that Howard suggested in his garden cities work. Thus, the role of expansion in Smart Growth work is considered in direct relation to the needs of the developers and the value of the

landscapes being developed. Green cities, large exemplar projects and Smart Growth therefore all provide a number of ideas that have been discussed in the green infrastructure literature. They have also been integrated into the planning literature with green matrices and green grid ideas being found in UK and European projects developing green infrastructure (see Beatley, 2000).

Current Focus of Green Infrastructure Research

The current research into green infrastructure can be broadly split into two categories; conceptual research and practical application. In the first category authors and practitioners have now taken onboard the underlying concepts outlined in the historical work of Olmsted and Howard and contextualised within contemporary landscape planning. Consequently, the ideas of landscape multi-functionality, policy and practice integration, and the importance of understanding landscape form and function have been heavily emphasised in the current green infrastructure research. Furthermore, researchers from a number of UK academic institutions including the Newcastle University (Davies et al., 2006), the University of Manchester (Gill et al., 2007) and Leeds Metropolitan University (CUDEM, 2006) have been at the forefront of the conceptual green infrastructure research. Concurrently England's Community Forest network, the Office of the Deputy Prime Minister (ODPM) and CABI Space have produced a number of important pieces of practice led green infrastructure research which take on the concepts of authors such as Davies et al. Within these documents the practical benefits to social and ecological populations are heavily emphasised placing green infrastructure at the fore of sustainable landscape management practices (Blackman and Thackray, 2007). Though both ecological and social agendas utilise a number of similar concepts to outline the proposed utility of green infrastructure, the main differences in is the way in which the research is framed. The development of conceptual ideas into practical landscape management practices are therefore an important area that green infrastructure researchers have to address. If this issue is not addressed then the values proposed by Davies et al. (2006) could be lost in translation.

Work recently conducted by the Community Forests network including 'The Green Infrastructure of Sustainable Communities' (Blackman and Thackray, 2007) has attempted to link a number of the theoretical debates into practical delivery. The development of conceptual ideas into practical landscape management practices is therefore an important area that green infrastructure researchers have to address. If this issue is not addressed then the values proposed by Davies et al. (2006) could be lost in their translation. Although England's Community Forests have constructed their ideas using some of the elements noted by Olmsted they use contemporary practice based research to a greater extent. The work of Benedict and McMahon (2006), Williamson (2003), TCPA (2004) and Green Infrastructure NW (www.greeninfrastructurenw.org, 2008) are all used by the Community Forests approach to green infrastructure development. In contrast Kambites and Owen (2007), and Mell and Roe (2007) reference the concepts and theories presented in *Table 1* in their green infrastructure research. *Table 1* highlights a range of documents that have discussed and support the green infrastructure agenda. The number of documents focussing on the concept is constantly increasing as more environmental organisations and researchers start to acknowledge the value that green infrastructure may hold for their own work. *Table 1* outlines only a small number of the documents that have been written about green infrastructure but it does highlight the cross over between conceptual and practitioner based work (i.e. the contrasting discussions of multi-functionality between TEP (2005), ODPM (2004), Gobster and Westphal (2004) and Davies et al (2006)). However, what *Table 1* does not show are the nuances of description and understanding that can be

Elements of Green Infrastructure	Authors
Assessability	Countryside Agency and Groundwork (2005); Gallent et al. (2004); Hidding and Tenuissen (2002)
Concept and a resource	Davies et al. (2006); Benedict and McMahon (2006)
Connectivity and networks	TEP (2005); Benedict and McMahon (2002); TCPA (2004); Williamson (2003); Countryside Agency (2006)
Integration of different cross-boundary people, places and policies	TEP (2005); TCPA (2004); Weber, Sloan and Wolf (2006); Countryside Agency (2006)
Scale (GI size, political, physical landscapes)	TEP (2005); TCPA (2004); Countryside Agency (2006)
Multiple benefits	TEP (2005); Benedict and McMahon (2002); ODPM (2003); Williamson (2003); Lindsey et al. (2001); Countryside Agency (2006)
Multi-functionality	TEP (2005); ODPM (2003); TCPA (2005); Gobster and Westphal (2004); Countryside Agency (2006); Davies et al. (2006)
* TEP is an environmental consultancy firm based in the northwest of England.	

Table 1 Green infrastructure elements from research documents (1999-2006)

found between conceptual and practitioner based green infrastructure research. Jack Ahern of the University of Massachusetts is one researcher who has tried to bridge this gap in his work on green infrastructure. Ahern's background in landscape, architecture and planning provide him with a theoretical and practice viewpoint on green infrastructure. This is a view that enables his work to combine broad concepts of space, form and function with practical implementation and delivery ideas (Ahern, 2007). The ability of Ahern to link the economic, ecological and social aspects of green infrastructure with the underlying principles of the concept have allowed his work to move beyond that of Benedict and McMahon (2002; 2006) who do not provide such a depth of detail or analysis in their own work. Ahern's work thus mirrors the work of Kambites and Owen (2007) and Roe and Mell (2007) in its development of a green infrastructure argument that acknowledges both its antecedents and its future potential. Table 1 thus highlights that although there is a contrasting nature to the documents referring to green infrastructure they may use the concept for the same purposes. However, within these documents the actual definitions of green infrastructure vary significantly depending on the focus of the document and the work of the researchers who compiled it. This is readily apparent if the work of Williamson (2003) and TEP (2005) are compared. TEP highlight the spatial elements of green infrastructure development before outlining that the planning of green infrastructure should be for the benefit of human populations and economic before ecological purposes.

Green Infrastructure: the physical environment within and between cities, towns and villages. The network of open spaces, waterways, gardens, woodlands, green corridors, street trees and open countryside that brings many social, economic and environmental benefits to local people and communities.

TEP (2005:1) emphasis added

In contrast to the TEP definition Williamson promotes green infrastructure as a life support system for the local and wider environment. She places the greatest importance on ecological ideas and a secondary level of importance on human benefits. The differences in these two definitions are therefore clear and are symptomatic of the differences in views on what green infrastructures are and what they should constitute. These discussions as to what green infrastructure actually means

is an on-going process of negotiation between researchers and practitioners placing their thoughts and hierarchal views onto the concept.

Our nations natural life support system - *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 America's communities and people.*

Williamson (2003:4) emphasis added

Although there are now a number of research teams reviewing the development of green infrastructure only a small number have attempted to link the theory with the practice. Davies et al. (2006) is one team who attempted to link these areas when they produced a green infrastructure planning guide in 2006. Their work achieved a high level of synthesis between the conceptual debates relating to green infrastructure and its practical applications in the real world. Maggie Roe one of the members of the Davies et al research team has subsequently produced a number of interesting pieces of research outlining a number of issues raised by Davies et al. (Roe and Mell, 2007; Mell and Roe, 2007). Under the supervision of Maggie Roe a research studentship has also been supported at the University of Newcastle. This project has provided an opportunity to develop the concept of green infrastructure and has worked closely with the North East Community Forests to provide the work with a real world planning focus. What each of these authors (Roe and Mell, 2007; Davies et al., 2006; Williamson, 2003) has been able to achieve in their research is firstly to raise the profile of green infrastructure work and aid its implementation into national documents. They have also promoted the main tenants of green infrastructure in European and North American research in an attempt to contextualise green infrastructures. What is needed now is for this work to be taken further by researchers, policy makers and practitioners into issue specific areas such as climate change control, urban regeneration or health. Examples do exist relating the green infrastructure concept to adaptive planning practices in action. One such area is the work of green infrastructure using water resources to mitigate against climate change.

The role of water is viewed by many as being of major importance to green infrastructure thinking and has led researchers to discuss a potential sub-category of blue-green or turquoise infrastructure (Ahern, 2007). It has been proposed that because climate change is viewed as one of, if not most important issue currently discussed by planners and developers that green infrastructure thinking needs to acknowledge this and react accordingly. Researchers working on green infrastructure have consequently promoted the value of the concept as a way of controlling climatic change through the sustainable design of housing and larger scale infrastructure development (Beatley, 2000). Sustainable Urban Drainage Systems (SUDS), green walls and roofs, as well as better building design i.e. those proposed under the Leadership in Energy and Environmental Design (LEED) standards (US Green Building Council, 2007) are just a small number of examples of how climate change can be planned for. The role that environmental designs play is therefore crucial in some of the thinking relating to green infrastructure. In Kelly Cave's work on the Rogue River, Michigan, she describes how the Rouge River National Wet Weather Demonstration Project (Rouge Project) highlights the ways in which a well designed SUDS systems controls water surges by providing reservoirs that can store, filter and release excess rainfall or storm water during surge (i.e. excess rainfall and poor infiltration) events in suburban water systems at appropriate times. Cave notes that level of combined sewer overflow (CSO) and control of fluctuating storm water was easier to control using a SUDS compared to a traditional sewer or water retention system and provide better environmental protection from adverse storm conditions (Cave, 2002). Ferguson (2002) also highlights the role SUDS can play as a green infrastructure in controlling adverse climatic conditions. Ferguson's work focused on infiltration basins and porous pavements highlights how these design techniques hold, and slowly release excess water because of their ecological composition . Fergu-

son goes onto to say that using SUDS the conveyance and retention of water is such that the built landscape, designed with green infrastructure features, can act in similar ways to a natural system.

A second example of green infrastructure in practice is the increasing value of green infrastructure in tackling ill health and obesity. Currently over 8.2 billion a year are spent tackling the effects of poor diet, a lack of exercise and the increasingly sedentary lifestyle of people in the UK (DCMS, 2002). Conversely the UK Department of Health has stated that with a 10% rise in exercise and overall health, over 500 million could be entered back into the national economy each year (DoH, 2004). Green infrastructure has thus been viewed by many as a way of achieving these health targets and lowering the costs of health care to UK tax payers (Mell, 2007a). Duly, there has been an increase in the number of initiatives aimed at improving the quality of health in the UK since these figures were produced. Projects including the 'Walking your way to health' programme, green gyms, and more recently the North East Community Forests Green Exercise programme have all focussed on utilising existing green infrastructure resources to improve health. Within each of these programmes a framework of actions and initiatives are developed that allow people to actively engage with the landscapes around through programmes of formal exercise and training in environmental awareness, or by motivating people to use the landscape as a more informal gateway promoting personal use of the wider landscape. The moderation of these programmes has highlighted the positive feedback of participants who state that being outside not only improves their physical health but also their psychological health. This view is supported by the research of Kaplan and Kaplan (1989) and Ulrich (1986) who have proposed that green infrastructures can provide a number of formal and informal benefits for people that includes improvement of physical and psychological health, promotion of education or a better understanding of the world around them. These benefits, they say, can be increased by providing access to the physical spaces, and access to motivational programmes that people view as valuable for improving their health.

What both of these examples highlight is that green infrastructure offers a range of benefits (ecological, economic and social) that can work in a number of different contexts. Health and climate change have links but are often discussed separately; however under the green infrastructure umbrella they can be discussed as two options meeting similar goals (i.e. sustainability and well-being). This appears true of a large proportion of the conceptual and practitioner work relating to green infrastructure, where multi-functionality and the proposed benefits the concept holds can be used by planners, health officials or climate change researchers. However, the future of green infrastructure is still somewhat uncertain.

Where can Green Infrastructure go from here?

Despite the rapid rise in research into both the concept and delivery of green infrastructure doubt still remains as to whether it can be fully embedded into planning policy. However it can be proposed that there has been an acknowledgement from the authors and researchers working on green infrastructure that the process offers a plethora of options that planner's can utilise to achieve their development goals. Climate change, urban regeneration and better design are just three areas that have been suggested where green infrastructure planning can promote the better places to work, live and recreate as outlined by the Office of the Deputy Prime Minister (ODPM, 2005) and England's Community Forests (England's Community Forests, 2004). Further research and further funding are therefore all required to promote green infrastructure thinking. Further research is needed to support the benefits associated with green infrastructure i.e. health (Mell, 2007a) or the multi-functional benefits outlined in the Countryside in and Around Towns agenda (Countryside Agency and Groundwork, 2005). However, to promote such research further funding must be made available from national and regional environmental or planning organisations. Only with the support of agencies like the Department for Communities and Local Government (national level)

or Natural England (national or regional level) will sufficient funding be made available for further green infrastructure research. This is a vitally important point as the majority of research into green infrastructure suggests that the varied focus of the concept can provide wide ranging benefits to ecological, economic and social spheres (Kambites and Owen, 2007; Benedict and McMahon, 2006). What these researchers are now looking for is the capital investment in funding green infrastructure projects to provide further evidence of the concepts wide ranging benefits.

Discussions relating to green infrastructure planning must therefore take place at all levels; in university teaching and at international conferences (i.e. Mell and Roe, 2007) which are, and will continue to be two of the main ways that green infrastructure thinking will be developed. In 2007 at least two conferences were held that focussed on promoting the use of green infrastructure and provided a forum for cross-disciplinary discussions. In March 2007 the Fábos Landscape Planning and Greenway Symposium had a number of presentations and discussions relating to green infrastructure development. Whilst in December 2007 the International Association of Landscape Ecology held a conference discussing the application of landscape ecology principles and green infrastructure in urban design and planning. Each of these conferences shows that there has been a clear progression in both the thinking and practice of green infrastructure at a number of different scales since the concept was first discussed. However without funding and research support the green infrastructure agenda may fall short of the opportunities currently open to it. Consequently the role of academics and practitioners is essential in supporting green infrastructure through continued teaching and research of the concept. If this is achieved then the findings of green infrastructure work will continue to influence planning policy and practice. Already in the Thames Gateway (ODPM, 2003; ODPM, 2005) green infrastructure has been outlined as being essential to the sustainable future of the area. This view is further supported in the Barker Review of Land Use Planning where the DCLG have stated that 10% of all funding should be set aside for green infrastructure development (Blackman and Thackray, 2007). High profile projects of national importance are therefore one method of promoting green infrastructure to different areas of planning. The Conservation Fund in the United States is another group who has been using a similar process to promote green infrastructure at a Federal, State and county level. By developing nationally well-received research articles by Benedict and McMahon (2002; 2006), and the Conservation Fund have been able to successfully discuss green infrastructure at a strategic level in the US. Weber et al. (2003) have also been able to achieve similar results in the State of Maryland, and in particular with their work on the Chesapeake Bay area. The role of Weber et al and the Conservation Fund have assumed a comparable role to that of the DCLG and authors such as Roe and Mell (2007), Davies et al. (2006) and the TCPA (2004) in the UK, who have discussed green infrastructure in a variety of contexts and as a modern landscape management mechanism for long-term or sustainable planning.

As the TCPA (2004), Davies et al. (2006) and Roe and Mell (2007) have stated, green infrastructure planning has been debated as offering a number of broad benefits in ecological, economic and social spheres including the provision of a process through which climate change can be mitigated. This paper has also outlined some of the broader social and economic benefits proposed in current government policy relating to green space and urban renewal. Overall, green infrastructure thinking has been used to develop places for sustainable living that allowed people to develop links with their environments and to create and share prosperity. Therefore green infrastructure as a delivery mechanism, with a number of appropriate foci can aid this process but only if developed appropriately. Like many green space planning mechanisms, green infrastructure planning must take into account the needs of the environment, and local perceptions to develop innovative green spaces, or places that allow people to move within and around their environments freely. As Jan Gehl (1987) notes when discussing urban design; first life, then spaces, and finally then buildings, proposing that liveable spaces are at the heart of acceptance and continued use of spaces.

To achieve these objectives a number of practices have to be put into place including some of the following. Firstly, developments must take into account the different needs of ecological, economic and social influences when decisions of appropriate design are being made. This must also view each of these areas of equally important in meeting targets set by the Department of Health (DoH), Department of Culture, Media and Sport (DCMS) and the Department for Communities and Local Government (DCLG). If developers do not take the needs of health, social inclusion and service provision into account then the long-term viability of urban renewal may be unrealistic. Secondly, as a mechanism for delivering answers for climate change, green infrastructure must also be developed at an appropriate scale and with a relevant focus. Any underestimation of the complexity of green spaces within the urban-rural matrix could undermine the value of the space itself and hinder its function (CABE Space, 2003; 2005a; 2005b). Consequently, a strategic systems approach is proposed as an effective mechanism for a fuller understanding of the ecological interactions and functions of any given landscape. Finally as an appropriate mechanism for sustainable places, green infrastructures is not a quick fix solution but should be viewed as part of a long-term process of developing liveable spaces. Designed appropriately and developed with ecological, economic and social factors in mind green infrastructure can be a valuable component of the urban form for successful renewal. In the same manner that communications, housing or transport infrastructures cannot develop better places to live individually, together this is possible.

Finally, collaborative approaches to green infrastructure planning can bring together many separate policy areas, including natural resource management, nature conservation, landscape, recreation, public health and regeneration. Collaborative or consensus planning approaches may not now be revolutionary but 'complementary, normalised and contingent' in the context of many countries (Woltjer, 2000, pg.247). This is a useful approach that can be used in areas where the development of, and agreement on, conceptual understandings as well as practical processes are needed. It can also be suggested that the education of professionals relating to the potential of green infrastructure could help provide a stronger knowledge base from which to develop new tools for implementation by planners, managers and policy-makers. This, and developing more concrete mechanisms for ensuring green infrastructure is central to the planning process, are the next challenges for green infrastructure planning. It was also clear that there is a need for very practical guidance for those working at the local and regional level as to how to turn such conceptual thinking into useable planning tools.

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