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Green Infrastructure: Mainstreaming the Concept

Understanding and applying the principles of Green Infrastructure in South Worcestershire

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

This study was undertaken by Hayley Pankhurst (Environmental Planner for Herefordshire and Worcestershire) and presented as a dissertation forming part of the requirement for the award of an MSc Degree in Environmental Policy and Management at the University of Gloucestershire on 26 March 2010. As such, any opinions expressed are that of the author.

This study provides a structured consideration of the history of Green Infrastructure (GI) and emergence of the concept, the legislative and planning case for GI, the incentive and need provided by the Government's growth agenda and best practice examples in the Northwest of England and Northamptonshire. Lessons learnt throughout the study have been collated and used to develop of a Checklist for Successful GI. Although developed primarily to inform South Worcestershire's GI process, the Checklist is a roadmap which could be applied to any Local Planning Authority in England.

This publication is directly relevant to Outcome 3: Sustainable Use of the Natural Environment, with connections to Outcomes 1, 2 and 4. It may be useful to Natural England officers involved in any stage of the GI process and to Local Planning Authorities embarking on the GI process.

Care should be taken when referring to Chapters 4 and 5 as the planning system and delivery mechanisms discussed are subject to change. In particular, the planning system is currently in a state of flux following the change in Government in May 2010.

For up to date information on any of the case studies discussed, please refer to the following websites:

- Worcestershire: **www.worcestershire.gov.uk/cms/default.aspx**
- South Worcestershire: **www.swdevelopmentplan.org/**
- North West: **www.ginw.co.uk**
- River Nene Regional Park: **www.riverneneregionalpark.org/**

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Further information
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Abstract

Green Infrastructure (GI) is, in essence, a strategic network of green spaces which connects urban and rural areas, delivering multifunctional benefits which support ecological services and increase quality of life. As such, GI provides a way to deliver sustainable development. However, its application by Local Planning Authorities across England remains inconsistent. This study provides an analysis of GI to inform its application in South Worcestershire, an area encompassing three Local Planning Authorities and the Worcester Growth Point. South Worcestershire's GI planning process has been hindered by financial and temporal constraints, lack of in-house expertise and false starts. This study provides a structured consideration of the history of GI and emergence of the concept, the legislative and planning case for GI, the incentive and need provided by the Government's growth agenda and best practice examples in the Northwest of England and Northamptonshire. Throughout this study the lessons learnt have been collated and used to develop of a Checklist for Successful GI. Although developed primarily to inform South Worcestershire's GI process, the Checklist is a roadmap which could be applied to any Local Planning Authority in England. The need for clear leadership, nationally and locally, and clarification around mechanisms for the delivery and ongoing management of GI continue to be barriers to its uptake. Decisive action is needed if the opportunities provided by GI are to be realised.

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Chapter 1: Introduction

1.1 Overview

The concept of Green Infrastructure (GI) is rapidly becoming ensconced in land use planning. GI offers a way for environmental evidence, in the widest sense of the term, to inform development plan production, as well as a practical means of delivering sustainable development. However, there is still considerable confusion and uncertainty about what GI is, what value it adds and how it can be achieved and delivered on the ground. This is perhaps confounded by the piecemeal approach to the subject, with ad hoc information from all manner of sources and a lack of clear leadership. As a result, the application of GI varies greatly between Local Planning Authorities. Whilst there are numerous exemplars emerging nationwide, other authorities are either struggling to emulate the approach or yet to be convinced of its worth.

The aim of this study is to evaluate and inform the application of GI in South Worcestershire, an area encompassing three Local Planning Authorities and the Worcester Growth Point. The application of GI in South Worcestershire to-date has been hindered by financial and temporal constraints, lack of in-house expertise and false starts. South Worcestershire now faces a serious challenge if its GI evidence base and Strategy, including a delivery plan, is to be taken forward as a part of the emerging Core Strategy. As such, South Worcestershire illustrates some of the challenges and barriers to the wider uptake of the GI approach across England, and this study intends to extrapolate lessons relevant to the mainstreaming of GI.

To achieve its aim, this study draws together information from academic, professional and best practice sources and undertakes an appraisal of the shortcomings and successes of GI in South Worcestershire. The lessons learnt from each section are summarised in a table, concluding each section. These lessons are then synthesised into a 'Checklist for Successful GI', presented in Chapter 8 (the stages in devising this checklist are presented in Appendix 6). South Worcestershire is evaluated against this checklist and recommendations are made for the ongoing production of a GI evidence base, strategy and policy implementation. Conclusions are derived which have a wider relevance to the mainstreaming of GI in the belief that the experience from South Worcestershire can inform the approach taken in other typical Local Planning Authorities, i.e. those which are not associated with 'best practice' or forerunners in this field.

This study draws upon my role as Natural England's Environmental Planner for Herefordshire and Worcestershire through which I am directly involved in the development and application of GI Strategies in South Worcestershire and elsewhere.

1.2 Introduction to Green Infrastructure

The concept of GI will be explored in greater depth through the course of this study. For this introduction, it is necessary to explain what GI is and its relevance is to Local Planning Authorities (LPA) and the planning system. There are many definitions of GI. Natural England (NE), the government's advisor on the natural environment, provides this lengthy definition in its recently published *Green Infrastructure Guidance*:

"Green Infrastructure is a strategically planned and delivered network comprising the broadest range of high quality green spaces and other environmental features. It should be designed and managed as a multifunctional resource capable of delivering those ecological services and quality of life benefits required by the communities it serves and needed to underpin sustainability. Its design and management should also respect and enhance the character and distinctiveness of an area with regard to habitats and landscape types.

Green Infrastructure includes established green spaces and new sites and should thread through and surround the built environment and connect the urban area to its wider rural hinterland. Consequently it needs to be delivered at all spatial scales from sub-regional to local neighbourhood levels, accommodating both accessible natural green spaces within local communities and often much larger sites in the urban fringe and wider countryside" (Natural England, 2009a, p. 7).

Planning Policy Statement 12 and the Town and Country Planning Association's *Ecotowns Green Infrastructure Worksheet* uses the following definition:

"A network of multi-functional green space, both new and existing, both rural and urban, which supports the natural and ecological processes and is integral to the health and quality of life of sustainable communities" (DCLG, 2008, p. 5 and TCPA, 2008, p. 5).

Taking the words common to most definitions, GI is, in essence, a strategic network of green spaces which connects urban and rural areas, delivering multifunctional benefits which support ecological services and quality of life. This is not a new concept (as explored in Chapter 2), but what marks GI as different to previous iterations is the recent increase in the scale of and support for its application in the land use planning system. This is largely due to the changes to the planning system implemented by the *Planning and Compulsory Purchase Act* (2004), underpinned by the government's Sustainable Communities agenda. GI, with its emphasis on functions, offers a tangible way of delivering liveability and local distinctiveness, two fundamental objectives of the planning system. GI is promoted across the suite of national Planning Policy Statements (PPS) with which all Development Plans in England are required to conform. PPS12 makes the requirement for GI to be incorporated into the Core Strategy evidence base unequivocal.

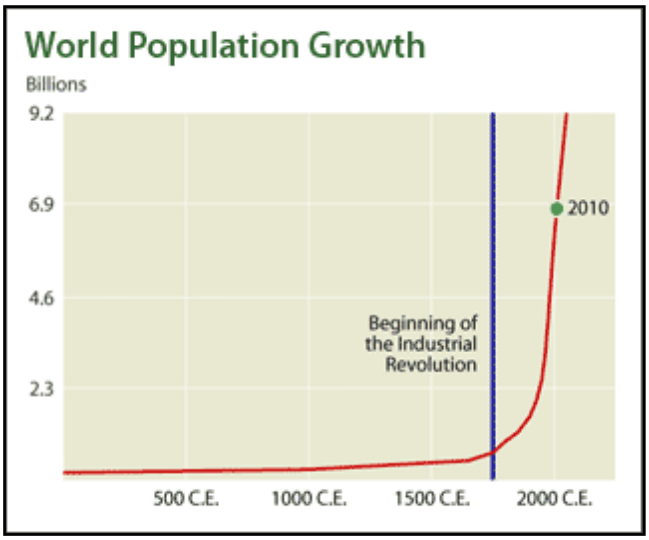
Despite the requirement for GI evidence and the clear benefits it brings in terms of delivering sustainable communities, the application of GI across England remains sporadic. An internal poll compiled by NE in February 2010 found that 67% of Local Planning Authorities in Growth Areas/Points (see section 3.3) have or are working towards some form of GI evidence, 23% do not/are not and 10% are unknown to NE officers (poll for internal use only but available in Appendix 1). South Worcestershire represents those Local Planning Authorities which, for one reason or another, face significant challenges if GI is to be achieved.

Chapter 2: The Origins of Green Infrastructure

In order to evaluate the successful application of GI, it is necessary to understand what the term means. Although the term 'Green Infrastructure' is relatively new, the concepts underpinning it are not. The term GI was originally applied to water management and land use planning in the USA during the 1980's-90's (Engleback, 2009 and Anon, 2009a). However, the concepts which underpin it can be traced through the beginnings of environmentalism, landscape architecture and planning. These interdisciplinary roots give GI its strength and this section explores them in greater detail.

The industrial revolution in the 1800's brought huge changes to society and the environment. World populations increased exponentially and there was a shift from rural to urban living. In 1825, London became the first city in the UK with a population of one million. By 1850 this number had doubled, and half the British population were living in urban areas (Engleback, 2009). The changes wrought in part by the industrial revolution resulted in the emergence of two of the key concepts which underpin GI; urban planning and nature conservation. These concepts developed in parallel to each other.

Figure 1: World Population Growth



(McLamb, 2009)

The modern planning system has its roots in the steps taken to improve the lives of the working classes during the Industrial Revolution. Rapid urban expansion resulted in accommodation being built quickly, cheaply, and with little forethought. Overcrowding and lack of sanitation meant diseases were rife; life expectancy was around thirty-five (CPRE, 2009). Pioneers such as Robert Owen, who initiated a model industrial community at New Lanark in 1835 (Engleback, 2009), and Sir Edwin Chadwick, author of *The Sanitary Conditions of the Labouring Population* (1842), drove forward urban improvements and public health reforms (Lambert, year unknown). Improvements often included the creation of public parks, intended to *"reduce [the] social stress which was threatening the existing social order and political systems"* (French, 1973; Heckscher, 1977; Pregill and Volkman, 1993; Schenker, 1995; Maruani and Amit-Cohen, 2007). Rapid urban expansion had detached inner cities and their working-class residents from open spaces (Pregill and Volkman, 1993; Maruani and Amit-Cohen, 2007) and parks focused on *"providing a response to human demands for recreation, amenities and environmental quality"* (French, 1973; Heckscher, 1997; Turner, 1992; Tibbets, 1998; Maruani and Amit-Cohen, 2007). The UK's first public park was opened in Birkenhead, Merseyside, in 1843,

followed by Victoria Park in London in 1845 (Engleback, 2009). These parks had a 'domesticated' character, consisting of lawns and trees, with little regard to wider environmental considerations (Maruani and Amit-Cohen, 2007).

Whilst urban planning was becoming more sophisticated, the concept of nature conservation, particularly 'wilderness' preservation, was growing in popularity. It was in the United States between 1850 and 1920 that conservation became a *"broadly popular political and cultural movement"* (the Library of Congress, 2002). Industrialisation and urbanisation gave rise to a greater appreciation of nature for its own sake, and a sense of man's moral duty to protect it. The literature of the time, including Henry Thoreau's study into simple living, *Walden* (1854), George Perkins Marsh's *Man and Nature* (1864) and Jack London's *Call of the Wild* (1903) illustrates a growing awareness of man's impacts upon the environment and a burgeoning desire to preserve nature as something wild and separate from human experience. Social movements such as the Sierra Club, established by John Muir in 1892, reflected this ideology and greatly influenced the politics of the time (the Sierra Club, 2009). In 1872, Yellowstone National Park was designated – the first in the world (the Library of Congress, 2002). In contrast, the UK's first National Park, the Peak District, was not designated until 1951 (Peak District National Park Authority, 2010).

Urban planning and nature conservation perhaps first came together in the 'park systems' developed towards the end of the 19th Century. Boston's 'Emerald Necklace', initiated in 1877, was a *"complex multi-functional environmental design solution"* which linked areas by green corridors. The corridors were designed principally to manage water, but incorporated transport infrastructure and *"scenic landscapes informed by ecology"* (Engleback, 2009, p. 24). Other examples include Prospect Park in New York, Cleveland's plans for Minneapolis and Saint Paul (Maruani and Amit-Cohen, 2007 and Benedict and McMahon, 2006), and Abercrombie's plan for a London Open Space System (1943), which aspired to *"create a system of open spaces interconnected by green trails, to enable continuous movement through open spaces in the city"* (Turner, 1992; Maruani and Amit-Cohen, 2007, p. 6), allowing *"the town dweller to get from doorstep to open country through an easy flow of open space from garden to park ... from green wedge to greenbelt"* (Engleback, 2009, p. 25). These park systems are perhaps the earliest examples of what we would today term GI, integrating environmental and anthropocentric concerns, with a success that is still apparent today. Boston's emerald necklace provides *"a welcome respite from city life and serves as a home to many kinds of wildlife seldom found in an urban environment"* (Benedict and McMahon, 2006, p. 26), whilst the greenways established under Abercrombie's plan form part of London's modern 'Green Grid' (Engleback, 2009).

Despite the apparent success of the park systems, the principles of working with nature did not become enshrined in urban planning at this stage. It is accepted that in order for a new subject to become established, the ground must be prepared and the time must be right. In his exploration of the history of ecological economics, Ropke (2004) emphasises that *"a new field cannot be created by original ideas alone"* (p. 296) and deems social change and related discourse as instrumental in preparing the ground for the new discipline. These factors are equally relevant to GI, which has taken time to become established. Viewed in this way, successful park systems were perhaps the first step in preparing the ground. Interestingly, Ropke views the establishment of a reputational organisation as a critical final step in embedding the concept (Whitley, 2000; Ropke, 2004). It is questionable to what extent this has yet been achieved for GI.

Urban planning and environmental awareness were once again brought together in the Garden City movement. Developed by Ebenezer Howard towards the end of the 19th

Century, Garden Cities are considered by many to be the cornerstone of modern planning (Walmsley, 1995, Maruani and Amit-Cohen, 2007 and Engleback, 2009). Howard's *Garden Cities of To-Morrow* (1902) (first published as *Tomorrow: A peaceful path to reform* in 1898) was a response to uncontrolled growth, unsanitary conditions, pollution, lack of open space and the socioeconomic challenges of the time (Aalen, 1992; Ward, 1992b; Girling and Helphand, 1994; Maruani and Amit-Cohen, 2007). It proposed comprehensive urban planning which delivered practical measures to combat these issues, focusing on balancing development and nature. Garden Cities were designed to be limited in size (1000 acres for 30,000 people, subdivided into six wards), surrounded by permanent greenbelt (5000 acres for 2000 people), with rail connections to the urban centre and neighbouring satellite towns (Walmsley, 1995). Fixing the size of the 'town' and preserving the 'country' provided *"immediate access to the countryside without sacrifice of city work opportunities, social stimulation and cultural diversion".* The country penetrated the town with *"radial structure[s] with open spaces as central parks, as green fingers between neighbourhoods and as peripheral greenbelts"* (Ward, 1992a; Girling and Helphand, 1994, Maruani and Amit-Cohen, 2007, p. 6). Early examples include Letchworth (1903) and Welwyn Garden City (1920) (Maruani and Amit-Cohen, 2007). Howard's model was applied worldwide, examples including Stockholm, Copenhagen, Helsinki, Moscow and Paris (Walmsley, 1995). The model is still relevant today, being the forerunner for New Towns and the *"prototypical eco-town"* (Engleback, 2009, p. 25).

The UK's New Towns movement was a response to the damage and destruction of the Second World War. The restoration of cities, homes and infrastructure was seen as an opportunity to improve living conditions on a grand scale (English Partnerships, 2007) and the *New Towns Act* (1946) intended to achieve this. Inspired by Garden Cities, New Towns were to deliver a *"successful balance between living and working"* by incorporating high proportions of green space (English Partnerships, 2007). Between 1946 and 1955, eleven New Towns were designated, eight of which were *"'overspill' towns designed as residential panaceas for the problem of what to do with blitzed, smoggy, ration-book London"* (Glancey, 2006). Early examples include Harlow in Essex, where *"housing clusters were sized according to walking distances to schools and shops and surrounded by green space"* (Engleback, 2009, p. 25). Other examples include Stevenage, Hemel Hempstead and Corby.

The 1960's saw a resurgence of New Towns as a means of providing for growing populations. Nine further New Towns were designated, including Redditch, Milton Keynes and Warrington. In some respects the New Towns programme represents one of the most successful urban policies of post-war Britain – New Towns accommodate over two million people and provide more than one million jobs (English Partnerships, 2007). However, in other regards the more recent New Towns were less successful than their predecessors. Glancey (2006) considers that:

> *"Something has always been missing from Basildon, as from Stevenage, Crawley and even Milton Keynes. More or less successful in terms of health, education and general prosperity, each lacks the kind of emotional core or architectural heart that makes many of us think so highly of old towns and cities"*.

In the more recent New Towns *"the car ... is king, queen and all princes"* (Glancey, 2006) and it is very difficult to get around on foot. Milton Keynes, still the UK's largest Greenfield project (English Partnerships, 2007), is 20% green space, has over 20 million trees and has been described as *"a kind of giant park"* (Glancey, 2006). However, it exemplifies the design common to the 1960's-70's New Towns; a grid of roads and associated planting dividing neighbourhoods (Engleback, 2009). The problems of sense of place and sustainable transport may be related. Walmsley (1995) refers to *"new town blues"* in the United States' New Towns of the 1960s-70s, where low densities and dependency on the

car reduced, in essence, the sense of community (p. 91). Today's planning system must learn from the successes and failures of Garden Cities and New Towns.

Figure 2: Milton Keynes from the air

(Miltonkeynes.com, 2010)

The 1960's and 70's were a time of rising environmental awareness amongst the scientific community, the general public and politicians. Protests against nuclear power, waste, and pollution from chemical fertilizers and detergents helped to bring environmental concerns to the fore of social awareness (Worster, 1994; Craige, 2001; Ropke, 2004). Rachel Carson's *Silent Spring* (1962) was perhaps the first popular publication to question the soundness of the economic argument as justification for environmental damage. The book remained a top-ten best seller for six months (Murphy, 2005). Increasing environmental awareness was heightened by population growth and concerns about natural resources. Paul Ehrlich's *The Population Bomb* (1968) and the Club of Rome's *Limits to Growth* (1972) questioned the sufficiency of food production (Ropke, 2004). *Limits to Growth* concluded:

> *"If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity"* (The Club of Rome, year unknown, p. 1).

The case for radical change to address these environmental issues and forge a stable society was also potently made in the Ecologist magazine's *A Blueprint for Survival* (1972) (Goldsmith, Allen *et al.,* 1972). The 1973 oil price shock and *"the ensuing years of energy crisis"* (Ropke, 2004, p. 298) helped to take this message home.

Supported by growing public awareness, the principles at the heart of GI began to receive international assent in the form of sustainable development. The United Nations Conference on the Human Environment in Stockholm, 1972, demonstrated that the challenges related to the environment, population growth and resources were now acknowledged by global governments (Ropke, 2004). It was agreed that development and the environment, hitherto addressed as separate issues, could be managed in a mutually beneficial way (Defra, 2007). This was distilled into the concept of 'sustainable development'. There are numerous definitions of sustainable development, but perhaps

the most frequently quoted is that of the Brundtland Commission: *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (World Commission on Environment and Development, 1987). Whichever definition is used, sustainable development seeks to integrate social, economic and environmental needs, now and into the future. As such, this gives assent to the principles embodied by the park systems, Garden Cities and early New Towns, and to the concept of GI.

Despite a growing awareness of the issues in the ensuing years since Stockholm, environmental considerations remained little used in land-use planning. McHarg (1969) believed that this was due to the difficulties in quantifying and displaying environmental information to planning professionals in a meaningful way. Planners needed a way to make sustainable development more tangible. In his landmark book *Design with Nature* (1969), McHarg makes the case for using natural processes as the basis for determining development priorities (Benedict and McMahon, 2006). McHarg argued that:

> *"We need nature as much in the city as in the countryside. In order to endure we must maintain the bounty of that great cornucopia which is our inheritance. It is clear that we must look deep to the values which we hold ... We need, not only a better view of man and nature, but a working method by which the least of us can ensure that the product of his works is not more despoliation"* (McHarg, 1969, p. 5).

Drawing upon his own experiences, McHarg proposed using map overlays of environmental information to inform development.

McHarg's proposition was made eminently more deliverable with the development of Geographic Information Systems (GIS) in the 1960's. The Canada GIS, the first in the world, was developed as a direct result of increasing government involvement in land-use planning (Tomlinson, 1984) against a backdrop of increased awareness of environmental pressures. Tomlinson (1984) surmises:

> *"Canada in the sixties was a country that was feeling, perhaps for the first time, that its natural resources were not limitless. Rural depopulation was accelerating. There was increasing competition among the potential uses of land within the commercially accessible land zones"* (Tomlinson, 1984, p. 19).

The perceived need for the GIS corresponded with the technical capabilities necessary to take such an approach. Today, GIS is often an essential tool in GI planning, used to perform the land resource evaluation, habitat mapping and green space which leads to the identification of existing GI (Jackson, 2007).

The term 'green infrastructure' was first explicitly used in the United States during the 1980-90's (Engleback, 2009 and Anon, 2009a). The expression was employed to emphasise the life support functions of the natural environment (Anon, 2009a), often referred to as ecological services, with *"particular reference to dealing with storm water and ground water recharge"* (Engleback, 2009, p. 24). Hough's *City Form and Natural Processes* (1984) and Spirn's *The Granite Garden* (1984) further advanced the idea of a *"green infrastructure informed by ecology ... linking human and natural systems"* (Engleback, 2009, p. 25). The application of GI in the USA has gained favour through its companion, 'smart growth'. The term smart growth appeared in the 1980's-90's as a reaction against urban sprawl (Haeuber, 1999; Southerland 2004; Jackson, 2007, p. 1), an issue cited by 26% of respondents to a year 2000 poll as *"the most important problem facing the community where you live"* (Pew Centre for Civic Journalism Poll, 2000; Benedict and McMahon, 2006, p. 11). Smart growth is defined as development that is *"economically sound, environmentally friendly, and supportive of healthy communities – growth that enhances quality of life"* (Benedict and McMahon, 2006, p. 11). Smart growth thus embodies sustainable development. Benedict and McMahon (2006) consider the

first principle of improved development to be determining where not to develop, and promote GI as a means of identifying these areas. Further, the need for 'smart conservation' is highlighted, enabling the integration of conservation with growth management efforts. GI provides a delivery mechanism for smart growth and smart conservation, or, likewise, sustainable development.

The above review illustrates that, in many ways, GI is not a new concept. The evolution of park systems, Garden Cities and the earlier New Towns embody the essence of GI and provide working examples from which we can learn. However, one key difference is the scale at which GI is being applied. Previously the reserve of single projects, often driven by an enlightened individual or local government, GI in England is now supported by central government policy and is required for many Growth Areas/Points (explored in Chapter 3). This change is owed largely to Government endorsement of sustainable development. The UK government's strategy on Sustainable Development, *Securing the Future* (March 2005) is expected to underpin all UK policies (Defra, 2005), including planning policies. GI essentially offers a methodology for the planning system to firstly ensure a holistic consideration of social, economic and environmental concerns, and, secondly, translates this into land-use priorities. If done successfully, GI will achieve sustainable development.

Table 1: Learning to take forward – Origins

Lessons Learnt	Reasoning/evidence
Exploration of the origins of GI	
Interdisciplinary	GI has clear interdisciplinary roots, drawing upon land-use planning, ecology, landscape architecture and other specialism's. GI has historically been driven from two distinct angles, quality of life and ecology. This interdisciplinary base gives GI its strength, leading towards GI as a delivery mechanism for sustainable development.
Multifunctionality underpinned by an understanding of ecology	The first examples of a multifunctional approach appeared in the park systems of the late 1800's, combining ecology, landscape and ecological services with movement and recreation. The Garden Cities created in the early 1900's applied this approach to urban planning for the first time.
The importance of focusing upon societies needs	Garden Cities and early New Towns had a similar focus on tailoring their urban form, including greenspace, to human needs. The more recent New Towns lost this focus and are arguably less successful than their earlier counterparts as a result, lacking a sense of place.
GI as a delivery mechanism for sustainable development	Drawing upon its interdisciplinary roots, GI provides a way to integrate the fundamental components of sustainable development, economy, environment and society. For GI to be successful, its interdisciplinary nature must be embraced and utilised in the approach taken to strategy production and delivery.
The role of GIS	GIS plays an important role in collating GI evidence and in its advocacy, allowing its conceptualisation.

Chapter 3: The Case for Green Infrastructure

The concept of GI has garnered recent favour in spatial planning. This section outlines the principle drivers for GI in England.

3.1 Legislation

There is no direct statutory requirement to undertake a GI Study/Strategy or have a GI policy in Regional Plans or Core Strategies. However, there is legislation which can be used to make this case. This legislation focuses primarily upon the ecological services aspect of GI, drawing upon the lengthy history of this subject and its role underpinning GI.

Article 10 of Council Directive 92/43/EEC on the *Conservation of natural habitats and of wild fauna and flora* (the Habitats Directive (1992)) states that:
"Member States shall endeavour, where they consider it necessary, in their land use planning and development policies, and in particular with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild flora and fauna".
This is reinforced by Regulation 3 (4) of the Conservation (Natural Habitats &c.) Regulations (1994), which requires that "every competent authority in the exercise of any of their functions, shall have regard to the requirements of the Habitats Directive so far as they may be affected by the exercise of those functions" (Simpson, 2009).

Section 40 of the *Natural Environment and Rural Communities Act* (2006) states:

> *"Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity".*

The definition of 'conserving' includes restoring or enhancing a population or habitat (Simpson, 2009).

The *European Landscape Convention* (2007) promotes landscape planning, management and protection across Europe. The Convention recognises that the quality of all landscapes matters as landscapes contribute towards environmental, social and economic value (Landscape Institute, 2009). As a signatory, the UK is committed to:

- Recognise landscape in law;
- Establish and implement policies aimed at landscape protection, management and planning;
- Establish procedures for the participation of the public and local and regional authorities; and
- Integrate landscape into regional and town planning policies and into cultural, environmental, agricultural, social and economic policies.

(Landscape Institute, 2009)

Although these duties can be enforced, making the case for the wider interpretation of GI relies largely upon other levers.

3.2 Planning Policy

Each country in the UK has its own planning system. Planning legislation for England and Wales is primarily consolidated in the *Town and Country Planning Act* (1990). The *Planning and Compulsory Purchase Act* (2004) introduced substantial changes intended to strengthen the focus on sustainability, transparency, flexibility and speed. The Act initiated a move from Planning Policy Guidance (PPG) to Planning Policy Statements

(PPS) at the national level, from Regional Planning Guidance and Structure Plans to Regional Spatial Strategies (RSS) at the regional level, and from Local Plans or Unitary Development Plans to Local Development Frameworks (LDF) at the local level. The Act enhances the 'plan led' system, with a clear chain of conformity from national through regional to local planning. This is intended to give clarity to developers and enable identified issues to be addressed. There is an emphasis on using planning as a positive tool for change which can be characterised by the substitution of 'land-use' for 'spatial' planning, reinforcing a *"desire to integrate environmental, economic and development criteria when producing policy"* (Stubbs, 2008, p. 120).

At the national level there are currently twenty-five PPG/PPSs plus two supplements, providing guidance on statutory provisions, links to wider Government policies and specific advice to Regional Planning Bodies (RPB) and Local Planning Authorities (LPA). There is no direct policy requirement for regional plans to incorporate GI. However, there *is* a requirement for LDF Core Strategies to be informed by a GI evidence base. *PPS12: Creating strong, safe and prosperous communities through Local Spatial Planning* (2008) gives guidance to LPAs relating to the creation and content of their LDF and is the only PPS to refer specifically to GI, stating:

> *"4.8 The core strategy should be supported by evidence of what physical, social and green infrastructure is needed to enable the amount of development proposed for the area, taking account of its type and distribution. This evidence should cover who will provide the infrastructure and when it will be provided. The core strategy should draw on and in parallel influence any strategies and investment plans of the local authority and other organisations.*
>
> *4.9 Good infrastructure planning considers the infrastructure required to support development, costs, sources of funding, timescales for delivery and gaps in funding. This allows for the identified infrastructure to be prioritised in discussions with key local partners. The infrastructure planning process should identify, as far as possible:*
>
> - *infrastructure needs and costs;*
> - *phasing of development;*
> - *funding sources; and*
> - *responsibilities for delivery.*
>
> *4.10 The outcome of the infrastructure planning process should inform the core strategy and should be part of a robust evidence base".*

(Emphasis added)

(DCLG, 2008)

The policy wording gives GI real weight. The reference to delivery means that the findings of the evidence report must be implemented, not just used to direct policy development. By implication, this is then a requirement for a GI 'strategy', with a plan of action to achieve its goals, rather than just an evidence base study.

A number of other PPG/S cover subjects clearly related to GI. A fuller overview of these is provided in Appendix 2, but in short:

- *PPS1: Delivering Sustainable Development* – sets out overarching principles for the planning system. There is a clear case to be made for GI as contributing towards the delivery of sustainable development (ODPM, 2005a);
- *PPS1 Climate Change Supplement* – requires the delivery of sustainable transport, including walking and cycling, shape places to minimise vulnerability and provide

resilience to climate change, conserve and enhance biodiversity, recognising the climate change implications (DCLG, 2007);

- *PPS1 Eco Towns Supplement* – Sets standards for exemplar developments, many of which are relevant to GI (DCLG, 2009d);
- *PPS3: Housing* – Primarily about housing supply, but includes elements on quality design, including public transport, access to open space, climate change mitigation and adaptation, local distinctiveness and biodiversity, and promotes the use of Design Codes/Masterplans (DCLG, 2006b);
- *PPS7: Sustainable Development in Rural Areas* – Promotes the use of Landscape Character Assessment. Requires support of recreation in the countryside, recognises the importance of the urban fringe and promotes maximising its beneficial use. Requires protection of natural resources, sensitive exploitation of renewable energy and the conservation of landscape, wildlife and historic value. Sets out protection of Areas of Outstanding Natural Beauty (ODPM, 2004);
- *PPS9: Biodiversity and Geological Conservation* – Requires policies and decisions to maintain, and enhance, restore or add to biodiversity and geodiversity interests. Recognises the value of habitat networks and requires their maintenance, repair and protection (ODPM, 2005b);
- *PPS12: Creating strong, safe and prosperous communities through Local Spatial Planning* – One of only two PPS to specifically refer to GI (the other being the PPS1 Eco Towns Supplement), this PPS introduces the requirement for GI evidence and information on delivery/implementation (DCLG, 2008);
- *PPG13: Transport* – sustainable transport, accessibility to key services by walking and cycling (ODPM, 2001);
- *PPG15: Planning and the Historic Environment* – Promotes consideration of the historic dimension of the landscape as a whole (Department of the Environment, 1994);
- *PPG17: Planning for Open Space, Sport and Recreation* – Requires open space standards based on audits, including standardised typologies and consideration of quantity and quality. Recognises the value of the urban fringe and encourages its use for recreation. Promotes improvements to Public Rights of Way. The Companion Guide specifically endorses Natural England's Accessible Natural Greenspace Standards (ANGSt) (ODPM, 2002a);
- *PPS25: Development and Flood Risk* – Prioritises the use of sustainable drainage systems (SuDS) (DCLG, 2006c).

The planning system is subject to almost constant change. At the regional level, RSS (many of which are still in-production) are now to be combined with Regional Economic Strategies to form a single Regional Plan. National planning guidance is also undergoing changes, the timetable for which is provided in Appendix 3. Of particular note is the combination of PPS9 with elements of PPG17 and PPS7 into a PPS entitled *Planning for a Natural and Healthy Environment*, the draft of which is open for consultation 9 March 2010 – 1 June 2010 (DCLG, 2010b). In bringing these policies together the single PPS intends to ensure the delivery of *"healthy sustainable communities which adapt to and are resilient to climate change and [give] the appropriate level of protection to the natural environment"* and *"to deliver, for the first time, planning policy on green infrastructure"* (DCLG, 2010b, p. 10). The consultation draft emphasises the need for a *"strategic and 'big picture' approach"* to GI (DCLG, 2010b, p. 11), focusing on the delivery of ecosystem services including climate change adaptation, which is a cross-cutting theme throughout

the PPS. The new PPS provides a critical opportunity to raise the profile of GI and increase clarity for RPBs and LPAs.

3.3 The Government's Growth Agenda

The primary driver of GI in England is the Government's growth agenda, the scale of which brings unique opportunities and associated risks. The Government plans to build three million new homes by 2020 in a bid to tackle affordability issues in high demand areas and ease the plight of people trapped in homes they can't sell in low demand areas (ODPM, 2002a). The Government's *Sustainable Communities Plan* (2003) sets a framework for the delivery of this growth, which is intended to create communities, not just housing estates, and, in doing so, *"improve the quality of life for people up and down the country"* (the then Deputy Prime Minister Gordon Brown; ODPM, 2002a). GI provides a way for growth to meet this aim.

A primary mechanism for the delivery of growth is the Government's Growth Areas/Points initiative (GA/GP), implemented in response to Kate Barker's *Review of Housing Supply* (2004). Growth Point status is not a statutory designation, rather a relationship between central and local government. LPAs were invited to apply for GP status if they could deliver 20% more growth than set in their Development Plans as of October 2003, with at least 500 homes a year. This growth would be delivered by the LPAs, forming a part of the overall housing allocation dictated by the RSS. In return, central government has made extra funding available to support the evidence studies and infrastructure needed to make this growth happen. Accepted GA/GP are shown on Figure 3. Together, GA/GP will deliver:

- 1.6 million homes built through regional plans and Growth Areas;
- 100,000 extra homes by 2016, delivered through the 29 Growth Points announced in October 2006;
- 50,000 extra homes delivered through the 21 additional Growth Points announced in July 2008;
- At least five Eco Towns by 2026, providing up to 200,000 homes by 2020.

(DCLG, 2009c and EA, 2010)

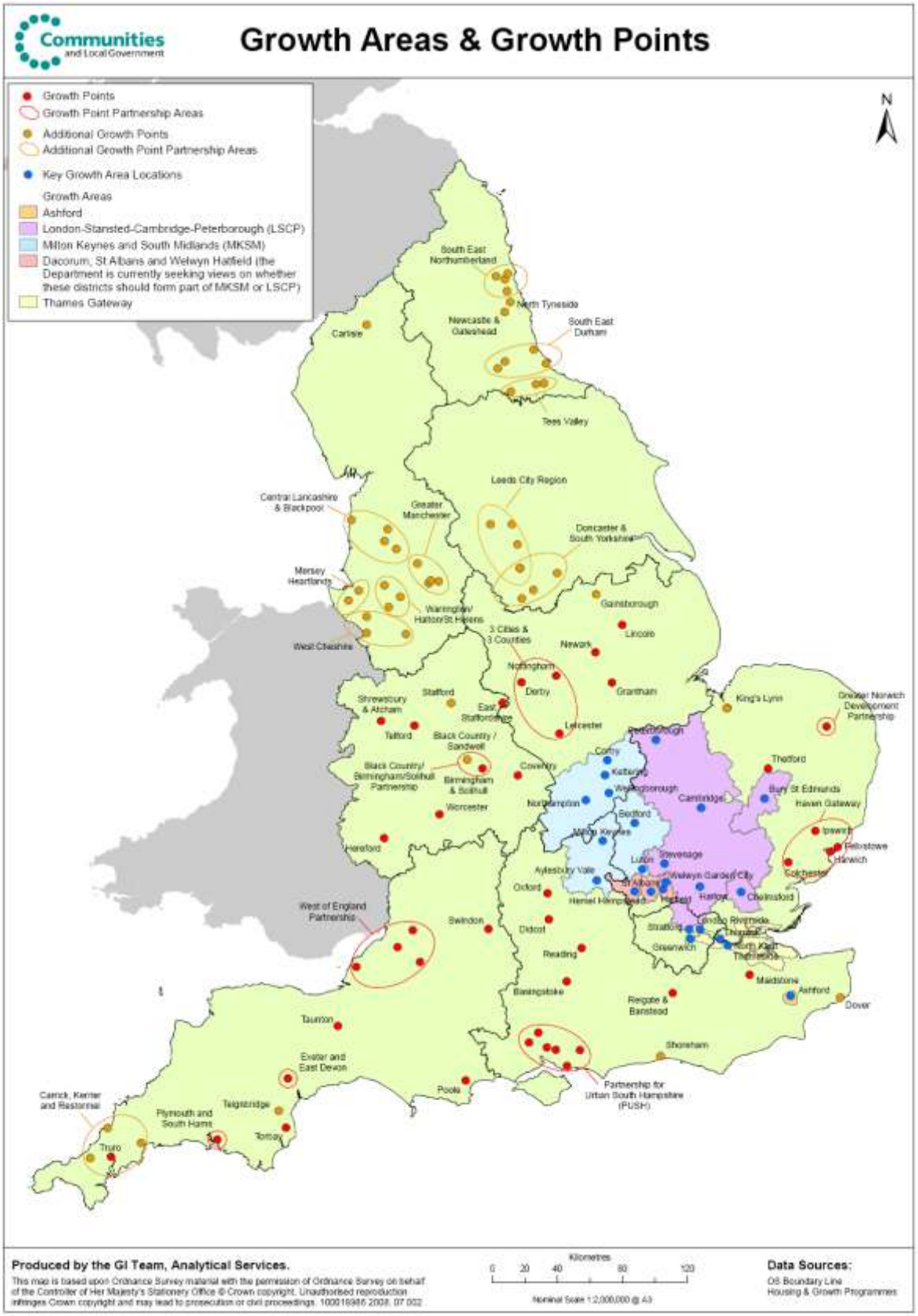
GA/GP provide a focus for GI efforts. Firstly, GI provides a means for ensuring growth on such a large scale delivers sustainable communities, i.e. works with rather than being imposed upon the existing environment, leads to development which is locally distinctive, enhances ecosystem services, or, in short, is more likely to be sustainable. Secondly, GA/GP are major population centres. Focusing GI efforts in these areas will benefit more of the population as a whole and more of the urban population in particular, who, due to the lifestyles dictated by urban form, arguably need it the most (see section 4.1.3).

The Government recognises that in order to create communities, growth must be supported by infrastructure, and GI can be included within this. The delivery of *"good schools, healthcare, local transport, and green spaces"* (emphasis added) is recognised as crucial not only for future residents, but to address the concerns of existing communities (DCLG, 2009c). When accepting GA/GP applications, central government imposed a number of tailored conditions the GA/GP has to meet. In some cases, the production of a GI Strategy has been made a condition of GA/GP status.

In theory, GA/GP also provides the best opportunities for the delivery of GI. Funding for GA/GP can be obtained in three main ways; from mainstream exchequer funding, from private sector development contributions or from specific top-up funding made available

by central government (DCLG, 2009c). The role of development contributions is considered more fully in Chapter 5, but in short, the larger the development the greater the public benefits which can be required, including GI. Central government 'top-up' funding for GA/GP is principally through the Growth Area Fund (GAF), which GA/GP LPAs must bid for. Central government invested £440m 2003-2004 and £705m 2008-2011 towards GA/GP studies and infrastructure (DCLG, 2009c). It is entirely feasible that GA/GP could obtain central government funding to produce a GI Strategy, or even to deliver specific GI projects. Given this backdrop, GA/GP should be leading the way with GI.

Figure 3: England's Growth Areas and Growth Points



(DCLG, 2009b)

Table 2: Learning to take forward – Making the Case for GI

Lessons Learnt	Reasoning/evidence
Making the Case for GI	
Biodiversity legislation can help make the case for GI	The Habitats Directive (1992) and the NERC Act (2006) require LPAs to conserve, restore, enhance and manage biodiversity in their planning and wider functions.
The post-2004 spatial planning system is intended to be a 'positive tool for change'	Spatial planning intends to better integrate environmental, economic and development criteria, thereby delivering sustainable development.
LPA's Core Strategies should be informed by a GI evidence base	Planning Policy Statement 12 states that the Core Strategy *"should be"* informed by a GI evidence base which considers type, distribution and delivery. The PPS effectively requires the delivery of a GI Strategy with a defined delivery end.
National planning policies require the delivery of GI components through the planning system	National PPSs clearly require LPAs to deliver individual components of GI as follows, in no particular order: - Walking and cycling - Climate change mitigation and adaptation - Conservation and enhancement of biodiversity - Local distinctiveness - Recreation in the countryside - Enhancement of the value of the urban fringe - Conservation of the landscape - Conservation of the historic environment as a whole - Maintenance and enhancement of geodiversity - Maintenance, protection and repair of networks for biodiversity - Adequate provision of different types of high quality accessible open space - Improvements to Public Rights of Way - The use of Sustainable Drainage Systems (See Appendices 2 & 3 for summaries of PPS)
Proposed changes to national planning polices provide an opportunity to better integrate GI components	The proposed combination of national planning policies on biodiversity, geological conservation, recreation and landscape is expected to better integrate these GI components (See Appendix 3 for summary of ongoing changes to PPS)
The growth agenda gives the need for GI some urgency	GI provides a means of ensuring growth delivers the intentions of the Sustainable Communities Plan; creating communities and improving quality of life.
Growth Areas and Growth Points provide a focus for GI efforts	Growth Areas and Growth Points are leading the way regarding GI. They also provide the greatest opportunities for GI in terms of need, both in terms of making this growth sustainable and as a population centre, and in terms of delivery, on the back of development contributions or using central government funding (see Figure 3 for map of Growth Areas/Points).

Chapter 4: The Green Infrastructure Concept

This Chapter provides a more detailed consideration of what GI is and the benefits it can deliver.

4.1 Green Infrastructure Themes

At the heart of GI is the concept of a multifunctional network. 'Multifunctionality' is the idea that GI should deliver multiple benefits, both through its individual components and through the sum of its parts. The assets which comprise the GI network have historically been and are often still thought of in terms of single functions or separate entities. For example, parks are for recreation, nature reserves protect a species or habitat (Landscape Institute, 2009). However, this approach *"fails to recognise the symbiosis between the quality and connectivity of natural assets with local environmental and economic performance"* and can result in *"a disconnected series of inadequately-managed natural elements which deliver far fewer public benefits than could be provided* (Landscape Institute, 2009, p. 1). Nevertheless, it is necessary for ease of explanation to list of some of the primary benefits the GI network should deliver. The following is by no means an exhaustive list, as GI can be turned to many purposes.

- Protection and enhancement of the landscape
- Maintenance and enhancement of biodiversity
- Protection and promotion of the historic environment
- Climate change adaptation
- Climate change mitigation
- Access and recreation
- Movement
- Health
- Education
- Economic benefits
- Water management
- Dealing with waste
- Food production
- Stronger communities
- Local distinctiveness

These benefits can be grouped into several key themes – landscape, biodiversity, historic environment, access/movement/recreation, water management and climate change. These themes are considered in turn below. However, even considering individual themes it is impossible not to stray into multifunctionality; the landscape is a product of geology, hydrology, the historic environment, biodiversity and human influences, climate change incorporates a consideration of water management and urban green space.

4.1.1 The Landscape

In many senses, a comprehensive understanding of the landscape is the cornerstone of GI. Our landscapes are the result of the interaction of natural and cultural factors over many thousands of years. As such, an understanding of the landscape necessitates an understanding of its building blocks; geology, soils, hydrology, the historic environment, land use and biodiversity. The highest quality landscapes will often be those within which these natural and cultural factors are most clearly traceable or where historic and

biodiversity interests overlap – therefore the landscape lends itself to considerations of multifunctionality. England has a rich and diverse landscape comprising areas of their own distinct local character, the retention and enhancement of which is essential to local distinctiveness. However, landscapes are also a product of human perception (Hanley *et al.,* 2009, p. 1404). The European Landscape Convention defines landscape as *"An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors"* (Council of Europe, 2000; Natural England, 2009d). Natural England *et al.* (2007) expand this thus:

> "*Landscape is a meeting ground between past, present and future as well as between natural and cultural influences. It has both a physical and an emotional presence and sets a context for people's lives"* (p. 2).

The physical properties of our landscapes plus the feeling or perception they give to us combine to give us a 'sense of place' (Cheng *et al.,* 2003; Hanley *et al.,* 2009). This sense of place is fundamental to creating locally distinctive communities. Therefore at a fundamental level, GI incorporates considerations of landscape in order to provide quality places for people to live in.

The landscape can be defined at a variety of scales. Nationally, the UK is subdivided into 159 National Character Areas (see Figure 4), each with characteristics defining it from the next. Landscapes can also be defined regionally, sub-regionally, or even down to field scale (see Figure 5). Therefore consideration of the landscape can be tailored to fit the scale of GI.

Spatial planning can have a significant impact on the landscape, in a short time and with lasting consequences. Decisions on the location, scale, density, form and design of developments have the ability to maintain, detract from or enhance the landscape. Every landscape has a unique character and differs in terms of its quality, condition, sensitivity to and capacity for different types of change. Landscape character is defined as *"the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people"* (Landscape Institute and IEMA, 2002; SWJCS, 2009a, p. 11). It can be degraded by the addition of uncharacteristic features or the loss of characteristic ones, leading to a *"slide towards uniformity ... a dilution of character"* (SWJCS, 2009a, p.11). Making positive decisions depends upon an understanding of the landscape. Landscape Character Assessment (LCA) is a standardised technique to assess and record the attributes which make a landscape distinctive (SWJCS, 2009a), and, as such is a fundamental component of GI analysis.

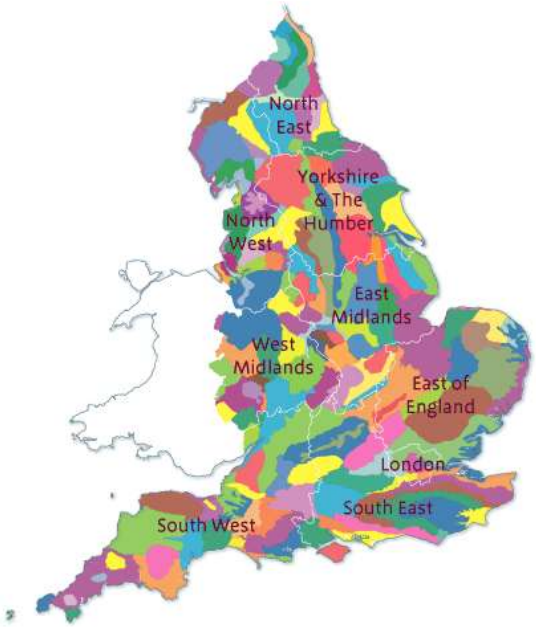
LCA is an established technique commonly used to inform decisions on development site selection and design. However, integrating LCA into GI offers several advantages. The GI approach provides a 'double assessment' of the landscape, firstly through considering its building blocks as separate components (e.g. geology, soils, hydrology, the historic environment), and secondly through its assessment of the output of the interactions between these elements, the landscape. This will increase the understanding of the landscape, what makes it special and how its quality can be enhanced. The GI approach can help to ensure developments work with the landscape, protecting and enhancing it. Applying this approach means that mitigation may not be required but where damage from development is unavoidable well-understood GI assets can be used to mitigate its impacts, for example by softening or buffering the urban edge. The network approach of GI can be particularly advantageous in this regard. Barker (1997) considers green networks to have important landscape values at macro and micro scales and quotes Spirn (1984) as stating that the green network *"gives a structural foundation which goes with the grain of the landform"* (Barker, 1997, p. 15).

An outstanding issue is perhaps that of future landscapes. As yet, there is no consensus about what a given landscape should look like in the future and to what extent this should draw upon the past. Denton-Thompson (2009) considers that *"whilst we accept that we have the power to transform landscapes by intent or as a bi-product of other drivers of change ... we still do not have a clear vision for the multi-functional landscape that future generations will require"* (p. 8). It is clear that landscapes are dynamic and our future landscapes will continue to be influenced by changes in our climate, agriculture, housing and development needs and our reactions to these, such as progress towards a low carbon society (Natural England, Defra and English Heritage, 2007). What is not clear is the direction we want these changes to take us, or what action we should take to get there. In some instances an aspiration to retain current landscapes is assumed, such as within National Parks. However, research by Hanley *et al.* (2009) into people's attitudes to change within Loch Lomand and the Trossach's and the Lake District National Parks found that attitudes were influenced by information on past landscape change and past attitudes. They conclude that:

> *"those engaged in landscape management should be aware that public perceptions of 'specialness' associated with a particular landscape do not automatically mean that that landscape should be kept exactly as it is. There may, in fact, be a desire to 'improve' it, the particular attributes of which need to be carefully deduced and which are no doubt culturally and temporally inspired"* (Hanley *et al.,* 2009, p. 1411).

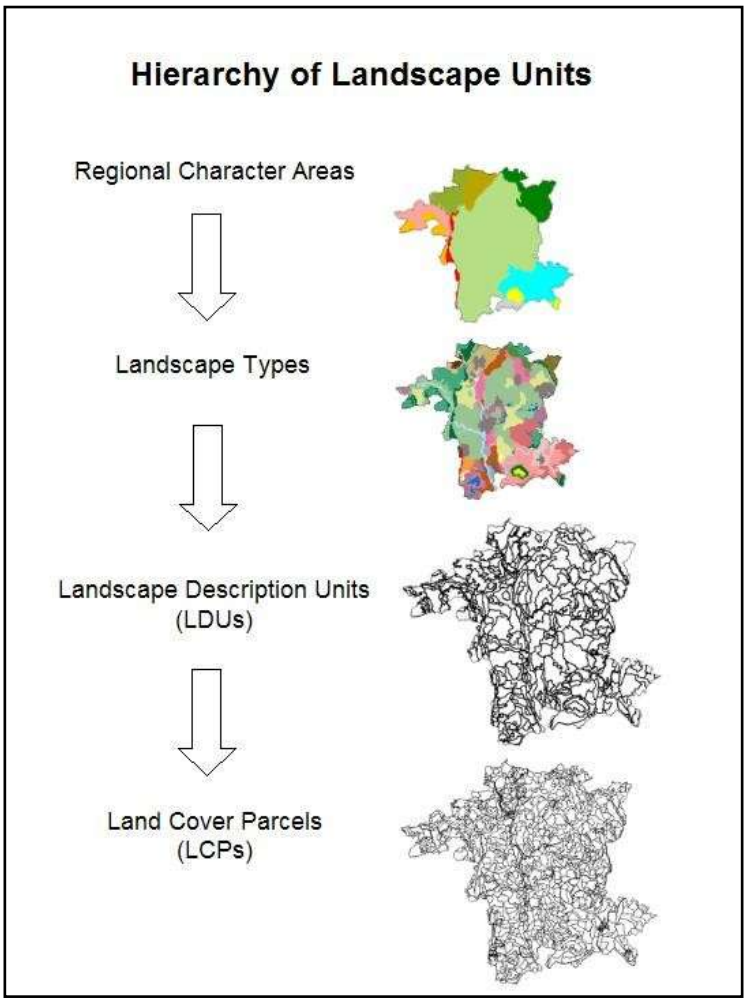
Conversely, in areas where landscape is considered to be degraded there may be aspirations to transform the area, for example post-industrial landscapes, but these landscapes may equally be highly valued. GI may help to answer this question, providing the framework for the wide-ranging debate advocated in Natural England's *Future Landscapes* Position Statement (Natural England, 2010) and leading, as it does, to more robust and inclusive landscapes.

Figure 4: National Character Areas



(Natural England, 2009e)

Figure 5: Regional and Sub-Regional Landscape Units



(SWJCS, 2009a, p. 14)

Table 3: Learning to take forward - Landscape

Lessons Learnt	Reasoning/evidence
Landscape	
Understanding the landscape is an essential cornerstone of GI	Landscape is a product of many of the themes of GI and as such assessing and understanding the landscape is the first step towards delivering multifunctionality. Therefore landscape is an essential element of GI.
Landscape assessments can be tailored to any scale of GI	Landscape can be considered at national, regional, sub-regional or local scale as required.
Landscape Character Assessment is easily integrated into GI	Landscape Character Assessment provides a readily applicable methodology for assessing what makes a landscape special, and should form a part of GI analysis and design.
The landscape is vital to local distinctiveness and sense of place and should be treated appropriately	Areas of high landscape value should be protected and enhanced by development and by the delivery of GI. Areas of low landscape value should be restored, but this does not necessarily mean returning to the past. The GI approach should give direction to decisions and management decisions.

4.1.2 Biodiversity

Biodiversity is defined as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (JNCC, 2007). The term biodiversity therefore includes what we commonly call 'wildlife' but has a much broader meaning, encompassing ecosystems and their interactions, i.e. the natural world in the round. Biodiversity is the planet's life support system. At its most fundamental, it provides us with oxygen and food. Biodiversity underpins our modern lives, providing fertile soils for agriculture, medicines, raw materials and many 'free' ecosystem services which are often taken for granted, such as the purification and storage of water and the reduction of airborne pollution. Biodiversity is also essential for our health and wellbeing, with recognised aesthetic and psychological benefits (Pretty, 2009). However, biodiversity of course has an intrinsic value; it is important for its own sake. There is therefore a moral dimension to its conservation.

The world is currently experiencing unprecedented extinction rates – 100 to 1,000 times faster than ever before (Pretty, 2009) – with human actions the root cause. In the UK, habitats have become increasingly fragmented as a result of agricultural intensification, urbanisation and infrastructure development (Boothby, 2004). Under these conditions *"many species show population declines, reductions in geographical range, and a lowered diversity"* (Boothby, 2004, p. 69). The UK's system of designated sites has been on the front line in the defence of biodiversity since 1947 (RTPI, 2001; Boothby, 2004), but in some respects further exacerbates the issues. Practices, attitudes and actions are characterised by which side of the dividing line they are on, despite the fact that the designated site is a 'fiat object', one with a boundary imposed by humans (Boothby, 2004). It is also widely recognised that coverage by designated sites is inadequate as the sole means of achieving nature and biodiversity conservation. Just 6.3% of England is designated as Site of Special Scientific Interest (SSSI) (Oldfield *et al.,* 2004). There are also evident inequalities of representation; 65.8% of highlands are SSSI, compared to only 3.5% of lowlands (Oldfield *et al.,* 2004). Adams (1996) considers that designations

often reflect *"accidents of land tenure and the financial circumstances of conservation organisations, irrelevant to natural processes and environmental problems"* (Adams, 1996, p. 116; Boothby, 2004, p. 67). With an average area of just 0.2km^2, SSSI *"may not be large enough to support large populations of formerly common, wide-ranging species"* (Osborne et al., 1999; Oldfield *et al.,* 2004; p. 307). It is clear therefore that designated sites alone are far from and never can be sufficient to conserve more than samples of our biodiversity.

Biodiversity which is confined to *"ghettos in SSSI and other sites bearing ... impressive acronyms"* (Perraton, 1999, p. 1; Boothyby, 2004, p.67) is at risk through its isolation. Mismanagement or accidental damage pose risks, but a more fundamental risk is that of climate change. Research by the Wildlife Trusts found *"a 3ºC temperature rise equates to about a 340-mile northward shift"* (Eversham, 2009, p. 30). The intricacies of local conditions mean matters are unlikely to be this clear-cut. The increased risk of extreme events leading to local extinctions in isolated populations will be an earlier indicator of the underlying issue (Bloomfield, 2010). In this scenario, species must find new 'climate space' where the temperature and habitat suit them (Eversham, 2009). The composition of habitats within designated sites may fundamentally change, and their reason for designation may no longer be present. If species and habitats do not have space to adapt, they may be lost. A few wet summers coupled with sub-optimal habitat could lead to the loss of the Wood White in Worcestershire, for example (Bloomfield, 2010). As Eversham (2009) points out, our biodiversity has adapted time and time again, responding to glacial and interglacial's - *"The difference this time is that the UK's wildlife strongholds are now largely cut off by intensive land use"* (Eversham, 2009, p. 32). In addition, the speed of change is much faster, potentially decades rather than millennia.

It is clear then that in order to maintain and conceivably enhance biodiversity, fragmentation must be reduced. The concept branded varyingly as landscape-scale conservation or ecological networks intends to increase linkages, reducing fragmentation, and is easily incorporated into the network approach of GI. However, to successfully enhance biodiversity GI needs to be aware of several ecological principles. Practitioners must avoid placing an anthropocentric perspective on the needs of biodiversity. Functional connectivity can take the form of corridors, networks, stepping stones or mosaics, but 'wildlife corridors' are often promoted in planning policy, perhaps because they are easily understood. However, Bennett (1998) recommends that:
"claims such as 'wildlife corridor' ... should not be included or accepted in planning strategies unless consideration is given to the specific biological purpose of the linkage and how its design, dimensions and management will be directed to meet that goal" (Bennett, 1998, p. 127).

The connectivity needs of a given species depend upon structural and behavioural components (Bennett, 1998). As Low *et al.* (2005) communicate:

> "some animals are specialists and others are generalists ... some species require very specific types of habitat while other, generalist species, benefit most from having a variety of habitats and connections between habitats" (Low et al., p. 87; Jackson, 2007, p. 2).

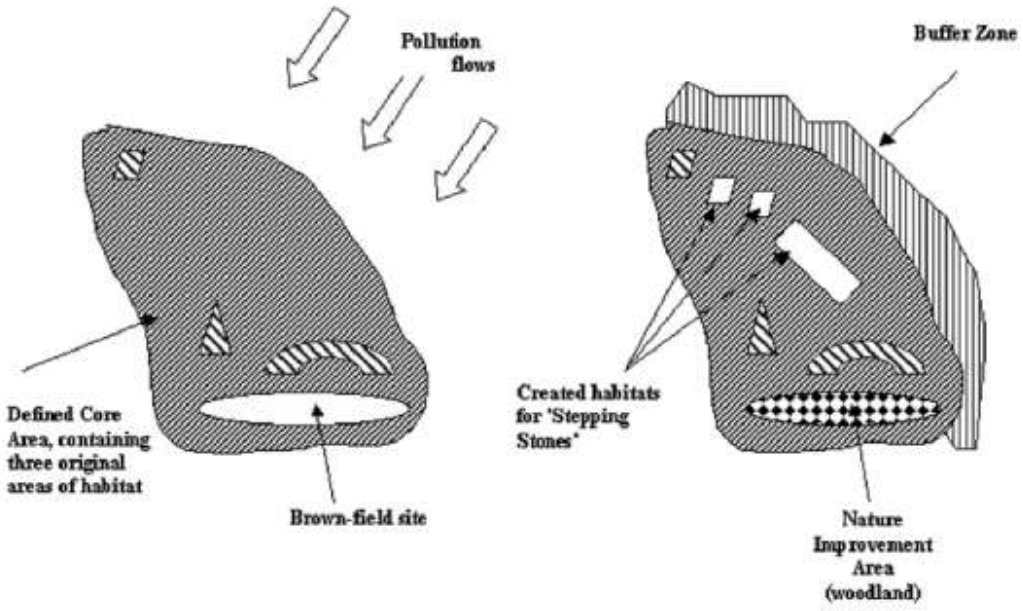
In as disturbed an environment as lowland Britain "a close mosaic of stepping-stone habitat patches may be as effective as a continuous strip in allowing [species] to permeate the whole area" (Barker, 1997, p. 4). Connections should therefore be tailored to their purpose.

Designated sites have a vital role to play in successful ecological networks, providing the gene pool for any biodiversity expansion. This has led to the concept of designated sites such as SSSI forming 'core areas' within a network, to be buffered and linked (Barker,

1997 and Boothby, 2004). Figure 6 illustrates this approach. There is widespread agreement that stakeholder involvement is crucial to the success of core areas. Land acquisition and the application of Section 106 Agreements (see Chapter 5) are likely to remain limited; therefore voluntary sympathetic action by private land owners is essential to achieving biodiversity objectives (Boothby, 2003 and Oldfield *et al.,* 2004). However, the appearance of a line on a map denoting a 'core area' may be perceived as *"an encroachment by the planning system, an interference with legitimate farming practice"* (Boothby, 2004, p. 72). Stakeholder involvement is critical in providing a platform to explain that *"it is not intended that the physical creation of a network will result in a new acronym or conservation designation"* (Boothby, 2004, p. 72).

It is also important to recognise that all biodiversity management takes place in a social, economic and political context. It may therefore be impossible to deliver an ecologically idealised system to maintain habitat connectivity (Bennett, 1998). It is therefore intuitive that biodiversity is best protected not by isolating it, but by making it a part of everyday landscapes and lives. This may require social and economic goals to be considered when defining an ecological network. Barker (1997) suggests that whilst the protection and development of green networks is important, *"it is dangerous to place too much emphasis on one single aspect of their function"* (Barker, 1997, p. 5). Networks which draw upon social considerations are also more easily justified and defended as they delivery multiple benefits. In this regard, biodiversity will clearly benefit from its inclusion in GI.

Figure 6: Schematic of physical components of an ecological network



Most networks comprise four physical elements. ***Core Areas*** *contain high-quality habitat and well-sustained species populations.* ***Nature Improvement Areas*** *are identified for intervention; here habitat can be improved, leading to increased sustainability for existing species populations or enhanced (re-)colonisation from Core Areas. Improvements can exploit a range of inventive techniques.* ***Corridors or stepping stones*** *provide continuous or patchy links (as appropriate to the species concerned) between existing species strongholds, in order to aid species dispersal and colonisation. Finally, where needed, protective* ***buffer zones*** *can be created to mitigate external pressures from, say, intensive agriculture.*

(Boothby, 2004, p. 69)

Table 4: Learning to take forward - Biodiversity

Lessons Learnt	Reasoning/evidence
Biodiversity	
Designated sites should form core areas within the GI network	Designated sites are a critical genetic resource which the extension of habitats and species' ranges relies upon.
Designated sites should be buffered and linked, but links should be tailored to their purpose	Corridors are the most obvious type of link, but stepping stones and habitat patches/mosaics can be equally effective and should be recognised. When devising the GI network consideration should be given to the biodiversity priority, and the network tailored accordingly.
Biodiversity should be a part of our everyday lives and landscapes	Designated sites alone are not enough to maintain our biodiversity, let alone enhance it. The GI approach provides an opportunity to make biodiversity a part of our everyday lives and landscapes, increasing biodiversity and, perhaps crucially, raising public appreciation and awareness.
Biodiversity networks must be delivered in the context of social and economic benefits	In the UK at least, it is impossible to create and deliver an ideal ecological network due to social and political considerations. The GI approach offers a way to integrate ecological and social concerns, ensuring biodiversity networks are valued and more easily defensible, and effective in the long term, as a result.

4.1.3 The Historic Environment

As mentioned in the Section 4.1.1, our present day landscapes have been shaped over generations by interactions between people and the environment, whether urban or rural. This section provides greater focus on the specifics of the historic environment as a GI asset.

The historic environment is perhaps most widely recognised through prominent designated features, such as Cathedrals, Ancient Monuments or Listed Buildings. However, historic interest is not confined to these most obvious features. Rather, *"those sites are the most visible components in a shimmeringly complex historic landscape filled with ancient, medieval and modern ecologies and histories and also filled with complex meanings and values for contemporary communities"* (Herring, year unknown, p. 2). All semi-natural areas are, by default, 'semi-cultural'; artefacts of human agency, modified, intentionally or incidentally, by various and changing management decisions and land use systems (Herring, year unknown). Diverse archaeological sites and remains, ancient woodlands and historic field patterns may be less understood by the general public, but have an essential cultural and social value. The historic environment is *"filled with complex meanings and values for contemporary communities and contemporary individuals"* (Herring, year unknown, p. 2). People develop deep-rooted relationships with the cultural and semi-natural worlds they inhabit and the historic fabric gives people, whether they are conscious of it or not, something with which they identify. The historic environment is therefore a vital component of sense of place.

The historic environment plays an essential role in sense of place and, thereby, local distinctiveness. As such, it has an obvious role to play in the delivery of the Government's Sustainable Communities agenda. English Heritage, the Government's statutory advisor

on the historic environment, categorises its contribution towards this agenda as work which:

1. *Develops understanding of the historic environment;*
2. *Get[s] the historic environment on other people's agendas;*
3. *Enables and promotes sustainable change to the historic environment;*
4. *Helps local communities care for the historic environment;*
5. *Stimulates and harnesses enthusiasm for the historic environment.*

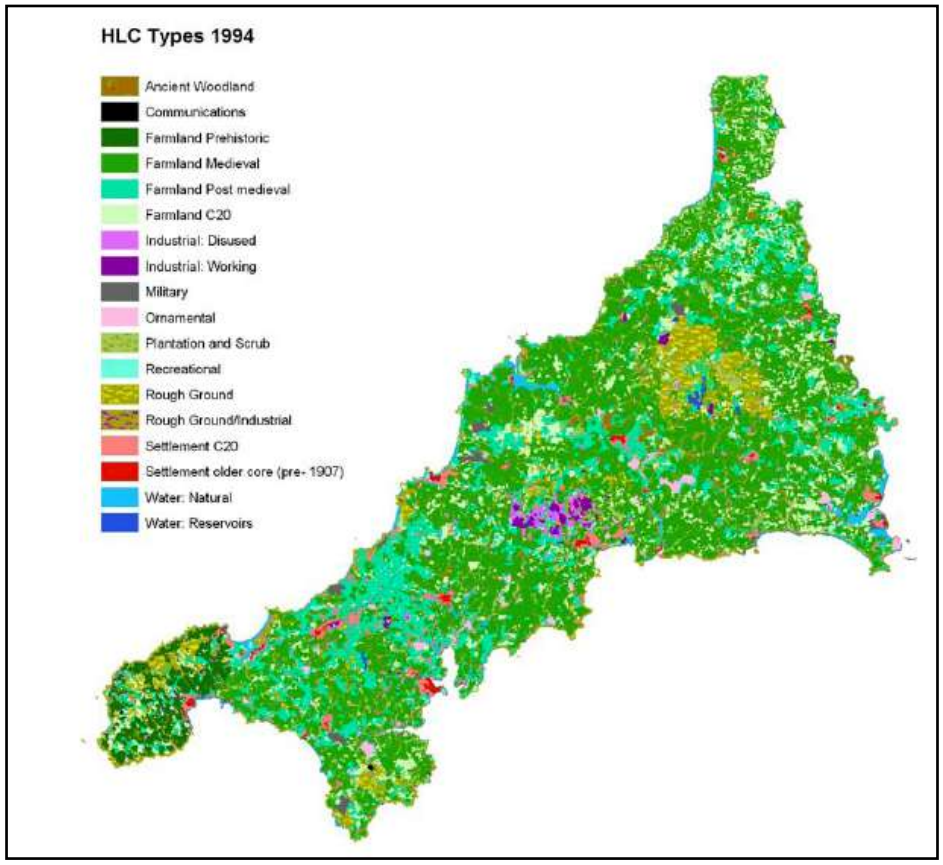
(English Heritage, year unknown).

Whilst the contribution of the historic environment to sustainable communities is clear, the relationship between the historic environment and GI is still very much in development. EH is supportive of the GI concept, having backed the Commission for Architecture and the Built Environment's 'grey to green' campaign which calls for a shift in funding and skills towards GI (CABE, 2010), and is currently producing guidance on GI and the historic environment. However, in contrast to other areas, e.g. biodiversity, the role of the historic environment in GI has received little academic attention (Mindykowski, 2010). There is, however, a growing understanding of this area led by professional bodies and LPAs looking for practical solutions to the conundrum: how to deliver growth which respects and promotes the historic environment?

Endorsed by EH, 'characterisation' is being promoted as integral to spatial planning (English Heritage, 2004) and may provide an answer to this question. The term characterisation describes a number of methods, applicable at different scales, which are used to capture *"our overall feeling for the totality of a place – not just to collect facts about who built that building, what style it is in, whether it is rare, what an archaeological site can tell us about our predecessors or how a designed park reflects 18th-century taste, but about what the place as a whole means to us"* (English Heritage, 2004, p. 2). Characterisation is seen as a fluid, iterative process which has no 'final answer', rather, it is a research tool to help *"understand better the complex intertwining roads of past decisions, actions and inactions that have led to the present day's historic environment"* and to inform future choices – *"to preserve or manage, to create or leave well alone"* (English Heritage, 2004, p. 3). Historic Landscape Characterisation (HLC) is a technique developed by the then Countryside Commission in conjunction with EH in 1994 (Herring, year unknown) which intends to fill the gap in understanding regarding the wider historic environment (English Heritage, 2001). The method *"depends on historic landscape character being not only various but also repetitive"* (Herring, year unknown, p. 3).

In HLC, blocks of land are attributed to one of a range of Landscape Types, with block size varying according to the grain of the landscape and the methodology employed (English Heritage, 2001). Landscape Types are pre-determined through consideration of the sensitivity of characterisation required and the range of character in the study area (Herring, year unknown). GIS databases are used to underpin judgements and interpretations of the attribution of Type (English Heritage, 2001). The Type of each block is recorded as a colour-coded polygon on GIS, supported by a database that *"records key descriptive and interpretative attributes and the degree of confidence with which any interpretations have been made"* (Herring, year unknown, p. 3). Before HLC, *"no satisfactory method existed for identifying the historic character of the whole landscape"* (English Heritage, 2001, p. 24) and the historic environment fell between the analysis of the natural and urban environments.

Figure 7: An Example of Historic Landscape Characterisation



(Cornwall County Council, 1994; Herring, year unknown, p. 12)

Historic Environment Characterisation (HEC) is a rapidly developing 'next generation' of characterisation, where HLC is combined with Landscape Characterisation and Historic Environment Records data into one integrated historic environment assessment. HEC is specifically tailored towards assessing the impact of development and design (Brown, Clarke and Havis, 2006, p. 8). The value of this approach is its provision of a multi-dimensional characterisation and assessment of the historic environment, but also that it addresses capacity, sensitivity and opportunity. HEC considers a much broader set of data and its setting. This includes abstract elements such as below-ground archaeology and palaeo-environmental deposits, but also landscape components like woodland, land division expressed by hedgerows, parklands and other designed landscapes. This form of characterisation provides evidence of the intrinsic and essential relationship between the historic environment and the GI concept.

HLC and HEA provide a practical means for the historic environment to be incorporated into GI. Their spatial expression means their information is accessible by non-specialists, including others involved in the GI process. It also allows the historic environment data to be overlain with other maps, lending itself to assessments of multifunctionality. By presenting a clear understanding of the historic environment, HLC and HEC provide planners with an interpretative tool to ensure development is appropriately sited and designed. Incorporating HEC into GI complements this, for example, green space can be located to preserve archaeology or buffer Scheduled Ancient Monuments and historic field patterns can be incorporated within a new development, the overall effect being to respect, preserve and work with the historic fabric. Such issues are equally applicable to the urban environment. Strange (1997) quotes a growing recognition amongst

policymakers and planners that historic cities are *"facing considerable pressure to retain those historic characteristics that make them attractive to residents, visitors and businesses* (Strange, 1997, p. 227) and Waitt (2000) considers that contemporary urban experiences are *"lacking a sense of depth, originality, and place"* (Baudrillard 1988; Eco 1986; Giddens 1991; Lash 1990; Sayer 1991; Waitt, 2000, p. 837), the very issues recognised by Glancey (2006) in relation to the later New Towns. Both refer to the role of heritage in encouraging tourism and spending. The appeal of historic settlements to tourists is easily understood, but features such as canals or disused railways, both with industrial heritage value, or, equally, semi-natural assets such as ancient woodlands also have the potential to increase local distinctiveness and draw in visitors. The inclusion of the historic environment in GI provides an opportunity to achieve the interpretation and promotion needed to make this happen.

Table 5: Learning to take forward – Historic Environment

Lessons Learnt	Reasoning/evidence
Historic Environment	
The historic environment shapes our landscape and is a vital component of sense of place	The visibility and integrity of the historic environment influences people's attitudes and feelings towards a place. Being informed by and working closely with the historic environment is therefore vital to creating locally distinctive places.
Historic Landscape Characterisation is easily incorporated into GI and lends itself to assessments of multifunctionality	• Characterisation provides a method for considering the historic environment holistically and, as such, is promoted by English Heritage. • HLC is an accessible means of presenting historic environment information to non-specialists, encouraging an interdisciplinary approach. • Characterisation can inform future choices for place shaping, and, as such, could help to direct GI priorities.
GI can provide a means to ensure the protection, enhancement and promotion of the historic environment	GI provides a practical means to ensure the protection of the historic environment. Its inclusion within GI provides an opportunity to capitalise on public interest in the historic environment through its interpretation and promotion, raising awareness.

4.1.4 Water Management

In many scenarios watercourses provide the lynchpin in the GI network. In the UK, watercourses may provide the only remaining semi-natural linkage in a heavily urbanised or intensive agricultural landscape. As many settlements have grown up around rivers due to their historical significance as trade routes and for defence, watercourses often connect urban areas with the wider countryside. Thus watercourses provide an obvious opportunity for a GI link. Watercourses also embody multifunctionality. Watercourses can be significant elements of landscape character, are popular for recreation and tourism and may be associated with interesting historical or geological features, such as gravel terraces. Their value as a wildlife 'corridor' is easily grasped. A well planned GI network can build upon and enhance this multifunctionality.

The spate of recent flood events, for example Worcestershire and Gloucestershire in July 2007 and Cumbria in November 2009, has brought flooding to the public's attention. Although flooding in the UK is *"mild by global standards"* and claims few lives (Tunstall *et al.,* 2004, p. 1), the social and economic costs of flooding and flood mitigation are high.

According to the Environment Agency (EA), 1.85 million homes, 185,000 commercial properties and approximately five million people are at risk from flooding in England and Wales (EA, 2001; Tunstall *et al.,* 2004). Instances of surface water flooding are on the increase, as ageing sewerage and foul water drainage systems struggle to cope with increasing/higher peak run-off. Over two thirds of the 57,000 homes flooded in summer 2007 were flooded by surface water (Pitt, 2008). The Foresight Report *Future flooding* (2004) estimated 80,000 homes to be at 'very high risk' of surface water flooding (Parliamentary Office of Science and Technology, 2007). Given the predicted increase in intensities of rainfall events with climate change, the risk will only increase.

GI can help to reduce flood risk. At the strategic scale, naturalising floodplains through changing land use and/or creating wetlands can increase flood storage capacity. Wetlands act like a sponge, absorbing excess water and releasing it slowly – known as attenuation. This can benefit climate change adaptation. In addition, wetlands benefit water quality by filtering pollutants, deliver biodiversity benefits by providing habitat, are part of the historic landscape and could be promoted for recreation/tourism. At the local scale, Sustainable Drainage systems (SuDS) such as reedbeds or swales can deliver similar benefits. The EA's flood risk management scheme for the River Quaggy in Sutcliffe Park, London, exemplifies the GI approach. The scheme opened up the culverted River Quaggy and created a wetland area, reducing the flood risk to 600 homes and businesses (Copas, 2007; CIWEM, 2007). It also benefited the environment – providing natural habitat within an urban area – and society – providing amenity greenspace, increasing local pride and reducing crime (CIWEM, 2007).

Water resources are also increasingly pressurised. Groundwater supplies one third of the drinking water across England and Wales (EA, 2009), but is suffering from draw down, which can deplete public water supply and damage ecosystems (Foster and Chilton, 2003 and EA, 2006). Passive shading, summer water collection and storage of winter water are likely to become more prevalent in the future and there is considerable scope for GI to help in this regard. The use of SuDS and wetland creation can also help to recharge groundwater.

If these benefits are to be achieved, GI must be informed by hydrological information. PPS25 sets out a requirement for LPAs to undertake a Strategic Flood Risk Assessment to inform the preparation of the LDF (DCLG, 2006, c), and most are also undertaking a Water Cycle Study as a means of determining what water infrastructure is required, ensuring growth makes best use of opportunities and adapts to environmental constraints, and, importantly, providing a platform to involve Water Companies in the planning process (EA, year unknown). GI Strategies should draw upon these data sources.

Table 6: Learning to take forward – Water management

Lessons Learnt	Reasoning/evidence
Water Management	
Watercourses are an obvious link in the GI network	Watercourses are often the only semi-natural element in an otherwise urban or intensive agricultural landscape. They often connect urban areas to the wider countryside.
Watercourses embody multifunctionality	Watercourses provide wildlife corridors and are popular for recreation. They may also have historic or geological interests.
GI can help to reduce flood risk, at a strategic or local scale	Floodplain naturalisation or the creation of wetlands can improve flood water retention, attenuating flows, as well as benefiting wildlife and storing carbon. Sustainable Drainage Systems can have similar benefits, on a more local scale, and may also provide an amenity and recreation resource.
GI can help to protect and recharge water resources	Provision of shade and the storage of water.
GI strategies should draw upon information from Strategic Flood Risk Assessments and Water Cycle Strategies	

4.1.5 Access, Movement and Recreation

The state of the nation's health is increasingly reported in the media. Obesity in particular is perceived as *"a significant social and health issue"* (RTPI, 2009, p. 17), reported as directly contributing to 34,000 premature deaths in the UK (Royal Commission on Environmental Pollution, 2007; Anon, 2009b). Lifestyle-related health issues have economic as well as social implications. Physical inactivity in England costs an estimated £8.2 billion a year (Anon, 2009b). These problems are predicted to worsen. The Foresight Report *Tackling Obesities: Future Choices* (2007) estimated that by 2050 over half of the population will be clinically obese (Abell, 2008, and RTPI, 2009).

There is a clear relationship between people's lifestyles and their health and wellbeing, and exercise is integral to both. General Practitioners can now prescribe health walks or even golf (The Telegraph, 2009). Over 2,000 Walking the Way to Health Initiative (WHI) walks take place every day (Natural England, 2009b), and their value is recognised in the Department for Health's *Physical Activity Plan* (2009) and the strategy *Healthy Weight, Healthy Lives* (2008), which aims to get people walking an extra 1,000 steps a day (Abell, 2008, p. 14). The success of such schemes can be attributed to their location in the natural environment, giving people *"staying power"* when it comes to exercise (Bird; Natural England, 2009b).

In addition to the physical benefits, there are recognised physiological benefits associated with contact with the natural environment. For example, *"hospital patients ... recover quicker when they have a view of a tree and studies show that stress levels drop when sufferers move into a leafy environment"* (Anon, 2009b). Research by Sheffield University has shown that greener streets *"have a profoundly positive influence on socio-economic behaviour, with at least a 35% drop in crime, fewer absences from the workplace and an increased awareness of the environment"* (Diamond, 2009, p. 16). Pretty (2009) suggests that humans have been *"hard-wired for nature"* by our evolution, and for this reason *"we*

appear to function better in environments that offered us a good chance of survival in the past" (Pretty, 2009, p. 22). The benefits are symbiotic, beneficial for both humans and the environment. The Wildlife Trusts state that *"green exercise leads to more ecological knowledge, the fostering of social bonds and improved behavioural choices towards the environment at large"* (Pretty, 2009, p. 21). Whatever the reason, the benefits of health walks in a 'green' environment are borne out by hard facts, as illustrated by Figure 8.

Figure 8: Results of Greenspace Scotland's *Health Impact Assessment of Greenspace*

£4.2 billion	Annual cost to the NHS of obesity and related diseases
50 per cent	Reduction in risk of heart attack by a daily walk in the park
91 per cent	People who believe that public parks and open spaces improve quality of life
300 per cent	Increased likelihood of residents being physically active in residential areas with high levels of greenery.[3]

(Greenspace Scotland, 2009; CABE, 2009, p. 4)

There is widespread cross-disciplinary agreement, backed by research, that access to good quality green space is fundamental to health and wellbeing. Living Streets, a national charity campaigning for better streets and public spaces, believes everyday activities such as walking to school and going to the shops hold the key to reducing obesity; *"gym membership and organised football teams are excellent for those with the access and the motivation, but simply aren't realistic for the great majority of people"* (Abell, 2008, p. 14). *Healthy Weight, Healthy Lives* (2008) highlights the need to create urban and rural environments *"that make activity safe, accessible and the norm"* (Abell, 2008, p. 14). Spatial planning can play a fundamental role in achieving this. The Royal Town Planning Institute's (RTPI) Good Practice Note *Delivering Healthy Communities* (2009) highlights the role of planning in shaping environments to make healthier living realistic;

> *"the ways in which buildings and places are configured influence people's living, working and travel patterns; the shape of the local economy; people's opportunities to access local food; and their propensity to be physically active. At the same time, patterns of pollution will affect the local environment and in turn affect human health"* (RTPI, 2009, p. 3).

The application and delivery of a GI approach can make healthier choices possible by delivering safe, attractive and accessible local green space and pedestrian and cycle routes away from the hazards of traffic. Therefore GI can help to encourage healthy choices.

Given the above, it is apparent that the quantity and quality of accessible green space is fundamental. Quantity can be measured in various ways, but perhaps the most relevant to GI is Natural England's Accessible Natural Greenspace Standards (ANGSt), which state:
No person should live more than 300m from their nearest area of accessible natural greenspace of at least 2ha in size;
There should be at least one 20ha accessible natural greenspace within 2km from home;

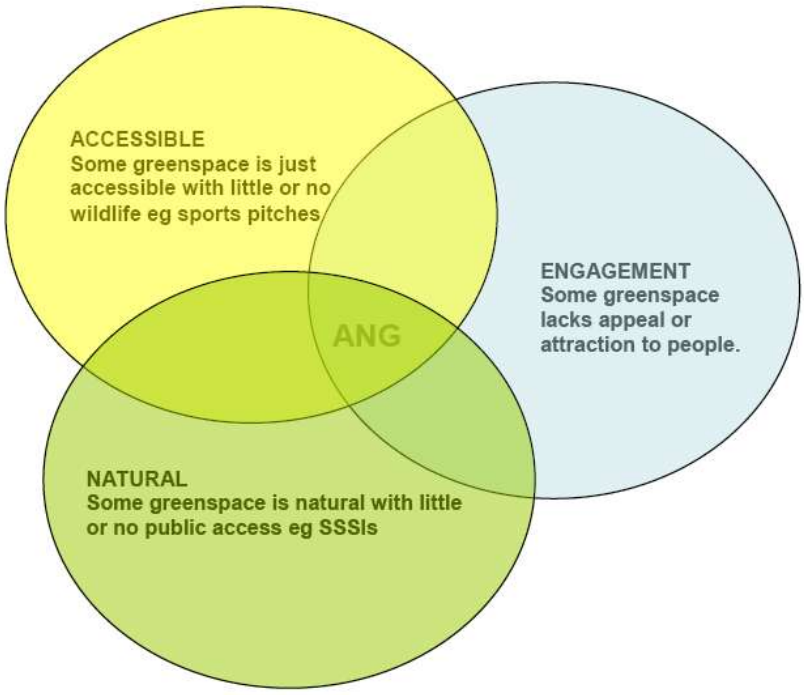
There should be one 100ha accessible greenspace site within 5km;
There should be one 500ha accessible natural greenspace site within 10km;
At least 1ha of statutory Local Nature Reserve should be provided per 1000 head of population.

(Natural England, 2009c)

These standards are based on extensive research and practical experience, and further, are recognised in the Companion Guide to PPG17 (ODPM, 2006). As illustrated by Figure 9, ANGSt aims to meet the needs of people and nature. As such, ANGSt is a useful delivery component of GI.

Quality of green space as important as quantity. Aesthetics, design and management are vital to encouraging use of green space. Low quality green space compromised by graffiti, litter and vandalism can be detrimental to wellbeing and fear of crime may lead to underuse (RTPI, 2009). Management plans, backed with resources, are a vital tool for tackling such issues and are already required for all Local Nature Reserves. An authoritative presence, such as Park Rangers, can also help. Achieving an award such as the Green Flag Award can help to raise public confidence, as well as attracting greater recognition and funding, helping to improve the area further.

Figure 9: Pictorial representation of the Natural England's Accessible Natural Greenspace Standards balance



(Natural England, 2009c, p. 5)

Table 7: Learning to take forward – Access, Movement and Recreation

Lessons Learnt	Reasoning/evidence
Access, movement and recreation	
GI can positively influence healthy lifestyles	Obesity and related health issues are often lifestyle related. GI can encourage the integrating of exercise into daily lives, helping to combat obesity.
Walking the Way to Health Initiatives which delivered in greenspaces are more likely to be effective	People are more likely to stick with WHI undertaken in green spaces due in part, to the feelings of wellbeing which contact with nature brings.
Accessible Natural Greenspace Standards can be delivered through GI	ANGSt provides a methodology, already recognised in national planning policy, which can be applied to ensure the delivery of appropriate levels of GI.
Management Plans, backed with resources, are important to ensuring the benefits of greenspace are delivered	Quality of greenspace is as important as quantity. Poor quality greenspace can reduce its use. Management Plans can help to ensure reasonable standards and the achievement of awards can further promote an area, increasing its value to the local population.

4.1.6 Climate Change

GI can play a significant role in climate change mitigation and adaptation. The climate change mitigation imperative is well versed and therefore not covered at length here. Suffice to say, *"anthropogenically 'forced' climate change, coupled with the post-peak oil scenario demand a paradigm shift in how we plan, design and live"* (Engleback, 2009, p. 25). The weather already has a significant effect on society and the economy. The European heat wave of summer 2003 claimed an estimated 35,000 lives (Larsen, 2003; Gill *et al.* 2007, p. 2). The UK's summer 2007 floods cost an estimated £3bn in insurance claims (Pitt, 2008). The instances of extreme events such as these are expected to worsen in frequency and scale with climate change. Mitigation and adaptation are therefore *"an essential part of ensuring our communities remain desirable places to live and work"* (Shaw *et al.,* 2007, p. 2).

GI can mitigate greenhouse gas emissions in a variety of ways. The provision of local recreation areas and pedestrian and cycle routes reduces the need for motorised transport. Vegetation can play a role in reducing solar heat gain in buildings, reducing the demand for energy for air conditioning, which is likely to increase with climate change induced warming (Gill *et al.,* 2007). Other, less obvious, benefits include the provision of low-energy water management systems, for example SuDS, providing space for local food and renewable energy production and carbon storage by vegetation (Coombs and Hesketh, 2007).

Perhaps the most important role of GI in climate change is its contribution towards adaptation. Even if our emissions were significantly reduced tomorrow, *"the lag in the climate system means that emissions we have already put into the atmosphere will continue to affect the climate for several decades to come"* (Shaw *et al.,* 2007, p. 2). The impact of climate change on humankind will be significant, *"be it through uncomfortably high temperatures, greater incidences of flooding, strain on water resources and quality, or less stable ground conditions"* (Shaw *et al.,* 2007, p. 2). All aspects of our lives must therefore be 'climate proofed'; adapted to future climates. The *Stern Review* (2006) estimates the economic cost of adaptation to climate change to be one per cent of global GDP if done now, increasing to at least five per cent if the investment were left for 10-20

years (Engleback, 2009). Climate change adaptation is therefore both critical and urgent, and spatial planning plays a vital role in its delivery.

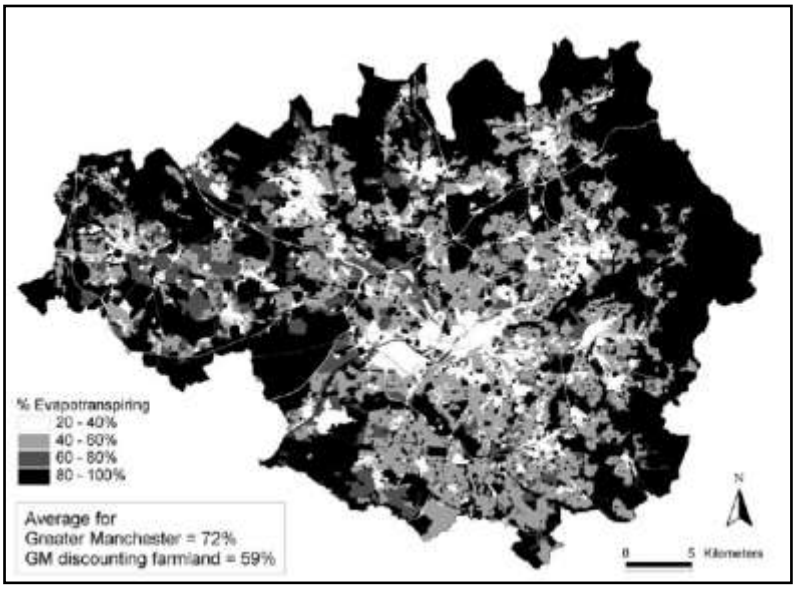
In 1991, 90% of the UK population lived in urban areas (Denham and White, 1998; Gill *et al.,* 2007). Urban areas have *"distinctive biophysical features"* including the urban heat island effect and changes to hydrology resulting from increased proportions of impervious surfaces (Gill *et al.,* 2007, p. 2). These effects are likely to be amplified by climate change, with repercussions already being experienced. Research by the World Wide Fund for Nature drew attention to significant recent warming across EU capital cities (WWF, 2005; Gill *et al.* 2007). On a local scale, Sustainability West Midlands' research report *The Potential Impact of Climate Change in the West Midlands* (2004) found that during the 20th century annual average temperatures rose by 0.6˚C (GOWM, 2009). *"The warming of the urban environment in summer is an important issue because of its implications for human comfort and well being"* (Svensson and Eliasson, 2002; Eliasson, 2000; Gill *et al.,* 2007, p. 16). According to the UK Climate Impacts Programme 2009 predictions (UKCIP09), there is a 90% probability that the West Midlands region will experience increased summer temperatures of 3.9˚C - 4.8˚C by 2050, depending upon ongoing emissions levels (GOWM, 2009). These scenarios do not take urban surfaces into account and *"there is likely to be significant urban warming over and above that expected for rural areas"* (Wilby and Perry, 2006; Wilby, 2003; Gill, 2007, p. 2). Hot discomfort temperatures are defined as 25˚C for bedrooms and 28˚C for office blocks. Buildings are classed as overheated when these temperatures are exceeded more than 5% of the time (Shaw, Colley and Connell, 2007, p. 18). Figure 10 illustrates patterns of overheating expected with climate change.

Figure 10: Projection of the percentage of hours that the 'hot' discomfort temperature is exceeded due to climate change

(UKCIP, 2005; Shaw, Colley and Connell, 2007, p. 18)

Urban green space can have a significant cooling effect, contributing towards climate change adaptation. That *"even modest increases in tree canopy cover can significantly reduce the urban heat island effect via evapotranspiration and shading"* (Landscape Institute, 2009, p. 5) is well understood as a theory, but has only recently begun to be quantified. Research by the University of Manchester quantified the relationship between ground cover and temperature and surface water runoff. The proportion of evapotranspiring surfaces in Greater Manchester was calculated and input into energy exchange and surface water runoff models. The simulation was run against the UK Climate Impacts Programme 2002 predictions for low and high emission scenarios with the proportions of green space within the defined areas used as a variable (Gill *et al.,* 2007).

Figure 11: Proportion of evapotranspiring surfaces in Greater Manchester



(Gill *et al.,* 2007, p. 6)

The Manchester study found that maximum surface temperature is *"very dependent on the proportion of green cover"* (Gill *et al.,* 2007, p. 8). Adding 10% green cover to high density urban areas kept maximum surface temperatures at or below the 1961-1990 baseline temperatures for all but the 2080 high emissions scenario (Gill *et al.,* 2007). Conversely, removing 10% of green space increased maximum surface temperatures by 7°C (Gill *et al.,* 2007). This is compared to increases of 1.7°C - 3.7°C by the 2080s if surface cover was not changed.

Regarding surface water runoff, the study found that *"the more built up ... the more surface runoff there will be"* (Gill *et al.,* 2007, p. 12). Increasing green cover in residential areas by 10% reduced the runoff from a 28mm precipitation event (expected by 2080 under a high emissions scenario) by 4.9%, and increasing tree cover by 10% reduced runoff by a further 5.7% (Gill *et al.,* 2007). However, the study concluded that green areas alone are not sufficient to moderate the surface water volumes associated with the climate change projections.

The study also considered the benefits of green roofs. Green roofs provide a unique opportunity to retrofit GI into dense urban areas, where space is at a premium. The study found that adding green roofs to all buildings had a dramatic effect on maximum surface temperatures, *"keeping temperatures below the 1961-1990 current form case for all time periods and emissions scenarios"* (Gill *et al.,* 2007, p. 10). The benefits became more pronounced with increasing time periods and emissions scenarios. By 2080 under a high emission scenario, temperatures were reduced by 7.6°C (Gill *et al.,* 2007). Green roofs were also found to significantly reduce runoff. By the 2080's under high emissions, adding green roofs limited increases in runoff to 43.6%, compared to 65.5% without (Gill *et al.,* 2007).

Climate change mitigation and adaptation is increasingly recognised as the challenge of our time. GI provides a practical means of delivering mitigation and adaptation. Therefore perhaps climate change – and the failure of political processes to cap it – provides an important new incentive for GI, one which the advocates of GI would do well to promote.

Table 8: Learning to take forward – Climate Change

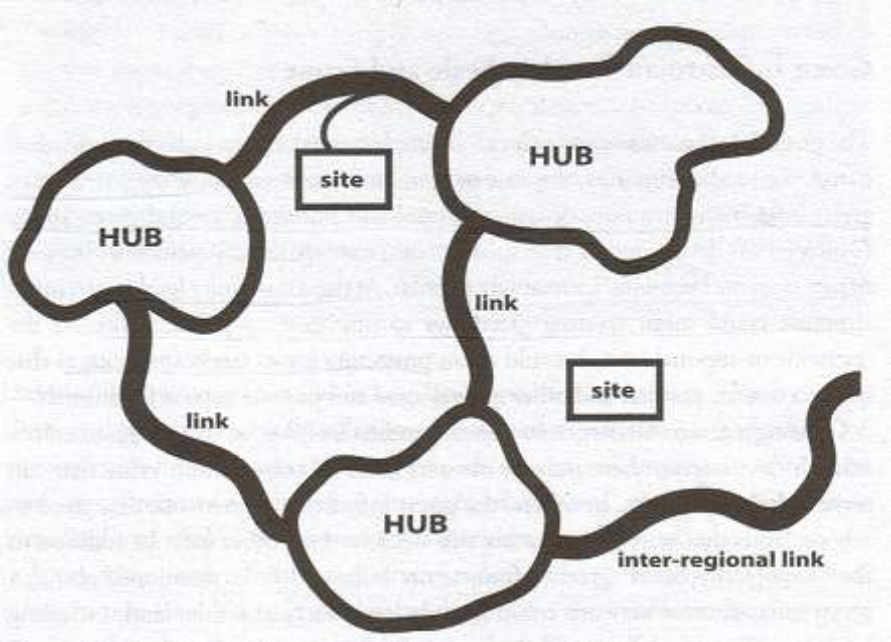
Lessons Learnt	Reasoning/evidence
Climate Change	
GI can help reduce emissions and should be designed to deliver this	• The provision of local recreation areas and non-motorised movement routes can reduce greenhouse gas emissions. • GI can include provision of allotments or other informal space for growing food or even energy crops. • Vegetation can keep buildings cool, reducing the need for air conditioning, but would need to be strategically planted. • The carbon storage capacity of vegetation should not be overlooked.
Urban GI plays an important role in alleviating rising temperatures and this benefit should not be overlooked	The role of urban greenspace in mitigating temperatures should be recognised and given priority. Urban greenspace should be given sufficient protection from the pressures of growth, particularly where classed as brownfield land. The GI network should deliver new urban greenspace where deficits are identified and offset any losses to development. Street trees and green roofs provide a way to retrofit GI into urban areas. Green roofs are effective at urban cooling.
Urban GI plays an important role in reducing surface water runoff, but considerable commitment will be needed to realise these benefits	Research in Manchester found that greenspace and green roofs are needed to adequately mitigate the surface water runoff levels associated with climate change.

4.2 A Multifunctional Network

Delivering all of the potential GI benefits requires considerable forethought, planning and resources. It is important to recognise that no single area will deliver all of the potential benefits. Hence the concept of a GI network, the sum of which is greater than its parts. In England, the concept of a multifunctional network is perhaps almost inevitable. Barker (1997) considers that human settlements have spread to the extent that *"England is essentially an urban area with a good network of greenspace"* (p. 1). Coombs and Hesketh (2007) echo this sentiment and state that *"on a small and well-populated island, whether we like it or not, land is an economic commodity, and if we are to stand up for the environment, we must robustly advocate the multiple benefits that a healthy green infrastructure sustains"* (p. 16). They believe all land should be multi-functional, *"unless there are powerful reasons for it not being so"* (Coombs and Hesketh, 2007, p. 17).

The GI network consists of a series of areas, linked together. This is often simplistically presented according to the example below:

Figure 12: The GI Network



(Maryland Department of Natural Resources; Benedict and McMahon, 2006, p. 13)

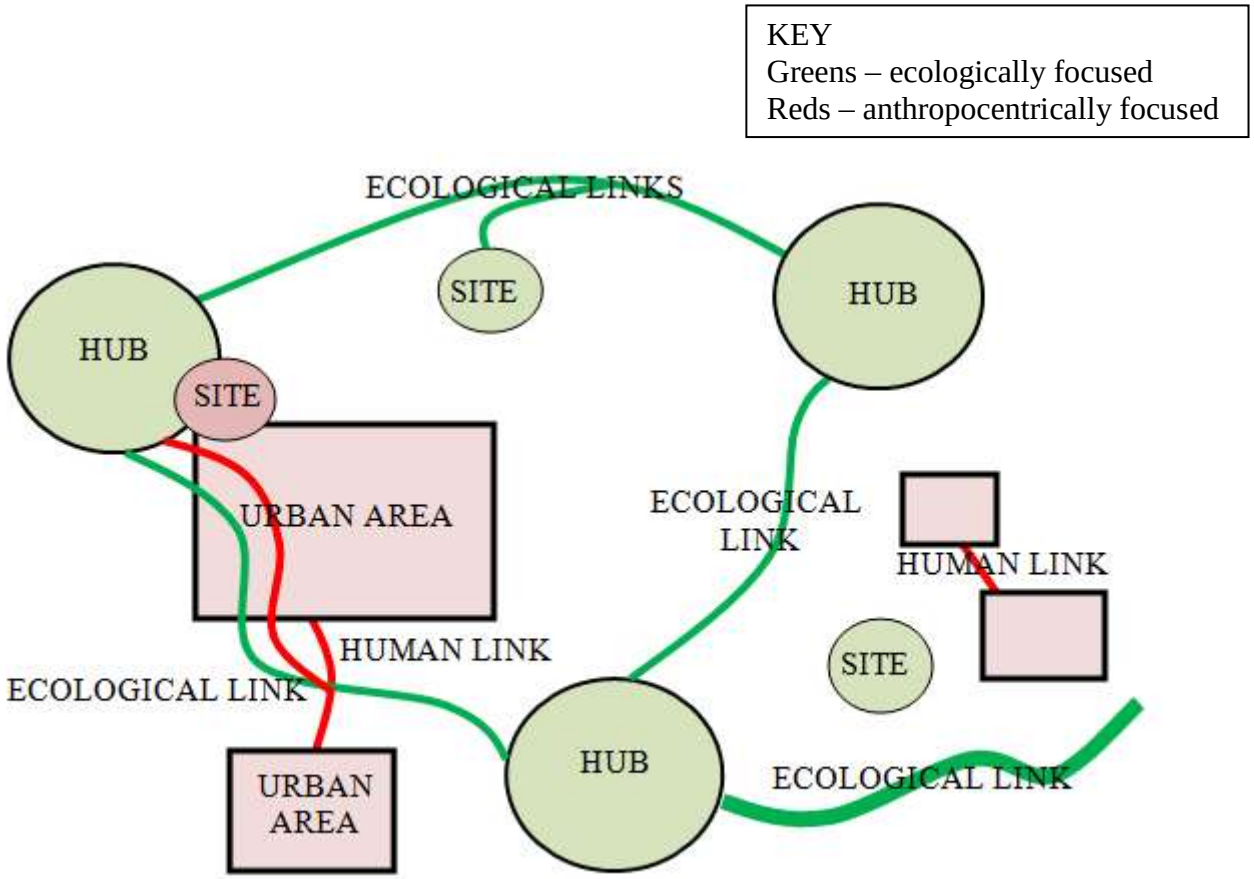
The network is anchored by 'hubs', sometimes called cores or nodes, which *"provide space for native plants and animal communities, as well as an origin or destination for wildlife, people, and ecological processes moving through the system"* (Benedict and McMahon, 2006, p. 13). Hubs can be any shape or size but are often larger, ecologically focused areas. The network is connected by 'links', sometimes termed conservation corridors, greenways or landscape linkages. Links vary in size and function, but while their value for recreation is noted, they have been traditionally focused towards maintaining ecological services and biodiversity (Benedict and McMahon, 2006). 'Sites' are similar to hubs but are smaller, localised, and may not be as well connected. However, they can still contribute important values (Benedict and McMahon, 2006).

Conceptualising the network in this way allows those involved in the GI process to quickly grasp the network concept. However, this diagram was developed in the USA and perhaps for this reason there is an obvious flaw when applying it to the UK – the omission of urban areas. Ecology and ecological services are vital inputs to GI and have helped to shape the concept, but to ignore existing or planned urban areas is to ignore its principle driver and delivery mechanism in this country. In England, the value and recent rise in popularity of GI hinges upon its use as a delivery mechanism for sustainable development. This is reflected in the number of 'human' focused GI benefits discussed in section 4.1.

Taking this forward, GI in the UK can perhaps be presented as in Figure 13. This diagram is based on the Maryland diagram but includes urban areas, human focused hubs/sites (e.g. country parks) and human focused links (e.g. movement routes). Superimposing urban areas onto the ecological network provides a very different perspective of the network's priorities. For example, pressure points and opportunities can start to be perceived (Figure 14) and, from this, actions and priorities (such as buffering and linking) defined and a delivery plan developed, forming a credible GI Strategy. It is, however, acknowledged that this diagram still presents a very simplistic interpretation of GI. In reality, the white areas represent the wider landscape context, informing, influencing, and

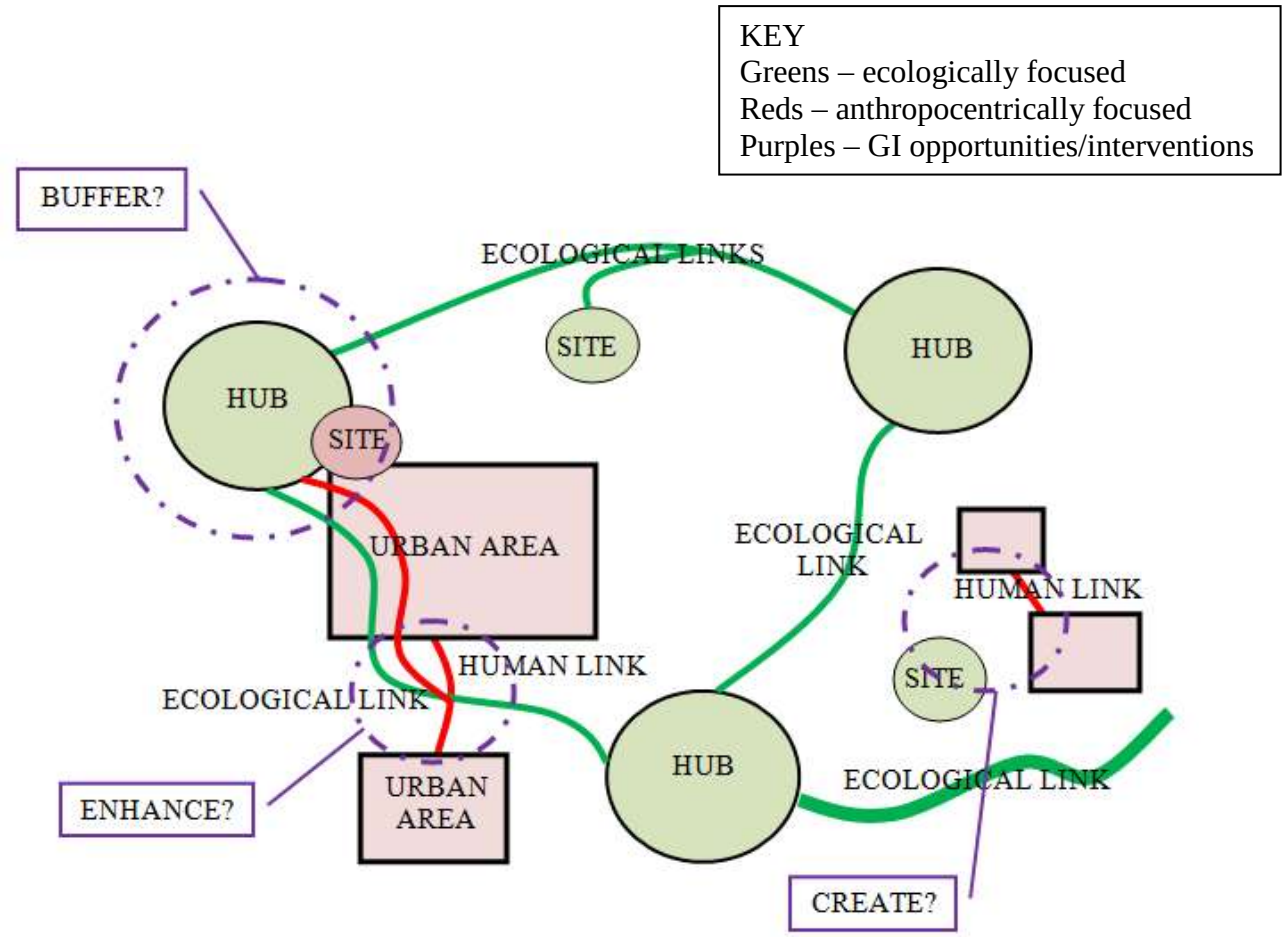
having graded boundaries with any elements labelled as GI, whilst the 'human' (red) and 'natural' (green) elements of GI are mutually associated, not exclusive (Booth, 2010).

Figure 13: The GI Network incorporating Human Influences



(Based on: Maryland Department of Natural Resources; Benedict and McMahon, 2006, p. 13)

Figure 14: Pressure Points and Opportunities



(Based on: Maryland Department of Natural Resources; Benedict and McMahon, 2006, p. 13)

Approaching GI as a network enables the consideration of interactions between locations and functions. But if the GI network is to effectively deliver all its potential benefits, it must thread through urban areas, urban fringes and the countryside. However, the priorities in each of these areas will be different. For example, in a dense urban area opportunities to add GI space will be limited and GI may be focused towards meeting human needs. Therefore the priority may be retrofitting street trees and green roofs, contributing towards climate change adaptation. In the transitional urban fringe area providing access and recreation opportunities for the adjacent population may be a priority. In the wider countryside landscape and biodiversity conservation at a strategic scale may be the priority. Thus the potential functions of the GI network can be considered as layers, with different functions coming to the fore as the circumstance of place dictates. Figure 15 illustrates this concept. Considering GI as a series of 'layers', able to be applied in any sequence as circumstances and intentions dictate, may aid the practical application of GI, allowing priorities to be formulated for a given area.

Figure 15: GI benefits layers – illustrative primary drivers

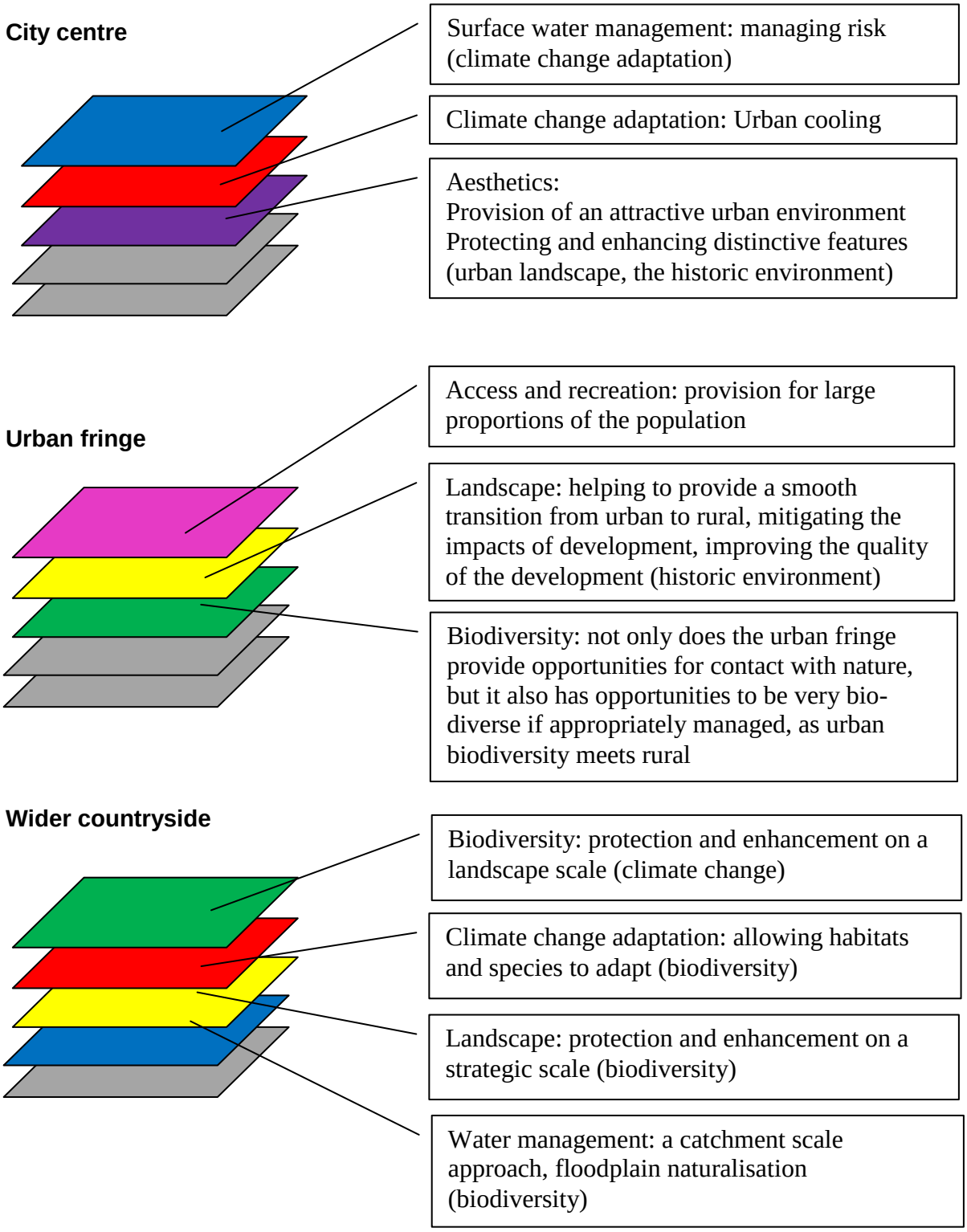


Table 9: Learning to take forward – Multifunctional Networks

Lessons Learnt	Reasoning/evidence
Multifunctional networks	
The sum of the network is greater than the parts	The totality of GI benefits will be delivered by the network as a whole. It is unlikely that any individual component will deliver the whole raft of benefits, although each component should deliver some level of multifunctionality.
The network comprises hubs, sites and links	Considering the network in this way provides a quick handle on the concept.
The network should include urban areas and human-focused hubs, sites and links	It is impossible to create an ecologically ideal network due to human land use. In any case, to try to do so would be to underplay two key drivers of GI in the UK; quality of life and sustainable development. Therefore any network concept should include urban areas and human-focused hubs, sites and links. This allows a consideration of the continuum of interactions between natural and human aspects of the environment, which can naturally progress towards actions/delivery planning.
GI priorities will vary and different GI benefits can be prioritised as circumstances dictate	If the GI network is to achieve all of its functions the network must connect urban, urban fringe, rural and natural areas. However, the priorities in each area will vary. GI should be tailored towards the desired outcome, with different functions brought to the fore as required. It may help to consider possible GI benefits as a series of layers which can be ordered as circumstances dictate.

Chapter 5: Green Infrastructure Delivery

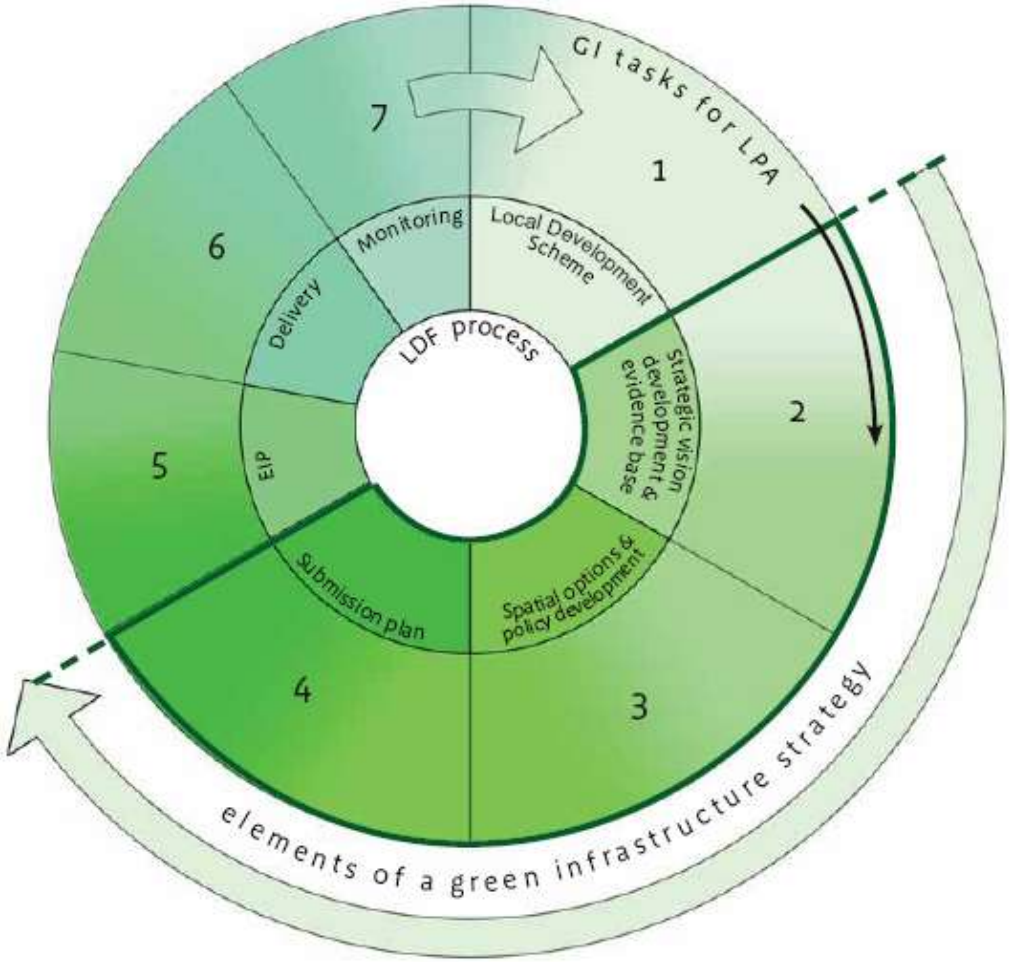
This section is not intended to provide a step-by-step account of how to undertake GI, from mapping to implementation. Such guidance can be easily obtained (e.g. Natural England's *Green Infrastructure Guidance* (2009) or the many regional guidance documents). Rather, this section presents a brief overview of the process, identifying some of the issues which may be encountered. There are also numerous best practice examples on how to undertake and deliver GI, two of which are explored further in Chapters 6 and 7.

Guidance on the successful delivery of GI promotes a logical progression from evidence gathering through to delivery (Natural England, 2009a and TCPA, 2008). Evidence should be gathered early and used to inform the development of Sustainable Community Strategy (SCS) and Local Area Agreements (LAA) which, in turn, inform the direction and development of the LDF. This progression ensures GI evidence informs all elements of the Development Plan, from site selection to master planning, helping ensure GI is planned and delivered as *"an integral part of the community"* and *"recognised as a valuable community asset"* (Natural England, 2009a, p. 43). Developers and other delivery agencies are involved in the process from the start, ensuring early buy-in to the concept. Figure 16 illustrates NE's perspective on this process.

One of the first tasks in the production of the GI evidence base is the gathering of data. There is general agreement that GI planning should make use of existing information sources such as Landscape Character Assessment, Historic Landscape Characterisation, habitat mapping, PPG17 audits, Strategic Flood Risk Assessments and Indices of Multiple Deprivation, and consider existing standards and strategies such as Accessible Natural Greenspace Standards, Local Transport Plans and Rights of Way Improvement Plans (Natural England, 2009a). It may be easiest to present this information as a series of themes (see Chapter 4) before combining and summarising it, the output of which is sometimes termed environmental characterisation (as recommended in Natural England (2009) and as done in the River Nene Regional Park and in Worcestershire). Environmental characterisation summarises the existing GI resources. Considering the same information from the opposite perspective can give an understanding of needs and deficiencies. Taken together, environmental characterisation and deficiencies/needs analysis form the bedrock of the GI evidence base. From this, the GI network can be defined (and indicated on proposals maps or key diagrams if desired) and opportunities and priorities for action will start to become apparent.

The evidence gathering process requires input from a wide range of stakeholders and thus provides an opportunity to initiate a steering group. The steering group may include representatives from different elements of the LPA, statutory bodies, agencies, local developers, landowners and community groups (Natural England, 2009a). Within this group there will be members whose buy-in is essential to GI delivery. Involving these delivery partners in the defining of the GI network and delivery plan will ensure they are committed to future provision and management, helping to guarantee the achievement of the GI Strategy's aims. Workshops and/or consultation events provide a way to achieve this.

Figure 16: Integrating GI and the Spatial Planning Process



GI tasks for LPA	GI advisory group role
1 -Identify how GI will be addressed in the Local Development Framework.	Confirm membership and roles of local GI Advisory Group to LPA. Comment on approach to GI in LDS.
2 -Environmental characterisation of plan area. -Establish local need for GI functions. -Identify deficiencies in existing GI (amount and type). -Initial assessment of broad opportunities and key delivery partners. -Document evidence base for future EIP.	Make data available for environmental characterisation. Advise on standards and other methods for assessing need.
3 -Identify GI opportunities. -Develop spatial GI options. -Develop supporting policy options. -Consult GI stakeholders. -Refine Options. -Other relevant strategies. -Initial scoping of delivery mechanisms.	Respond to consultation on options development. Address conflicts between environmental stakeholders.
4 Develop spatial plan for GI network with: -Strategic GI on Key Diagram. -All GI in Site Allocations / DPD/ Area Action Plan. -Core Strategy policy framework. -Consult on and define delivery and long term management mechanisms.	Respond to consultation on delivery mechanisms.
5 -Refer to GI evidence base, if required.	Provide expert witnesses, if required.
6 -Secure relevant Local Area Agreement targets. -Planning decisions.	Advise on models for delivery.
7 -Monitor performance of GI in relation to identified functions.	Promote standardisation of monitoring across region. Highlight instances where management is diverging from planned function.

(Natural England, 2009a, p. 47)

The production of a GI evidence base is, to a certain extent, the most easily achieved phase of the process. Although evidence gathering is ideally undertaken early, if this is not possible it can be undertaken at any stage prior to submission of the Core Strategy. This is recognised in Natural England's guidance (Natural England, 2009a). Such a scenario is likely given that awareness of GI has only been slowly increasing and that Local Development Schemes enforce strict timetabling of the LDF production. However, the way in which the evidence base is compiled can have implications further into the process. Limited stakeholder involvement from the beginning may impact upon delivery. Faced with a finished strategy, GI may be a 'nasty surprise' for developers, introducing an additional cost which was not accounted for from the start and which may therefore impact upon the viability of a site. Lack of community consultation constitutes a missed opportunity to present GI as a means of addressing concerns arising from growth proposals. The selective inclusion of stakeholders may give those not included a negative view. Opportunities to link the GI strategy into other strategies may also be missed, some of which may be able to deliver GI aims, for example, Local Biodiversity Action Plans or Rights of Way Improvement Plans.

The inclusion of a delivery or implementation plan gives a GI strategy an essential 'doing' end without which it will ultimately prove worthless. The delivery of GI secures the environmental and community benefits required for sustainable development. However, this element may prove the biggest challenge for LPAs. The delivery of GI is most simplistic when considering development sites. Developers can incorporate GI in site master plans with comparative ease, provided requirements are clearly presented. LPAs have the option of producing 'Concept Statements' for development sites, expressing the kind of place the new development should create and aiming to ensure the development delivers the best possible benefits (Countryside Agency, 2003). This approach *"reduces the number of objections to development proposals and ... should speed up the development control process"* (Countryside Agency, 2003, p. 2). On-site GI can be secured using planning conditions or a Section 106 Agreement – a legally binding agreement between the LPA and the landowner under Section 106 of *The Town and Country Planning Act* (1990). The Community Infrastructure Levy (coming into force 6 April 2010) offers an opportunity to standardise the delivery of benefits currently negotiated on a site-by-site basis (DCLG, 2010c), and the incorporation of GI within this is critical. Off-site delivery directly through developments is also relatively simple where the land is in LPA or partner ownership as S106/CIL can be put to this purpose. Roof taxes, where the LPA requires developers to pay a standard tariff per new dwelling to fund supporting infrastructure, are more unusual but have been used with great effect, such as in Milton Keynes, Mid-Bedfordshire and Plymouth.

The delivery of the wider GI network presents a different challenge. Wider GI delivery will rely largely upon landowners voluntarily committing to undertake or refrain from certain actions (Boothby, 2004). The use of 'soft levers' whereby landowners are paid to deliver effective environmental management on their land will be crucial to securing the delivery of GI on private land. Existing soft levers include Natural England's Environmental Stewardships schemes and the Forestry Commission's Woodland Grants Scheme and Challenge Funds (Natural England, 2009a). Stakeholder involvement is crucial to gaining the support and commitment of landowners and ensuring soft levers are appropriately targeted to deliver GI on private land.

There are a number of other funding streams which can be channelled towards specific projects where landowners are amenable. In Growth Areas/Points, Growth Area Funding could be used to enable the LPA or other agencies to purchase land for large projects, or to fund a package of smaller projects. Other funding streams which could be put towards GI include:

- Heritage Lottery Fund grant initiatives such as Parks for People, which supports capital and revenue projects to improve parks, including historic parks and designated landscapes, and create opportunities for communities to learn about the natural environment.
- Big Lottery Fund grant initiatives such as Access to Nature (administered by Natural England). This aims to encourage people to understand, access and enjoy our natural environment, and can be used creatively to involve people in their local greenspace.
- The SITA Trust's Enriching Nature and Enriching Communities grants, which are aimed at mitigating the impacts of waste processing and landfill sites on the local community.
- DCLG's Safer and Stronger Communities Fund, which is aimed at tackling anti-social behaviour, empowering communities and improving the condition of street and public spaces, particularly in disadvantaged neighbourhoods, and runs 2005 – 2010.

(Natural England, 2009a)

The multifunctional nature of GI enables a robust funding bid to be put forward, with the partnership approach reducing competition amongst stakeholders, increasing the likelihood of obtaining funding. However, having the resources to secure these grants/funds may be a constraining factor.

An additional consideration is the ongoing management of the network. The Landscape Institute (2009) identify inadequate investment in long-term management as a significant barrier to GI, leading to a lack of appreciation of the potential GI assets represent and, consequently, a lack of investment in its future. They recommend that GI is afforded the same level of long-term investment as 'grey infrastructure' such as sewers and electricity networks. Where soft levers are used, ongoing management is a condition of payment. Where GI is delivered on development sites the LPA will need to come to an agreement concerning future management with the developer. Often developers may be willing to undertake management for a set time period, following which responsibility passes into the hands of the LPA. LPA departments responsible for the maintenance of parks and other areas forming the GI network need to be involved early in the process if they are expected to take responsibility for its maintenance. Their funding and training needs should not be overlooked. Opportunities for revenue generation from GI which can be put back into its management should be identified and measures put into place, for example, car park fees and visitor centre profits from country parks (shown by the River Nene Regional Park). More unusual opportunities might include event space, food production or biofuels (Landscape Institute, 2009).

Table 10: Learning to take forward – Delivery

Lessons Learnt	Reasoning/evidence
Delivery	
There should be a logical progression from evidence gathering through to delivery	• Evidence gathering • Environmental Characterisation • Needs and deficiencies analysis • Definition of the GI network • Delivery plan • Informing the SCS/LAA • Feeding through into the LDF • Delivery
Early stakeholder involvement is critical if GI is to achieve its potential	Stakeholders, developers and other delivery agencies should be involved from the start, ensuring their buy-in. Even where time is an issue, stakeholders should be involved in the process as much as is possible, as their lack of involvement may compromise the delivery of GI.
GI delivery within development sites should be secured using standard measures	• Concept plans can be used to influence site master planning • Conditions, S106 or the emerging CIL should be used to secure delivery
GI delivery off-site on land within LPA or other partner ownership should be secured using standard measures	S106/CIL can be turned to this purpose, and standardised Roof Tax Levy's have been used with great success in some parts of the country.
Soft levers should be used to deliver GI on private land	The majority of the GI network will be in private ownership and therefore voluntary agreement to undertake or refrain from certain activities will be the primary GI delivery mechanism. Stakeholder involvement is crucial to both getting voluntary agreement from landowners and ensuring soft levers are appropriately targeted and taken-up.
Grants should be investigated as a means of delivering specific projects	There are a variety of grants which can be put towards GI. The multifunctional nature of GI can help convince funders that the scheme offers wide benefits and value for money. A partnership approach can increase the likelihood of obtaining funding.
The long-term management of GI should be secured up-front	The GI network requires long-term management, and investment in GI should be treated as is investment in grey infrastructure. Opportunities to raise revenue from GI functions/uses for the management of GI should be investigated.

Chapter 6: Learning from Best Practice – the Northwest of England

The GI work underway in the Northwest has been recognised as national best practice. The *Northwest Green Infrastructure Guide* (2008) won an award from the Royal Town Planning Institute, the report *Green Infrastructure for the Liverpool and Manchester City Regions* won a Landscape Institute award, publications from NE, Defra and CABE quote examples from the Northwest and individual projects have also been commended (NENW, 2009). This section evaluates the successes of the Northwest's approach to GI and extracts lessons relevant to its wider application. This evaluation is based upon a desk-top study and a visit undertaken with Natural England's West Midlands Planning and Partnership's Team members on 13 October 2009 (agenda and photographs in Appendix 4).

6.1 An Introduction to the Northwest

The Northwest comprises the counties of Cumbria, Lancashire and Cheshire, the metropolitan districts of Greater Manchester and Merseyside and the unitary authorities of Blackburn-with-Darwen, Blackpool, Halton and Warrington (see Figure 17). The Northwest is a region of contrasts. It has a diverse and attractive natural environment which includes the Lake District and portions of the Yorkshire Dales and Peak District National Parks (DCLG, 2009a) and the longest stretch of undeveloped coastline in England (NENW, year unknown b). It has a rich historic heritage, including features such as Hadrian's Wall World Heritage Site and the historic towns of Chester and Lancaster. The Northwest was also the birthplace of the Industrial Revolution. The subsequent decline of manufacturing industries in the 1980's-90's led to economic, social and environmental degradation, and this legacy forms the backdrop of the modern Northwest and the challenges it faces.

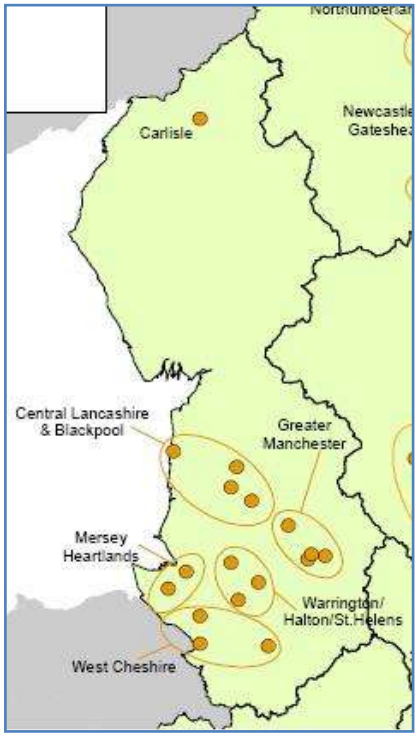
Today, the Northwest is home to 6.8 million people (NWRDA, 2006a). Its cities are modern and cosmopolitan; Liverpool was crowned European Capital of Culture in 2008. The region has a £98 billion economy and 230,000 firms (NWRDA, 2006a). Greater Manchester has overtaken Birmingham as *"the most important sub-regional economy outside London"* (DCLG, 2009a). West Cheshire's Gross Value Added (GVA) is consistently above the UK average (DCLG, 2009a). However, the Government believes the region is *"still not contributing its full potential to the UK economy"* (NWRDA, 2006a). GVA per head is 12% lower than the English average (4NW, 2008), unemployment rates are higher than the national average and there is an output gap of £13bn (NWRDA, 2006a). The region is tackling these challenges with an ambitious programme of building and regeneration.

The Northwest has seventeen Growth Points, grouped into six Growth Partnership Areas (see Figure 18) (DCLG, 2009c). Growth is seen as a means of tackling deprivation and achieving regeneration, bringing business and employment into an area and improving quality of life. The GP's will collectively deliver 75,000 homes on top of the levels set in the RSS, which themselves pose significant increases compared to previous policy (DCLG, 2009c).

Figure 17: The North West Region

(RDA, 2009)

Figure 18: The North West's Growth Points and Growth Point Partnership Areas



(Extract from Figure 3)

6.2 Green Infrastructure and Regeneration

Although the Northwest's growth agenda is fundamentally the same as elsewhere in the UK, i.e. growth to provide homes and drive the economy, it is also subtly different due to its urban regeneration focus. The Northwest is not starting with an undeveloped area or a green field, rather with existing settlements, with existing footprints, populations and patterns of living and with recognised issues to be overcome. The Northwest is in the difficult position of needing to provide large-scale growth and regeneration that enables the region to fulfil its economic potential, improves quality of life and benefits and the environment without alienating the community or losing the characteristics that make the region special. GI offers a potential solution to this dilemma. It is seen as being an essential *"preparation for growth"*, helping to ensure that the Northwest can deliver its growth and regeneration aspirations within the environmental limits, and helping to provide a critical infrastructure based on an understanding of the benefits it can bring (Moss, 2010).

GI has gained high-level recognition in the Northwest and is promoted in the Regional Economic Strategy (RES) (2006). Achieving a sustainable economy is a key element of the government's sustainable development agenda. Sustainable cities are seen as competitive cities, gaining the market edge by being innovative, ethical and reducing risks, such as from climate change (Lovell, 2008). The RES is essential to achieving these goals and thus intends to have sustainable development at its core (NWRDA, 2006a). The RES sets a twenty year economic strategy for the Northwest, intended to *"continue the transformation of the economy by building on [the region's] many assets and tackling [the region's] areas of underperformance"* (NWRDA, 2006a, p. 3). RES Action 113 is to:

> "Develop the economic benefit of the region's natural environment through better alignment of environmental activities and economic gain" (NWRDA, 2006a, p. 48).

This is qualified by the statement that the environment is:

> "A key under-exploited economic resource for the region and part of our quality of life. It is important to nurture the natural resources of the region and to develop a strategy for green infrastructure and transport corridors" (NWRDA, 2006a, p. 48).

Thus, GI in the region is given a clear economic focus.

The Northwest RSS (2008) closely aligns with the RES and strongly reflects the region's growth aspirations. Although this approach is hardly surprising, the economic focus was judged to be to the detriment of environmental issues, which were described as *"under-played"* at the RSS's Examination in Public (NWRDA and 4NW, 2008). The EiP Panel allowed the RSS to proceed to adoption subject to strong changes and an instruction to move rapidly towards an integrated Regional Strategy. As a direct result, the role of the environment in achieving social and economic objectives was better expressed within the RSS's overarching spatial policies and policy *EM3: Green Infrastructure* was significantly strengthened (provided below) (NWDA and 4NW, 2008). Policy EM3 outlines the broad objectives for GI but relies upon further guidance and local action to take it forward.

Figure 19: Northwest RSS Policy EM3 – Green Infrastructure

Policy EM 3

Green Infrastructure

Plans, strategies, proposals and schemes should aim to deliver wider spatial outcomes that incorporate environmental and socio-economic benefits by:

- conserving and managing existing green infrastructure;
- creating new green infrastructure;
- enhancing its functionality, quality, connectivity and accessibility.

Local authorities should work with partners to:

- identify partnerships at an appropriate scale to take forward green infrastructure planning, in the context of relevant environmental and socio-economic objectives. Green infrastructure should include the identification, development and management of new areas of open space. This should be complemented by the retention, enhancement and adaptation of existing sites;
- ensure that a key aim of green infrastructure is the maintenance and improvement of biodiversity;
- protect the integrity of sites of national and international importance including the historic environment;
- use existing strategies and frameworks to develop consensus on green infrastructure priorities and associated data needs;
- promote physical and mental health benefits through access to and usage of open spaces by disadvantaged groups and communities;
- set out the significant green infrastructure needs across the spectrum of economic, environmental and social objectives;
- identify and secure opportunities for delivery and put in place implementation plans;
- integrate proposals to improve green infrastructure in the delivery of new developments, particularly through area based regeneration initiatives and major proposals and schemes;
- maximize the role of green infrastructure in mitigating and adapting to climate change;
- provide new areas of appropriate greenspace where development would otherwise cause unacceptable recreational pressure on sites of international ecological importance, for example where new housing is proposed close to such sites.

Local Delivery of Green Infrastructure Plans should seek first to make use of existing delivery mechanisms supplemented by bespoke delivery mechanisms where necessary.

A Green Infrastructure Guide for the North West has been produced which provides more detailed guidance and will assist the way this policy is put into practice.

(Government Office for the North West, 2008, p. 94)

6.3 A Partnership-Led Approach

The success of the Northwest's GI is largely a product of its exemplary partnership working and the involvement of the right stakeholders within this. At the time of writing, the two principle partnerships in the region were the North West Green Infrastructure Think Tank and Natural Economy Northwest.

The North West Green Infrastructure Think Tank is a quarterly discussion forum involving government agencies, non-departmental public bodies, national and regional environmental delivery bodies and the academic and consultancy sectors. Regional government is directly involved as Government Office for the North West, 4NW and the Northwest Regional Development Agency are members, maintaining the direct connection between GI and the region's regeneration. The forum has been instrumental in guiding the progression and delivery of GI in the region, supporting policy development and hosting a signposting website (www.greeninfrastructurenw.org.uk/). The Think Tank developed the *North West Green Infrastructure Guide* (2008), as referred to in RSS policy EM3. The Guide is primarily a 'hearts and minds' document which articulates the concept of GI and provides guidance for the production of GI Strategies (North West Green Infrastructure Think Tank, 2008). Following its publication uptake of the GI approach has been positive, with Lancashire, Greater Manchester, Cumbria, Merseyside and Cheshire working on GI strategies in 2008 (Wilmers, 2008). The Think Tank is currently producing detailed guidance for planning GI at the sub-regional level. The draft emphasises the need to work in partnership, recognising that past environmental projects have suffered from a fragmented approach which has allowed them to be *"marginalised by the need to concentrate on economic and social development"* (Barton and Jones, 2009, p. 15).

Natural Economy Northwest (NENW) is a partnership initiative running from 2007 to 2010[1]. The partnership is focused on the integration of GI and the economy. It is led by Natural England, the Northwest Regional Development Agency and SITA Trust on behalf of a range of economic and environmental partners (ECOTEC, 2008). The partnership has a shared vision of *"a prosperous economic future with a thriving natural environment"* (Wilmers, 2007, p. 16) and aimed to *"nurture natural environment projects that, with the right investment, will deliver, economic, social and cultural benefits across the Northwest"* (Natural Economy Northwest, 2009a). NENW was expressly tasked with the delivery of RES Action 113.

[1] Since writing this study, NENW has finished. An ongoing regional partnership (NW Natural Economy Alliance) is continuing activity at a lower level, but with organisations under serious review. There is also a renewed focus on the Sub-Regional level of activity. Martin Moss, Natural England's North West Green Infrastructure lead, states:
"One of the key things we have been trying to achieve is GI planning and engagement at multiple spatial scales – regional – sub-regional-district-local. The regional has to a large degree gone, but not completely. The most important spatial scale is now sub-regional / city regional with a good deal of activity especially in Cheshire, Liverpool and Manchester City regions. In addition, there are a variety of districts producing more detailed GI plans, e.g. Liverpool. There are increasing efforts to embed in more local township or regeneration area scales and a rising number of specific projects (such as with hospital estates etc) doing GI plans".

Although there is widespread acknowledgement that GI will bring economic benefits, quantifying these impacts is a major challenge (Landscape Institute, 2009). NENW tackled this challenge head on. NENW's work focuses on mainstreaming the natural environment within sustainable economic development. NENW defines its key areas of work as follows:

- *Increase awareness of the value of the natural economy;*
- *Commission and disseminate research;*
- *Provide direction to promote effective use of limited financial resources;*
- *Contribute to the development and delivery of Regional and sub Regional strategies;*
- *Facilitate natural economy project development and encourage project delivery;*
- *Promote and facilitate Green Infrastructure and Natural Tourism;*
- *Encourage strategic investment in natural economy projects; and*
- *Facilitate training, skills innovation and advice to business.*

(ECOTEC, 2008)

Under this remit, NENW has funded, produced and collated a vast array of information concerning the economic benefits of GI, encompassing a wide range of subjects such as natural tourism, benefits for businesses and wetland creation (NENW, 2009).

6.4 The Economic Benefits of Green Infrastructure

Many of the Northwest's findings in relation to the economic benefits of GI are pertinent to its wider application. It is neither possible nor appropriate to review the entirety of the evidence collated and research undertaken in this study. Instead, this section extracts evidence considered most relevant to the mainstreaming of GI.

There are currently twelve GI research reports available from the NENW website, as well as numerous reports on natural tourism, wetlands, public benefit recording, biodiversity and socio-economics and natural benefits for businesses. These reports are intended to address what was seen as a key challenge for the region – how to shape a strong economic case for environmental improvements. *"'Green' issues might be very attractive, it's argued, but where are the economic benefits? What difference will they make to jobs, health and the economic strength of areas struggling with deprivation and social problems?"* (NENW, 2009). According to NENW's research, the potential benefits are plentiful. Research undertaken by ECOTEC in 2008 highlights the direct and indirect economic benefits GI can deliver. NENW has categorised the benefits into eleven main areas, presented by Figure 20. The table which follows provides further explanation around each benefit. This information is taken from research reports by ECOTEC, available from the Natural Economy Northwest website.

Work is now underway to develop a menu of agreed methodologies for quantifying the economic and ecosystem benefits of GI project proposals. Research towards this by ECOTEC identified ten Key Tests for evaluating the benefits of GI:

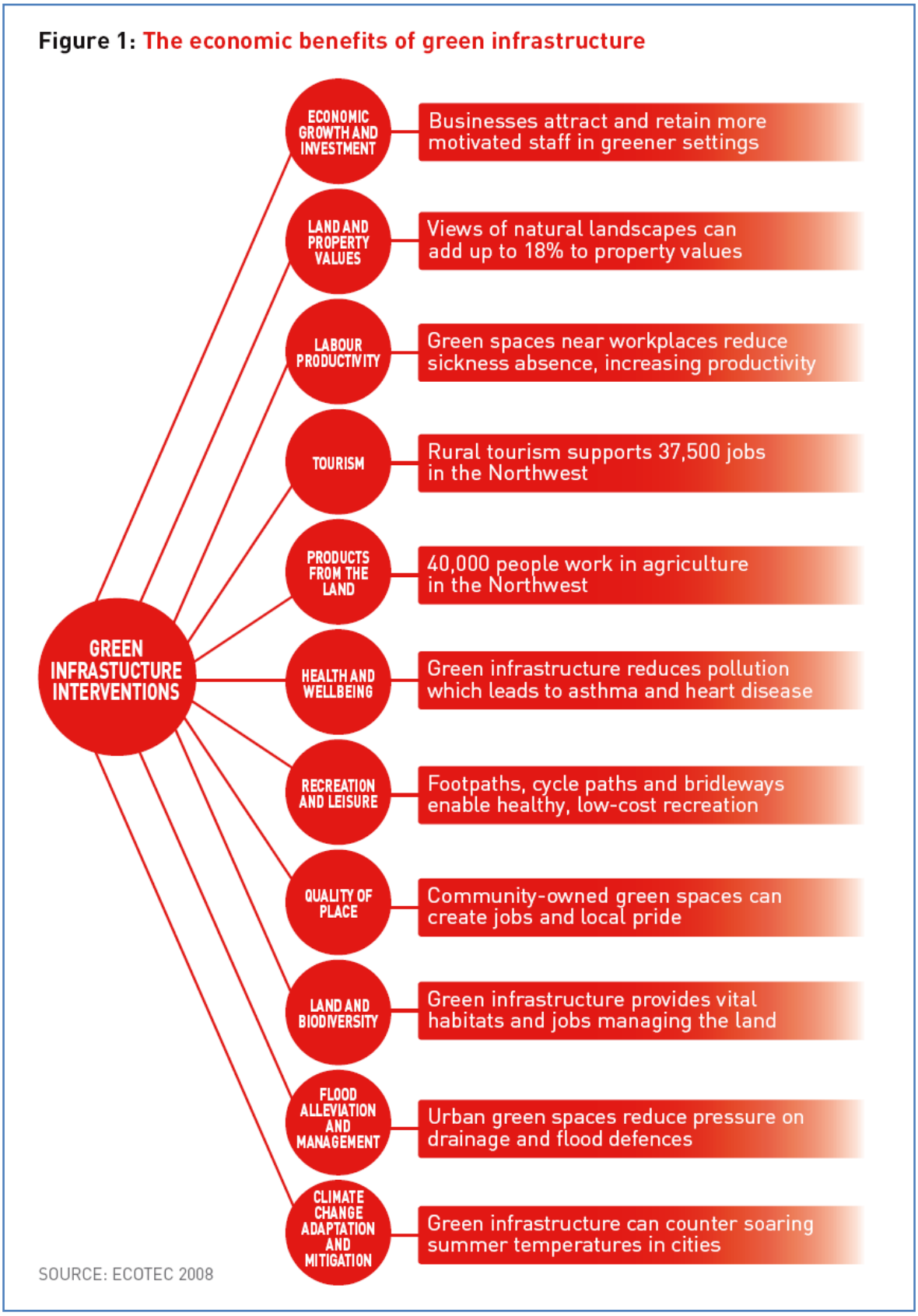
- Key Test 1: Contributing to Gross Value Added (GVA);
- Key Test 2: Delivering against RES Indicators for Monitoring;
- Key Test 3: Delivering NWDA core outputs;
- Key Test 4: Contributing to Headline Strategic Added Value;
- Key Test 5: Contributing to Natural Economy Strategic Added Value;
- Key Test 6: Delivering against Public Service Agreements;

- Key Test 7: Downstream economic effects;
- Key Test 8: Risk Reduction;
- Key Test 9: Valuing Ecosystem Services;
- Key Test 10: Creating Return on Investment.

(ECOTEC, 2009)

These Key Tests are intended to be applied *"by different stakeholders in different circumstances seeking to quantify the economic value of Green Infrastructure investments, from programme through to project level, taking account of the range of potential interventions possible and the considerations, interests and appraisal techniques used by different potential investors"* (ECOTEC, 2009, p. 3). Thus the tests provide a technique for valuing GI and evidencing impact, helping to justify investment. This work is to be followed by more focused research, including a report aimed at providing project managers with a step-by-step approach to delivering, measuring and demonstrating the economic contribution of GI (TEP, Ibis Environmental and Design Consultants and ECOTEC, 2009).

Figure 20: The Eleven Economic Benefits of GI



(ECOTEC, 2009; NENW, year unknown a)

Table 11: Explanation of the Economic Benefits of GI

Benefit	Qualifying and quantifying the benefits
GVA	The natural environment is directly responsible for £2.6bn GVA in the Northwest and directly supports 109,000 jobs. Improvements to the region's image help to attract businesses and hold high value industry, entrepreneurs and workers.
Land and property values	Views of natural landscapes can add up to 18% to property values. Houses close to parks are on average 8% more expensive than similar properties further away. Higher properties values in themselves can improve an area's image.
Labour productivity	Studies suggest working environments significantly impact productivity. Employees work better in a greener environment, absenteeism is reduced and high grade staff stay in post longer.
Tourism	Visitors are worth £10.9bn per year to the Northwest, supporting 200,000 full time jobs. The rural economy element of this is worth around £770m a year. GI could significantly increase this. The annual value of forests in the UK in terms of recreation and landscape value equates to some £400m. Woodland recreation in England has a value of between £1.66 and £2.78 per visit. An additional 330,000 visitors to the National Forest since 1995 have contributed an additional £128m annually, creating and supporting more than 500 full time equivalent jobs. Breeding ospreys at Bassenthwaite Lake attract around 100,000 people each season. A study in 2003 found that these visitors spent £1.68m, of which £420,000 was directly attributable to the ospreys.
Products from the land	Agriculture accounts for 2% of GDP but there are opportunities to increase this through diversification. Biomass is the main source of renewable energy in the UK but according to the Forestry Commission resources are underused. Using more domestically-grown wood for renewable energy could result in a 60% increase in wood production, with significant opportunities to create jobs.
Health and well-being	GI can help to combat lifestyle related illnesses, reducing public costs and the burden of sick pay on employers.
Recreation and leisure	Economic benefits from employment and visitor spending. Health benefits and associated savings.
Quality of place	The Government's Urban Green Spaces Task Force in 2002 emphasised that declining green spaces has helped weaken community cohesion in many deprived areas. Creative approaches can offer cost savings for landowners and LPAs, increase community ownership and cut crime.
Land and biodiversity	Healthy ecosystems are critical to the functioning of GI. Investment in GI can create land management employment opportunities. There are links with economic activities such as natural tourism and country sports.
Flood alleviation	Some 212,500 properties in the Northwest are at risk of flooding. Carlisle suffered severe flooding in 2005 and 2009. GI can improve drainage and reduce flood risk, reducing costs from damage.
Climate change	The Northwest's woodlands have been valued at £601m in possible markets for carbon capture and storage. GI offers a sustainable, low-cost way of adapting to climate change, regulating temperatures and reducing surface water runoff. GI can help biodiversity adapt to climate change.

6.5 A Climate Change Focus

The NW's approach to GI has a focus on technical development. Functional assessment is at the heart of the approach, enabling strong links to the ecosystem services elements of GI (Moss, 2010). One example of this is the climate change focus evident in many of the Northwest's GI projects. The NW Climate Change Action Plan recognises the role of GI in carbon capture and sequestration and allocates action 10.3, *"The regional assessments of the risks, opportunities and priorities for green infrastructure in adapting and mitigating climate change"*, to Community Forests NW (Climate Change Northwest, 2010, p. 19). The involvement of the University of Manchester in the GI Think Tank has created a strong relationship with academic research into this area (see section 4.1.6). Two such projects are outlined in Figures 21 and 22.

Figure 21: Liverpool Knowledge Quarter

Liverpool Knowledge Quarter (KQ) was supported by NENW as a demonstration of ways in which GI could be incorporated into the design and implementation of urban regeneration.

The KQ is economically important *"driving some 15% of the city's annual GVA despite only accounting for 1% of its land area"*, but environmentally and socially *"compromised"*, with some of the worst neighbourhood deprivation in the country (Urbed, 2007).

The long-term vision is to reconnect the area with a strong network of places and routes drawing upon the area's unique combination of learning and cultural assets (Urbed, 2007). This regeneration intends to *"show how environmentally sustainable new buildings and spaces can be inserted in ways that enhance the city's classical character and help link opportunity with need"* (Urbed, 2007), and GI plays a vital role in this.

Greenspace (green) and Urban Places (brown)

(URBED, 2007)

Research by IBIS Environmental and Design defined climate change adaptation as a priority (IBIS, 2008).

GI therefore focuses on retrofitting trees, shrubs, long grass, wetlands, living roofs and green walls. Research undertaken by the Mersey Forest indicated that the KQ has the potential to deliver 6.6ha of green roofs (NENW, year unknown b).

On the basis of NENW's involvement and research, the *Urban Design Framework and Public Realm Implementation Plan* for the KQ has a GI Appendix (IBIS, 2008).

Figure 22: The Mosslands Project

The Mosslands Project aims to link and expand remnant lowland raised bogs across 6,600ha between Warrington, Wigan and Salford, buffering and linking the Manchester Mosses Special Areas of Conservation. Historically the majority of the mosslands landscape was covered by lowland raised bog. Following the construction of the railways, the land was drained and improved for agricultural production resulting in the loss of much of this habitat. Today, the only remnants are the sites designated to protect their nature conservation value. Peat extraction is ongoing to this day (Moss, 2009).

The Mosslands Project, steered by the Mosslands Action Group, intends to *"address the current fragmentation and decline of the landscape and develop a cohesive structure to reduce conflicts between different landuses, particularly conservation, agricultural, peat extraction and development interests"* (JBA Consulting, year unknown). It brings together stakeholders, local residents and landowners to plan more effectively for the area's future.

The restoration of Astley Moss is part-funded by Foundation, *"an innovative climate fund for the Northwest of England that gathers up donations from individuals, businesses and other organisations and uses them to support a variety of community-based carbon reduction projects"* (Foundation, 2010). Restoring 2.5ha of peatland here will cost £25,000 and will offset 31 tonnes of CO2 annually and 620 tonnes over the project lifetime (Foundation, 2010).

Table 12: Learning to take forward – the Northwest of England

Lessons Learnt	Reasoning/evidence
The Northwest of England	
The GI approach is tailored towards the region's priorities	The region's GI approach is a response to the Government's regeneration and economic priorities for the region.
There is clear top-down support for GI	GI is given high level support by regional government. The GI requirement is clearly set out in the RES and RSS, cascading down to local action. Regional government are a clear presence in partnerships, giving legitimacy to the inclusion of GI in the economy.
There is clear leadership	The region's partnerships have a clear purpose and focus and provide leadership for sub-regional/local action.
An extensive evidence base has been compiled to promote GI, tailored towards the region's regeneration and economic priorities	• There is excellent wide-ranging research which all contributes towards Natural Economy Northwest's aim. Taken together, this builds a very robust case for the economic value of GI. The research is primarily focused on the Northwest but does draw upon national research (e.g. by CABE). The principles of the findings will be the same across the UK. • Desk-based research is demonstrated on the ground by a series of case study examples. These examples are clearly focused towards a specified GI priority, e.g. climate change adaptation, helping to demonstrate its successful achievement. • Further research provides an 'off the peg' solution to the need to demonstrate measurable GI outcomes in order to justify its employment, which could be adjusted for application outside the Northwest.
Climate change is a primary driver which GI responds to	Many of the Northwest's practical GI projects provide an innovative response to the challenges posed by climate change.

Chapter 7: Learning from Best Practice – the River Nene Regional Park, Northamptonshire

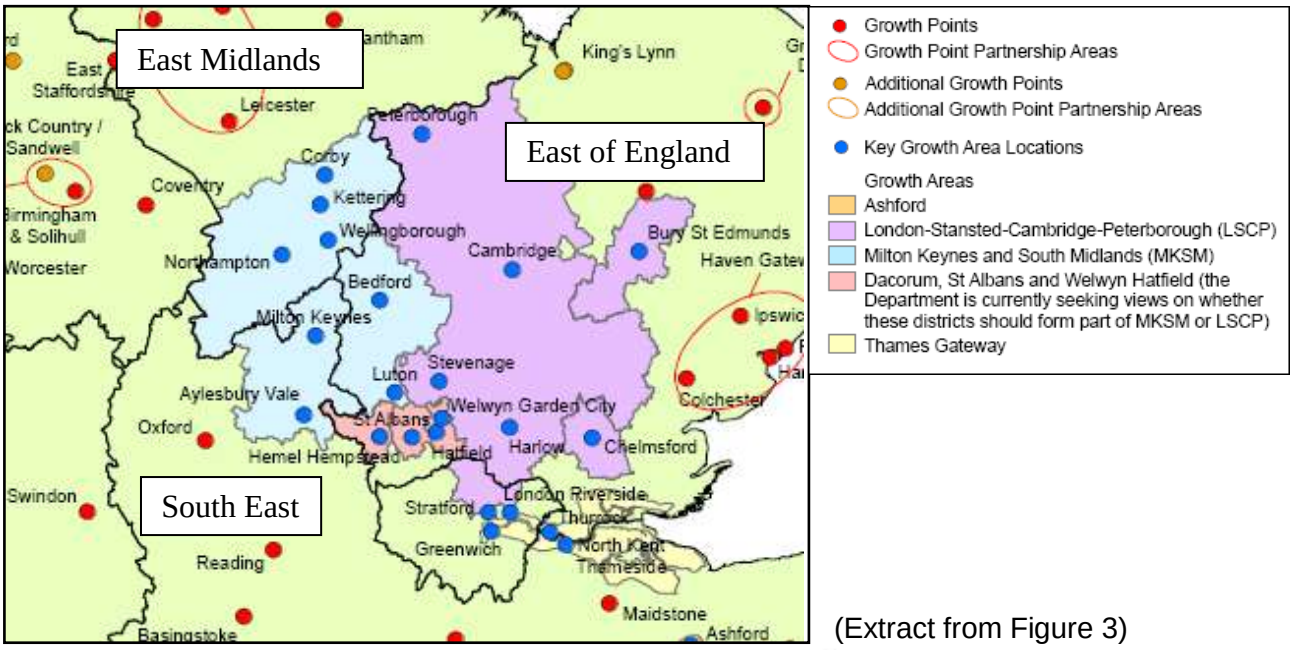
Northamptonshire's GI work is recognised as national best practice. Its online GIS suite won the Strategic Landscape Planning category of the Landscape Institute Awards 2007, the RTPI's national E-Government Award and was highly commended by the Association of Geographic Information (Kerrou, 2008). The work of the River Nene Regional Park has been recognised as best practice and is often quoted in GI guidance. This section evaluates the successes of Northamptonshire's approach to GI and extracts lessons relevant to its wider application. This evaluation is based upon a desk-top study and two visits, the first of which on 11 September 2009 was learning day for South Worcestershire planning officers and GI partners, the second of which was with Natural England's East Midlands team members on 3 December 2009 (agendas and photographs in Appendix 5).

7.1 Introduction to the River Nene Regional Park

The River Nene Regional Park (RNRP) is located in Northamptonshire, in the East Midlands. Northamptonshire is only 10% urbanised (DCLG, 2005; North Northamptonshire JPU, 2008) and has a *"strong rural character"* (RNRP, 2009b) with *"many unspoilt villages and varied landscapes"* (Kerrou, 2008, p37). However, Northamptonshire is part of the Milton Keynes & South Midlands (MKSM) Growth Area (see Figure 23), which will result in increasing urbanisation over the next 11 years. MKSM was the first growth area of its kind (Government Office for the South East, East Midlands and East of England, 2005) and is the largest of four major growth areas proposed by the 2001 Regional Planning Guidance (Government Office for the South East, 2009). MKSM will deliver 224,000 new homes and 192,000 new jobs between 2001 and 2021 (MKSM IRB, 2009). The GA is subdivided into Local Delivery Areas, with two located in Northamptonshire (Figure 24).

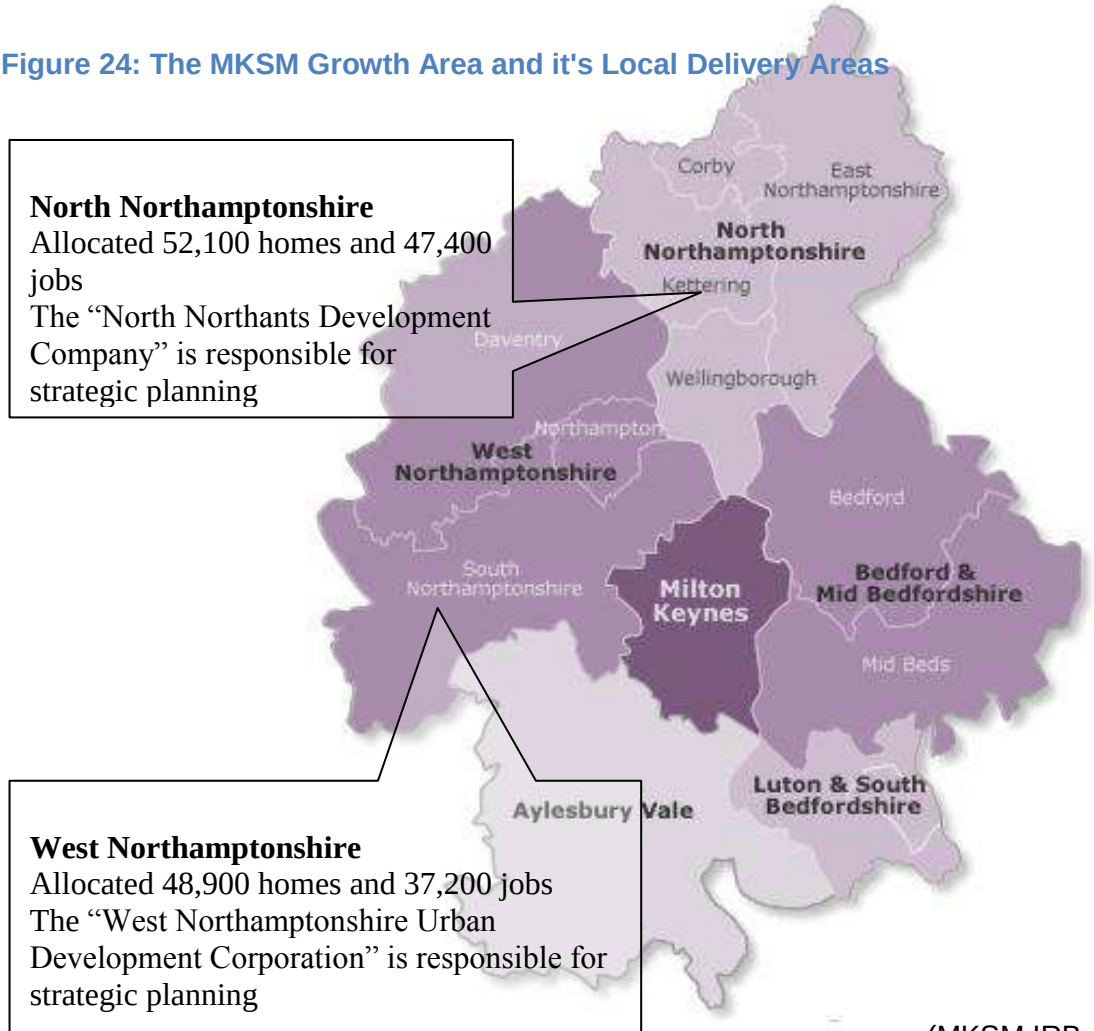
The unprecedented levels of growth proposed present a multitude of challenges, such as how to deliver this growth without causing irreparable damage to the local environment and how to ensure the 'liveability' of the new communities created. However, local stakeholders recognised that the growth also offered a unique opportunity to deliver equally large-scale GI benefits which may otherwise be unachievable. The Northamptonshire LPA took ownership of the growth and responded proactively and positively. Their approach resulted in the establishment of the River Nene Regional Park and the creation of the Environmental Character and Green Infrastructure Suite, both hailed nationally as best practice.

Figure 23: The Milton Keynes and South Midlands Growth Point and Regional Context



(Extract from Figure 3)

Figure 24: The MKSM Growth Area and it's Local Delivery Areas



North Northamptonshire
Allocated 52,100 homes and 47,400 jobs
The "North Northants Development Company" is responsible for strategic planning

West Northamptonshire
Allocated 48,900 homes and 37,200 jobs
The "West Northamptonshire Urban Development Corporation" is responsible for strategic planning

(MKSM IRB, 2009)

7.2 The River Nene Regional Park

The concept of a Regional Park focused on the River Nene valley was first established in Northamptonshire's Structure Plan (1996). Policy RN1 expressed the intention to establish a Regional Park in the River Nene valley to *"help balance the demands of development and conservation"* (Northamptonshire County Council, 2001, p. 97). Northamptonshire County Council (NCC) and local environmental partners realised that the establishment of the proposed Regional Park could help to tackle the challenges inherent in delivering the proposed growth. However, the RNRP is not a park in the traditional sense of the word. Although its area can be defined on a map (see Figure 25), the Park is more of a delivery mechanism than an output.

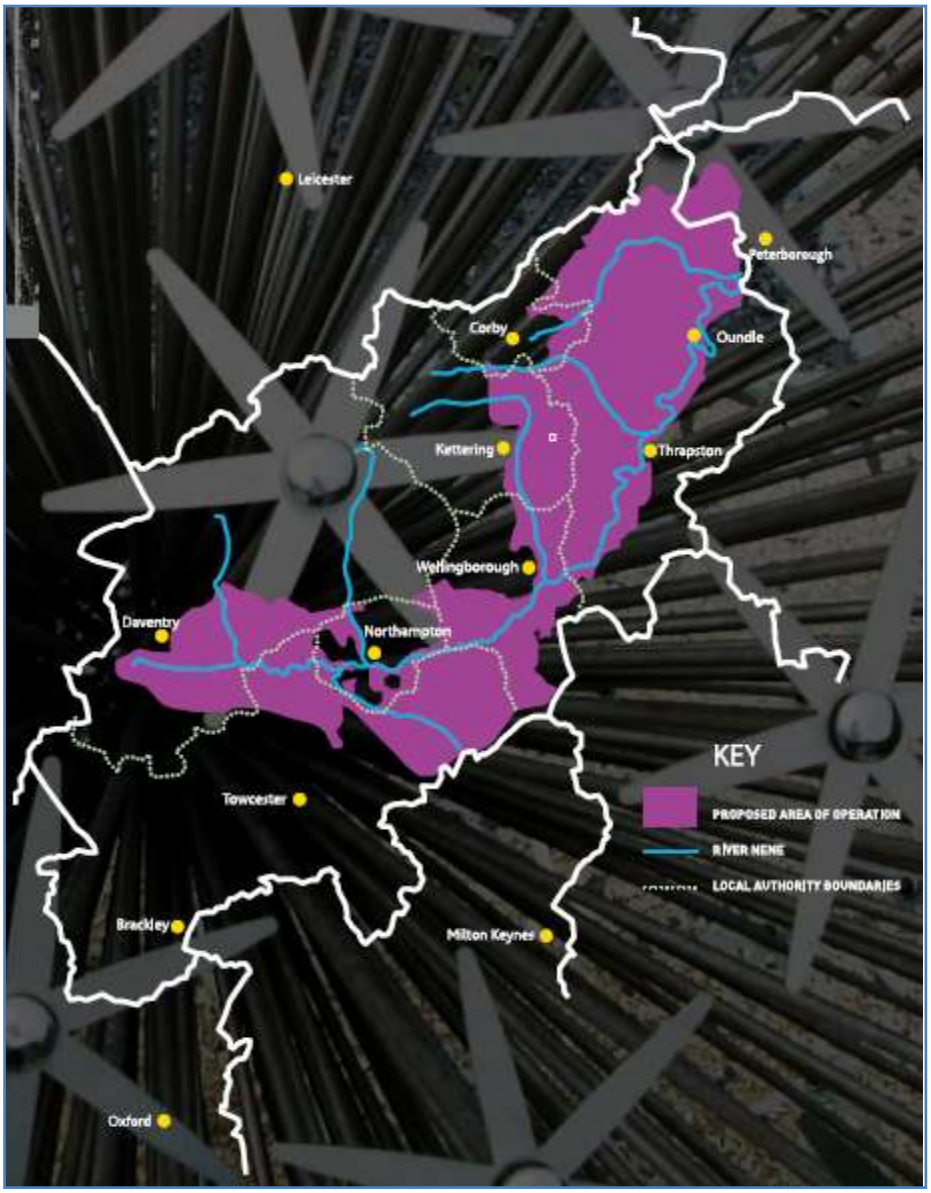
In December 2003 NCC commissioned a Feasibility Study into the establishment of the Regional Park (Landscape Design Associates, 2004a). The Study found numerous projects which could contribute were already underway but lacked co-ordination, and, as a consequence, *"the full cumulative benefits of individual investments [were] not being fully realised"* (Landscape Design Associates, 2004a). The Study concluded that by coordinating and building upon these existing initiatives the Park could deliver *"significant environmental, social and economic benefits and support the creation of sustainable communities in Northamptonshire"* (Homes and Communities Academy, 2009). The RNRP therefore consists of individual projects delivered in a coordinated way to form a network. Figure 26 illustrates project locations. In a sense RNRP is a 'virtual park', only existing on the ground through the sum of its parts. This approach mirrors that previously applied to the Thames Gateway (RNRP, 2005), but its application in a rural area was ground-breaking.

The RNRP partnership was formed in 2003, bringing together Northamptonshire's LPA's, the Environment Agency, the Forestry Commission, NE and partners from the public, private and voluntary sectors (Homes and Communities Academy, 2009). The partnership *"moved rapidly from concept development to project delivery"* (Homes and Communities Academy, 2009), delivering 'quick win' projects which gave initiative impetus. Known as 'tangible projects', these quick wins had been identified through the Feasibility Study and were intended to advertise the RNRP initiative. Using part of an initial £400,000 of funding from DCLG (East Midlands Green Infrastructure Network, 2008), RNRP set up a grant scheme to fund 75% of total project costs (East Midlands Green Infrastructure Network, 2008) and invited projects to be submitted for consideration. Such a high proportion of funding is unusual within the environment sector and was therefore likely to attract capital-heavy projects which were achievable within a short timeframe. The following projects were selected for funding:

- Salcey Forest (see Figure 27);
- Stanwick Lakes (see Figure 28);
- Barnes Meadow;
- Chester Farm;
- Kingfisher Lodge;
- Nene Way;
- Martin Moore Community Woodland;
- Land Advisor post;
- Green Infrastructure - the development of the Environmental Character and Green Infrastructure Suite (given further consideration in Section 7.3).

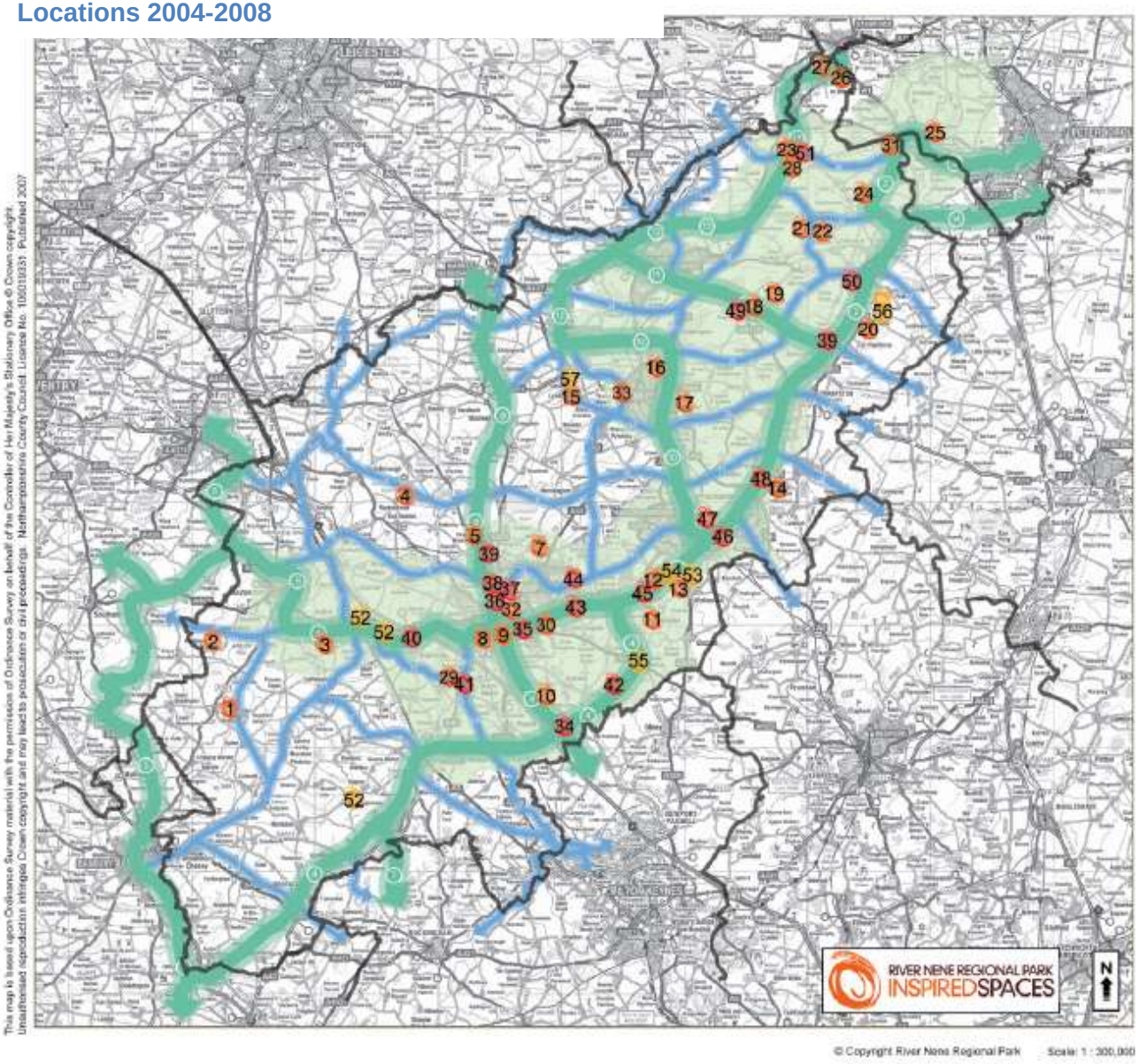
(RNRP, 2005)

Figure 25: River Nene Regional Park boundary



(RNRP, 2005)

Figure 26: River Nene Regional Park Project Locations 2004-2008



Environmental Grant Scheme

1 Byfield Parish Council
2 Helidon Milennium Fund
3 W G Batchelor & Son
4 Ravensthorpe Parish Council
5 Garatt, Chapel Brampton
7 Moulton Parish Council
8 Wildlife Trust/ English Partnership
9 Friends of Delapre Abbey
10 Turney Farming, Quinton Green
11 Grendon Parish Council
12 Wildlife Trust, Summer Leys
13 Adrian Lewis
14 Stanwick Pre- School
15 Uplands Farm, Loddington
16 Brambleside CP School
17 Groundwork North Northants
18 Fermynwoods Contemporary Arts
19 National Trust, Lyveden New Bield
20 Edward Seymour
21 Wildlife Trust (Black Hairstreak)
22 Wildlife Trust (Southwick Wood)
23 RSPB, Top Lodge
24 Nassington Parish Council
25 River Nene Organics
26 P & J Griffin
27 Wothorpe Towers Preservation Trust
28 Fineshade Community Orchard
29 Gayton Parish Council
30 Southcourt Environmental
31 Wildlife Trust, Standens Pasture
32 Northampton Arts Collective
33 Kettering General Hospital Pocket Park

Green Infrastructure Projects

34 Salcey- Phase 1 Infrastructure Improvements
- Phase 2 Tree Top Way
35 Barnes Meadow Wet Grassland Creation
36 Breathing Spaces, Central Parks
37 Racecourse improvements
38 Kingsthorpe Local Nature Reserve
39 Martin Moore Community Woodland
40 Nene Way Improvements
41 British Waterways
42 Yardley Chase & Salcey Forest HLF
43 Breathing Spaces- Mid Nene Valley
44 Breathing Spaces- East Northampton Woodlands
45 Wetland Wilderness
46 Chester Farm
47 Wilsons Pits
48 Stanwick Lakes
49 Fermwynwoods International Arts
50 Kingfisher Lodge
51 Top Lodge

Higher Level Stewardship

52 Flore, Upper Heyford, Wappenham (Banner)
53 Wollaston (Lewis)
54 Wollaston (Wyldes)
55 Yardley Hastings (Hutchinson)
56 Armstrong Hall Farm, Polebrook (Ashby)
56 Armstrong Lodge, Polebrook (Ashby)
57 Manor Farm, Orton (Chester)

Figure 27: Salcey Forest


(http://www.forestry.gov.uk/salceyforest)

(Salcey Forest, 2010)

Salcey Forest is an ancient woodland located on the clay plateau between Northampton and Milton Keynes. The Forest has been an important public recreation area for many decades and is important for nature conservation (RNRP, 2009a).

The Forestry Commission won RNRP funding to improve existing recreation facilities for a range of outdoor activities, such as cycling and horse riding, to restore 25 hectares of ancient pasture woodland, to install new woodland bird hides and to create a new wildlife lake (Landscape Design Associates, 2004b).

The project also delivered a 2 mile all-ability trail suitable for families with pushchairs and wheelchair users. This included innovative wooden bridges to take wheelchairs up and over the archaeological features associated with the medieval hunting forest (RNRP, 2009a). The project carried on evolving, with the recent installation of the innovative all-ability Salcey Forest Treetop Walkway (RNRP, 2009a). More than 200,000 people visit Salcey Forest each year (Homes & Communities Academy, 2009).

Figure 28: Stanwick Lakes

Stanwick Lakes cover 500 acres of former gravel pits. Previously owned by Hanson's Aggregates, East Northamptonshire District Council purchased the site with the view of creating a visitor attraction of local and regional significance. The unique selling point of the project is that it combines pursuits such as walking, cycling and water sports with interpretations of the rich archaeological heritage and the internationally significant wildlife (RNRP, 2009a).

Phase 1 of the proposal was a 'Tangible Project', and included *"the opening up of the green route using the former railway line, the design and delivery of the central hub area, the provision of play areas, adventure play trails and outdoor youth facilities"* (Landscape Design Associates, 2004b). The project was delivered by RNRP with the Rockingham Forest Trust and East Northamptonshire Council (RNRP, year unknown a, p. 6).

Further developments have incorporated:

- A central building providing indoor activities and visitor interaction carbon neutral and of attractive and striking design due to open Easter 2009;

- A bicycle hire centre providing further recreational opportunities, but also a steady revenue income to assist in the long-term sustainability of the site;
- Water sports facilities offering canoeing, sailing and windsurfing interpretation of the site's heritage and wildlife value;
- An iconic outdoor stepped grass amphitheatre, providing an innovative cultural and community resource for family entertainment;
- A willow structure providing a focal point of natural art engagement with the local community through volunteer programmes.

(RNRP, 2009a)

(http://www.rivermeneregionalpark.org/default.asp?PageID=30)

(RNRP, 2009a)

The success of the RNRP partnership approach is founded on clear leadership, excellent partnership working and astute business management. The RNRP is a partnership, comprising government bodies, public bodies and environmental organisations. This partnership approach is then extended as the RNRP works with external organisations to help them coordinate their efforts and *"see the natural environment as an asset that can deliver financial return on investment"* (RNRP, year unknown a, p. 3). The original RNRP grants scheme attracted nineteen new partners, *"many of whom would not have been seen as typical partner organisations"* (East Midlands Green Infrastructure Network, 2008). One of the advantages of partnership working is that organisations are *"able to adopt a coordinated approach to bidding for funding, rather than ... competing against one another"* (Homes and Communities Academy, 2009).

The RNRP has a clear delivery focus. Following the Tangible Projects, the RNRP provided a Green Infrastructure Grant Scheme which ran from 2006-2008. This provided grants aimed at *"[benefiting] urban, urban fringe and rural communities; [improving] access links between and within urban and rural areas; [enhancing] the built heritage; [improving] the landscape; [promoting] enjoyment and understanding of the countryside and the environment and address problems of misuse of the countryside and the environment"* (RNRP, year unknown a, p. 8). Grants varied from £500 to supply water to an allotment site to over £76,000 for historic building restoration (Homes and Communities Academy, 2009). The scheme was tightly controlled. Administration costs were kept to a minimum, making more money available for projects. Grant applicants were *"impressed with the speed and straightforwardness of the application process and the lack of bureaucracy"* (East Midlands Green Infrastructure Network. 2008).

Good financial management is essential for any initiative focusing on the delivery of projects, and the RNRP partnership has shown considerable accomplishment in this area. The initial £400,000 of funding was used to attract a further £600,000 through, for example, match funding and lottery bids. This equates to obtaining a further £1.73 for every £1 spent (East Midlands Green Infrastructure Network, 2008). In 2005, RNRP secured £1.5m from ODPM's Growth Areas Fund, which enabled the delivery of £6m of

initiatives (RNRP, year unknown a). In 2006, RNRP secured a further £4.5m of GAF, used to deliver £12m of initiatives (RNRP, year unknown a). Whether this momentum is maintained in today's economic climate will be a measure of RNRP's success, but the multifunctional nature of GI should help to aid its promotion.

The direction of RNRP made its formalisation as a business a logical next step. In 2007 RNRP became a Community Interest Company (CIC); an independent not-for-profit organisation, able to hold assets on behalf of the community (RNRP, 2009a). RNRP *"did not see itself as a profit making company"*, but recognised the potential for holding land, managing or owning spaces or possibly receiving land under Section 106 (RNRP, 2007, p. 7). Becoming a CIC provided the ability to hold assets and operate for community benefit. The RNRP CIC is governed by a Board of 16 members, representing the original partners and community and landowner bodies (RNRP, 2009a). The Board are responsible for making key financial decisions and prioritising RNRP's future delivery (RNRP, 2009a). By becoming a *"formally constituted, independent organisation"* RNRP hoped to become a *"recognised and respected organisation with a long term vision"* (RNRP, 2007, p. 7).

The RNRP CIC's vision is:

> *"By 2016 the River Nene Regional Park will be an independent, inclusive, reciprocal and beneficial partnership of public, private and third sector members. It will be nationally and internationally recognised as the centre of excellence for the piloting, co-ordination and delivery of regional sustainable development. It will address strategic issues such as climate change, the enhancement of local biodiversity and the innovative development of the environment as an asset for social development, education, leisure & recreation, heritage & cultural activity, and as a primary vehicle of economic regeneration"* (RNRP, 2009a).

To achieve this Vision, RNRP identified five core themes which its work/projects should fall within:

- *Project enabling* – tangible and signature projects, which promote and thereby enable the RNRP concept;
- *Place-making* – aiming to celebrate or reinforce local identity, possibly by acquiring sites for RNRP initiatives;
- *The centre of excellence for environmental initiatives and innovation* – helping to establish the RNRP as a centre of excellence through innovative ways of working, using the latest design, technology and research and development;
- *Championing green infrastructure across the region* – providing technical support, training, awareness raising, promoting or marketing green infrastructure assets and information sharing;
- *Enabling carbon offsetting and addressing climate change* – supporting the RNRP programme of research into climate change and carbon offsetting principles, using innovative technologies, raising awareness, including through co-ordinating and communicating action.

(RNRP, year unknown a, p. 4)

These five themes are central to the RNRP's business plan, adopted 2007, and inform its future work.

7.3 Northamptonshire Environmental Character and Green Infrastructure Suite

Northamptonshire's Environmental Character and Green Infrastructure Suite (EC&GI Suite) was developed over five years and launched in 2006 (RNRP, 2009b) (http://www.rnrpenvironmentalcharacter.org.uk/). The Suite was developed specifically to inform the planning process by the consultants Landscape Design Associates in partnership with the RNRP and the Northamptonshire Landscape Partnership (Kerrou, 2008). By helping planners, developers and the community to understand *"how the landscape has evolved and functions"* (RNRP, 2009b) the suite enables more informed decision-making around future development.

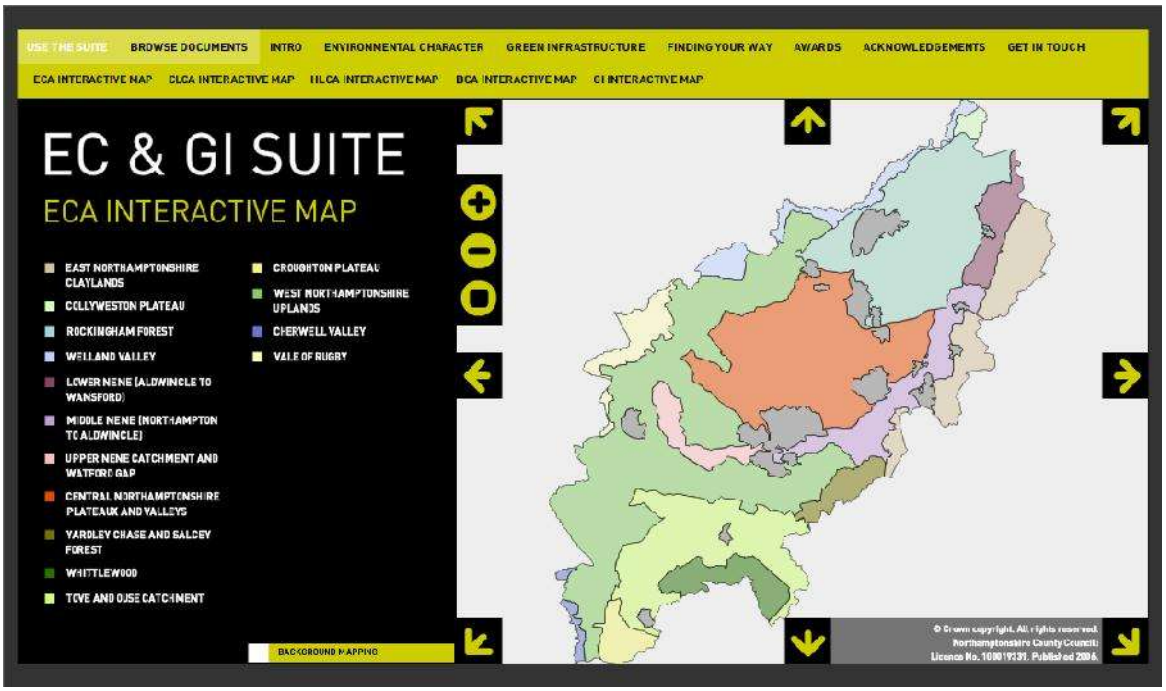
The Suite is web-based and comprises five interactive maps:

- Environmental Character Assessment;
- Current Landscape Character Assessment;
- Historic Landscape Character Assessment;
- Biodiversity Character Assessment;
- Green Infrastructure.

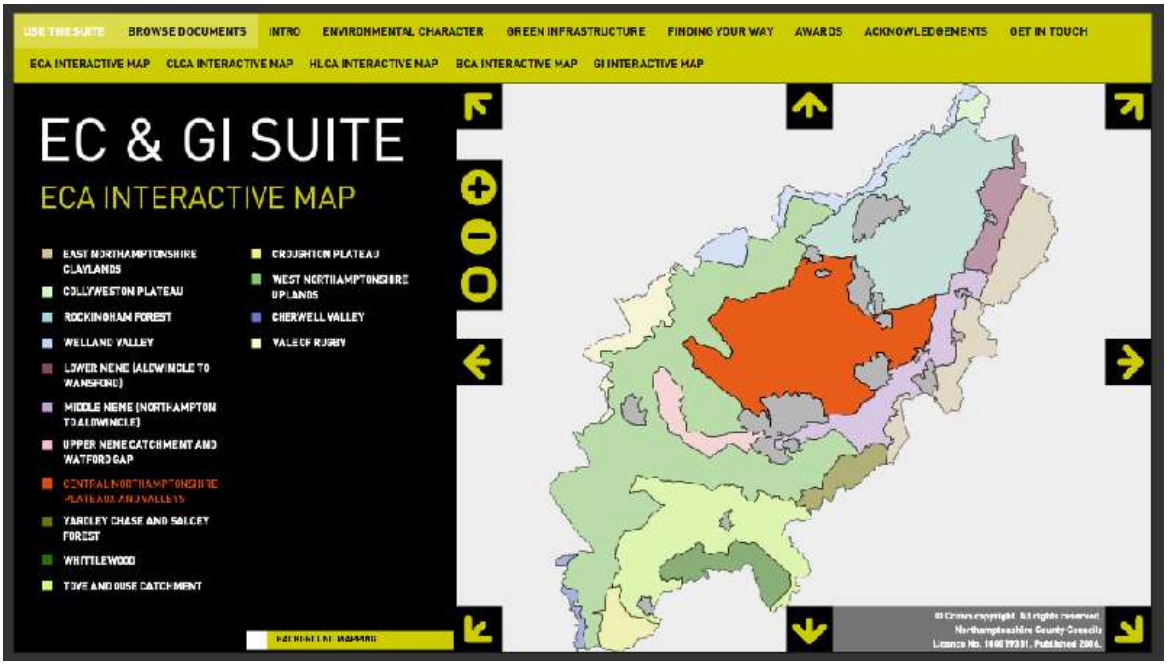
Each map is underpinned by a technical study accessed through the maps which provides additional detail and explanation. Figures 29 and 30 provide a step-by-step illustration of the Environmental Character Assessment Interactive Map and Green Infrastructure Interactive Map in action.

Figure 29: RNRP Environmental Character Assessment Interactive Map

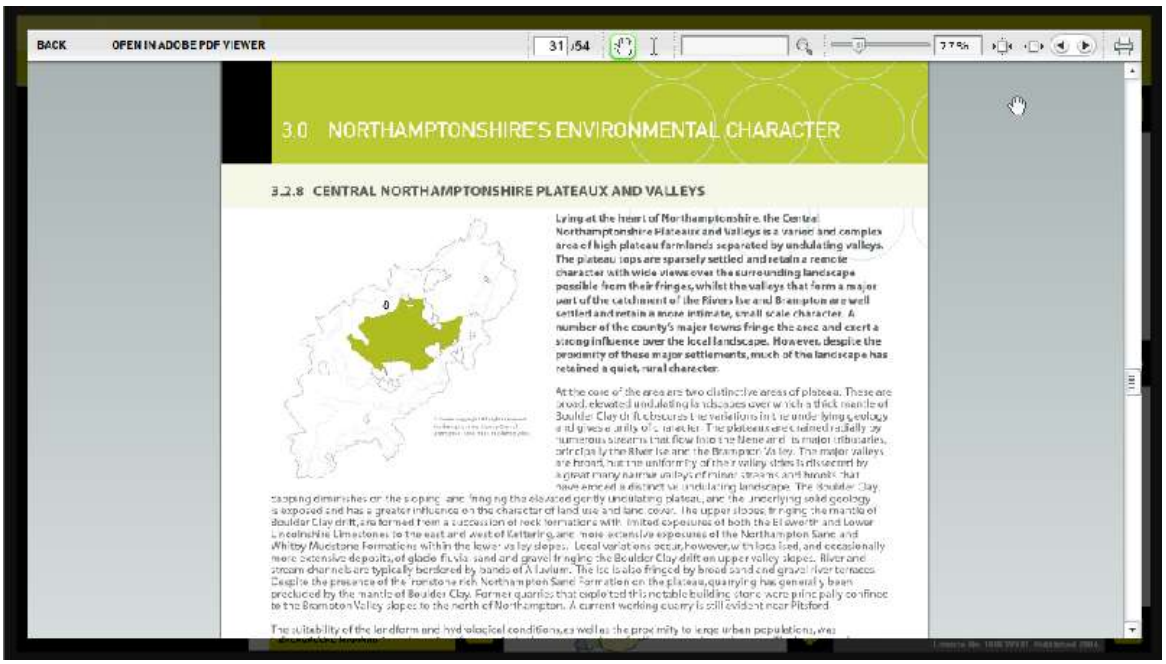
Step 1: On opening the Environmental Character Interactive Map the user is faced with a map of Northamptonshire which is sub-divided into Environmental Character Areas, the names of which are listed and hyperlinked on the left.



Step 2: The user can chose to click on either an area or a hyperlink to access further information



Step 3: A PDF document opens in a new window. This provides a detailed explanation of the Environmental Character Area selected.

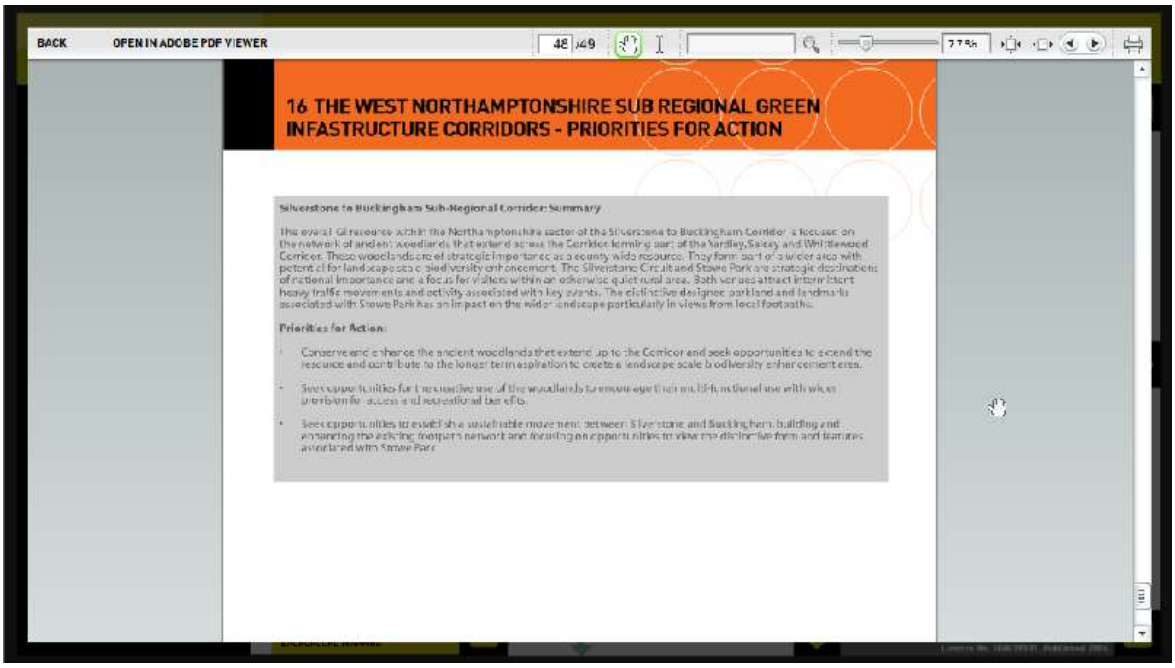


(RNRP, 2009b)

Figure 30: RNRP Green Infrastructure Interactive Map

Step 1: Opening the Green Infrastructure Interactive Map presents the user with a map of Northamptonshire's GI network with numbers which relate to a list of hyperlinks on the left hand side.

Step 2: Clicking on a number or hyperlink opens a PDF document in a new window which provides further explanation and detail, including giving the GI priorities for the area selected.



(RNRP, 2009b)

When Northamptonshire's GI work was in its infancy GI was more usually associated with urban areas. Some GI benefits are by their nature more diffuse in rural areas and consequently GI networks can be more difficult to define. The rural nature of Northamptonshire therefore necessitated an innovative approach. A pilot study was initially undertaken, focusing on Corby. This provided a transferable methodology which was refined through peer review before being applied to the wider county (East Midlands Green Infrastructure Network, 2008).

The definition of the GI network was reached through a staged approach. The methodology built on the baseline data from an Environmental Character Assessment. Data was primarily gathered through GIS analysis, undertaken in-house, and included:

> *"countywide geology and soils, satellite based land use survey data drilled down to single fields combined with Defra typologies on field shape and size, species and habitat distributions, physiographic and landform data, distribution of heritage sites, aerial photography and ground truthing the visual landscape elements"* (Kerrou, 2008, p. 25).

The GI process took this data and considered ways to develop the relationship between these GI assets through the identification of *"strategic and local communications corridors"* to *"link settlements, amenities and attractions"*, drawing on information on biodiversity habitats, corridors and reservoirs to *"define a biodiversity network that would maximise opportunities for connectivity between habitats and ensure that they did not become isolated"* (RNRP, year unknown b).

Northamptonshire's use of mapping, survey and analysis to support the planning process was, at the time, cutting edge (East Midlands Green Infrastructure Network, 2008). The EC&GI Suite was the first to *"define GI networks for both urban and rural areas at a sub regional scale of assessment"* (East Midlands Green Infrastructure Network, 2008). The Suite requires updates every five years or so to *"maintain [its] accuracy and integrity ...*

thereby keeping the data relevant and informative" (Kerrou, 2008, p. 37). The limited updates required means the Suite is *"financially and technically viable"* (Kerrou, 2008, p. 37).

The Suite's value for planners and developers alike lies in its collation, interpretation and subsequent simple presentation of complex subjects. It *"brings together all aspects of landscape and environmental planning in a meaningful way"* (RNRP, year unknown b), and in doing so, provides *"an objective and transparent framework"* for use in decision-making (East Midlands Green Infrastructure Network, 2008). This methodology puts specialist information in an easily comprehendible form into the hands of decision makers. In doing so, it addresses the issues first identified by McHarg (1969) with a methodology very similar to that which he developed and advocated. The Suite *"enable[s] a proactive approach to planning, design and project delivery, and facilitate[s] participation by land use managers and the development industry, as well as the public, private and voluntary sectors and general public"* (RNRP, 2009b) and fosters a *"strong sense of ownership of environmental planning"* (Kerrou, 2008, p. 36).

The EC&GI Suite informs the LDF and Core Strategies of both North and West Northamptonshire (East Midlands Green Infrastructure Network, 2008). The Suite has already been influential in guiding growth in several Northamptonshire towns and *"has successfully been used in draft form in three public inquiries since 2005"* (Kerrou, 2008, p. 36). It could equally be used to inform the required Sustainability Appraisal and Strategic Environmental Assessment of plans or could form a Supplementary Planning Document in its own right. The Suite also informs the development management process, providing a baseline against which the quality of proposed developments can be assessed. Regional and local policies require its use in relation to all major developments and recommend its use as *"part of any planning application or future environmental studies such as landscape and visual impact assessment"* (RNRP, 2009b). Crucially, this places the onus on the developer to use the Suite to inform their development and to supply evidence of this as a part of their planning application. This allows planning officers to make informed decisions on applications and means that that the quality of developments can be monitored.

Use of the suite will produce tangible benefits. Firstly, it allows protection, ensuring development respects the landscape (in its widest sense) and therefore *"that the qualities of the landscape that we cherish can be retained and enhanced for future generations"* (RNRP, 2009b). Secondly, it informs enhancement by identifying *"areas with investment potential that use green space to make it more accessible to local communities"* (Kerrou, 2008, p. 35) and through subsequent positive effects such as *"generating new leisure and recreational opportunities, bringing educational facilities and encouraging green local businesses to a given area"* (Kerrou, 2008, p. 35). Furthermore, the usefulness of the suite extends beyond planning; *"The data provided can be applied to priority investment initiatives, in combination with deprivation index data, to highlight areas with most potential for development and environmental sustainability"* (Kerrou, 2008, p. 36). The project also supported the establishment of the RNRP Community Interest Company, *"which has since become the focus for environmental innovation and green investment in Northamptonshire"* (Kerrou, 2008, p. 37).

Table 13: Learning to take forward – Northamptonshire

Lessons Learnt	Reasoning/evidence
Northamptonshire	
The GI response was a response to the pressures on the County	The GI approach was a response to the unprecedented development pressures on the County and the wider MKSM Growth Area.
RNRP provides a clear delivery focus	The River Nene Regional Park consists of individual components delivered in a co-ordinated way to form a network, the sum of which is greater than the parts. The benefits of GI were demonstrated early on through the delivery of tangible projects, aimed at promoting GI and the RNRP. The initiative exhibits excellent financial management, aiding project delivery.
The RNRP partnership provides clear leadership	The RNRP partnership provided clear leadership and attracted a wide variety of partners. Partnership working enabled a co-ordinated approach to funding, reducing competition and maximising outputs. The formalisation of the partnership as a Community Interest Company is possibly unique and has formalised GI.
GIS has been used effectively to undertake most of the practical GI planning	GIS has been used to reduce the need for detailed ground surveys, which can be costly and time consuming and require significant expertise.
The innovative use of a web-based GIS has provided a tool which can directly underpin planning policies	The EC and GI Suite provides an interpretation of complex and specialist data which is simple to use and understand and can be used by planners and developers alike. The use of the Suite is required by Core Strategy policies, ensuring that GI informs planning applications. The onus is on the developer to comply with this policy, reducing pressure on LPA staff. The presentation on GIS enables more detailed information to be acquired by drilling down.

Chapter 8: Summary of the Lessons Learnt

Throughout this Study the lessons learnt have been collated. In order to allow the appraisal of the shortcomings and successes of GI in South Worcestershire, the lessons learnt have been synthesised into a Checklist for Successful GI. Table 14 presents this Checklist. The stages undertaken to reach this Checklist are presented in Appendix 6.

Table 14: Checklist for Successful GI

Question	Further information	Yes/No
Strategy Production		
1) Is there an effective steering group?		
1a) Is work being clearly led or coordinated?	Clear leadership is essential. A steering group is a logical way of meeting this need.	
1b) Are experts from environmental, social and economic disciplines involved in the process?	Partners may include planners, landscape officers, ecologists, countryside officers or parks and recreation officers, Walking for Health officers, the Primary Care Trust, Natural England, the Environment Agency, English Heritage, regional government, regeneration companies and developers. Given this list, the Local Strategic Partnership may provide a logical starting point. A steering group provides a logical mechanism for involving key partners and a diplomatic framework from which their priorities can start to be integrated.	
1c) Have partners with a delivery remit been involved early on in the process?	Involving delivery partners early on can help ensure their buy-in to the process and provide opportunities to align strategies. A steering group provides a possible mechanism to achieve this.	
1d) Is there high level buy-in to GI?	E.g. its recognition in Regional Economic Strategies or Regional Spatial Strategies (or equivalent). High-level buy-in can give GI production extra impetus and weight, potentially attracting partners and aiding delivery.	
1e) Is there an agreed overall vision for GI?	Having an overall vision may help to focus efforts and can influence decisions around the network and priorities.	
2) Is the information base sufficient?		
2a) Has an information gathering exercise been undertaken as a starting point?	In most cases there is a range of existing information which is relevant to GI - there is no need to 'reinvent the wheel'.	
2b) Does the information base include Landscape Character Assessment or	An understanding of the landscape is a cornerstone of GI. The landscape is a product of many GI components and as such assessing and understanding the	

equivalent?	landscape is the first step towards delivering multifunctionality. Many counties have undertaken partial or complete Landscape Character Assessment.	
2c) Does the information base include Historic Landscape Characterisation and/or Historic Environment Assessment?	A holistic understanding of the historic environment is vital if GI is to protect and enhance sense of place and deliver local distinctiveness. Historic Landscape Characterisation and Historic Environment Assessment lend themselves to assessing multifunctionality. Most counties are committed to producing HLC and/or HEA if they have not already done so.	
2d) Does the information base include ecological evidence, beyond designated sites?	Information on designated sites is available from Natural England. Many counties have complete or partial coverage by Phase 1 Habitat Surveys or similar. Most counties have a Biological Records Centre which holds useful information, including the Local Sites (wildlife and earth heritage) series and species records.	
2e) Does the information base include an assessment of access and recreation needs and opportunities?	A PPG17 compliant audit is a required part of the LDF evidence base and is likely to include information which can be slotted into the GI Strategy. If GI Strategy production begins early enough, the PPG17 audit brief should be influenced towards this end.	
2f) Does the information base include information on hydrology?	The LDF evidence base is required to include a Strategic Flood Risk Assessment. Information from which can be slotted into the GI Strategy, helping to ensure GI is underpinned by an understanding of environmental processes.	
2g) Has this information been integrated to provide an understanding of environmental character areas?	Considering environmental character areas can be a useful step towards defining GI priorities or spatial prescriptions.	
3) Is the GI network defined and are GI benefits clearly prioritised?		
3a) Are hubs, sites and links (or equivalent) defined?	Considering the network in this way enables the concept to be quickly grasped and lends itself to inclusion in Core Strategies (Proposals Maps or Key Diagrams).	
3b) Are there hubs, sites and links focused on ecological needs?	Key nature conservation sites should be recognised as hubs. The role of corridors, stepping stones and habitat patches for biodiversity should be recognised. Where a specific output is desired the network should be tailored to this purpose, e.g. the needs of a priority species. Ecological hubs (especially designated sites) have a different primary purpose to human focused ones, and in some instances may be unsuitable for recreation, e.g. sensitive SSSI, sites with rare breeding bird populations.	

3c) Are there hubs, sites and links focused on human needs?	GI in the UK is as much driven by quality of life and sustainable development as ecological considerations. Therefore any network concept should include urban areas and human-focused hubs, sites and links.	
3d) Have the relationships between ecological and human focused hubs, sites and links been considered?	The GI network must take these relationships into account if benefits are to be maximised, e.g. recreation pressures, opportunities to promote walking or cycling.	
3e) Have potential GI benefits within each discrete GI sub-section been prioritised?	The sum of the network is greater than the parts, and not all parts of the network will deliver all benefits, although all types of GI should deliver some level of multifunctionality. Prioritising the desired benefits from each area will aid their delivery.	
3f) Is the GI network clearly presented?	GIS may help with this.	
4) Does the network deliver key benefits?		
4a) Do the hubs, sites and links thread through urban and rural areas?	This is essential if all GI benefits are to be realised and GI is to serve its purpose.	
4b) Are watercourses recognised as a prime GI opportunity (where relevant?)	Watercourses are usually multifunctional and often connect urban and rural areas.	
4c) Will the network provide opportunities for every-day contact with biodiversity?	Contact with nature has recognised psychological benefits. The network should integrate biodiversity with society rather than isolate it, although it should be recognised that some sensitive interests e.g. rare breeding birds, will require human disturbance to be minimised.	
4d) Have opportunities to relate GI to economic considerations been identified and taken?	GI can directly and indirectly benefit the economy, e.g. tourist revenues, flood risk reduction. Recognising these benefits increases the chances of their delivery.	
Recognition of GI within the Local Strategic Partnership		
5) Is GI recognised by the Local Strategic Partnership?		
5a) Is GI included in the Local Area Agreement?	GI can be delivered through many council and other partners' activities, not just land use planning, and it's positioning as a means of meeting the targets and	

	underlying issues of the Local Area Agreement will be pivotal to outcomes.	
5b) Is GI included in the Sustainable Community Strategy?	This steers the Local Development Framework and is the starting point for partnership endeavours to shape/ attune actions and services to the needs and goals of individual places.	
6) Are there measures in place to deliver GI through LSP work areas?		
6a) Is the retrofitting of GI being promoted?	Council activities could provide opportunities to plant street trees, improve the functioning of green spaces, promote and improve provision for walking and cycling, improve drainage through use of Sustainable Drainage Systems.	
6b) Are promotions around healthy living linked into GI?	E.g. Walking the Way to Health Initiatives, the promotion and new provisions for of walking and cycling, the promotion of circular walks. Does the Primary Care Trust's business model support the GI rationale re preventative health care?	
6c) Is there an adequate supply of allotments?	GI could include allotment space, community orchards and small holdings for local food production.	
6d) Is the carbon storage value of GI recognised?	The relationship between local carbon reduction targets and GI maintenance and improvement as a carbon sink needs to be understood and employed in the overall local strategy for climate change mitigation.	
6e) Has the value of GI towards climate change adaptation been recognised?	The relationship between local adaptation priorities and GI needs to be understood and employed in the overall local strategy for climate change adaptation.	
Recognition of GI within the Core Strategy		
7) Is GI adequately covered in the Core Strategy policies?		
7a) Is there a GI policy within the CS?		
7b) Is GI cross-referenced in other relevant policies?	E.g. biodiversity, open space, health.	
7c) Is it clear what information on GI planning applications are required to include?	The onus must be on the developer to comply with the Core Strategy policy. Is it clear where information on GI is to be presented? E.g. GI to be included in	

	master plans, an intention to produce concept statements/plans to guide master planning.	
7d) Does the policy either include sufficient detail or refer users to an additional document which holds the detail?	It should be clear which approach has been used.	
8) Does the GI policy, supporting text or the referenced additional information include sufficient detail?		
8a) Is GI adequately defined?	This should conform with PPS12 and any definitions from a higher tier in the planning system e.g. regional, county.	
8b) Is GI promoted as a means of delivering sustainable development?	Supporting text should cover this and make explicit the role of GI in facilitating the Sustainable Community Strategy (5b) objectives.	
8c) Is GI promoted as a means of meeting environmental legislation?	Referring to legislation gives GI greater weight. The Habitats Directive (1994), the Natural Environment and Rural Communities Act (2006) and the European Landscapes Convention (2007) are relevant.	
8d) Are the social and economic benefits of GI clear?	GI is as much about social and economic factors as the environmental factors more usually associated with green networks.	
8e) Have standards for on-site GI delivery been set?	Recognised standards including Accessible Natural Greenspace Standards and the recommendations from PPG17 audits should be applied as standard. Larger developments perhaps offer greater opportunity, and eco-towns standards could be considered, e.g. 40% green space.	
8f) Are any requirements for off-site delivery set out?		
8g) Are identified priorities given appropriate delivery leverage?	E.g. development within a given area could be required to contribute to a Country Park to address an identified deficit.	
8h) Is the relationship between GI and sustainable transport promoted?		
8i) Is urban greenspace with GI value protected?		
8j) Is the retrofitting of GI promoted?		
9) Is GI included in other relevant LDF documents?		

9a) Is GI included in guidance on Planning Obligations and/or the Community Infrastructure Levy?		
9b) Is GI included in other relevant LDF documents such as Area Action Plans and relevant Supplementary Planning Guidance/Documents?		
10) Will GI delivery be adequately monitored?		
10a) Will the delivery of GI be monitored?	The Core Strategy will include a monitoring/implementation section and targets to ensure the GI policy is met should be included within this. This should ideally be reported in the Annual Monitoring Report.	
10b) Is it clear what action will be taken if GI delivery falls short of the desired level?	The Core Strategy monitoring/implementation section should outline actions to be taken if monitoring finds policies and derived standards/actions are not being met. This should include relevant GI targets.	
Delivery and Management		
11) Does the GI Strategy contain an adequate delivery plan?		
11a) Are there clear requirements to deliver GI on development sites?	GI delivers environmental and quality of life benefits for the residents of new growth and provides a way to address the concerns/issues of existing residents.	
11b) Have on-site delivery mechanisms been specified?	E.g. Conditions, Section 106, the Community Infrastructure Levy, a roof tax.	
11c) Has it been made clear that GI delivery goes beyond development sites?	The majority of the GI network is likely to be outside of growth locations.	
11d) Have off-site delivery mechanisms been outlined?	E.g. roof tax levies, agri-environment funding, woodland grants, big lottery grants or similar.	
11e) Are off-site delivery partners aware of the GI Strategy?	E.g. Natural England, the Forestry Commission, the Environment Agency, public and private landowners.	

11f) Is the GI Strategy included in other Strategies/Plans which may be able to contribute to its delivery?	E.g. Biodiversity Action Plans, Biodiversity Opportunity Maps, Rights of Way Improvement Plans, AONB Management Plans.	
11g) Have GI demonstration/flagship projects been identified?		
11h) Has the delivery of key schemes and/or flagship schemes been prioritised?	E.g. a distinctive Country Park to address an identified deficit, a flagship housing development to set the standard for the future, e.g. a purpose-built wetland to show the way in terms of Sustainable Drainage Systems or floodwater storage and wildlife-based tourism.	
11i) Is there a plan for how the delivery of key or flagship schemes will be achieved?	E.g. pursuit of a big lottery grant, a proposal to take this forward as a working group, a willing land owner.	
12) Are there clear provisions for the management of GI?		
12a) Is it clear how GI will be managed and who by?	The long-term management of GI should be secured up-front. The long-term management of GI should be secured up-front.	
12b) Is it clear how GI management will be funded?	Opportunities to raise revenue from GI towards its management should be investigated. New options for generating greater/more flexible local funds for local GI upkeep should be pursued.	

Chapter 9: South Worcestershire – A Case Study for mainstreaming Green Infrastructure

This Chapter uses the lessons learnt from the appraisal of GI, generically and in practice, to assess and inform the application of GI in South Worcestershire. South Worcestershire is introduced and the process so far is summarised (further information is provided in the Appendices). South Worcestershire is then evaluated and assessed against the 'Checklist for Successful GI' and recommendations are made as to the way forward.

9.1 Introduction to South Worcestershire

The following section introduces Worcestershire as a whole and South Worcestershire in particular, including its physical and human attributes and some of the economic, social and environmental challenges that it faces. The land use planning scenario for South Worcestershire is then introduced.

9.1.1 Spatial Portrait

Worcestershire covers 1735km^2 and is located in the West Midlands region (WCC, 2009). It adjoins the West Midlands conurbation, Staffordshire, Herefordshire, Shropshire and Warwickshire and shares its southern border with Gloucestershire in the South West Region (see Figure 31). There are six District, City and Borough Councils in Worcestershire: Bromsgrove, Redditch, Wyre Forest, Malvern Hills, Worcester City and Wychavon. The county has an estimated population of 555,400 (ONS 2007 midyear estimate) and over 223,049 households (2001 census) (ONS, 2009). Of these, 71% live in urban areas, principally Worcester, Redditch, Kidderminster, Stourport-on-Severn, Bromsgrove, Malvern, Droitwich Spa and Evesham (WCC, 2009). Worcester is the County Town and with about one-sixth of the county population, has a sub-regional role as its main service and employment sector. Under one-third of the population lives in rural areas, despite this comprising the majority of the county (WCC, 2009).

Worcestershire has relatively full employment, with 83.5% of the working population economically active in 2006/7. Employment is predominantly urban-based (WCC, 2009). Some towns, notably Bewdley, Pershore, Upton-upon-Severn and Tenbury Wells, provide a traditional market town role, serving an extensive rural hinterland. Worcestershire is well served by road connections; the M5 passes through its centre and is joined by the M42 in the north and the M50 in the south (SWJCS, 2008). The county exhibits a higher than average reliance on the private car, with 64% of the population driving to work (ONS, 2009). The provision of public transport is perceived as a major challenge, particularly in the more rural south of the county. Worcestershire is, however, relatively well served by railways, with two stations in Worcester and stations in each of the principal towns.

Worcestershire's environment is highly valued (SWJCS, 2008). The county has a rich historic heritage, including over 15,000 archaeological sites, 235 Scheduled Ancient Monuments and 6,800 Listed Buildings (WCC, 2009) as well as Registered Parks and Gardens, including Spetchley Park and the 'Capability Brown' landscape at Croome Court, and Registered Battlefields at Powick Bridge and Evesham. There are 111 SSSIs in the county (WCC, 2009) and 460 Special Wildlife Sites (Bloomfield, 2010). Worcestershire's unimproved neutral grasslands are of particular importance as they constitute over one quarter of the UK resource. There are two Special Areas of Conservation in the county; Bredon Hill, an outlier of the Cotswolds Area of Outstanding Natural Beauty (AONB), and Lyppard Grange ponds in Worcester city. The Malvern Hills, forming the border with Herefordshire, are an AONB with a large SSSI area and are an

extremely popular recreation destination. This part of the county forms part of the Abberley and Malvern Hills Geopark, one of only three in England.

Worcestershire is shaped like a shallow basin, with the geology comprised of harder rocks in the north and west contrasting with softer rock in the central and southern areas. This basin is a part of the catchment of the River Severn and its tributaries the Avon, Stour and Teme. Approximately 10% of Worcestershire is in the floodplain, including 9,146 properties (WCC, 2009). Flooding affects every major town in the county and will significantly affect where development can take place. However, some of the county's aquifers are suffering from over abstraction (Ofwat, 2006-7; WCC, 2009). The county also has several canals, including the Worcester and Birmingham Canal and the Droitwich Canal.

Figure 31: The West Midlands Region

(Pictures of England, 2009)

9.1.2 The Land Use Planning Scenario

Worcester City Council, Malvern Hills District Council and Wychavon District Council are working together to produce a South Worcestershire Joint Core Strategy (SWJCS). The primary driver for this collaboration is the growth allocated to the City of Worcester. The emerging West Midlands Regional Spatial Strategy (WMRSS) defines Worcester as a Settlement of Significant Development and proposes that the city delivers 10,500 homes. Due to Worcester's tight administrative boundary the WMRSS Phase 2 Revision Examination in Public panel recommended that 7,300 of this total be located in the adjoining districts of Malvern Hills and Wychavon. The WMRSS Phase 2 Revision is still subject to the Secretary of State's proposed changes and associated public consultation period, so the final level of growth for the study area remains uncertain (although little change is anticipated). An additional uncertainty is the lifespan and weight of the WMRSS itself as the ongoing Phase 3 of the Revision is being tailored to meet the new requirement to combine the RSS with the RES to form an integrated Regional Plan (WMRA, 2009).

In addition to its status as a Settlement of Significant Development, the City of Worcester is a Growth Point (GP). In promoting itself as a GP, the LPA stated the following ambitions for Worcester:
Residential growth to the order of 3,800 homes by 2016 (with the exact target to be determined through the RSS revision process);
A joint library and history centre, delivered in partnership with the University of Worcester;
A Parkway station to further improve rail links with Birmingham New Street and the rest of the country;
A revolutionary public transport system that has already been nominated for national awards;
A redeveloped river front linking the separate elements of the City Centre.

(DCLG, 2006a)

In total the SWJCS area is to deliver 24,000 homes and 183 hectares of employment land by 2026 (SWJCS, 2008)[2]. The delivery of the GP ambitions depends upon the outcomes of testing and public consultation to make sure *"individual proposals are sustainable, acceptable environmentally and realistic in terms of infrastructure"* (DCLG, 2006a). To ensure this happens, central government set the Worcester GP several conditions, including the following on Green Infrastructure:

"Produce a comprehensive Green Infrastructure Strategy, working closely with Natural England, to ensure (i) rigorous assessment of likely impacts of growth on designated sites (especially the River Teme SSSI, Northwick Marsh SSSI, Grimley Brick Pits SSSI, and any Special Wildlife Sites likely to be affected), including potential impacts from additional transport infrastructure; and (ii) identification and implementation of robust protection measures. Ensure that the strategy fully informs LDDs" (DCLG, 2010a).

Ideally a robust GI evidence base would have been in place from the very start of the SWJCS production, i.e. prior to the Issues and Options consultation (November 2007). As it is, the evidence base is still in production with the SWJCS proceeding to its pre-submission consultation in October/November 2010 before submission to the Secretary of State in March 2011, EiP May/June 2011 and adoption November 2011 (SWJCS, 2009b). The GI Strategy must be complete no later than September 2010 if it is to inform the pre-submission consultation on the SWJCS. Without a completed GI Strategy in place the SWJCS risks being found to be unsound as a result of an insufficient evidence base. In this instance the Core Strategy could not be adopted.

9.2 Summary of South Worcestershire's Green Infrastructure process

This section provides an overview of South Worcestershire's GI planning process to-date. Events are relayed in chronological order. It should be noted that considerable progress has been made since the initiation of this study. The author's input into the process and subsequently the steering of the project has been influenced by this study during its production.

[2] Following the change in Government, these figures are under review. Housing targets are now at the discretion of the Local Planning Authority, although they still have to be evidence based. See DCLG advice on the revocation of regional strategies, 6 July2010: http://www.communities.gov.uk/documents/planningandbuilding/pdf/1631904.pdf

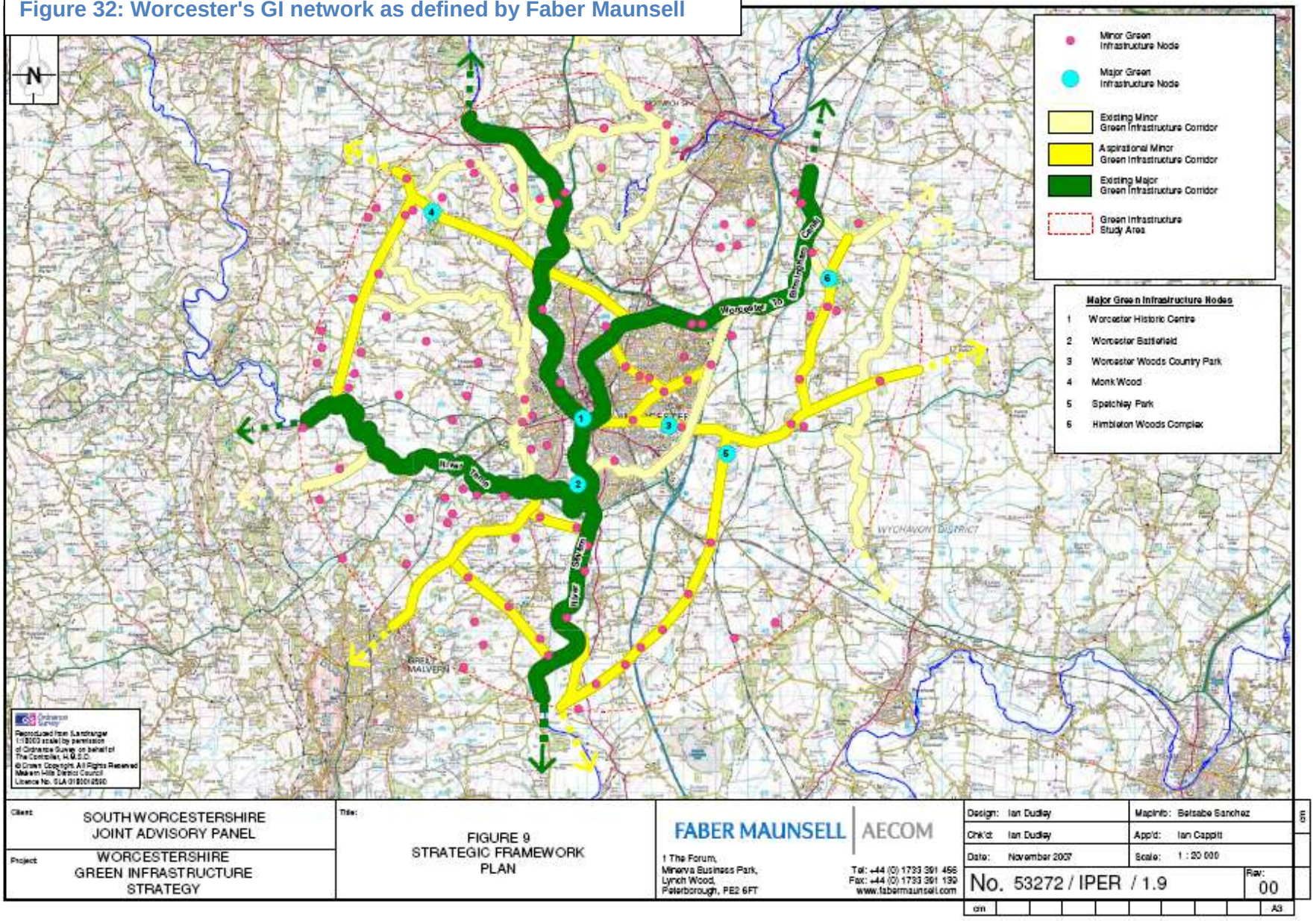
9.2.1 Faber Maunsell's Green Infrastructure Strategy, July 2007

In 2007 Worcestershire County Council (WCC) commissioned the consultancy firm Faber Maunsell to produce a Green Infrastructure Strategy, aimed primarily at meeting the Growth Point GI Condition. The Faber Maunsell Strategy (FM Strategy) comprised a strategic-level desktop analysis of existing data and the development of a long-term vision for GI in and around Worcester. The study covered Worcester city and the area up to 6km around it, reflecting the Growth Point location. The FM Strategy is provided in Appendix 7.

The FM Strategy defined existing major and minor GI nodes (hubs), existing major and minor GI corridors and aspirational minor GI corridors. These are shown in Figure 32. Existing major nodes are features considered to offer a high value across a range of functions. Existing major corridors are *"connecting features within the landscape that provide the means of the sustainable movement of wildlife and people and which hold a significant level of inherent value in themselves as habitats, destinations or linear landscapes"* (Faber Maunsell, 2007, p. 78). The principle watercourses are considered to offer the best connectivity and are therefore identified as existing major corridors. Existing minor corridors are local links that connect the landscape along existing routes, such as minor watercourses and long distance footpaths. The Strategy notes their potential for enhancement, funded by adjacent development. The Strategy identifies aspirational minor GI corridors as the priorities for investment. These are routes with an identified opportunity to connect isolated nodes, increasing functionality, such as by enabling greater species dispersal and opportunities for the public to enjoy contact with nature (Faber Maunsell, 2007).

When presented to stakeholders the FM Strategy received a certain amount of criticism, for several key reasons. Firstly and most fundamentally the FM Strategy only covers the Growth Point, meaning that it cannot be used to inform development across the wider South Worcestershire JCS area. Secondly, the Strategy was undertaken before Strategic Sites were proposed and therefore could not advise on the GI constraints and opportunities associated with the growth itself. Thirdly, the FM Strategy does not provide a clear delivery framework. Although existing strategies such as regional and Local Biodiversity Action Plans and the West Midlands Regional Forestry Framework are referred to in the policy overview provided, the FM Strategy does not translate their intentions and aspirations into actions for delivery on the ground. For the above reasons, the FM Strategy has come to be considered as a starting point in the GI process.

Figure 32: Worcester's GI network as defined by Faber Maunsell



9.2.2 The Interim Report, November 2009

Recognising the limitations of the FM Strategy, Natural England and Worcestershire County Council (WCC) offered to assist the South Worcestershire Authorities in the production of a fit-for-purpose evidence base. Following an initial meeting on 26 November 2008 it was agreed that work would be prioritised thus:

- A focus on the urban extensions, which would be allocated as Strategic Sites within the Core Strategy;
- Building up a strategic picture for the rest of the SWJCS area.

An initial agreement for joint working formalised the input of WCC and the author, both through Natural England's time and through this study. An initial work plan was also formulated, although it has undergone several iterations since and has not been rigidly adhered to. (See Appendix 8).

As a first step a GI Proforma was drawn up (Appendix 9), intended to answer questions as to:

- The evidence base currently available;
- The format of available evidence i.e. GIS, Maps, textual/descriptive;
- Previous research completed;
- Intended future research;
- The inclusion of GI concepts and linkages within current policy and strategy preparation and evaluation;
- Gauge the level of interest for future involvement in GI planning workshops.

This was sent to WCC Countryside Services and Transport teams, the Environment Agency, Worcestershire Wildlife Trust (WWT) and the Herefordshire and Worcestershire Earth Heritage Trust (EHT). From this proforma and the ensuing discussions it became clear that a range of information was already available and could be directly inserted into the GI Strategy. It was also clear that all the partners contacted were willing to be further involved in the process.

Addressing the urban extensions, after discussing the situation with the SWJCS team it was agreed that a list of GI assets and considerations would be produced for each of the housing allocation sites (see Figure 33). These lists were handed directly to site developers as a means of promoting early consideration of GI and its inclusion within site master planning. The lists provided information on individual components of GI, with each subject section written a by relevant local partner, as follows:

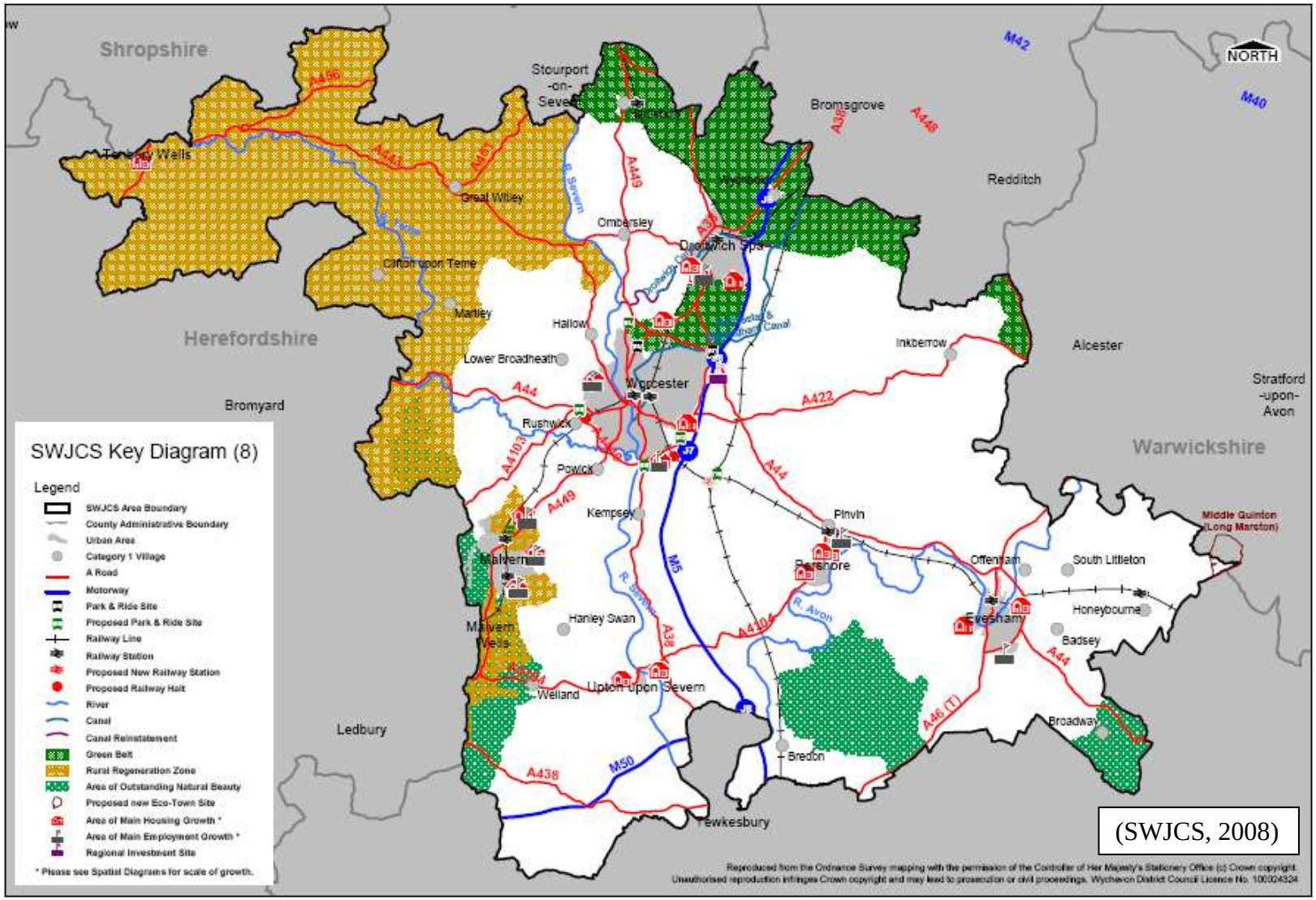
- Biodiversity –WCC;
- Landscape –WCC;
- Historic Environment –Worcestershire Archaeology Service;
- Access, recreation, leisure and tourism – study author, with proof reading by WCC Countryside Service.

Each section was based purely on desk-top surveys derived from the existing county data systems. There was no attempt to integrate the GI components or to identify GI needs or opportunities. The lists were entitled 'Working Lists' to convey the fact that they provided a starting point for more detailed consideration.

The data included in the Working Lists was then collated for the whole South Worcestershire area and used as the basis of an 'Interim Report' (Appendix 10). The Interim Report contains the Working Lists, followed by chapters on Landscape, Biodiversity, the Historic Environment, Access, Movement and Recreation, Geodiversity, the Water Environment and Health and Deprivation in South Worcestershire, each produced by the local partners/specialists who produced the Working Lists. Each chapter provides an overview of the subject as relevant to GI, for example the chapter on the Historic Environment presents Worcestershire's Historic Environment Assessment, with a brief explanation of the technique and maps of its outputs. The Report was edited by the study author. The Interim Report was intended to collate evidence but go no further, with a commitment to progress to a full GI Strategy post Core Strategy adoption.

It was considered that the FM Strategy, the Working Lists, the Interim Report and a specified commitment to produce a full GI Strategy post Core Strategy adoption would be sufficient to underpin the SWJCS Core Strategy as a whole and the GI Policy in particular, meeting the objective of making the Core Strategy sound. It was agreed that this was as far as it was possible to progress towards a full GI Strategy by the August 2009 deadline.

Figure 33: Sites Identified in South Worcestershire's Core Strategy Preferred Options Consultation (2008), indicated by 'house' symbols



9.2.3 Visit to Northamptonshire, 11 November 2009

On 11 November 2009 a group of the SWJCS LPAs officers and partners involved in the GI process undertook a learning trip to Northamptonshire. With the Interim Report having been completed and, as a result, partners and the LPAs being satisfied that the Core Strategy would be sound, there was a need to ensure the partners and LPAs were signed up to progressing the Strategy and moving on towards delivery. The delivery of GI was also seen by the LPAs and the stakeholders as a major challenge and somewhat outside of their comfort zone. In addition, the SWJCS team had recently appointed a permanent Project Manager whose buy-in was crucial to the future of the initiative. Having made contact with officers working for the River Nene Regional Park through this study, the author arranged a visit. The agenda for the day was devised balance presentations and discussion around the GI Strategy production and the Environmental Character and GI Suite with visits to practical projects selected to showcase the application of GI in a variety of situations (agenda and photographs available in Appendix 5). The day proved highly informative and inspirational, with the following key outcomes:

- The SWJCS officers and stakeholders agreed to define the GI network through a series of workshops, with less reliance on GIS – the RNRP officers had used this approach and advocated 'keeping it simple';
- The SWJCS officers and stakeholders agreed to produce a web-based GIS Suite following the example of Northamptonshire's Environmental Character and GI Suite;
- The SWJCS officers and stakeholders had a clearer understanding of what GI means in terms of delivery outputs. A senior SWJCS officer commented that he could really see that GI would result in more sustainable development and was excited by the prospect (Davies, 2009).

9.2.4 Progress towards a GI Strategy – ongoing

The Interim Report (see above) did not provide two vital steps in the production of a full GI Strategy; the definition of a GI network and the production of a delivery plan. It was agreed that the GI network would be defined in-house by SWJCS officers, primarily through the use of GIS. It was also agreed that the GI network and the detailed information which underpins it would be presented as an online GIS tool. This offered several advantages. Firstly, the more detailed information made available in the Interim Report would not be diluted by the need to present a GI network. Detailed subject-specific information would be accessible by filtering through the GIS layers. Secondly, by this stage there were already two GI reports and this work would constitute a third. This volume of information was unwieldy and impractical. A web-based GIS system would allow all the information to be collated and presented in a user-friendly way, similar to Northamptonshire's Environmental Character and GI Suite which is regarded as best practice and impressed the SWJCS officers on our visit 11 November 2009. The totality of GI documents and the web-based GIS would together form a 'GI Framework', to be presented as such on a website and directly referred to in the Core Strategy.

Recognising that the SWJCS authorities did not have the staff capacity or expertise to undertake the definition of the GI network or the production of a GIS tool, NE provided £15,000 from its regional GI budget towards the progression of these components of the GI Framework. However, WCC Planning and Environment Department suggested that they may be able to produce and host the GIS tool, which would significantly reduce costs. In this event it was agreed that any remaining sum would be put towards the

production of a delivery plan. As this is largely outside the experience of any of the partners, it was considered that it may be necessary to fund consultants to undertake some preliminary research towards this. This was agreed in a Memorandum of Agreement, available in Appendix 8.

9.2.5 Concept Statements – ongoing

It was agreed early on that the urban extensions should be the focus of GI efforts. Those sites coming forward as Strategic Sites within the Core Strategy would be the largest development sites in the county and therefore posed the greatest risks and opportunities for GI delivery. It was therefore decided that the Working Lists would be developed into Concept Statements (see Chapter 5). The Concept Statements would set out the stakeholders' wishes for the site, with the intention of promoting exemplary developments modelled on eco-towns standards, providing a benchmark for development in the rest of the county.

Concept Statements are currently in production for the West of Worcester Strategic Site, which is allocated 3,500 homes and 15ha employment land in the Preferred Options Core Strategy (SWJCS, 2008), and for the Newlands (Malvern) Strategic Site, which is allocated 1,100 homes and 10ha employment land. There are contrasting reasons for the selection of these two sites. Worcester West has advanced swiftly as a frontrunner from the house construction industry's standpoint since Preferred Options. The developer has undertaken considerable research already and has submitted an outline planning application in advance of the Core Strategy adoption. Given this pressure Worcestershire's GI stakeholders led by WCC felt it would be prudent to provide some additional steer. In contrast, the consultants working on the Newlands site proactively contacted the LPA and the partners involved in the Interim Report production, asking for advice as to how best to proceed. With a willing developer, this site perhaps offers an opportunity to showcase GI.

A draft Concept Statement has been produced for Worcester West, available in Appendix 10. This was produced by WCC with partner consultation at a workshop 13 January 2010. A further workshop is planned 23 March 2010. Partners were present from NE (the author), EA, WWT, Worcestershire Archaeology Service, Worcestershire Planning and Environment Service, Worcestershire Countryside Service, the SWJCS team and Malvern Hills District Council. The impact of GI on the economic viability of the site was raised as a key concern by the LPA officer responsible for the submitted planning application. In response, NE has undertaken work to determine what proportion of the site would be given over to GI. The preliminary findings of this are presented in Appendix 10.

9.2.6 The Core Strategy Green Infrastructure Policy - ongoing

Since the Preferred Options consultation (September 2008) the partners involved in the production of the Interim Report have been proactively involved in devising a GI policy for the Core Strategy. The policy iterations are available in Appendix 11. There is now a general consensus that the policy is appropriate (Figure 34). However, weaknesses identified through this study will be reported to the SWJCS production team to be addressed.

Figure 34: Draft South Worcestershire Joint Core Strategy Green Infrastructure Policy

Green Infrastructure

Green Infrastructure is a strategically planned and managed network of green spaces and related environmental features that intersperse and connect cities, towns and villages. It is the open spaces, waterways, gardens, woodlands, green corridors, wildlife habitats, street trees, natural heritage and open countryside. Green infrastructure can provide an integrated infrastructure and provide multiple benefits for the economy, environment and people.

Provision of green infrastructure is essential to delivering a high quality of life for existing and new communities and may also be seen as part of the life support system of an area. It can provide functions and environmental services to a community such as employment, recreation, physical health and mental well being, social interaction, contact with nature, drainage and flood management, climate change adaption and pollution control. Furthermore, it can create local distinctiveness, a high quality built environment and improve the quality and utility of the built environment and public realm assets.

It is now widely recognised that green infrastructure has a major role to play in providing for flood mitigation and adaptation measures, and enhancing and providing for biodiversity. This is seen as particularly important in the South Worcestershire area in the light of recent severe flooding experiences.

South Worcestershire incorporates a range of distinctive landscape characteristics that include biodiversity, geodiversity, open spaces, special landscapes and historic environment. These characteristics are crucial in delivering a quality of life and underpin the unique character for South Worcestershire.

The Regional Spatial Strategy defines ‘distinctive’ features of environmental importance in South Worcestershire as the Severn and Avon Vales, Malvern Hills and Teme Valley. Other examples include the Cotswolds and Malvern Hills Areas of Outstanding Natural Beauty and the Malvern Hills Geopark.

Features of architectural, archaeological and cultural interest abound in South Worcestershire and contribute significantly to the distinctive character of the locality. There is a rich diversity in the historic environment, which reflects human interaction with the landscape from the earliest prehistoric settlements to the present. Also, the valued identity of the urban areas, villages, hamlets and farmsteads has developed as these settlements have grown and evolved. Buildings of successive periods form part of a familiar and cherished local environment.

The physical and visual impact of new development upon the existing natural and historic environment needs to minimised. Development should be planned to be holistic and sustainable from the outset, integrated into the existing landscape and ensure valuable features are retained and enhanced.

The green infrastructure requirements of new development will be informed by the South Worcestershire Green Infrastructure Framework which provides an analysis and interpretation of the landscape, biodiversity and historic environment assets of the area. In addition reference will be made to local evidence documents including the following:

- Worcestershire County Landscape Character Assessment
- South Worcestershire Historic Environment Assessment
- Worcestershire Historic Landscape Characterisation
- County Historic Farmsteads Study
- Worcestershire Habitat Inventory
- Worcestershire Biodiversity Action Plan
- Conservation Areas, and any accompanying appraisals
- Historic Environments Record
- AONB Management Plans
- Supplementary Planning Documents

Policies and standards for the provision of open space with a sport, recreation or amenity value, and the protection and enhancement of existing areas, will be set out in the Site Allocations and Policies Development Plan Document.

Policy CS22 Green Infrastructure

New development proposals will be required to address the safeguarding and improving of existing green infrastructure, and enhancement by further provision, in line with the aims of the Green Infrastructure Framework. New provision will be required to deliver multifunctional benefits which promote recreation and tourism, public access, green education, biodiversity, geodiversity, protection and enhancement of the local landscape and historic assets and contribute to climate change objectives.

New provision should be well connected with existing green infrastructure, be appropriate to site size and reduce the fragmentation of habitats and cohesive historic landscapes. Where appropriate, priority will be given to delivery on aspects where benefits can be best achieved, such as contributions to the achievement of Worcestershire BAP targets, AONB Management Plans or the Rights of Way Improvement Plan, or to adopted local strategies for the historic environment or biodiversity. Development contributions will be used to retain and/or enhance off-site Green Infrastructure assets and connections.

(Smith, 2010)

9.3 Summary of the Worcestershire-wide GI work to date

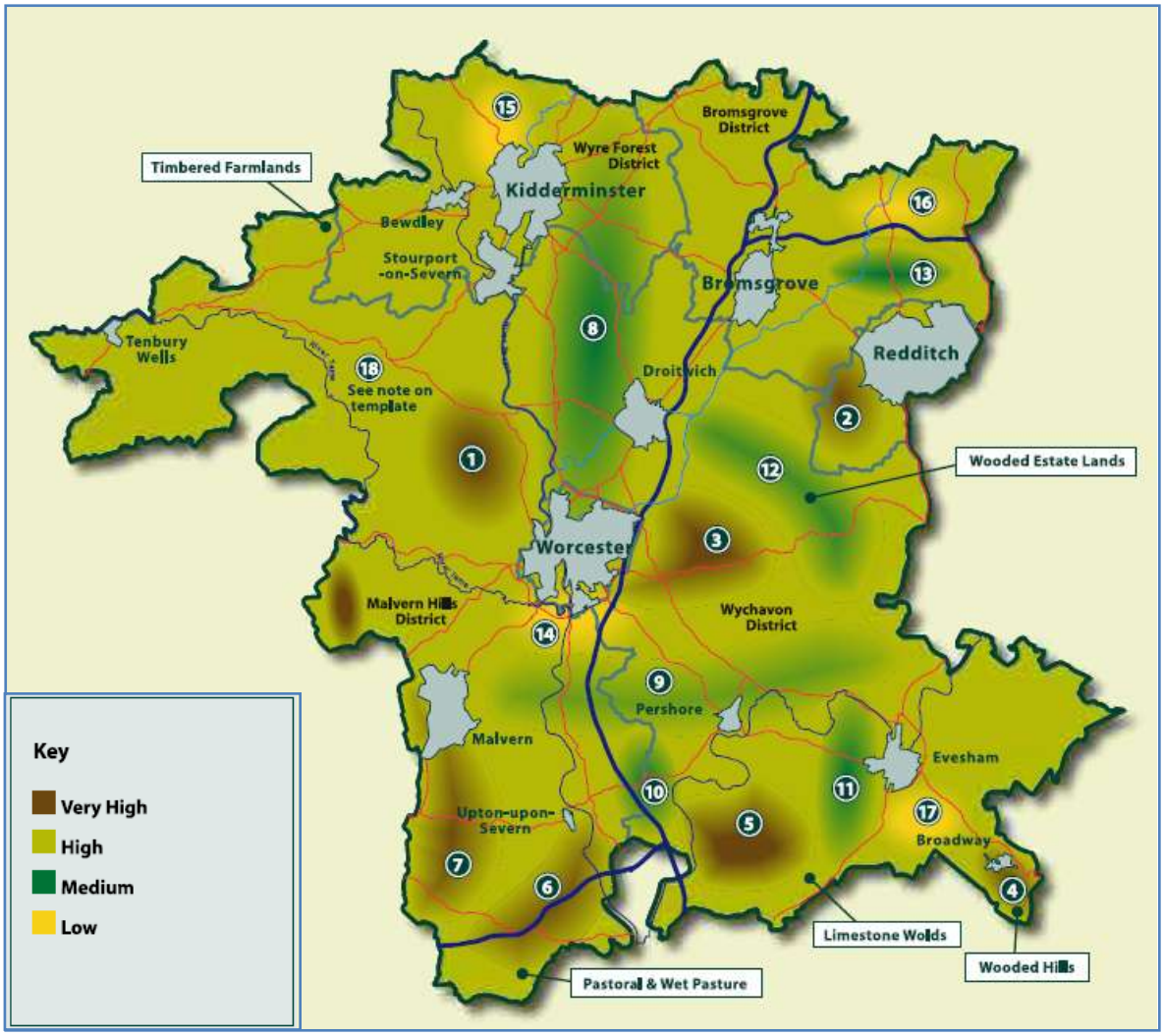
9.3.1 Sub-Regional Green Infrastructure

Running concurrently with the SWJCS GI work, WCC have been undertaking sub-regional i.e. county-wide GI planning. There is a firm view within WCC that GI should be considered at a strategic level, with local GI fitting into a strategic network. WCC completed the first stage in this process, the definition of Worcestershire's Environmental Character Areas (ECA), in February 2010. The ECA were defined from the integration of the county's Landscape Character Assessment, Historic Environment Assessment and the detailed biodiversity assessments which formed part of the Interim Report. These elements are considered by partners involved in the process to be the fundamental building blocks of GI. Although this work was undertaken largely in-house by WCC, partners were involved in the decision-making through a workshop held on 15 December 2009. The ECA are presented by Figure 35. The numbers indicate ECA, which have yet to be named. GI priorities or objectives for each ECA will be defined. WCC recognise the need to ensure stakeholders are involved in these decisions and to this end circulated a questionnaire asking for preliminary thoughts on names and priorities, available in Appendix 12. Following on from this WCC intend to define sub-regional GI networks. The exact process for achieving this is still emerging, but will be directed by the Worcestershire GI Steering Group, discussed below.

9.3.2 A Sub-Regional GI Steering Group

Recognising the need for co-ordination between the sub-regional GI planning and the local GI planning being undertaken by SWJCS and the other Districts, a GI Steering Group was suggested. The group's inaugural meeting took place 12 March 2010, hosted by Natural England and chaired by WCC. This initial meeting was targeted towards high-level LPA officers and partners, briefing them regarding work so far and gaining their commitment for future work. It is anticipated that officers responsible for day-to-day GI work will attend future meetings. The agenda and presentations from this meeting are available in Appendix 13. Appendices 14 and 15 provide information on the intensions for the development of this Steering Group.

Figure 35: Worcestershire's Environmental Character Areas, defined as having very high, high, medium or low existing GI value



9.4 Assessment of South Worcestershire's GI approach

Table 15: Assessment of South Worcestershire's GI approach to date against the GI Checklist (Table 14)

Strategy Production	
1) Is there an effective steering group?	**?**
Progress so far has been hindered by a lack of strong leadership and project steering capacity. Although NE and WCC have made efforts to fulfil this need through efforts to involve stakeholders in their work, there has been no formalised route map for GI. Communication and coordination continue to be issues. The newly created GI Steering Group intends to resolve these issues.	
1a) Is work being clearly led or coordinated?	?
A lack of leadership early on in the process led to a 'false start', with the Faber Maunsell Strategy not really meeting the expectations of stakeholders. The production of the Interim Report led to an informal 'working group' with Natural England initially providing a level of leadership. Staff changes at WCC during the production of the Interim Report led to a welcome increase in their capacity to input into the project and meant that further progress could be made than first anticipated. However, as a result the production of the Interim Report was delayed and pressures on other partners to deliver correspondingly more detailed work on their subjects were increased. The subsequent work by WCC, whilst very welcome, has led to some confusion amongst the SWJCS team as to the relationship between the various tiers and pieces of work. Communication, as well as co-ordination, has at times been less than ideal, but the new GI Steering Group should help to resolve these matters.	
1b) Are experts from environmental, social and economic disciplines involved in the process?	No
Environmentally focused groups have so far dominated the process, albeit from a wide range of perspectives, such as NE, EH.	
1c) Have partners with a delivery remit been involved early on in the process?	?
NE and FC have been involved throughout, although there is a recognised need for NE's land management officers (responsible for the dissemination of environmental stewardship/agri-environment funds) to be further involved in the process. This should be achieved through the Steering Group. Developers have not been directly involved but have been informed of GI issues for their consideration through the Working Lists. Two Concept Statements are being produced, but only one of the developers is positively involved in this process.	
1d) Is there high level buy-in to GI?	?
The Regional Spatial Strategy includes a policy on GI, which promotes GI Strategies as part of the LDF evidence base. Senior officers in the South Worcestershire team and the three LPA are fully engaged in the process. Support from elected Members is unknown.	
1e) Is there an agreed overall vision for GI?	No
There is a broad understanding but no specific vision yet.	
2) Is the information base sufficient?	**Yes**
Yes – the South Worcestershire GI evidence base is very thorough.	

2a) Has an information gathering exercise been undertaken as a starting point?	Yes
Yes. This exercise was undertaken as a part of the Interim Report.	
2b) Does the information base include Landscape Character Assessment or equivalent?	Yes
Yes. LCA had already been undertaken by WCC. WCC landscape officers compiled the Interim Report section on Landscape.	
2c) Does the information base include Historic Landscape Characterisation and/or Historic Environment Assessment?	Yes
Yes – HEC. The HEA for the County was already underway, being undertaken by Worcestershire Archaeology Service. Following dialogue initiated by the author on behalf of NE the Archaeology Service made significant efforts to finish the HEA for South Worcestershire in advance of that for the whole county, allowing its inclusion in the Interim Report. The Archaeology Service wrote the Interim Report section on the Historic Environment and English Heritage were consulted on the completed Report.	
2d) Does the information base include ecological evidence, beyond designated sites?	Yes
Yes. WCC already had GIS based detailed information on biodiversity, including a Habitat Inventory of the whole county. Biodiversity Opportunity Mapping was already underway to meet other requirements. This information was further analysed as a part of the Interim Report, the Biodiversity chapter of which was written by WCC's biodiversity team.	
2e) Does the information base include an assessment of access and recreation needs and opportunities?	Yes
Yes. The three South Worcestershire Districts had already produced PPG17 audits which were reviewed as a part of the Interim Report. NE produced maps of key features and NE's Integrated Access Mapping was included. The Chapter on Access, Movement and Recreation was produced by the author on behalf of Natural England, in conjunction with NE specialists, WCC Countryside Services officers and following limited consultation with WCC's Transport Department.	
2f) Does the information base include information on hydrology?	Yes
Yes. Information from the SFRA was included within the Interim Report's Chapter on the Water Environment. This Chapter was written by myself in my role at Natural England, with consultation with NE's Senior Specialist responsible for water within the Planning and Partnership's Team.	
2g) Has this information been integrated to provide an understanding of environmental character areas?	Yes
Yes. WCC's Sub-Regional GI Framework defines environmental character areas based upon a merge of their data on biodiversity, landscape and the historic environment with key access routes overlain.	
3) Is the GI network defined and are GI benefits clearly prioritised?	**?**
South Worcestershire's GI has not completed this stage yet. However, the findings of this Study will be used to inform progress towards this.	
3a) Are hubs, sites and links (or equivalent) defined?	?
Not yet. It was intended to achieve this through a workshop, proposed following the RNRP visit. However, this was delayed until WCC's work to define a sub-regional framework was completed as this provides a strategic framework within which South Worcestershire's (and the other Worcestershire District's) GI networks must fit. The intention is to produce a GIS database to present and allow interrogation of the sub-regional framework, local network and the detailed information made available in the Interim Report.	

3b) Are there hubs, sites and links focused on ecological needs?	?
Not as of yet, although there is a very strong baseline to ensure this happens.	
3c) Are there hubs, sites and links focused on human needs?	?
Not as of yet, although the need for a country park to support the Worcester West development was flagged up at the Concept Statement workshop.	
3d) Have the relationships between ecological and human focused hubs, sites and links been considered?	?
Not yet.	
3e) Have potential GI benefits within each discrete GI sub-section been prioritised?	?
Not yet. This will follow on from the defining of the local network.	
3f) Is the GI network clearly presented?	?
Not yet. The proposed GIS tool would be publicly available on-line and would meet this need.	
4) Does the network deliver key benefits?	**?**
Mixed. Further progress towards this is needed.	
4a) Do the hubs, sites and links thread through urban and rural areas?	?
Not yet, although Worcester City's Green Network will slot neatly into this and will arguably deliver much of the city's GI.	
4b) Are watercourses recognised as a prime GI opportunity (where relevant?)	Yes
The Faber Maunsell Strategy recognised the rivers as 'major existing GI corridors' but does not go into enough detail to consider smaller watercourses.	
4c) Will the network provide opportunities for every-day contact with biodiversity?	?
Unknown as of yet. The local level GI connections which would deliver this have yet to be defined.	
4d) Have opportunities to relate GI to economic considerations been identified and taken?	No
The economic opportunities relating to GI have been given little specific consideration as of yet although there are ample opportunities, particularly around tourism.	
Recognition of GI within the Local Strategic Partnership	
5) Is GI recognised by the Local Strategic Partnership?	**No**
Not fully. The Worcestershire Partnership Environment Group (a sub-group of the Local Strategic Partnership) should champion the approach and its relevance to all parts of the LSP's agenda, including dialogue with the LSP Board and workshops with other theme groups. This entails the scoping and seeking agreement to partnership theme group actions to further the design and delivery of the local GI framework. Both County and District LSPs need to be involved.	
5a) Is GI included in the Local Area Agreement?	No
No. If the LAA is rolled forward another three years from 2011, the shaping of the next version needs to commence in the second half of 2010.	
5b) Is GI included in the Sustainable Community Strategy?	No
No. Worcestershire's Sustainable Community Strategy was refreshed in 2008 and runs	

until 2013.	
6) Are there measures in place to deliver GI through LSP work areas?	
No.	
6a) Is the retrofitting of GI being promoted?	No
No.	
6b) Are promotions around healthy living linked into GI?	No
No.	
6c) Is there an adequate supply of allotments?	No
Not considered.	
6d) Is the carbon storage value of GI recognised?	No
No.	
6e) Has the value of GI towards climate change adaptation been recognised?	No
No.	
Recognition of GI within the Core Strategy	
7) Is GI adequately covered in the Core Strategy policies?	**Yes**
Yes. The Core Strategy contains a policy on GI which has evolved significantly through the production of the Interim Report, input from partners and the visit to RNRP and resulting decisions.	
7a) Is there a GI policy within the CS?	Yes
Yes. The partners who produced the Interim Report were also directly involved in the Core Strategy policy production, commenting on several draft versions.	
7b) Is GI cross-referenced in other relevant policies?	Yes
Yes. There is a reference to future DPD's in relation to open space standards. In addition, the policy includes references to other relevant strategies.	
7c) Is it clear what information on GI planning applications are required to include?	Yes
Yes. New developments are required to be informed by the South Worcestershire Green Infrastructure Framework. It is intended that this will be predominantly a web based GIS with links through to detailed documents, comparable with the RNRP website.	
7d) Does the policy either include sufficient detail or refer users to an additional document which holds the detail?	Yes
The Policy refers to South Worcestershire Green Infrastructure Framework and lists additional documents to be considered.	
8) Does the GI policy, supporting text or the referenced additional information include sufficient detail?	**Yes**
For the most part. There are identified weaknesses around the inclusion of delivery, which is not surprising given that the delivery plan is yet to be produced. Care must be taken to ensure this matter is adequately addressed in the GI Framework referenced in the policy. This 'policy hook' was deliberately included. The Core Strategy Policy is still in production, and other weaknesses identified here will be reported to the SWJCS team.	
8a) Is GI adequately defined?	Yes
Yes. The definition used reflects the RSS.	
8b) Is GI promoted as a means of delivering sustainable development?	Yes
This is not expressly stated but is strongly implied in the opening paragraph's line: *"Green infrastructure can provide an integrated infrastructure and provide multiple benefits for the*	

economy, environment and people".	
8c) Is GI promoted as a means of meeting environmental legislation?	No
No.	
8d) Are the social and economic benefits of GI clear?	Yes
Yes, although they could be more clearly presented.	
8e) Have standards for on-site GI delivery been set?	No
After much debate the SWJCS officers decided not to specify standards in the Core Strategy. However, the policy specifies that open space, sport and recreation standards are to be set in the Site Allocations and Policies DPD (consultation on which is scheduled for summer 2010). The emerging Concept Statements will set out the partners' aspirations.	
8f) Are any requirements for off-site delivery set out?	Yes
Yes. The policy states *"Development contributions will be used to retain and/or enhance off-site Green Infrastructure assets and connections".* Further detail should be included in the Delivery Plan, which is yet to be produced.	
8g) Are identified priorities given appropriate delivery leverage?	No
No. Priorities are yet to be defined. The policy does however refer to other strategies which will include actions, such as the Biodiversity Action Plan. The supporting text also provides clues as to what some of the priorities might be, e.g. flooding.	
8h) Is the relationship between GI and sustainable transport promoted?	No
Transport is only covered through implication in the term public access. This is a weakness which could easily be addressed.	
8i) Is urban greenspace with GI value protected?	Yes
Through implication in the sentence: *"New development proposals will be required to address the safeguarding and improving of existing green infrastructure"*.	
8j) Is the retrofitting of GI promoted?	No
No. This is a weakness which could be addressed.	
9) Is GI included in other relevant LDF documents?	**?**
N/A – the Core Strategy is the first document to be produced.	
9a) Is GI included in guidance on Planning Obligations and/or the Community Infrastructure Levy?	Yes
Referred to in the Core Strategy GI Policy.	
9b) Is GI included in other relevant LDF documents such as Area Action Plans and relevant Supplementary Planning Guidance/Documents?	?
N/A – these documents have not yet been produced. This is something to ensure in the future.	
10)Will GI delivery be adequately monitored?	**?**
As of yet no information on monitoring has been forthcoming. This is a large omission which needs to be dealt with.	
10a) Will the delivery of GI be monitored?	?
Unsure.	
10b) Is it clear what action will be taken if GI delivery falls short of the desired level?	?
Unsure.	
Delivery and Management	
11)Does the GI Strategy contain an adequate delivery plan?	**?**
The final GI Strategy does not exist, and there is not yet a delivery plan. However, the	

Core Strategy Policy and the Concept Statements progress delivery in the right direction. The delivery plan should draw upon these as a starting point.	
11a) Are there clear requirements to deliver GI on development sites?	?
Yes, set out in the Core Strategy policy.	
11b) Have on-site delivery mechanisms been specified?	?
The Core Strategy Policy refers to developer contributions.	
11c) Has it been made clear that GI delivery goes beyond development sites?	?
Yes, in the Core Strategy Policy.	
11d) Have off-site delivery mechanisms been outlined?	?
The Core Strategy Policy refers to developer contributions. The Policy also states *"priority will be given to delivery on aspects where benefits can be best achieved, such as contributions to the achievement of Worcestershire BAP targets, AONB Management Plans or the Rights of Way Improvement Plan, or to adopted local strategies for the historic environment or biodiversity"*.	
11e) Are off-site delivery partners aware of the GI Strategy?	?
NE, FC, the EA, Worcestershire Wildlife Trust and WCC's delivery related departments are aware. Private landowners are not aware.	
11f) Is the GI Strategy included in other Strategies/Plans which may be able to contribute to its delivery?	?
Not directly as of yet, although the organisations/partnerships responsible for the BAP, AONB Management Plans, RoWIP and Countryside Access and Recreation Strategy/Access and Informal Recreation Strategy are aware of the GI work. The Access and Informal Recreation Strategy is currently being produced (replacing the Countryside Access and Recreation Strategy), providing an opportunity to incorporate GI.	
11g) Have GI demonstration/flagship projects been identified?	?
Not yet.	
11h) Has the delivery of key schemes and/or flagship schemes been prioritised?	?
Not yet.	
11i) Is there a plan for how the delivery of key or flagship schemes will be achieved?	?
Not yet. NE are considering ways in which agri-environment schemes could be targeted towards this purpose.	
12) Are there clear provisions for the management of GI?	**?**
No. This clearly needs to be addressed in the delivery plan.	
12a) Is it clear how GI will be managed and who by?	?
No	
12b) Is it clear how GI management will be funded?	?
No	

9.5 Recommendations for South Worcestershire

Although GI planning in South Worcestershire is already well underway, the application of the Checklist for Successful GI has given rise to several key considerations which will steer the ongoing process.

Progress in South Worcestershire has been hindered by a lack of effective leadership and a project management discipline. Taking the project forward has relied upon individuals'/partners' willingness to undertake elements of work, but as a consequence, coordination and awareness of other pieces of work has sometimes suffered. The Worcestershire GI Steering Group offers a significant opportunity to resolve these issues. The Steering Group should aim to provide clarity as to the fit between different existing and proposed pieces of work and should progress towards a delivery focus. Future efforts should be made to involve a wider range of partners, at the right time, such as academics and the Primary Care Trust. The Worcestershire Local Strategic Partnership and its District level equivalents provide a structure which could be used to promote GI to new partners. The Steering Group should promote its relevance to the Sustainable Community Strategy and Local Area Agreement, and build alliances and seek resources to its ends. Consideration should be given to the agreement of a GI Vision, which could be a useful tool promotional tool. The approach should draw upon learning from the Northwest and Northamptonshire, where partnerships or working groups with different specific focuses have evolved from the initial partnership direction-setting.

There is currently a small but significant gap in South Worcestershire's GI evidence base. The county has been characterised, with a view to defining county-wide GI networks, and the site specific GI has been identified, but work is needed to define the GI between these levels, South Worcestershire's local GI network. It is this local GI which is the most valued by residents and which delivers the GI benefits necessary to making development sustainable. It would be logical to focus on defining the local GI network around and within main settlements, as the Environmental Character Areas and priorities drawn up as a part of the Sub-Regional Framework provide enough detail to inform GI in the wider countryside, where the delivery mechanisms will be different. The Working Lists and Concept Statements provide a useful starting point in this process and the Interim Report has gathered all the required information. Therefore this task would not have to be overly onerous and could possibly be achieved by a task and finish group or workshop. The Worcestershire GI Steering Group should give this direction.

In the absence of a delivery plan, the SWJCS Core Strategy GI Policy misses an opportunity to give clear direction to delivery. Even without the delivery plan, there are opportunities to strengthen the policy by tying GI into other strategies/programmes and putting broad monitoring requirements in place. In the absence of better alternatives, regard could be had to NE's emerging internal GI monitoring standard, 'hectares of GI delivered'. The GI Policy includes a hook to a SWJCS GI Framework, which the delivery plan must form a part of. The policy could be further strengthened by referring to relevant ecological legislation in the supporting text, making the link to sustainable transport more explicit and promoting the retrofitting of GI where opportunities arise.

There is an obvious need to produce a SWJCS GI delivery plan, to form a part of the overall SWJCS GI Framework. At present, there is no clear arrangement for how the GI delivery plan will be achieved. Natural England has provided some funding towards this, but with capacity issues at NE, WCC and the SWJCS LPA's it is not clear who will take this forward. The Worcestershire GI Steering Group will now give the necessary impetus.

Chapter 10: Conclusions

Green infrastructure planning seeks to develop spatial frameworks and targeted interventions to support the delivery of sustainable development. This concept is not new; early examples include the Park Systems and Garden Cities developed at the end of the 19th Century and the pre-1960's New Towns. Neither is the concept difficult to grasp. There is no need for the GI Strategy production process to be complicated and there is likely to be a considerable amount of existing information which can be turned to this purpose. In addition, there are best practice examples across the UK whose work demonstrates what can be delivered and how to achieve it. However, the practice across England does not fully reflect this theory as only 67% of the Local Planning Authorities in Growth Areas/Points have or are producing GI Strategies (see Appendix 1). The application of GI across the whole of the UK is likely to fall below this level. This poor uptake is despite an indirect but apparent backdrop of environmental legislation, the explicit requirement for Core Strategy's to be underpinned by a GI set out in Planning Policy Statement 12, the supporting guidance set out in other national planning policies and multitude of guidance documents on the subject (Town and Country Planning Association 2008, Landscape Institute, 2009, Natural England, 2009a).

This study has provided a structured consideration of GI from its evolution through to its application with the intention of informing the progression of GI in South Worcestershire. This entailed a consideration of the origins of GI, the legislative and planning case for GI, the incentive and need provided by the Government's growth agenda and a consideration of best practice in the Northwest of England and Northamptonshire. In undertaking this exercise it became necessary to summarise the learning to take forward from each section. This learning led to the construction of a 'Checklist for Successful GI'. Whilst developed primarily to inform South Worcestershire's GI process, the Checklist provides a roadmap which could be applied to any LPA in England.

The application of GI in South Worcestershire has, thus far, been far from ideal. Barriers and difficulties experienced include the pressures of the LDF production timetable, limited understanding of the outputs GI will deliver on the ground and the benefits which this could achieve, questions around the ability of the planning system to deliver GI and a lack of awareness of and integration with other potential delivery mechanisms. The LPAs were constrained by the lack of staff resource, expertise and funding, common issues within LPAs who are increasingly pressurised to deliver more for less. The difficulties encountered in South Worcestershire's GI process are likely to be more or less typical of those experienced elsewhere in the country. South Worcestershire therefore represents those LPAs which are struggling to achieve GI.

Undertaking this study has raised a number of overarching concerns relevant to the mainstreaming of GI. Firstly, it is clear that the delivery and management of GI poses some difficulties. Whilst LPA officers may be relatively comfortable with obtaining up-front capital for the delivery of projects, the long-term maintenance of GI assets is a different beast and one which is largely outside of the comfort zone, and, arguably, the responsibility of planning departments. The long-term success of GI therefore requires truly cross-departmental, cross-sector, multidisciplinary working, meaning that GI planning rapidly transcends the simple requirement for a Core Strategy evidence base report it first appears to be. Solving this issue requires a degree of innovative thinking but can be achieved, as illustrated in Northamptonshire. An alternative to the current reliance on a piecemeal approach to the delivery and management of GI has yet to be worked up nationally, but ultimately a system where GI is seen as a working landscape which pays for itself would be the most sustainable option and would provide for the long-term security of the network beyond the next funding round. This area would be worthy of future research.

Throughout this Study the question of leadership continually arises. Successful GI is to no small extent about enabling communication between stakeholders, partners and policy sectors, but national and local leadership is critical to taking GI forward. The current leadership deficiencies equate to a lack of committed ownership. Locally, the development of a shadowing or 'buddy' system whereby GI forerunners are partnered with struggling LPA's could significantly advance the application of the GI approach, as shown by the positive benefits achieved from the South Worcestershire LPA's and partners' visit to Northamptonshire. Nationally, the establishment of a reputational organisation is critical to embedding the process. Given that GI is relevant to a wide set of Natural England's interests and their existing involvement across England it seems logical that the role of GI 'champion' be formally giving to them, although other national stakeholders such as the Environment Agency, Forestry Commission and English Heritage should be formally involved. With leadership comes responsibility. Guidance on the benefits of GI has helped the subject make big strides with very modest resources, but there is a need for more decisive and sustained action, drawing on a wider pool of resources, if GI is to be rolled out successfully at the rate and scale required by growth scenarios. The proposed new Planning Policy Statement *Planning for a natural and healthy environment*, the draft of which is currently out for consultation, provides an opportunity to clarify this requirement and bring it to the fore, giving GI much more of a fighting chance.

Bibliography

4NW (2008). *North West Regional Spatial Strategy.* Available from: http://www.nwrpb.org.uk/documents/?page_id=4&category_id=275. [Accessed 19 September 2009].

Anon (2009a). Park City Conference, London, *Landscape,* March 2009, p. 11.

Anon (2009b). Planners urged to use 'green infrastructure' for better health and wellbeing, *The British Journal of Healthcare Computing & Information Management*, 3 February 2009. [Online]. Available from: http://www.bjhcim.co.uk/news/2009/n902002.htm. [Accessed 17 January 2010].

Abell, L. (2008). Walking back to health. *Green Places,* September 2008, p. 14.

Barker, G. (1997). A framework for the future: Green networks with multiple uses in and around towns and cities. *English Nature Research Report Number 256.* [Online]. Available from: *Natural England.* http://naturalengland.etraderstores.com/NaturalEnglandShop/product.aspx?ProductID=af6f98e0-7588-4ffe-9417-7de4e542bcf2. [Accessed 22 February 2009].

Barton, M., and Jones, N., (2009). *A Guide to Planning Green Infrastructure at the Sub-Regional level (Draft).* [Online]. Available from: http://www.greeninfrastructurenw.co.uk/resources/Sub_Regional_GI_planning_guide_v3.pdf. [Accessed 20 January 2010].

Benedict, M. A., and McMahon, E. T. (2006). *Green infrastructure: linking landscapes and communities.* 1st Ed. Washington: Island Press.

Bennett, A. F. (1998). *Linkages in the Landscape: The Role of Corridors and Connectivity in Wildlife Conservation.* 1st Ed. Gland, Switzerland and Cambridge, UK: IUCN.

Bloomfield, S. (2010). *RE: Possible impacts of climate change on biodiversity in Worcestershire.* Personal E-mail to Hayley Pankhurst 17 March 2010.

Booth, D. (2010). Feedback from MSc Dissertation 2nd marker. July 2010.

Boothby, J. (2004). Lines, boundaries and ontologies in planning: addressing wildlife and landscape. *Planning Practice and Research*, Volume 19, Number 1, p. 67-80.

Brown, N., Clarke, V., and Havis, R. (2006). *Rochford District Historic Characterisation Project*. [Online]. Available from: http://www.rochford.gov.uk/PDF/planning_historic_environment_project.pdf. [Accessed 24 February 2010].

Campaign to Protect Rural England (2009). *The Planning System.* [Online]. Available from: http://www.planninghelp.org.uk/planning-system. [Accessed 13 September 2009].

Chartered Institute of Water and Environmental Management (2007). *RSPB/CIWEM Living Wetlands Award 2007.* [Online]. Available from: http://www.ciwem.org/awards/living_wetlands/lwa_winner_2007.asp. [Accessed 13th December 2009].

Climate Change Northwest (2010). *Rising to the Challenge: A Climate Change Action Plan for England's Northwest (2010-2010).* [Online]. Available from: http://www.climatechangenorthwest.co.uk/assets/_files/documents/feb_10/cli__1265921054_NW_Climate_Change_Action_Plan_.pdf. [Accessed 7 March 2010].

Coombs, A. and Hesketh, F. (2007). The Green Infrastructure Imperative. *Landscape.* November 2007, p. 16-19.

Commission for Architecture and the Built Environment (2010). *Grey to Green Campaign.* [Online]. Available from: http://www.cabe.org.uk/grey-to-green. [Accessed 10 February 2010].

Commission for Architecture and the Built Environment (2009). *Future Health: sustainable places for health and wellbeing.* [Online]. Available from: http://www.cabe.org.uk/publications/future-health [Accessed 27 December 2009].

Countryside Agency (2003). *Concept Statements and Local Delivery Documents: Practical guidance for Local Planning Authorities.* [Online]. Available from: http://www.ruralcommunities.gov.uk/files/CA%20149%20concept%20statements.pdf. [Accessed 6 March 2010].

Davies, F (2009). *RE: SWJCS LPAs officers and partners visit to the River Nene Regional Park.* Personal E-mail to Hayley Pankhurst 15 November 2010.

Denton-Thompson, M. (2009). An Emerging Imperative, *Landscape,* March 2009, p. 8-11.

Department for Communities and Local Government (2010a). *Worcester Growth Point conditions reporting*. [Online]. Available from: https://growthpoints.communities.gov.uk/growthpoint/worcester/. [Accessed 10 January 2010].

Department for Communities and Local Government (2010b). Consultation paper on a new Planning Policy Statement: Planning for a Natural and Healthy Environment. [Online]. Available from: http://www.communities.gov.uk/publications/planningandbuilding/naturalenvironmentconsultation. [Accessed 10 March 2010].

Department for Communities and Local Government (2010c). *The Community Infrastructure Levy web pages.* [Online]. Available from: http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyimplementation/reformplanningsystem/planningbill/communityinfrastructurelevy/. [Accessed 21 March 2010].

Department for Communities and Local Government (2010d). *Programme for Replacement of Planning Policy Guidance Notes and Planning Policy Statements.* [Online]. Available from: http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/programmereplacement/. [Accessed 10 January 2010].

Department for Communities and Local Government (2009a). *North West of England Growth Points.* [Online]. Available from: http://www.communities.gov.uk/housing/housingsupply/growthareas/newgrowthpoints/newgrowthpoints/northwestofengland/. [Accessed 1 September 2009].

Department for Communities and Local Government (2009b). *Growth Areas and Growth Points Map.* [Online]. Available from: http://www.communities.gov.uk/documents/housing/pdf/898634.pdf. [Accessed 1 September 2009].

Department for Communities and Local Government (2009c). *Growth Points.* [Online]. Available from: http://www.communities.gov.uk/housing/housingsupply/newgrowthpoints/. [Accessed 1 September 2009].

Department for Communities and Local Government (2009d). *Planning Policy Statement: Eco-towns. A supplement to Planning Policy Statement 1.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/pps-ecotowns.pdf. [Accessed 22 January 2010].

Department for Communities and Local Government (2008). *Planning Policy Statement 12: Creating strong safe and prosperous communities through Local Spatial Planning.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/pps12lsp.pdf. [Accessed 18 December 2008].

Department for Communities and Local Government (2007). *Planning Policy Statement: Planning and climate change – supplement to planning policy statement 1.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/ppsclimatechange.pdf. [Accessed 22 February 2009].

Department for Communities and Local Government (2006a). *New Growth Points Partnership for Growth with Government: Worcester.* [Online]. Available from: http://www.communities.gov.uk/documents/housing/pdf/worcester.pdf. [Accessed 30 December 2009].

Department for Communities and Local Government (2006b). *Planning Policy Statement 3: Housing.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement3.pdf. [Accessed 22 January 2010].

Department for Communities and Local Government (2006c). *Planning Policy Statement 25: Development and Flood Risk.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement25.pdf. [Accessed 22 January 2010].

Department for the Environment, Food and Rural Affairs (2007). *UK Sustainable Development web pages.* [Online]. Available from: http://www.defra.gov.uk/sustainable/government/. [Accessed 6 November 2007].

Department for the Environment, Food and Rural Affairs (2005). *Securing the Future: delivering the UK sustainable development strategy.* [Online]. Available from: http://www.defra.gov.uk/sustainable/government/publications/uk-strategy/documents/SecFut_complete.pdf. [Accessed 17 December 2009].

Department of the Environment (1994). *Planning Policy Guidance 15: Planning and the Historic Environment.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/142838.pdf. [Accessed 22 January 2010].

Diamond, R. (2009). Forgotten fabric. *Green Places,* April 2009, p. 16-19.

East Midlands Green Infrastructure Network (2008). *East Midlands Green Infrastructure Guide.* [Online] Available from: http://www.rnrp.org/default.asp?PageID=8&n=RNRP+Publications. [Accessed 5 July 2009].

ECOTEC (2009). *The Economic Benefits of Green Infrastructure: Developing key tests for evaluating the benefits of Green Infrastructure.* [Online]. Available from: http://www.naturaleconomynorthwest.co.uk/resources+reports.php. [Accessed 19 September 2009].

ECOTEC (2008). *The Economic Benefits of Green Infrastructure: The public and business case for investing in Green Infrastructure and a review of the underpinning evidence.* [Online]. Available from: http://www.naturaleconomynorthwest.co.uk/resources+reports.php. [Accessed 16 September 2009].

Engleback, L. (2009). Advance and Retreat, *Landscape*, March 2009, p. 23-28.

English Heritage (2004). Characterisation. *Conservation Bulletin,* Issue 47, Winter 2004-5. [Online]. Available from: http://www.english-heritage.org.uk/server/show/ConWebDoc.10485. [Accessed 10 February 2010].

English Heritage (2001). Historic Landscape Characterisation. *Conservation Bulletin, Issue 40, March 2001.* [Online]. Available from: http://www.english-heritage.org.uk/upload/pdf/Conservation_Bulletin_40.pdf?1266064981. [Accessed 10 February 2010].

English Heritage (year unknown). *Delivering Sustainable Communities – The contribution of English Heritage.* [Online]. Available from: http://www.english-heritage.org.uk/upload/pdf/Sus_Comm_overview05.pdf?1264898653. [Accessed 10 February 2010].

English Partnerships (2007). *New Towns.* [Online]. Available from: http://www.englishpartnerships.co.uk/newtowns.htm. [Accessed 4 October 2009].

Environment Agency (2010). *Sustainable Communities: Position Statement.* [Online]. Available from: http://www.environment-agency.gov.uk/research/library/position/41185.aspx. [Accessed 14 February 2010].

Environment Agency (2009). *Groundwater web pages.* [Online]. Available from: http://www.environment-agency.gov.uk/business/topics/water/31785.aspx. [Accessed 7th December 2009].

Environment Agency (2006). *Underground, Under Threat – The State of Groundwater in England and Wales.* [Online]. Available from: http://www.environment-agency.gov.uk/research/library/publications/40741.aspx. [Accessed 6th December 2009].

Environment Agency (year unknown). *Water Cycle Studies Guidance.* [Online]. Available from: http://publications.environment-agency.gov.uk/pdf/GEHO0109BPFF-e-e.pdf. [Accessed 14 February 2010].

Eversham, B. (2009). Tomorrow's wildlife. *Natural World.* Winter 2009, p. 30-34.

Forestry Commission (2010). *Salcey Forest.* [Online]. Available from: http://www.forestry.gov.uk/salceyforest. [Accessed 10 January 2010].

Foundation (2010). *Foundation website.* [Online]. Available from: http://foundation.climatefund.org.uk/about. [Accessed 7 March 2010].

Gill, S. (2007). *Green Infrastructure for Climate Change Adaptation – the role of spatial planning.* Presented at the Green Infrastructure Training Event, Liverpool, UK, October 2007. [Online]. Available from: http://www.greeninfrastructurenw.org.uk/. [Accessed 31 August 2009].

Gill, S., Handley, J., Ennos, R., Pauleit. S. (2007). Adapting cities for climate change: the role of green infrastructure. *Built Environment.* Volume 33, Issue 1, March 2007, p. 115-13.

Glancey, J. (2006). Brave New World. *The Guardian.* 6 November 2006. [Online]. Available from: http://www.guardian.co.uk/artanddesign/2006/nov/06/architecture.communities. [Accessed 4 October 2009].

Goldsmith, E., Allen, R., Allaby, M., Davoll, J., and Lawrence, S. (1972). A Blueprint for Survival. *The Ecologist*, Volume 2, No. 1, January 1972. [Online]. Available from: http://www.theecologist.info/key27.html. [Accessed 20 March 2010].

Government Office for the North West (2008). *The North West of England Plan: Regional Spatial Strategy to 2021.* [Online]. Available from: http://www.gos.gov.uk/497468/docs/248821/RSSlowresolution. [Accessed19 September 2010].

Government Office for the South East (2009) *Growth in Milton Keynes and South Midlands.* [Online] Available from: http://www.gos.gov.uk/gose/ourRegion/growthAreas/mksmGrowth/. [Accessed 11 July 2009].

Government Office for the South East, East Midlands and East of England (2005). *Milton Keynes and South Midlands Growth Area e-bulletin.* June 2005, Issue 1. [Online] Available from: http://www.gos.gov.uk/497648/docs/170192/221841/221846/MKSMNewsletter6June.pdf. [Accessed 11 July 2009].

Government Office for the West Midlands (2009). *Climate Change webpages.* [Online]. Available from: http://www.gos.gov.uk/gowm/EnvironmentRural/394171/. [Accessed 6 January 2010].

Hanley, N., Ready, R., Colombo, S., Watson, F., Stewart. M., and Bergmann. E. A. (2009). The impacts of knowledge of the past on preferences for future landscape change. *Journal of Environmental Management*, Volume 90, (2009), p. 1404–1412. [Online]. Available from: www.sciencedirect.com. [Accessed 18 December 2008].

Herring, P. (year unknown). *Historic Landscape Characterisation.* [Online]. Available from: http://cemadoc.cemagref.fr/exl-doc/colloque/ART-00001451.pdf. [Accessed 13 February 2010].

Homes and Communities Academy (2009). River Nene Regional Park, Northamptonshire, *Showcase* [Online] Available from: http://showcase.hcaacademy.co.uk/case-study/river-nene-regional-park-northamptonshire.html. [Accessed 5 July 2009].

Ibis Environmental and Design (2008). *Assessing the Potential for Green Infrastructure development within projects.* [Online]. Available from: http://www.naturaleconomynorthwest.co.uk/resources+reports.php. [Accessed 22 February 2010].

Jackson, J. (2007). *Applying principles of Landscape Ecology to Green Infrastructure planning.* [Online]. Available from: http://www.iale.org.uk/files/Applying-principles-of-Landscape-Ecology-final.pdf. [Accessed 10 January 2010].

JBA Consulting (year unknown). *Fact Sheet: Mosslands Vision.* [Online]. Available from: http://www.jbaconsulting.ie/pdf/projects/environment/Manchester%20Mosslands.pdf. [Accessed 7 March 2010].

Joint Nature Conservation Committee (2007). *UK Biodiversity Action Plan website.* [Online]. Available from: http://www.ukbap.org.uk/. [Accessed 26 September 2009].

Kerrou, M. (2008). Listening to the Landscape, *Green Places,* March 2008, p. 34-37.

Lambert, T (year unknown). *A History of Birmingham.* [Online]. Available from: http://www.localhistories.org/birmingham.html. [Accessed 13 September 2009].

Landscape Design Associates (2004a). *River Nene Regional Park Feasibility Study: Executive Summary.* [Online] Available from: http://www.rnrp.org/images/PDF_Files/River_Nene_Regional_Park/Publications/Executive%20Summary%20.pdf. [Accessed 5 July 2009].

Landscape Design Associates (2004b). *River Nene Regional Park Feasibility Study: Review of Tangible Projects.* [Online] Available from: http://www.rnrp.org/images/PDF_Files/River_Nene_Regional_Park/Publications/Tangible20projects10.pdf. [Accessed 5 July 2009].

Landscape Institute (2009). *Landscape Institute Position Statement - Green infrastructure: connected and multifunctional landscapes.* [Online]. Available from: http://www.landscapeinstitute.org/PDF/Contribute/GreenInfrastructurepositionstatement13May09.pdf. [Accessed 4 January 2010].

Lovell, J. (2008). *Delivering the City Region's Environment Agenda.* Presented at the Green Infrastructure in Greater Manchester Seminar, October 2008. [Online]. Available from: http://www.greeninfrastructurenw.org.uk/. [Accessed31 August 2009].

Maruani, T., and Amit-Cohen, I. (2007). Open space planning models: A review of approaches and methods. *Landscape and Urban Planning.* Volume 81 (2007) pages 1-13. [Online]. Available from: www.sciencedirect.com. [Accessed 26 September 2009].

McHarg, I. (1969). *Design with Nature.* 1992 Ed. United States of America: John Wiley & Sons, Inc.

McLamb, E. (2009). *The Industrial Revolution and Its Impact Upon Our Environment.* [Online]. Available from: http://ecology.com/features/industrial_revolution/. [Accessed 13 September 2009].

Miltonkeynes.com (2010). *Miltonkeynes.com website.* [Online]. Available from: http://miltonkeynes.com/milton-keynes-photo-gallery.html. [Accessed 10 February 2010].

Milton Keynes South Midlands Inter-Regional Board (2009). *Milton Keynes South Midlands.* [Online] Available from: http://www.mksm.org.uk/home. [Accessed 19 July 2009].

Mindykowski, A. (2010). *RE: Discussion regarding the role of the historic environment in green infrastructure.* Personal E-mail to Hayley Pankhurst 10 January 2010.

Moss, M. (2010). *RE: Publication of Study.* Personal E-mail to Hayley Pankhurst 8 November 2010.

Moss, M. (2009). *RE: Natural England's West Midlands Planning and Partnerships Team visit to the Northwest.* Personal communications 13 October 2009.

Murphy, P. C. (2005). *What a book can do: the publication and reception of Silent Spring.* University of Massachusetts Press.

Natural Economy North West (2009). *Natural Economy North West website.* [Online]. Available from: http://www.naturaleconomynorthwest.co.uk/index.php. [Accessed 31 August 2009].

Natural Economy North West (year unknown a). *The Economic Value of Green Infrastructure.* [Online]. Available from: http://www.naturaleconomynorthwest.co.uk/resources+reports.php. [Accessed 8 September 2009].

Natural Economy North West (year unknown b). *Research Summary 13: Roof Greening in Liverpool.* [Online]. Available from: http://www.naturaleconomynorthwest.co.uk/resources+reports.php. [Accessed 22 February 2010].

Natural England (2010). *Natural England Position Statement: Future Landscapes.* [Online]. Available from: http://www.naturalengland.org.uk/Images/future-landscapes-ps_tcm6-17121.pdf. [Accessed 6 March 2010].

Natural England (2010b). *Internal Poll.* February 2010.

Natural England (2009a). *Green Infrastructure Guidance.* [Online]. Available from: http://naturalengland.etraderstores.com/NaturalEnglandShop/Product.aspx?ProductID=cda68051-1381-452f-8e5b-8d7297783bbd. [Accessed 24 December 2009].

Natural England (2009b). Walking Schemes Get the Green Light, *Natural England Press Release*, 11 February 2009. [Online]. Available from: http://www.naturalengland.org.uk/about_us/news/2009/110209.aspx. [Accessed 17 January 2010].

Natural England (2009c). *Operational Guidance for Natural England Staff: Accessible Natural Greenspace Standards.* [Online]. Available from: http://neintranettechnical/content/technical/docs/FINALANGST-Operational_Guidance_with_Case_Studies_V5doc.pdf. [Accessed 17 January 2010].

Natural England (2009d). *European Landscape Convention web pages.* [Online]. Available from: http://www.naturalengland.org.uk/ourwork/landscape/protection/europeanconvention/default.aspx. [Accessed 27 January 2010].

Natural England (2009e). *England's Landscapes web pages.* [Online]. Available from: http://www.naturalengland.org.uk/ourwork/landscape/englands/default.aspx. [Accessed 27 January 2010].

Natural England, Defra and English Heritage (2007). *European Landscape Convention – A framework for implementation.* [Online]. Available from: http://www.naturalengland.org.uk/Images/tcm232117_tcm6-8169.pdf. [Accessed 27 January 2010].

Northamptonshire County Council (2001). *Northamptonshire Structure Plan.* [Online] Available from: http://www.northamptonshire.gov.uk/en/councilservices/Environ/planning/policy/regional/Pages/StructurePlan-savedpolicies.aspx. [Accessed 29 August 2009].

North Northamptonshire Joint Planning Unit (2008). *North Northamptonshire Core Spatial Strategy.* [Online]. Available from: http://www.nnjpu.org.uk/docs/Adopted%20CSS%20Final%20Proof.pdf. [Accessed 15 August 2009].

North West Regional Spatial Strategy Examination in Public Panel (2007). *Panel Report.* [Online]. Available from: http://www.northwesteip.co.uk/downloads/2007_Panel%20Report_Main%20document.pdf. [Accessed 19 September 2009].

North West Regional Development Agency and 4NW (2008). *The Northwest Regional Strategy website.* [Online]. Available from: http://www.nwregionalstrategy.com/Home. [Accessed 19 September 2009].

Office for National Statistics (2009). *Neighbourhood Statistics: Worcestershire.* [Online]. Available from: http://neighbourhood.statistics.gov.uk/dissemination/LeadAreaSearch.do?a=7&c=worcestershire&d=13&r=1&i=1001&m=0&s=1261666202328&enc=1&areaSearchText=worcestershire&areaSearchType=180&extendedList=true&searchAreas=. [Accessed 24 December 2009].

Office of the Deputy Prime Minister (2006). *Assessing Needs and Opportunities: A companion guide to PPG17.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/156780.pdf. [Accessed 10 January 2010].

Office of the Deputy Prime Minister (2005a). *Planning Policy Statement 1: Delivering Sustainable Development.* [Online] ODPM. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement1.pdf. [Accessed 18 December 2008].

Office of the Deputy Prime Minister (2005b) *Planning Policy Statement 9: Biodiversity and Geological Conservation.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/147408.pdf. [Accessed 18 December 2008].

Office of the Deputy Prime Minister (2004). *Planning Policy Statement 7: Sustainable Development in Rural Areas.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/147402.pdf. [Accessed 22 January 2010].

Office of the Deputy Prime Minister (2002a). *Planning Policy Guidance 17: Planning for open space, sport and recreation.* [Online] ODPM. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/ppg17.pdf. [Accessed 18 September 2008].

Office of the Deputy Prime Minister (2002b). *Sustainable communities: Delivering through planning.* [Online]. Available from: http://www.communities.gov.uk/documents/corporate/pdf/SustainableCommunities.pdf. [Accessed 7 February 2010].

Office of the Deputy Prime Minister (2001). *Planning Policy Guidance 13: Transport.* [Online]. Available from: http://www.communities.gov.uk/documents/planningandbuilding/pdf/155634.pdf. [Accessed 22 January 2010].

Oldfield, T.E.E, Smith, R.J, Harrop, S.R, Leader-Williams, N. (2004). A Gap Analysis of Terrestrial Protected Areas in England and its Implications for Conservation Policy, *Biological Conservation.* March 2004, volume 120, p. 303-309 [Online]. Available from: www.sciencedirect.com. [Accessed 28 December 2008].

Parliamentary Office of Science and Technology (2007). *Postnote: Urban Flooding.* [Online]. Available from: http://www.parliament.uk/documents/upload/postpn289.pdf. [Accessed 15 November 2009].

Peak District National Park Authority (2010). *Peak District National Park Authority website.* [Online]. Available from: http://www.peakdistrict.gov.uk/. [Accessed 4 March 2010].

Pictures of England (2009). *Explore the West Midlands in England.* [Online]. Available from: http://www.picturesofengland.com/mapofengland/west-midlands-map.html. [Accessed 10 September 2009].

Pitt (2008). *Learning Lessons from the 2007 Floods.* [Online]. http://archive.cabinetoffice.gov.uk/pittreview/_/media/assets/www.cabinetoffice.gov.uk/flooding_review/pitt_review_full%20pdf.pdf. [Accessed 13 November 2009].

Pretty, J. (2009). Modern city, Stone Age mind. *Natural World.* Winter 2009, p. 21-24.

Regional Development Agencies (2009). *North West.* [Online]. Available from: http://englandsrdas.com/about_the_regions/north_west/. [Accessed 12 September 2009].

River Nene Regional Park (2009a). *River Nene Regional Park website.* [Online]. Available from: http://www.rivernene regionalpark.org/default.asp?PageID=2&n=RNRP+Home. [Accessed 5 July 2009].

River Nene Regional Park (2009b). *Northamptonshire's Environmental Character and Green Infrastructure Suite.* Version 2.2 [Online]. Available from: http://www.rnrpenvironmentalcharacter.org.uk/. [Accessed 5 July 2009].

River Nene Regional Park (2007). *Creating Successful Green Infrastructure Plans: Best Practice from the East Midlands and the River Nene Regional Park.* [Online] Available from: http://www.rnrp.org/images/PDF_Files/River_Nene_Regional_Park/Publications/GI%20brochureweb.pdf. [Accessed July 2009].

River Nene Regional Park (2005). An Insight into the River Nene Regional Park Initiative: Launch Edition, *Space,* Autumn 2005. [Online] Available from: http://www.rnrp.org/images/PDF_Files/River_Nene_Regional_Park/Publications/SPACE%20FINAL%20VERSION%2023.09.05.pdf. [Accessed 5 July 2009].

River Nene Regional Park (year unknown a). *The River Nene Regional Park: The Regional Parc in Context.* [Online] Available from: http://www.rnrp.org/images/PDF_Files/River_Nene_Regional_Park/Publications/RNRP%20brochure.pdf. [Accessed 5 July 2009].

River Nene Regional Park (year unknown b). *Northamptonshire's Green Infrastructure Study.* [Online] Available from: http://www.rivernene regionalpark.org/images/PDF_Files/River_Nene_Regional_Park/Projects/GIDocument2.pdf. [Accessed 16 August 2009].

Ropke, I. (2004). The Early History of Modern Ecological Economics. *Ecological Economics.* Volume 50, 2004, p. 293 – 314. [Online]. Available from: www.sciencedirect.com. [Accessed 24 September 2009].

Royal Town Planning Institute (2009). *Good Practice Note 5: Delivering healthy communities.* [Online]. Available from: http://www.rtpi.org.uk/download/6443/GPN5_final.pdf. [Accessed 15 January 2010].

Shaw, R., Colley, M., and Connell, R. (2007). *Climate change adaptation by design: a guide for sustainable communities.* TCPA, London. [Online]. Available from: http://www.tcpa.org.uk/pages/climate-change-adaptation-by-design.html. [Accessed 25 June 2009].

South Worcestershire Joint Core Strategy (2009a). *Green Infrastructure Interim Report.* [Online]. Available from: http://www.swjcs.org/greeninfrastructure/latest_interimreport_dec09/greeninfrastructure/Interim%20Report.pdf. [Accessed 10 January 2010].

South Worcestershire Joint Core Strategy (2009b). *South Worcestershire Joint Core Strategy website.* [Online]. Available from: http://www.swjcs.org/index.html. [Accessed 30 December 2009].

South Worcestershire Joint Core Strategy (2008). *Preferred Options Paper.* [Online]. Available from: http://www.swjcs.org/PO_CONSULTATION/swjcs_PO.pdf. [Accessed 30 December 2009].

Simpson, P. (2008). *Statutory Context for Green Infrastructure.* Presentation given at the Association of Local Government Ecologist's Conference, Liverpool, UK, 12 November 2008 [Online] Available from: http://www.alge.org.uk/publications/resources.php. [Accessed 26 January 2009].

Smith, B. (2010). *RE: South Worcestershire Core Strategy Draft Green Infrastructure Policy.* Personal E-mail to Hayley Pankhurst 15 January 2010.

Strange, I. (1997). Planning for change, conserving the past: towards sustainable development policy in historic cities? *Cities,* Volume 14, No. 4, 1997, p. 227-233. [Online]. Available from: www.sciencedirect.com. [Accessed 10 February 2010].

Stubbs, M. (2008). Natural Green Space and Planning Policy: Devising a Model for its Delivery in Regional Spatial Strategies, *Landscape Research,* February 2008, Volume 33, No. 1, p. 119-139.

TEP, Ibis Environmental and Design Consultants and ECOTEC (2009). *How to Deliver, Measures and Demonstrate the Economic Contribution of the Natural Environment at a Project Level: A Guide for Project Managers.* [Online]. Available from: http://www.naturaleconomynorthwest.co.uk/resources+reports.php. [Accessed 27 February 2010].

The Club of Rome (year unknown). *Limits to Growth: Short version.* [Online]. Available from: www.clubofrome.org/docs/limits.rtf. [Accessed 2 October 2009].

The Library of Congress (2002). *The Evolution of the Conservation Movement.* [Online]. Available from: http://lcweb2.loc.gov/ammem/amrvhtml/conshome.html. [Accessed 13 September 2009].

The Sierra Club (2009). *The Sierra Club website.* [Online]. Available from: http://www.sierraclub.org/john_muir_exhibit/. [Accessed 13 September 2009].

The Telegraph (2009). GPs to prescribe golf lessons to overweight NHS patients, *The Telegraph*, 25 June 2009. [Online]. Available from: http://www.telegraph.co.uk/health/healthnews/5635642/GPs-to-prescribe-golf-lessons-to-overweight-NHS-patients.html. [Accessed 17 January 2010].

Tomlinson, R. F. (1984). *Geographic Information Systems: A new frontier.* [Online]. Available from: http://books.google.com/books?hl=en&lr=&id=LR-mgKxIMfMC&oi=fnd&pg=PA18&dq=Invention+of+geographic+information+systems&ots=vWod-p1qpY&sig=i8n_lzHM6MVu_ZjMVf3346rbaXI#v=onepage&q=Invention%20of%20geographic%20information%20systems&f=false. [Accessed 3 October 2009].

Town and Country Planning Association (2008). *The Essential Role of Green Infrastructure: Eco-towns Green Infrastructure Worksheet Advice to Promoters and Planners.* [Online]. Available from: http://www.tcpa.org.uk/data/files/etws_green_infrastructure.pdf. [Accessed 24 December 2009].

Tunstall, S. M, Johnson, C. L, Penning Rowsell, E. C. (2004). Flood Hazard Management in England and Wales: From Land Drainage to Flood Risk Management. *World Congress on Natural Disaster Mitigation*. 19-21 February. [Online]. Available from: http://www.safecoast.org/editor/databank/File/FHM%20from%20land%20drainage%20to%20FRM%20in%20UK.pdf. [Accessed 13th December 2009].

Waitt, G. (2000). Consuming Heritage: Perceived Historical Authenticity. *Annals of Tourism Research*, Volume 27, No. 4, 2000, p. 835-862. [Online]. Available from: www.sciencedirect.com. [Accessed 10 February 2010].

Walmsley, A. (1995). Greenways and the making of urban form. *Landscape and Urban Planning*, Volume 33, 1995, p. 81-127. [Online]. Available from: www.sciencedirect.com. [Accessed 10 February 2010].

West Midlands Regional Assembly (2009). *Regional Spatial Strategy web pages*. [Online]. Available from: http://www.wmra.gov.uk/Planning_and_Regional_Spatial_Strategy/Regional_Spatial_Strategy/Regional_Spatial_Strategy_(RSS).aspx. [Accessed 25 December 2009].

Wilmers, P. (2008). *Natural Economy North West and the Economic Benefits of GI,* Presentation to the 14th Conference of the Association of Local Government Ecologists.

Worcestershire County Council (2009). *Waste Core Strategy for Worcestershire: Emerging Preferred Options Consultation.* [Online]. Available from: http://www.worcestershire.gov.uk/cms/pdf/Waste%20Core%20Strategy%20-%20Emerging%20Preferred%20Options6.pdf. [Accessed 12 November 2009].

World Commission on Environment and Development (1987). *Our Common Future.* Oxford University Press.

Urbed (2007). *Liverpool Knowledge Quarter.* [Online]. Available from: http://www.urbed.coop/journals_show.php?j_id=142. [Accessed 22 February 2010].