Green infrastructure: connected and multifunctional landscapes

Landscape Institute
Position statement

Foreword

We are faced with a wide range of serious environmental, social and economic challenges; developing housing to meet demographic changes, ensuring that our environments are resilient to a changing climate, maintaining adequate supplies of water, managing flood risk, securing food and energy supplies and safeguarding against biodiversity loss — all of these, and more, need to be considered by anyone concerned with the planning, design and management of our places.

The Landscape Institute believes that green infrastructure (GI) represents an approach to land use that has a critical role in meeting many of these challenges. It achieves this through its multifunctional and connected nature and is underpinned by the concept of ecosystem services, an approach which recognises the many benefits that are generated by natural ecosystems.

Taking a holistic approach, landscape practitioners are playing a key role in GI delivery in collaboration with other professions. This cross-professional approach can help ensure that GI delivers the wide range of benefits it has the potential to provide.

In recognition of the importance of GI, this Position Statement is designed to:

— explain the many benefits of GI and the policy objectives it can help achieve;
— demonstrate the critical role that landscape practitioners (landscape architects, managers and scientists) have to play in the development of GI;
— show how GI works.

The Landscape Institute calls for GI to be afforded the same priority as more conventional infrastructural components; a priority that the concept rightly deserves given its critical role in addressing a wide range of pressing environmental, social and economic challenges.

Neil Williamson
President

Jon Lovell
Chair, Policy Committee

01 Introduction

Our lives are surrounded and enriched by green assets. Some of these, like public parks, are planned and designed. Others, such as protected coastlines, may be more natural. Sometimes our green assets are unintended consequences of other kinds of planning — motorway verges and railway embankments provide a network of connected green spaces. Up until recently, these assets have generally been thought of in terms of single functions. Parks were conceived of as areas for play and recreation. Wildlife reserves were places dedicated to the preservation of particular species. Canal towpaths or cycle routes were planned for leisure or transport use.

The networks of green spaces, rivers and lakes that intersperse and connect villages, towns and cities are at the heart of our green infrastructure (GI). These elements perform a vast range of functions and deliver many benefits. Developing GI, a process which involves planning, design, implementation and management, presents an opportunity to achieve many social, environmental and economic objectives. Its multifunctional nature, with benefits enhanced through connectivity, means that GI represents an approach to the use of our limited land resource which cannot now be ignored.

The value of natural elements in urban and rural environments, and the economic, social and environmental benefits they provide, is beginning to gain recognition. However, there is still a widespread lack of awareness of how important these assets are, demonstrated by the frequent failure to plan, design and manage them appropriately. Natural assets are often seen as separate entities — afterthoughts in the discipline of land use planning which gives priority to 'grey infrastructure' at the expense of the natural environment. This approach fails to recognise the symbiosis between the quality and connectivity of natural assets with local environmental and economic performance. The result can be a disconnected series of inadequately-managed natural elements which deliver far fewer public benefits than could be provided.

Overcoming this failure — of policy, investment and service delivery — relies on the recognition that the natural environment has a critical role to play in sustaining life, and the quality of that life, through the provision of a range of different functions. It relies on an understanding that these functions are multiplied and enhanced significantly when the natural environment is planned and managed as an integrated whole; a managed network of green spaces, habitats and places providing benefits which exceed the sum of the individual parts. It is this concept of connectivity and multifunctionality which makes the GI approach such an important part of landscape planning and management.

The concern for the natural environment goes beyond environment for environment's sake. The advocacy of GI delivery in urban and rural environments is based on the fact that a wide range of challenges depend on both its quality and integrity, including:

— climate change mitigation and adaptation;
— safeguarding and encouraging biodiversity;
— economic productivity;
— food and energy security;
— public health and wellbeing;
— social cohesion;
— reconnecting people with the natural environment;
— sustainable use of a finite land resource; and
— the importance of place-making in sustainable communities.

A number of barriers to GI delivery inhibit uptake of an approach which leads to the development of rich, multifunctional places. There are many examples where GI has been successfully delivered throughout the country and multiple benefits have been generated. With an improved understanding of the concept, greater policy support, increased investment and a more collaborative approach, GI should become central to the way we think about and use our land.

02
Case studies

Five case studies have been chosen to show how multifunctional and connected GI has been delivered, bringing with it significant environmental, social and economic benefits

1
The North West — Newlands, The Mersey Forest and Weaver Valley Initiative

Of all UK regions, the North West of England has the richest track record in the delivery of urban GI. GI has been a feature of the region's planning and public policy throughout its journey from the world's first industrial powerhouse through its post-industrial transition towards a services and knowledge-based economy in the latter decades of the twentieth century. The North West was home to Britain's first publicly funded park, Birkenhead Park, created in 1847 by Sir Joseph Paxton as a green lung for the heavily-industrialised town. The first Groundwork Trust was established in St Helens in 1981 as a vehicle to regenerate a network of derelict, post-industrial sites, such as colliery spoil heaps, as public open spaces. The Mersey Basin Campaign was established as an environmental regeneration programme, predominantly focused on cleaning up the then dirtiest river in the world, but simultaneously delivering a wide range of social and economic benefits. Supported by strong regional policy, Newlands, The Mersey Forest and the Weaver Valley Initiative build on this track record, generating far-reaching environmental, social and economic benefits.

2
Crewe Business Park, Cheshire

Crewe Business Park in South Cheshire is a 27 hectare site at the heart of the transport infrastructure for the North West of England. GI has played a central role in its design and it has received awards for commitment to the environment. It illustrates how investment in GI can yield financial benefits as well as creating space for biodiversity and informal recreation. This approach is an excellent example of GI and multifunctional land use. At the time it was started, 20 years ago, this was a radical approach which has been justified by an excellent record of success. It demonstrates how, despite the relatively recent establishment of the term 'green infrastructure', the underlying GI concepts of multifunctional land use and connectivity have, in some cases, been a feature of land use planning, design and management for some time.

3
Ingrebourne Hill, London

Ingrebourne Hill is a 56 hectare site located in the London Borough of Havering, adjacent to the Ingrebourne River, Hornchurch Country Park and the communities of South Hornchurch and Rainham. In the 1950s Ingrebourne Hill changed from being a farm to a gravel extraction site until the 1960s when it was used for landfill. Various different land uses followed on the site until the Forestry Commission, through the Thames Chase Community Forest, became involved in turning it into a community green space. In 2006, extra funding was made available to develop additional GI on the site. The project illustrates the restoration of a brownfield site which has created new habitats for biodiversity and developed recreational infrastructure for local communities.

4
The River Ray Corridor, Swindon

The River Ray Corridor is a strategically important network in the North West of Swindon. In 1968 the valley of the River Ray was described as 'a major landscape penetration to the town centre' linking it 'intimately with the Thames Valley and its present and potential regional facilities'. Although the vision of the River Ray Corridor as an outdoor aquatic park was never realised, forty years on, it connects urban Swindon to its rural fringes and settlements through four major open spaces and linear links. The network is a good example of creating and developing GI through partnership working, with varied funding and community involvement and ownership. It also illustrates how such networks can develop over time.

5
The Royal Parks, London

The Royal Parks, London, have developed a demand-led funding approach to ensure that their important contribution to the environment, economy and society is maintained in the future. The approach to their management and operations is holistic and considers the various different demands with which they are faced. This approach must provide a mechanism which conserves and enhances the varied character of all Royal Parks and has relevance to the management of other green spaces across the country.

03 Green infrastructure terminology

Overview
GI includes the network of green spaces and other natural elements such as rivers and lakes that are interspersed between and connect villages, towns and cities. Individually these elements are GI assets and the roles that these assets play are GI functions. When appropriately planned, designed and managed, these assets and functions have the potential to deliver a wide range of social, environmental and economic benefits.

Much of this terminology has its origins in recent work conducted in North West England. This includes the approach developed by the North West Green Infrastructure Think Tank based on work by Susannah Gill and LI-registered practice TEP.

GI assets
GI assets include the natural elements which provide social, environmental or economic benefit. They can be specific sites or broader environmental features within and between rural and urban areas. A useful approach to outlining the different types of GI asset is to classify them according to the spatial scale at which each would typically be found.

Connectivity
Connectivity between different GI assets will help maximise the benefits that they generate. This connectivity can be visual or notional; however physical connections make the most impact. This connectivity can enhance public engagement with the natural environment, improve opportunities for biodiversity migration and assist in encouraging sustainable forms of travel.

GI functions
GI functions are the roles that assets can play if planned, designed and managed in a way that is sensitive to, and includes provision for, natural features and systems. Each asset can perform different functions, a concept known as multifunctionality.

Multifunctionality
Understanding multifunctionality is central to the GI approach to land use planning. Where land performs a range of functions it affords a far greater range of social, environmental and economic benefits than might otherwise be delivered.

Ecosystem services
Underpinning the multiple functions that GI assets perform is the concept of ecosystem services. Health and wellbeing depends on the range of services provided by ecosystems and their constituent parts: water, soils, nutrients and organisms. These services include:

- support: necessary for all other ecosystem services, e.g. soil formation and photosynthesis;
- provision: food, fibre, fuel;
- regulation: air quality, climate control, erosion control; and
- culture: non-material benefits for people, including aesthetic qualities and recreational experiences.

GI approach
GI approaches to land-use planning promote the widest range of functions which can be performed by the same asset, unlocking the greatest number of benefits. Such an approach enables us to demand more from the land in a sustainable way; by helping to identify when it can provide multiple benefits and to manage the many, often conflicting, pressures for housing, industry, transport, energy, agriculture, nature conservation, recreation and aesthetics. It also highlights where it is important to retain single or limited land use functions.

Typical GI assets and their associated scales

Local, neighbourhood and village scale **Town, city and district scale** **City-region, regional and national scale**	**Town, city and district scale**	**City-region, regional and national scale**
Street trees, verges and hedges	Business settings	Regional parks
Green roofs and walls	City/district parks	Rivers and floodplains
Pocket parks	Urban canals	Shoreline
Private gardens	Urban commons	Strategic and long distance trails
Urban plazas	Forest parks	Forests, woodlands and community forests
Town and village greens and commons	Country parks	Reservoirs
Local rights of way	Continuous waterfront	Road and railway networks
Pedestrian and cycle routes	Municipal plazas	Designated greenbelt and Strategic Gaps
Cemeteries, burial grounds and churchyards	Lakes	Agricultural land
Institutional open spaces	Major recreational spaces	National Parks
Ponds and streams	Rivers and floodplains	National, regional or local landscape designations (e.g. AONBs, NSAs and AGLVs) Canals
Small woodlands	Brownfield land	Common lands
Play areas	Community woodlands	Open countryside
Local nature reserves	(Former) mineral extraction sites	
School grounds	Agricultural land	
Sports pitches	Landfill	
Swales, ditches		
Allotments		
Vacant and derelict land		

04
The benefits of incorporating green infrastructure into the planning, design and management of landscapes.

The multifunctional nature of GI assets, underpinned by ecosystem services, means that they can deliver a diverse range of benefits which are mutually reinforcing and can be enhanced by the connectivity of these assets. It is important to fully appreciate the many benefits that GI can generate, including:

Climate change adaptation
Even modest increases in tree canopy cover can significantly reduce the urban heat island effect via evapotranspiration and shading, as well as improving air quality, which often suffers because of higher temperatures. This is just one of the features of The Mersey Forest and River Ray Corridor scheme. Connectivity of GI via wildlife corridors is critical in ensuring that biodiversity is safeguarded in the face of a changing climate and green space can ameliorate surface water run-off to reduce the risk of flooding.

Climate change mitigation
Well-designed and managed GI can encourage people to travel in a more sustainable way, such as cycling and walking. The River Ray Corridor has seen the development of cycleways linking Swindon with the National Cycle Network and other GI assets. In addition to acting as carbon sinks, trees and landform can reduce energy use for heating and cooling buildings by shading them in summer and sheltering them in winter. A GI approach to planning can also optimise the potential for efficient, decentralised, renewable energy, improving local energy security, providing space for ground source heating, hydroelectric power, biomass and wind power.

Water management
GI is a good approach for managing flood risk. This can involve placing sustainable drainage systems (SUDs) in developments to attenuate surface water runoff and enhance biodiversity and recreation. Agricultural land and wetlands can be used to store flood water in areas where there is no risk to homes and commercial buildings. GI can be used to manage coastal retreat as well as to restore wetlands, enhancing carbon sequestration whilst providing important wildlife habitat. At Ingrebourne Hill, water management has been controlled through drainage schemes and the on-site lake, designed to alleviate flooding of neighbouring properties and roads.

Dealing with waste
GI assets can deal with waste in a sustainable way. A good example of this is the use of reed beds which remove pollutants from water. Historically, waste has been placed in landfill sites, which have then been adapted for other GI functions, including wildlife habitats and leisure parks. Many of the sites under the Newlands programme, for example, use this approach, as has the work at Ingrebourne Hill. Closed landfill sites are a legacy which could provide a much greater range of functions if greater investment was made available.

Food production
Creating space for food production through allotments and community gardens and orchards, increases access to healthy food, provides educational opportunities, contributes to food security and reconnects communities with their local environment. Connecting local communities with these assets via footpaths and cycleways can encourage this reconnection further.

Biodiversity enhancement, corridors and linkages
The role of GI in providing wildlife habitat in both urban and rural areas is well established, but taking a landscape-scale approach to the planning, design and management of connected GI assets provides the framework within which species migration can more readily occur in response to environmental pressures such as climate change. At Ingrebourne Hill, a large pond has been developed to provide additional wetland habitat adjacent to the Ingrebourne Valley SSSI.

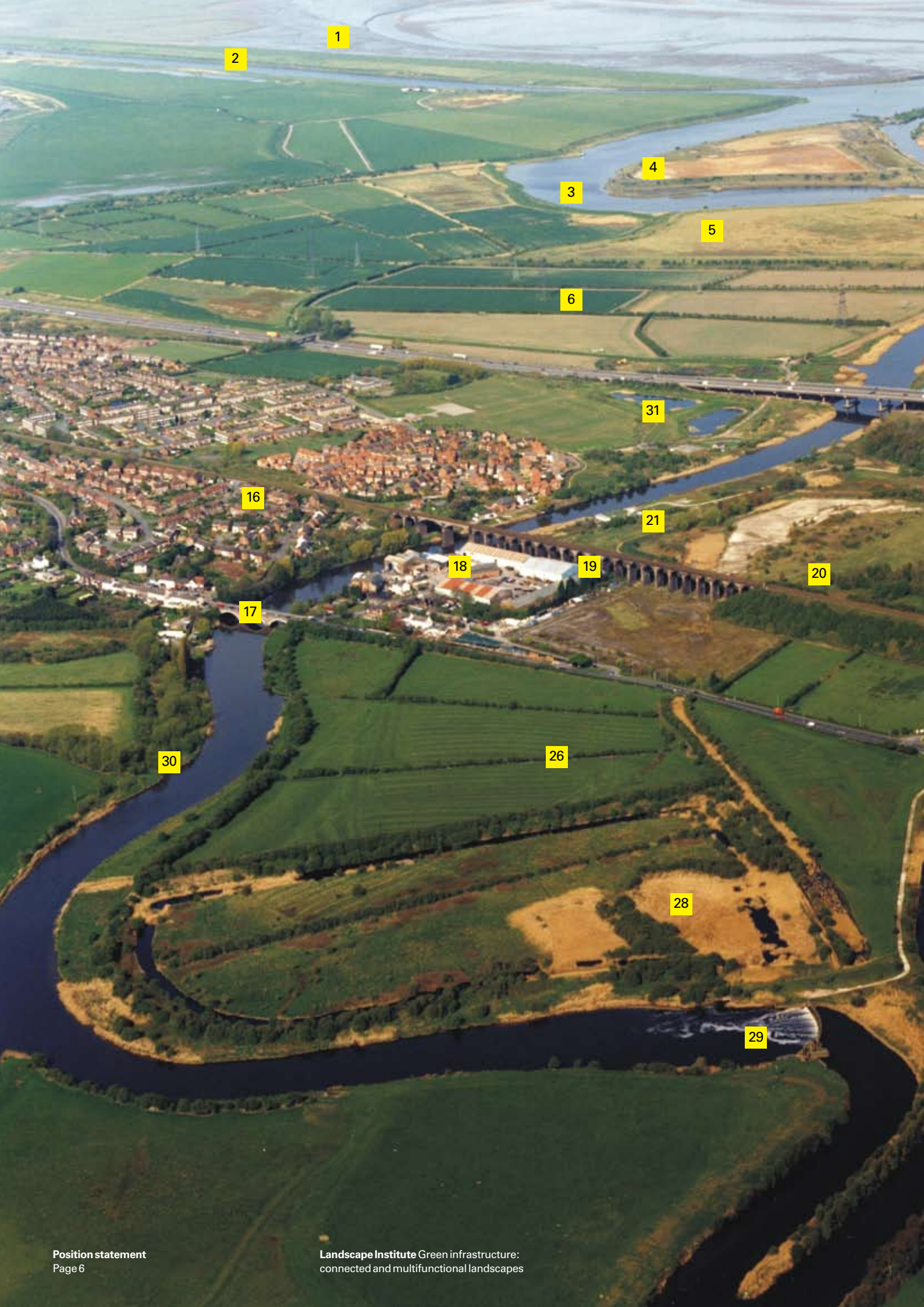
Recreation and health
As illustrated by all of the case studies in this position statement, accessible GI provides important opportunities for informal and active recreation. Ensuring that these assets are provided in close proximity to people's homes, are maintained properly, and are designed with the needs of local communities in mind, is critical to their positive role in public health and wellbeing.

Economic values
Quality green space can have a major positive impact on land and property markets, creating settings for investment and acting as a catalyst for wider regeneration. Work undertaken by Natural Economy North West, as outlined in the North West case study, is a good illustration of this. High quality, connected environments attract skilled and mobile workers which in turn encourage business investment, as is demonstrated at Crewe Business Park.

Local distinctiveness
Well-designed and managed GI assets, particularly those that engage local communities and which relate to landscape character and heritage, can enhance local sense of place and foster community spirit. They can be a catalyst for regeneration and stimulate employment opportunities by attracting investment and tourism. The Weaver Valley initiative has identified the natural environment as one of the key assets by which additional investment and tourism opportunities can be generated.

Education
As demonstrated by the River Ray Corridor and Ingrebourne Hill, natural environments which are connected to local communities can provide a range of educational opportunities and assist in reconnecting society with the natural environment; a fundamental prerequisite of living within environmental limits, and a cornerstone of the Government's sustainable development strategy.

Stronger communities
GI can help in meeting a wide range of community needs. The spirit of the GI approach means that social, environmental and economic potential is considered and optimised. It can be a focus for community participation through public management, as well as providing opportunities for education, training, volunteering and capacity building. Ingrebourne Hill, the River Ray Corridor and the Newlands programme provide good examples of this.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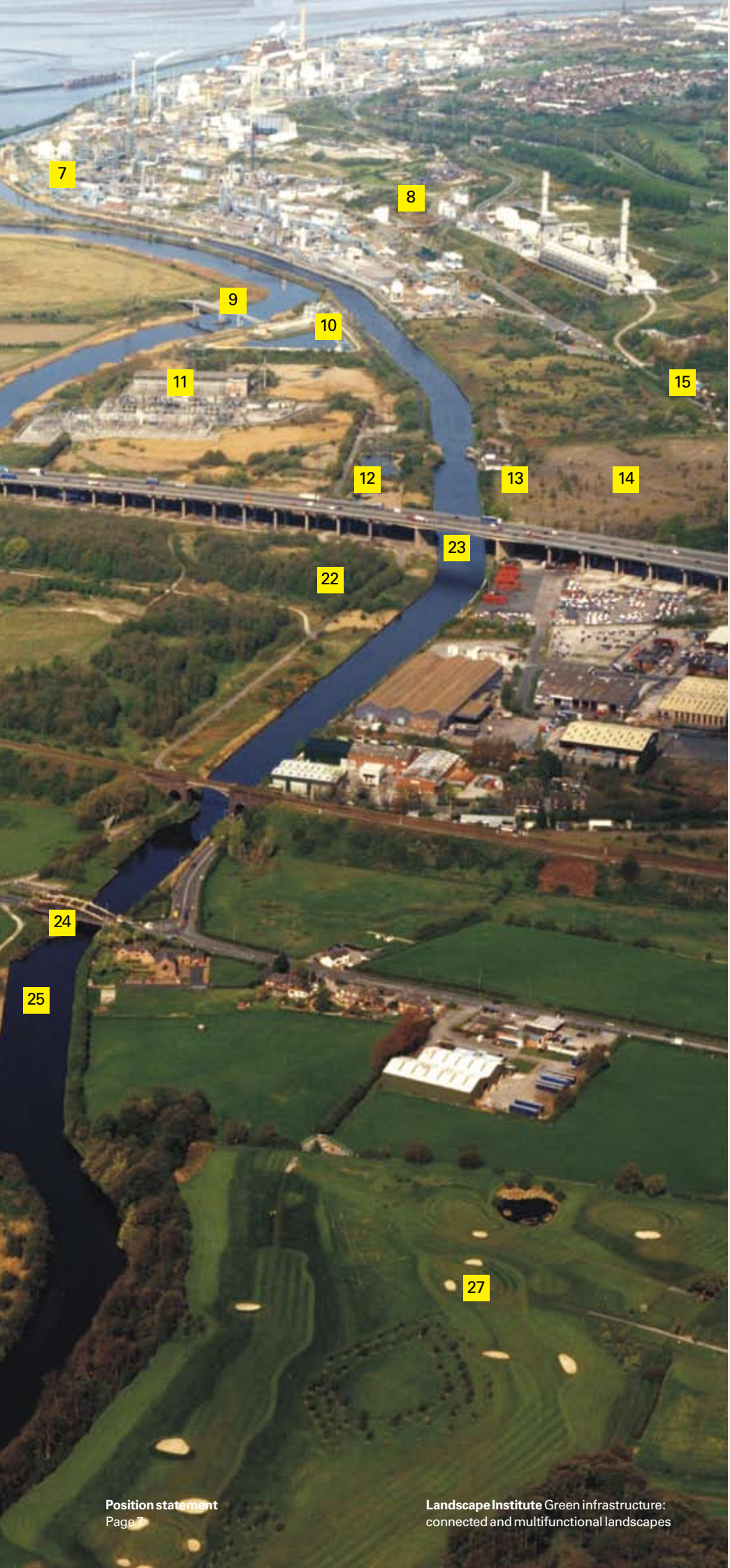

The Mouth of the Weaver

Demonstration of the many ways in which green infrastructure and traditional infrastructure coexist. This example shows some of the functions performed by different GI assets.

1 River Mersey – biodiversity, sense of place, tourism
2 Manchester Ship Canal – connections
3 River Weaver – biodiversity connections and tourism
4 Former chemical industry lagoon – biodiversity
5 Lagoon/dredging bed – biodiversity
6 Drained estuary marshes, important habitat with hedges and ditch network
7 Large-scale industry, green space between buildings for recreation
8 Nature reserve surrounding power station
9 Bridge – connectivity
10 Lagoon – biodiversity
11 Substation with green setting
12 Ponds used for fishing and biodiversity interest
13 Rowing club – recreation, historic buildings and surroundings
14 Abandoned soap waste lagoons – natural regeneration
15 Ancient woodland fingers
16 Market town – open space and local distinctiveness
17 Gateway to market town – listed building
18 Pathway through industrial estate – connectivity
19 Viaduct – local landmark, historical interest
20 Former chemical works lagoon – biodiversity
21 Sailing club and accessible water front
22 Woodland planted around edges
23 Motorway bridge across Weaver Navigation – views and connectivity
24 Swing bridge – local landmark
25 Weaver Navigation – recreation, connectivity, biodiversity
26 Agricultural land – ridge and furrow, hedges
27 Golf course – recreation, tourism biodiversity on river edge
28 Former dredging beds now reed beds and swamp
29 Weir listed structure – historic interest
30 Riverside Walk
31 Open space urban fringe

Landscape Institute Green infrastructure: connected and multifunctional landscapes

05 The potential for the landscape profession

Landscape practitioners are engaged in every stage of the GI approach and are leading a revolution in the way in which GI is developed. This includes the planning of environmental resources, the design of new public realm, implementation of strategy and the management of delivered projects. Landscape practitioners have a pivotal role to play with other professionals in all stages of a GI process, which operates at all spatial scales.

Landscape practitioners are trained in a broad range of disciplines with an ability to think holistically and see the bigger picture. This means that the profession understands the many processes at work which shape the land and appreciates the need to consider potential changes to which a particular location could be subjected over time. The result is a profession which is ideally placed to provide the vision and tenacity needed for the sustainable development of our GI assets.

06 Delivery: policy and funding

There is an increasing understanding of the social, environmental and economic benefits of green space and other natural components within and between our settlements. In order for these benefits to be fully realised, a fundamental shift is still required in our approach to land use planning. At a strategic level this will require the embedding of GI policy at the national, regional, sub-regional and local level.

Policy

There is currently no national policy for GI. However some policies provide scope for advancing GI delivery on the ground. Some contain specific mention of GI whereas others may be more implicit in their reference. Additionally, a number of other policy priorities can be achieved through a GI approach to the way we plan, design and manage our environment.

International: The European Landscape Convention

The European Landscape Convention (ELC), came into force in the UK in March 2007. It provides a platform for the evolution of land use planning, design and management into one which is more aligned to the key principles of a GI approach. The main objective of the ELC is to promote landscape planning, management and protection across Europe, with the term 'landscape' defined as: "An area as perceived by people whose character is the result of the action and interaction of natural and/or human factors".

The importance of the ELC lies in the government-level recognition that landscape needs to be afforded a high priority, from government down to the general public. It recognises that the quality of all landscapes matters, not just the best of them, as they all contribute towards environmental, social and economic value. The ELC commits all signatories 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.

As a holistic approach to land use planning which recognises the action and interaction of natural and human factors taking place in a particular area, GI is one way of achieving many of the commitments of the ELC. This is particularly the case with regards to the integration of landscape into cultural, environmental, agricultural, social and economic polices.

National

The multifunctional nature of GI means that there are a wide range of national, regional and local policies to which it can contribute. Some policy documents acknowledge GI directly or, at the very least, the important role that the natural environment has to play in the way we approach the land resource. For example:

England

— PPS1: Delivering Sustainable Development (2005): recognises the value of the natural environment to economic and social wellbeing.
— Supplement to PPS1: Planning and Climate Change (2007): underlines the value of GI to 'urban cooling, sustainable drainage systems and conserving and enhancing biodiversity'.
— PPS7: Sustainable Development in Rural Areas (2004): emphasises the role of the planning system in rural areas to ensure the protection and enhancement of the natural environment.
— PPS9: Biodiversity and Geological Conservation (2005): sets out how the planning system should contribute to biodiversity and geological conservation.
— PPS12: Local Spatial Planning (2008): states that a local planning authority's 'core strategy should be supported by evidence of what physical,

social and GI is needed to enable the amount of development for a proposed 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.'

- PPS25: Development and Flood Risk (2006): invites responsible parties to make 'the most of the benefits of GI for flood storage, conveyance and sustainable drainage systems (SUDs).
- PPG17: Planning for open space, sport and recreation (2002): requires local authorities to carry out open space audits, assessments and develop open space standards.

Scotland

- The National Planning Framework 2 (NPF2): laid before Scottish Parliament in December 2008. Once approved, this will guide the spatial development of Scotland until 2030. NPF2 outlines the importance of Green Networks (the term most often used in Scotland in referring to green infrastructure) in the regeneration of post-industrial areas of Scotland. Paragraph 94 highlight the role of a Central Scotland Green Network in 'delivering a step change in the quality of the environment for people, landscape and nature'.
- Scottish Planning Policy (SPP11): Physical Activity and Open Space (2007): It identifies the potential role that open and greenspace can play in the drive to make people more active and create a healthier population.
- Planning Advice Note (PAN) 65: Planning and Open Space (2008): advises on the role of the planning system in protecting and enhancing existing open spaces and providing high quality new spaces. It sets out how local authorities can prepare open space strategies, gives examples of good practice and outlines the need to ensure that the aspirations of the local community are taken into account when considering local open space.

Wales

- Update to Technical Advice Note 12 (TAN) Design (2008): states that a local planning authority should give an early indication of its landscape design expectations. This should include the desire to provide for habitat connectivity in addition to the intrinsic role of landscape in the sustainable management of resources.
- TAN 22: Sustainable Buildings (in preparation): allows for the integration of GI.
- Unitary Development Plans – Interim Development Control Guidance on Biodiversity Conservation and Enhancement in Development Proposals: guidance developed by individual local planning authorities are emphasising the importance of GI in that concept plans must protect key habitats as well as identifying the site's surrounding GI.
- Natural Heritage – A Pathway to Health 2007 (CCW/WAG): recognises the connection between GI and human health.

Northern Ireland

- PPS1: General Principles (1998)
- PPS2: Planning and Nature Conservation (1997)
- PPS8: Open Space, Sport and Outdoor Recreation (2004)
- PPS15: Planning and Flood Risk (2006)

Even where it is not specifically mentioned GI should still be advocated as a means of achieving many current policy objectives relating to:

- climate change mitigation and adaptation;
- energy security;
- housing provision;
- community cohesion;
- development of sustainable communities;
- improving health and wellbeing
- food security;
- water management;
- biodiversity;
- transport; and
- play.

A full appreciation of the multi-functional nature of green infrastructure means that many of these objectives can be achieved by the same assets or by a connected network of assets.

Funding

Capital

Securing funding for the delivery of GI is critical in turning strategy into reality and delivering the multiple benefits that this approach to land use planning. Sources of capital funding include Section 106 Agreements, Housing Growth Funding (including New Growth Point and existing growth area funding), commercial investment, European Union funding, Lottery grants, Local and Multi Area Agreement funding, and traditional local authority and private sector funding. The Planning Act of 2008 (England and Wales), also contains enabling powers for local authorities to apply a Community Infrastructure Levy (CIL) on new developments in their areas to support the delivery of vital infrastructure. The central role that GI has to play in supporting communities must be recognised and reflected in increased investment via the CIL when regulations come into force.

Revenue

Even where initial GI funding has been secured, it is critical that completed projects receive the necessary funding for their ongoing management, often in perpetuity. Though often difficult to secure, sources of revenue funding can include income generating opportunities to be derived from GI assets, such as franchising, licensing and entry fees, endowments, community trusts, commercial investment and traditional local authority funding.

It is vital that more funding solutions are made available to the maintenance and management of GI assets, particularly those which should by their very purpose be accessible to the public at no cost. The Royal Parks has developed a 'demand-led' funding approach which ensures that evidence used to support requests for funding is based upon the actual needs of the spaces for which it is responsible. Without adequate investment, GI assets are restricted in their ability to generate multiple benefits. Such an outcome undermines the vital role that GI can play in meeting a range of objectives. It also reinforces the misconception that the natural environment is 'nice to have' rather than a 'must have', irrespective of the economic climate.

Barriers and recommendations

Barriers →	Recommendations →	Who should take the lead?
01 A lack of understanding of GI and the importance of multifunctional land use planning and connectivity between spaces.	National Planning Policy Statements on GI should be developed to ensure that it is a central and formative element of spatial planning. Such guidance would need consistency in defining GI and provide support for the range of benefits that it can provide, without being too prescriptive.	National governments
02 A planning system which does not have sufficient force or resources to turn GI strategies into completed projects.	Significantly improve the impact of Local Authority Building Control in post-completion compliance testing new developments.	National governments Local Government Association, Convention of Scottish Local Authorities, Northern Ireland Local Government Association Local Authority Building Control departments
03 A shortage of professionals, including landscape practitioners, who have the skills needed to plan, design and manage successful GI.	Greater investment in cross-professional training to encourage improved, joined-up working between the different disciplines involved in GI planning, design, implementation and management.	National governments Landscape Institute Other professional bodies Employers Academic institutions
04 An increasingly urbanised society has led to a detachment from the natural environment, which is seen as a place to be visited rather than an integral part of daily life.	Develop a strong vision and communication strategy for the natural environment with which to engage with the general public and with business.	Natural England, Countryside Council for Wales, Scottish Natural Heritage, Environment and Heritage Service — Northern Ireland. National Farmers Union, National Farmers Union Scotland Major food retailers
05 Inadequate investment in the long-term management of GI assets means that benefits are less likely to be realised and/or deteriorate over time. This in turn leads to a lack of appreciation of the vast potential that these assets offer with a consequent lack of investment in the future.	Include robust arrangements for effective implementation and sustainable long-term management in GI strategies Consider the income generating opportunities to be gained from GI assets, such as biofuels, food production and space for events, so that profits can be reinvested into ongoing maintenance and management.	Those responsible for GI strategies, including landscape practitioners Local authority and non-government green space managers
	Adequate resources for GI provision and management. Require and enforce GI and afford it a level of recognition and investment comparable with that of traditional 'grey' infrastructure components (for example, transport, energy, telecommunications), and be the starting point from which other development takes place.	Local authorities Regional development agencies Commercial investors Other funding bodies

Barriers →	Recommendations →	Who should take the lead?
06 A culture of short term thinking means that GI, a long term contributor to many environmental, social and economic issues, fails to receive sufficient support.	Integrate GI into related policy agendas such as housing, health, climate change, sustainable transport, tourism and recreation. Inspire clients and employers to consider the multiple benefits of a GI approach.	National governments Regional development agencies Landscape practitioners
07 Investment is often needed in GI before growth occurs, therefore planning gain via Section 106 Agreements is not always sufficient.	Develop a national funding stream for strategic GI investments through Comprehensive Spending Review and annual Budgets.	HM Treasury Natural England, Countryside Commission for Wales, Scottish Natural Heritage, Environment and Heritage Service — Northern Ireland
08 Administrative boundaries can limit the area that needs to be considered for effective GI implementation.	Use GI strategies to identify and plan for a multifunctional approach to open space planning, at a sub-regional level where appropriate. Use spatially defined GI strategy to inform the Local Development Framework process. Adopt a GI strategy as a Supplementary Planning Document in each Local Planning Authority area. Identify the GI resource within local authority areas and put in place measures to overcome any deficit in functionality and benefit delivery.	Local authorities Regional development agencies Sub-regional partnerships
09 Standards-based approaches to open space have in the past tended to place undue emphasis on quantity rather than quality and on single use land allocations rather than rich, multifunctional green space.	Better representation of quality of landscape and GI should be included in assessments of the performance of local authorities.	National auditing offices Environmental Audit Committee
10 It is often difficult to quantify the full economic benefits to be gained from investment in GI. Private sector bodies are not widely convinced of the commercial benefits of becoming involved and therefore making land available for multifunctional land use.	Increased investment into the economic benefits of GI, not just green space.	HM Treasury Environmental Audit Committee Commercial Investors

Case Studies

1 The North West — Newlands, The Mersey Forest and Weaver Valley Initiative
2 Crewe Business Park, Cheshire
3 Ingrebourne Hill, London
4 The River Ray Corridor, Swindon
5 The Royal Parks, London

Case Study 1:
The North West — Newlands, The Mersey Forest and Weaver Valley Initiative

A group of projects in the North West is used to illustrate GI at a range of different levels because of the rich track record of its delivery in the region.

There is however a difference between the way some other regions and the North West have defined GI.

"Green Infrastructure is the Region's life support system — the network of natural environment components and green and blue spaces that lies within and between the North West's cities, towns and villages and which provides multiple social, economic and environmental benefits."

Unlike some other definitions that assume GI is a system that overlays only part of the non-built environment, the North West definition shows that GI is 'everywhere and anywhere' (North West Green Infrastructure Guide).

The North West Green Infrastructure Guide sets out a five-stage process for GI planning:

1. Partnership and priorities;
2. Data audit and GI resource mapping;
3. Functional assessment;
4. Needs assessment; and
5. Intervention plan.

Projects below illustrate that approach.

Newlands

Newlands is a £59 million land regeneration programme that is developing durable, economically viable community woodland on brownfield land across the North West region. The programme is a partnership between North West Regional Development Agency (NWDA) and the Forestry Commission (FC), but works closely with a wider range of partners both on a programme scale (Groundwork, Community Forests North West, Land Restoration Trust,) and on a project-by-project basis (local authority and private sector land owners, local communities, private sector consultants and contractors). Newlands is currently delivering projects across the North West, all of which are assisting with the economic, social and environmental regeneration of the region. At present there are seven projects completed or underway and this case study focuses on one of these, Moston Vale. A GI approach to land use, planning, design and management is central to the programme.

The 21 hectare Moston Vale project in North Manchester has been transformed into a new 'urban countryside', contributing to the Manchester City Region plan to create better living environments with an enhanced economic value. A former domestic landfill once blighted by anti-social behaviour, Moston Vale is now a significant contributor to the area's economic regeneration. It is at the heart of North Manchester's Housing Market Renewal (HMR) area which falls in the top 5 per cent of the national Index of Multiple Deprivation (IMD). Through Newlands, Moston Vale is now a quality setting for investment which is also critical to its future management. New access, sports and recreation facilities are also serving local communities and improving their physical environment, health and wellbeing.

Green infrastructure assets

It was recognised at the outset of the Newlands programme that there was a need to identify sites that could deliver the maximum socio-economic benefits if regenerated. Therefore the Public Benefit Recording System (PBRS) was created. This is a bespoke GIS tool that creates needs-based assessments set around four categories; social, economic, environmental and access. PBRS enables a holistic, evidence-based strategic appraisal which can steer investment, affording maximum value added per pound spent. This work was undertaken by registered Landscape Institute practice, TEP.

In the planning and development of Newlands projects, a wide variety of GI assets is developed and enhanced. The GI assets at Moston Vale include open grasslands, both rough and managed, small woodland copses, wildflower meadows, pathways, sports ground and street trees.

Connectivity

The Moston Vale site design allows easy access from local areas. Site boundaries are marked by low fencing which discourage illegal access by vehicles, but which still afford views across the site and encourage people to enter the community woodland. Consequently the whole site is perceived as open and accessible. The boundaries of the site are marked by large trees and help to connect it with the surrounding areas.

The newly established pathway across the centre of the site links to the surrounding roads and local areas of housing. There are access points on the site which allow people from a nearby business park to move onto Moston Vale. Street tree planting around the Moston Vale site is creating 'fingers of outreach' into the community, drawing people into the site and helping to expand the site's benefits.

Benefits

Climate change adaptation and mitigation

By regenerating areas of brownfield land, and complementing them with street greening within the wider communities, Newlands is helping urban areas across the region to prepare for climate change; establishing new community woodlands that help to tackle urban heat island effect. Re-establishing planting on these sites, especially with the importation of soil and tree planting, also helps to insure the surrounding urban areas against an increased flood risk.

Biodiversity enhancement, corridors and linkages
Two key elements of the site design plans are natural tree planting and wildflower meadows, which both encourage wildlife back to the site. Better management of existing tree planting and the general environment on site will also improve on-site biodiversity. The connection with the Irk Valley project, which prioritises biodiversity also links work carried out on the site with activity to promote biodiversity in the wider area.

Economic value
The ethos of Newlands is to create durable, economically-viable community woodlands. Through a range of different means, Newlands is encouraging stimulation in local economies, and in turn having an impact on the whole region. Newlands seeks to create zones of influence around project areas that will make it a more competitive choice for local and inward business investment.

Newlands is having a positive impact on house prices, and both formal and informal research has shown that community woodlands can have a dramatic effect in this area. There are informal reports that house prices have almost trebled since Newlands began work at Moston Vale. However, more compelling is the 2005 independent District Valuers review, which surveyed the impact of new community woodland development on house prices in the St Helen's area of Merseyside. The increase attributed directly and exclusively to the woodland was over £15million. Although not a Newlands site, this is an excellent sign for the scheme, which develops sites on a similar model.

Stronger communities
By regenerating derelict, underused and neglected land which, by virtue of its history sits at the heart of local communities, Newlands is combatting associated social problems such as anti-social behaviour and low-level crime.

Work on the Newlands sites also helps to restore community pride and cohesion — the projects seeks to unite people in the local area, and then give them a focal point where they can meet and hold community events.

The woodlands that Newlands creates focus on providing the local community with appropriate facilities to encourage recreation and healthier lifestyles. At Moston Vale, the football pitch and changing rooms that Newlands installed are an extremely important element of the site. This has enabled a local youth football club to re-establish in the area. Pathways have been enhanced by open planting schemes and lighting, using solar lights. Since the site has been developed, the FC and partners have organised a number of community activities on site, from fun days to an on-site photography competition, which have also encouraged use of Moston Vale for recreation.

Role of the landscape practitioner
At the planning phase, FC landscape architects worked with Groundwork Trusts and the site owners on a consultation process with local communities to identify feelings, history and expectations of the project. They incorporated these outcomes into the masterplan and identified constraints and opportunities at Moston Vale by working with specialists, from Scott Wilson and White Young Green, who undertook site investigations in soil and hydrology.

At the design phase, FC landscape architects provided significant input into the Forest Design Plan, working with FC development teams and local partners. They were also responsible for drawing up the final stage of the design. Implementation of the plans saw landscape architects drafting the formal funding application, working with NWDA and the management of the works on site.

Policy and funding
Newlands delivers against local, regional and national strategies including the Regional Economic Strategy (RES) and Manchester, Liverpool and Central Lancashire City regional plans. It also contributes to local HMR Programmes. £59million of NWDA funding is allocated to Newlands across a 20 year project period. Each project has a development and management budget set, directly relating to the needs of the individual site. For example, the Moston Vale project was funded with £1.69million for the regeneration and 20 years of ongoing maintenance. All Newlands' projects include a legacy fund to ensure that the site will be well maintained and developed over a 20 year period. Each site is leased from its owners on a 99 year lease meaning that the FC will maintain each of the Newlands' project for this period of time; a commitment that will protect the initial investment in the very long term.

Further information

Chris Waterfield, Project Officer, Forestry Commission

www.forestry.gov.uk

www.newlands.gov.uk

The Mersey Forest and Weaver Valley Initiative

The Mersey Forest, England's largest Community Forest, has been delivering GI projects in the North West for many years and has taken a pioneering lead in the regional GI strategy and approaches to climate change. It is one of the leading environmental regeneration initiatives in the North West. Since 1994, through community and partnership working, it has planted over 8 million trees and transformed almost 5,000 hectares of land.

The Mersey Forest has also played a key role in leading the GI intellectual debate, hosting consultation events and documents, applying for funding to further partner working, priority-setting and sharing good practice and setting up procurement routes for consultancy and implementation projects.

The Weaver Valley Initiative commenced as a regional park proposal, hosted by the former Cheshire County Council, and is a primary regional regeneration project aiming to deliver economic development, environmental improvements and social benefits to mid-Cheshire and its surrounding area. The Weaver Valley Strategic Framework is a vision for connecting, transforming and energising the area, to capture the unique sense of place and to generate the cross-cutting benefits. A GI approach is central to the strategy and Weaver Valley is working in partnership with The Mersey Forest in progressing the Cheshire sub-regional GI strategy.

Green infrastructure assets

An analysis of the area breaks down the area's GI, into 19 types which include parks and formal gardens, outdoor sports facilities, woodland, water courses and bodies, grassland, heathland and moorland, coastal habitats, agricultural land and allotments.

Benefits

The Mersey Forest is a regeneration initiative which goes much further than planting trees. Through multifunctional use of the various GI assets, a wide variety of benefits has been realised. Praised as a 'visionary concept', the 'more from trees' approach brings a whole range of environmental, social and economic benefits to the region. The Forest has won the Brian Redhead Award for Environmental Sustainability, created woodlands that 20% of local people visit at least once a week and by improving the image of towns and cities sets the scene for growth within the region's £98 billion economy. It has achieved all of this and more through a partnership of local authorities, landowners, the Forestry Commission, Natural England and businesses including United Utilities.

The Weaver Valley Regional Park/ Regeneration Initiative has been identified as a primary regional regeneration project to deliver image and regeneration benefits to mid-Cheshire and its surrounding area. The Weaver Valley Strategic framework is a vision for connecting, transforming and energising the area, to capture the unique sense of place and to drive forward environmental transformation and social renaissance. It includes the vision for the way GI can create multifunctional benefits.

Climate change adaptation and mitigation

The Mersey Forest's massive planting of native trees and woodlands, provides for carbon sequestration which can help mitigate further climate change by absorbing and storing carbon. The trees planted can assist in climate change adaptation by intercepting and allowing the infiltration of rain water into the ground, helping to reduce the risk of flooding on agricultural land and in the built environment. In addition they reduce temperatures through shading and evapotranspiration. The Mersey Forest woodlands have the potential to create renewable energy through energy crops such as willow and poplar.

Likewise Weaver Valley plans habitat creation and creates new links to the countryside for walking and cycling, including re-establishing links to the water and more sustainable transport opportunities can be encouraged. There are community-led, small-scale hydro-schemes being developed in some key locations along the River Weaver. Long-distance trails and cycle routes provide recreation and functional routes for journeys to school and work, with the specific aim of reducing car dependency.

Water management

There has always been the risk of flooding on the Weaver particularly in Northwich and this is likely to increase with global warming. Restoring floodplains and recreating wetlands in the Weaver Valley will reduce flood risk in downstream areas and improve water quality. Habitats such as reed beds, fens, ponds wet woodland and grasslands can be created.

Biodiversity enhancement, corridors and linkages

The Mersey Forest project is helping achieve national biodiversity targets. So far, over 2,900 hectares of new woodland and 800 hectares of wildflower meadow, wetlands and other habitats have been created, over 90km of hedgerows have been repaired or planted and more than 110 ponds established – all helping to restore the natural diversity of the region's wildlife. Weaver Valley will create new habitats for animals such as water voles and otters, creating a stimulus to improve water quality for people and wildlife. Weaver Woodlands aims to join up the Weaver Valley's ancient woodland and will significantly improve the sub-region's ecological network.

Landscape Institute Green infrastructure: connected and multifunctional landscapes

Recreation and health
The Mersey Forest Partnership is now working closely with health agencies in the North West to use forestry as a way of tackling rising coronary disease and obesity. This can be achieved by encouraging people to keep active by walking, jogging, cycling and taking part in other outdoor activities. Research has shown that the project has created woodland which at least 20% of local people visit once a week. Weaver Valley develops the Weaver Way network of walking and cycling routes, and supports access to the environment, through interpretation, visitor facilities, walking routes, guided walks, and detailed leaflets and guides.

Economic value
The Mersey Forest has attracted £36million of new investment and been responsible for the development 150 new jobs. The Mersey Forest is an important part of the region's tourist industry, contributing towards approximately 30 million visits to the North West's woodlands and forests per year.

The Mersey Forest has helped towards regional image improvement by greening key transport routes; concentrating on land alongside main transport routes, particularly motorways. It is involved in tackling the substantial areas of neglected and derelict land for which forestry is the only realistic productive use, through reclaiming land and persuading private landowners to establish new woodland on neglected sites.

The Weaver Valley acts as a catalyst for the renaissance of the area's market towns and villages. The visitor economy will be enriched through individual towns developing their own distinctiveness. A study of the regeneration initiatives in Crewe, under taken by TEP, showed the potential for GI to realise the town's stated top priority need for image improvement linked with harnessing sustainable growth as a regional town and gateway.

The development of The Mersey Forest project has enhanced forest industries and stimulated the markets for local timber. The Forest is also providing training in forestry skills, rural crafts and land management to help stimulate local forest industries and prepare the workforce for new opportunities.

Education
The Mersey Forest provides an outdoor classroom and education centre to deliver programmes that build on the curiosity and energy of young people. A recent survey of teachers working with The Mersey Forest to improve school grounds found that improved pupils' behaviour; reduced accidents and conflicts within the playground, improved image of the school and reduced staff stress levels.

The role of the landscape practitioner
As part of the Weaver Valley Initiative, landscape architects have been involved since its beginning as staff of the delivery organisations and through GI projects, research and masterplanning projects delivered via consultants. The programme manager and two other team members are landscape architects. Landscape design and implementation has involved landscape architects from Cheshire County Council, Crewe and Nantwich Borough Council and practices TEP and Steve Ryder Associates. Other professionals involved have included engineers, planners, tourism experts, heritage and culture specialists, economists and ecologists.

The Mersey Forest has a landscape architect as the chair of its board and has employed landscape architects, landscape planners and landscape managers in key roles in delivery projects. Practices that have undertaken consultancy work for The Mersey Forest have included Cass, TEP, Gillespies, Land Use Consultants, Chris Blandford Associates, Casella Stanger and Randall Thorp.

Policy and funding
There is policy coverage in the North West, which cascades GI into different development levels, beyond that required from national guidance and law. The North West of England Plan – Regional Spatial Strategy (RSS) to 2021 provides for GI and the Regional Economic Strategy (RES) calls for better alignment of environmental activities and economic gain, aligning GI in mitigating negative social and environmental impacts. The emerging Regional Strategy (RS2010) will integrate economic and spatial strategies. The indications in the consultation draft are that GI will be included in a meaningful way. The Natural Economy North West (NENW) report 'Developing an outline strategy for linking grey and green infrastructure' (NENW 2008) provides a policy overview of the development of both GI and more conventional infrastructure. The North West Green Infrastructure Guide provides the regional perspective on GI's component parts, how it can be represented spatially, and steps required for sound GI planning. This also made a valuable contribution to the developing concept of GI and links it to the region's climate change action plan. Research in 2007, 'The Economic Value of Green Infrastructure', provides strong grounds for GI adding value to the North West's economy. The need to integrate green GI at the sub-regional level with sub-regional action plans (SRAPs) is acknowledged. The Mersey Forest, on behalf of NENW, has commissioned consultants to prepare a guide to planning GI at the sub-regional level. This will be published in 2009. Meanwhile all sub-regions in the North West are progressing GI strategies.

Further information

www.merseyforest.og.uk

www.weavervalley.org.uk

www.naturaleconomynorthwest.com

www.greeninfrastructurenw.co.uk

Paul Nolan, Director of The Mersey Forest and Chair of the North West Green Infrastructure Steering Group

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Case Study 2:
Crewe Business Park

Introduction
Crewe Business Park in South Cheshire is a joint venture between Crewe and Nantwich Borough Council and the former Cheshire County Council (A new unitary authority, Cheshire East is the local authority responsible for this area from 1 April 2009). It is located close to the M6 motorway, Crewe mainline train station, Manchester Airport and 1½ hours from London by train.

The objectives of the business park are to create employment, to obtain capital receipts from the disposal of the plots, to maintain a high quality office environment, to raise the profile of the area, to be a catalyst for inward investment, to deliver an innovative concept and to provide value for money. Planning the landscape structure to sustain wildlife, creating an attractive setting and investing in links with the local community was seen as fundamental to achieving these objectives

The park's inception was over 20 years ago and the approach, which is a true exemplar of multifunctional GI, was radical for its time and has been proven a success. The objectives set out above have been achieved. The park is well-managed through the service charge, which results in high standards and quality being maintained. Public access and use for education purposes is encouraged.

Green infrastructure assets
The layout of the park was designed to follow natural contours and features, such as water courses, original trees and hedgerows and areas of ecological importance. The shape and orientation of buildings were designed to blend with the existing landscape. Landscape management was planned and vacant plots and park fringes laid to wildflower meadow to provide wildlife habitat. Traditional management methods such as willow spiling to the banks of the stream, pollarding and hedge laying were used.

Natural features on the site include the Valley Brook, a sandy stream which flows through the park and is lined by crack willow, alder and oak trees, were retained. The site is also noteworthy for its species-rich grassland, which is integrated into the park wherever possible. Hedgerows, valuable as bird-nesting sites, and wildlife corridors, are another vital element in the development. The many hedgerows on the park were retained as linear woodland belts in conjunction with new planting of thousands of native trees and shrubs. An 'ancient' hedge and ditch, which had separated two parishes historically, that links the Quakers' Coppice to a water body was preserved within the layout.

Quakers' Coppice, immediately adjacent to the business park, is a 9 hectare woodland, designated as a site of biological interest (SBI) because of its value to ground-nesting birds, native bluebells and two UK biodiversity priority habitats; broadleaved woodland and wet woodland. It has 8 ponds and is publicly accessible. Preparations are being made to gain local nature reserve (LNR) status.

Ponds in the business park provide habitats for protected species and some have been developed to give pond-dipping opportunities for education purposes. There are footpath routes through and round the business park, providing pedestrian through-routes and opportunities for walking and exercising. A green transport plan is still to be developed.

Developers of the individual plots are encouraged to include rainwater collection from building roofs to nearby ponds and to plant native species and include water bodies in the individual building landscape treatments.

Connectivity
The Crewe Business Park GI comprises natural and enhanced ecosystems that provide connectivity. These include Valley Brook, which forms the northern boundary of the business park and includes many mature trees and hedgerows, the ancient hedgerow and ditch, other ditches, reed beds and pond systems, the wildflower meadows that were created on vacant plots and on the fringe of the business park. Habitats were retained and created to ensure linkages with the adjacent Quakers' Coppice were maintained.

The business park provides a series of interconnected paths through and round the site. Pedestrian connections which have no cycling restrictions, are made with the adjacent university halls of residence, a health club, the main

gate to the university and to Quakers' Coppice, from which there are further footpath connections south past an older industrial estate and to open countryside. Access improvements including a new footbridge and self-closing gate, which help wheelchair users and prams gain access to the site, have been undertaken recently. A circular route has been created to discourage random trampling in areas of ground-nesting birds, way markers, interpretation board and tactile signage has been added and the bird-hide has been refurbished.

Economic value

The business park has generated over £4.5 million in capital receipts and created over 2,800 jobs. Companies on the site include Fujitsu, DEFRA, Health Shield, Focus DIY, Wulvern Housing, Air Products, Red Eye International and Kids Unlimited.

It offers a high quality office environment, which is the reason for some businesses choosing to locate here. One high-tech occupier said they had chosen to move to Crewe Business Park because they needed to present a good image to visitors from affluent countries such as America, Japan, and Germany as well as the unique ecological policy being appropriate for its business. The Park has received local and national recognition and has been the catalyst for spin off developments nearby such as Manchester Metropolitan University South Cheshire Faculty.

Crewe's ecological policy and the development of the business park has been successful in attracting companies to locate to the business park, and therefore the economic value to be gained from investment in GI can be demonstrated. One business, a precision components firm, cited the quality of the environment as a primary reason for locating its European headquarters at Crewe.

Climate change adaptation and mitigation

The wildlife corridors retained and created are important for species migration. The site incorporates water bodies, some of which are used for drainage purposes and developers are encouraged to collect rainwater from the buildings into the natural systems. A comprehensive sustainable urban drainage system (SUDs) was not part of the original design, as the scheme pre-dates more sustainable approaches to drainage. However, adjacent developments have incorporated SUDs.

In the era of the site's planning, over 20 years ago, there was less importance attributed to the need to plan for more sustainable approaches to travel and energy production. Access to the site by car is still high and a green transport plan is to be developed.

Biodiversity enhancement

Landscape planning from the outset was designed with biodiversity enhancement in mind. The design of both the structural GI and that of the individual plots aims to enhance species diversity and to ensure habitats are retained for rarities such as protected invertebrates. The management, through Cheshire County rangers' excels in combining nature conservation and its inherent biodiversity preservation with education.

Recreation, health and wellbeing

From first opening, the site has been popular with walkers and with office workers for lunchtime exercise. Healthy living walks are organised through the site. The site provides an off-road link from Manchester Metropolitan University (MMU) halls of residence, built more recently on the adjacent site with the main university entrance and the town centre.

Stronger communities

Whilst attracting large blue chip companies to the area, the management also aimed to maintain links with the local community. The public are welcome to enjoy the open spaces and country walks around the business park, even though it is designated as private land. Local school visits and pond-dipping events are organised by the countryside rangers, the local agricultural college students designed one of the roundabouts as a competition and a local school has its own wild flower garden. The on-site security personnel have become interested and involved in the nature conservation aspects and on-site species surveys. Interpretation is provided throughout the natural areas.

Role of the landscape practitioner

The borough landscape architect was involved in the initial planning of the site, working as part of a multi-disciplinary team including engineers, planners, estates surveyors and basing site layout requirements on ecological surveys provided by the, then, Cheshire Conservation Trust. Landscape management was considered from the outset and throughout the Park's development regular meetings have taken place involving the two authorities with representatives from estates, rangers and a landscape architect, where the wildlife and management issues have been discussed and agreed. The GI for all phases was worked up in a masterplan that was implemented incrementally.

The borough landscape architect designed and supervised the implementation of all aspects of the landscape in the 'greenway' area, which consisted of all the structural, off-plot landscape works. The borough landscape architect with responsibility for development control has also had a role in pre-application discussions with any new companies wanting to locate on the business park with regard to the plot-specific landscape — encouraging native planting and water bodies.

Policy and funding

The costs of the infrastructure and proceeds from disposals were shared on a 50/50 basis between the two authorities. The capital input to include the land element and infrastructure has amounted to around £1.75million. Both authorities pooled their joint land resources and additional farmland was purchased.

The purpose behind Crewe Business Park was to provide B1 (office) employment within the borough, at the same time realising capital receipts from the disposal of the plots on a long lease (125 year) basis with the payment of a service charge by the occupiers to manage and maintain the business park.

The Park was designed to move Crewe forwards in response to the economic shift from heavy industry to high technology and service sectors. The landscape was planned to sustain wildlife habitats whilst creating opportunities to improve the well being of the borough.

Future Plans

The local authorities invested in a successful international marketing campaign to attract occupiers as the low density, high-tech end use made sites more expensive per square meter than some others in the area. The local authorities have continued to ensure the management, maintenance and monitoring is on going for the business park. Funding applications have been submitted and council funding provided for works that will improve habitats and accessibility to the adjacent Quakers' Coppice, marking its key contribution to the Valley Brook corridor and is part of a wider network of open spaces in a town that is disadvantaged in terms of access to natural places.

Further information

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Case Study 3: Ingrebourne Hill, London

Introduction
Ingrebourne Hill is a 56 hectare site located in the London Borough of Havering, adjacent to the Ingrebourne River, Hornchurch Country Park and the communities of South Hornchurch and Rainham. In the 1950s Ingrebourne Hill changed from being a farm to a gravel extraction site until the 1960s when it was used as a landfill. Through the 1970s and 1980s the landfill site was also intermittently used by travellers for grazing their animals. In the late 1990's the Civil Engineering firm CJ Pryor set up Ingrebourne Valley Limited (IVL) to acquire the land. IVL received planning permission to carry out a second restoration of the site by adding inert material over the existing waste and finishing the ground to create a public greenspace. As a result of the added material, the landform is distinctly higher than its surroundings and consequently offers commanding views over the Thames to the south, as well as along the Ingrebourne River. Much of the marsh land surrounding the adjacent Ingrebourne River is waterlogged, presenting the site with specific habitat opportunities in addition to some drainage issues. The elevation drops to the site's southern boundary where there is a large pond.

The Forestry Commission (FC), through the Thames Chase Community Forest, became involved in the project to turn the site into a community greenspace for increased public benefit and entered into negotiations over the long-term use and management of the site as part of the Thames Chase Community Forest. The final agreement is an innovative public/private partnership between IVL and the FC. The FC and its partners delivered Phase1 (24 hectares) of this project in 2003. In 2006 Communities and Local Government's, Thames Gateway Delivery Unit offered £1million of funding to develop additional GI on the site over and above the requirements set by the planning conditions. The project aim was to restore a brownfield site to create suitable new habitats adjacent to the Ingrebourne Valley Local Nature Reserve (SSSI) and develop recreational infrastructure to consolidate existing GI at the adjacent Hornchurch Country Park.

Green infrastructure assets
The GI assets at Ingrebourne Hill include meadow and grassland areas, hedgerows, a range of tree planting areas (high forest, low forest and shrubs), screen and security planting for nearby homes and a large pond providing additional wetland habitat adjacent to the Ingrebourne Valley SSSI.

Multifunctional land use
Ingrebourne Hill is a green space with a good balance between wildlife habitats and community space. Public access is actively encouraged and ranges from walkers and cyclists to horse riders. The provision of a mountain bike trail has also helped to engage teenage groups.

The provision of hard and soft paths helps to provide access throughout the site. The site design incorporates elements of zoning to help separate the conflicting interests of different user groups, for example excluding people on foot from the mountain bike area, or horses from the majority of hard paths.

The high level of public access and recreation is carefully dovetailed into the environmental and ecological requirements. Areas that are less accessible due to establishing trees offer good habitats where there is reduced disturbance.

Connectivity
Ingrebourne Hill is located within the Ingrebourne Valley, the most significant geographical feature in Havering, extending 15km between Harold Hill in the north to the River Thames. The site provides a section of the London Loop long distance footpath that runs along the edge of the Ingrebourne River almost along its full course.

Ingrebourne Hill forms part of the East London Green Grid (ELGG), as identified in Part 3 of the Areas Framework for Thames Chase, Beam and Ingrebourne. Ingrebourne Hill fulfills specific Green Grid objectives through improvement of an existing site for local benefit and use as well as enhancing local connectivity. The site is one of the 42 sites that form the Thames Chase Community Forest, which covers 40 square miles of green belt land around East London and South West Essex. Within the Community Forest the FC has established and manages 10 sites covering approximately 532 hectares. Ingrebourne Hill offers a direct connection into Hornchurch Country

Park to the north where there are links to further Community Forests sites such as Berwich Glades and Woods. There is continuing development in this area to regenerate more brownfield sites that will further enhance local connectivity.

The Thames Gateway falls just to the south of Ingrebourne Hill. However, there is direct connection through foot and cycle access and local bus services. The provision of car parking on site enables access to and from the Gateway. Pathways have been developed linking the site to surrounding residential communities and 3km of grass horse trails connect to surrounding bridleways. 2.1km of cycle trails connect to the surrounding communities, including shops and places of employment.

Benefits

Climate change adaptation and mitigation

Combined with the other Thames Chase sites, woodlands created in the community forests over the last ten years to the east of London will make a contribution to carbon fixation. The scheme also ameliorates the anticipated impact of climate change especially in regards to liveability on a personal level as it provides local communities with a cool, pleasant place to relax as the trees establish.

Water management

Water management has been enhanced through drainage schemes and the on-site lake, designed to alleviate flooding to neighbouring properties and roads. Grass and tree establishment will increase precipitation infiltration into the soil, reduce rainwater run-off rates and thereby lower the risk of local flooding.

Biodiversity enhancement, corridors and linkages

Ingrebourne hill provides habitat connectivity along the Ingrebourne Valley SSSI at a landscape scale. It also secures additional habitats suitable for great crested newt, water vole, grass snakes, other reptiles and invertebrates. Skylark is also now regularly found throughout the year on the open grassland habitats. The site also acts as a robust buffer between the existing surrounding built environments and the Ingrebourne Valley SSSI, as well as suitably located vantage points for users to enjoy the SSSI from a distance, minimizing disturbance.

Recreation, health and wellbeing

The scheme provides GI to approximately 12,500 people directly adjacent to the neighbouring community of South Hornchurch and approximately 134,000 people within a 4km catchment. This provides opportunities for exercise through walking and cycling routes connecting surrounding communities and places of work. Recent research demonstrated that over 90% of visitors came to the site to exercise, encouraged by:

— 4.1km of stone footpath trails, of which 0.9km are suitable for all abilities in addition to open access throughout the grass areas of the site;
— Rights of Way Improvement Plans and links to open access areas;
— provision of picnic spots and rest points;
— a variety of natural play elements as well as more formal play structures; and
— a community events space.

Economic value

Ingrebourne Hill Contributes to existing tourism by providing new attractions and links between them. Additional tipping of inert fill to create landform over landfill both created jobs and boosted business income, as well as modelled best practice in restoration procedure. This in turn gave confidence to the local planning authority that landfill restoration to a high standard is achievable and financially viable.

Stronger communities

The creation of a permanent green space has ended the inconvenience of living next to a quarry and landfill site. This has given reassurance to local people that future development is highly unlikely.

General fly-tipping and vandalism have reduced, mostly due to the 'self-policing' that comes with increased local community use. The site provides a focal point for meeting and engaging with other local residents. Recent research demonstrates that 77% of visitors live within 2 miles of the site, and a further 20% within 6 miles

Role of the landscape practitioner

At the planning phase, FC landscape architects were involved in options-testing for drainage, public access,

woodland design, recreation and habitat creation. Working with cultural heritage advisors, ecologists and soil scientists, the landscape architects developed the masterplan and created visual presentations to secure funding of £1million. They were also responsible for final submission of the planning application.

At the design phase, landscape architects worked with a range of specialist consultants, designers and community workers to develop artwork and interpretation for the site, recreation designs and the Forest Design Plan. At implementation, landscape architects worked with FC civil engineers to develop contract documentation for tendering. Also, in collaboration with civil engineers and contractors, landscape architects were responsible for the installation of site entrances, trail layouts and furniture and signage locations. The issue of ongoing management of the site involved landscape architects working with foresters to develop site management plans which are designed to ensure that the objectives of the project continue to be delivered.

Policy and funding

The development of the Forest is driven in part by the Thames Chase Plan. This provides national & local contexts as well as policy frameworks, and a forest strategy. The plan is a non-statutory document that draws its strength from the statutory plans that it embraces and complements.

Ingrebourne Hill has also been developed in the context of the ELGG initiative. This initiative complements the aims and objectives of the Thames Chase Community Forest. Ingrebourne Hill falls under part 3.2 'Ingrebourne Valley and Quarry Landscapes' of the ELGG area framework and was identified as a phase 1 project. Ingrebourne fulfills the ELGG aims by helping to provide connectivity to surrounding sites within the Community Forest and also enhances the quality of the existing space for local communities.

The development of Ingrebourne Hill meets key objectives within the strategy and delivery plan for England's Trees, Woods and Forest (ETWF), in particular relating to aim 4 'Quality of Life'. It also delivers outputs identified within key national and regional strategies, such as Communities and Local Government's 'Transforming Places; Changing Lives, a framework for regeneration', and 'Regeneration and Sustainable Growth'.

Although Ingrebourne falls just outside the Thames Gateway area, Communities and Local Government awarded £1million of funding based on the benefits that this project would bring to local communities including those within the Gateway.

As with a number of other GI initiatives of this kind, there is no revenue funding for the maintenance and management of Ingrebourne Hill. This will have to be funded from existing FC budgets. The cost is estimated at around £1,000 per hectare per year; approximately £56,000 per year for Ingrebourne Hill. In some instances this funding difficulty is impacting on the organisation's ability to contribute to future GI projects.

Future plans

The FC now has a 99 year management agreement with the site owner, with land being handed over in three phases after restoration. Phase one (24 hectares) was completed in 2003, phase 2 (21 hectares) completed in 2008 with the final phase (11 hectares) due for completion in 2010-2011.

It is likely that further brownfield sites to the north of Ingrebourne Hill will at a later date be restored to provide access to additional GI along the Ingrebourne Valley area. The London Borough of Havering has expressed an aspiration in the future to develop a bridge across the Ingrebourne River to allow residents from Rainham to access the site from the southeast.

Community events will continue to promote the site, engage local schools to use the area as a green classroom and encourage self-led events and activities. Maintenance will continue under the management of the Forestry Commission Thames Chase office to benefit the community and wildlife while at the same time continuing to develop the site as funding opportunities occur.

Further information

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Case Study 4: The River Ray Corridor, Swindon

Introduction
The River Ray Corridor is a strategically important network in the North West of Swindon. The River Ray as the nucleus of a 'Circular Water-side Park Belt' was initially identified in Planning for Swindon, a report prepared for the Post War Planning sub committee in 1945. In 1968 the valley of the River Ray was described as 'a major landscape penetration to the town centre' linking it 'intimately with the Thames Valley and its present and potential regional facilities'. There was recognised potential to integrate this major open space feature with the open space network of the existing town, the Hreod Burna Parkway by way of Moulden Hill and Rodbourne Green. Although the vision of the River Ray Corridor as an outdoor aquatic park was never realised, 40 years on it connects urban Swindon to its rural fringes and settlements through four major open spaces and linear links. The network is a good example of creating and developing GI through partnership working, multiple funding streams, community involvement and ownership. It also illustrates very well how such networks develop over time.

Identification of the green infrastructure assets
The River Ray Corridor consists of a range of GI assets. These include Purton Woods, owned by the Woodland Trust, planted 10 years ago on agricultural land. 'The Tree for All' programme saw the planting of over 6,000 trees in 2005 on the site. It also includes Rivermead, a wildlife-rich open space incidental with the development of Rivermead industrial estate. Mouldon Hill Country Park is a new and developing asset with links to the North Wiltshire Canal and Swindon to Cricklade Steam Railway, serving the North West of the town. Finally, Shaw Forest Park, a former landfill site, has been transformed into Swindon's only urban forest. The Park is a flagship for the Great Western Community Forest.

Assets providing connectivity
Within the River Ray Corridor, connectivity has been enhanced via a number of GI assets, including the River Ray Parkway, an off-road greenway for walkers and cyclists. Sustrans Route 45 follows the River Ray Parkway and links Swindon to the National Cycle Network. The Thames Water Lagoon Nature Reserve is designated as a County Wildlife Site and connects with the River Ray itself.

Benefits

Climate change adaptation and mitigation
The connectivity between the GI assets as demonstrated in the River Ray Corridor will allow for species migration in the face of a changing climate. Approximately 90,000 new trees have been planted at Purton Woods and Shaw Forest Park alone. The development of the River Ray Parkway as well as Sustrans Route 45 will encourage more sustainable forms of transport such as walking and cycling.

Water management
Recently, a reed bed system to filter surface water containing low level contaminants running off Shaw forest Park has been designed for Swindon Borough Council by The Wild Fowl Trust at Slimbridge Construction started in March 2009.

Biodiversity enhancement, corridors and linkages
The Corridor, particularly around Shaw Forest Park and the Thames Water Lagoon is now a noted stronghold for several protected and threatened species including otters and wetland birds such as the snipe, greenshank, reed bunting and a new population of little egrets. As such, County Wildlife Site designations in the area are to be extended to include new sites.

Recreation and health
Sustrans volunteers and BTCV have been involved in upgrading and maintaining Route 45 and working with the Great Western Community Forest to establish a walking trail, sponsored by Timberland UK and the Primary Care Trust, connecting Swindon to Purton. This work in itself can contribute towards the health

and wellbeing of local volunteers, in addition to the subsequent opportunities for health and recreation that this work delivers. The links between Swindon itself and the GI assets of the River Ray Corridor have reconnected local communities with natural environments.

Economic values
The project has also supported the development of sustainable economic opportunities, such as local farm shops, agri-environment schemes and organic farming.

Education
Field work using the site is now embedded within mainstream educational activities at Nova Hreod School, a secondary school where the Forest Schools programme have been successfully targeted at children.

Stronger communities
Many thousands of people have been actively involved over the past decade or so in practical landscape and habitat enhancement works across the area. Several local community-based groups are now self-sustaining and continue to take an active role in the management of several of the sites including the coppice woodland management group at Peatmoor, and community wardens at Rivermead. The Wiltshire Wildlife Trust's 'Active Too' programme, part based in the area, has recently received a Goldstar award from the Cabinet Office as an exemplar of volunteer involvement for people at risk of social exclusion. In the case of 'Active Too' this involved people with long term disabilities and those with few or no qualifications.

Role of the landscape practitioner
Currently the borough's landscape architects are working in close collaboration with The Forward Planning Section on the delivery of the GI strategy and will be writing the GI supplementary planning document (SPD) which forms part of the Core Strategy.

Recently landscape architects have been involved in designing many of the components of the River Ray Parkway in particular the Borough Council's landscape architects have been and continue to be involved in the masterplanning and detailed design and delivery of Mouldon Hill Country Park and Shaw Forest Park. The River Ray restoration was lead by the Wiltshire Wildlife Trust in liaison with Swindon Borough Council landscape architects, the Environment Agency, Thames Water and local communities and volunteers. The Environment Agency's consultant landscape architect Anthony Stiff Associates designed and administered the project. W S Atkins provided specialist hydrological design.

At implementation landscape architects have written specifications and administered contracts for the River Ray Restoration, Mouldon Hill and Shaw Forest Park. Landscape architects have also been involved in writing management and maintenance plans for those parts of the site within Swindon Borough Council's ownership that will pass to the Parks Section. Other professions involved in the planning, design, implementation, management and maintenance of the GI process include hydrological and civil engineers.

Policy and funding
The River Ray Corridor responds to a number of national planning policies, notably PPS9: Biodiversity and Geological Conservation in addition to PPG17: Planning for Open Space, Sport and Recreation. The project has not been funded as an entity, however the sources of funding are diverse and include England's Rural Development Programme, Woodland Grant Scheme, Countryside Agency Programme (Timberland Trail), developer contributions via s106 of the Town and Country Planning Act, community based grants, the charitable sector, Tipping Income and capital funding from local Councils.

Further information

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Case Study 5: Royal Parks Management and Operations Plans

Introduction
The 2,000 hectares of historic parkland that constitute London's eight Royal Parks are among London's most well known green spaces, providing recreation for millions of people each year. The Royal Parks are a good example of GI in action, with benefits including:

- health and wellbeing through, for example, sports, walking, cycling and recreation;
- tourism and economic value, with restaurants and cafes;
- formal recreation, community activities and events such as concerts and shows;
- important site for ecology and biodiversity;
- water management;
- heritage preservation;
- play;
- climate change adaptation and mitigation; and
- amenity value for the whole community.

The Royal Parks are owned by the Sovereign and managed by The Royal Parks, an executive agency of the Department for Culture, Media and Sport. They have a balanced and holistic approach to their management and operations which considers the various demands they face. This approach provides a mechanism which conserves and enhances the varied character of each Royal Park. The Royal Parks is funded by central government with a requirement to generate additional income. This is done through licences to cafes, sports and recreation businesses, and additional events.

The Royal Parks' landscape development and design manager has built on work previously undertaken by Land Use Consultants and developed management and operations plans. These plans are produced for each of the Royal Parks and are developed to meet local character and needs.

Management Plans
Each management plan includes:

- summary background to the Park, including a description of wider environment and strategic framework;
- a short description of the Park, identifying the main management issues;
- a vision for the Park;
- objectives and actions which are intended to achieve the vision, some applying to the entire Park, others to specific areas within the Park; and
- implementation summary, including monitoring systems.

Operations Plans
The Operations Plan contains the annual Action Plan for the Park and records progress made in the previous year. The format was developed in 2005 and uses the Green Flag Award Criteria. The Plan contains information from the Management Plan, The Royal Parks' Corporate Plan and other Royal Parks' documents.

A key feature of the plans is the annual visitor survey which has been conducted for each of the parks since 1994. The surveys ask visitors about their satisfaction with the park environment, facilities provision, information and staff. This information is converted into key performance indicators which allow The Royal Parks to compare the quality of the visitor experience year-on-year and to identify 'Action Areas' for improvement. This means that The Royal Parks can, as far as possible, follow a 'demand-led' approach to funding which provides evidence for funding requests and ensures that investment is made in appropriate areas of the park maintenance and management programme. For example, cycling provision and facilities have been improved as a result of public demand, encouraging visitors to cycle to the parks rather than drive.

Further information
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The policy section of the Landscape Institute's website is regularly updated with news and information on GI.
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