Green Infrastructure

An integrated approach to land use

Landscape Institute Position Statement

Landscape Institute
Inspiring great places

Foreword

In 2009 when the Landscape Institute first launched its Position Statement on green infrastructure (GI), the concept of GI was not commonly understood, and had relatively little public status. In the four short years since then the collective knowledge and understanding has grown exponentially, and the concept has become pervasive at all levels of government, throughout the private sector, and with the public. It is now endorsed and promoted at all levels by a wide range of organisations, each promoting its benefits from their own perspective.

With such support, why therefore does the Landscape Institute need to revisit the subject? The problems we face now are quite different; then we needed to address a lack of understanding and acceptance across a broad front, whereas now we face greater social, environmental and economic issues. The need is to demonstrate the contribution that GI can make towards solving those problems, using the tools of planning policy and economic value in a world that requires facts and numbers to support what should be seen as common sense. Business, land owners and the environment need each other more than ever, and can gain most for us all when planned, designed, built and managed for their mutual benefit.

This new Position Statement clearly shows how the landscape profession can lead this process by approaching spatial planning through the integrated use of GI in a way that will deliver the solutions that today's society needs.

Sue Illman, President, Landscape Institute

Great Fen Landscape
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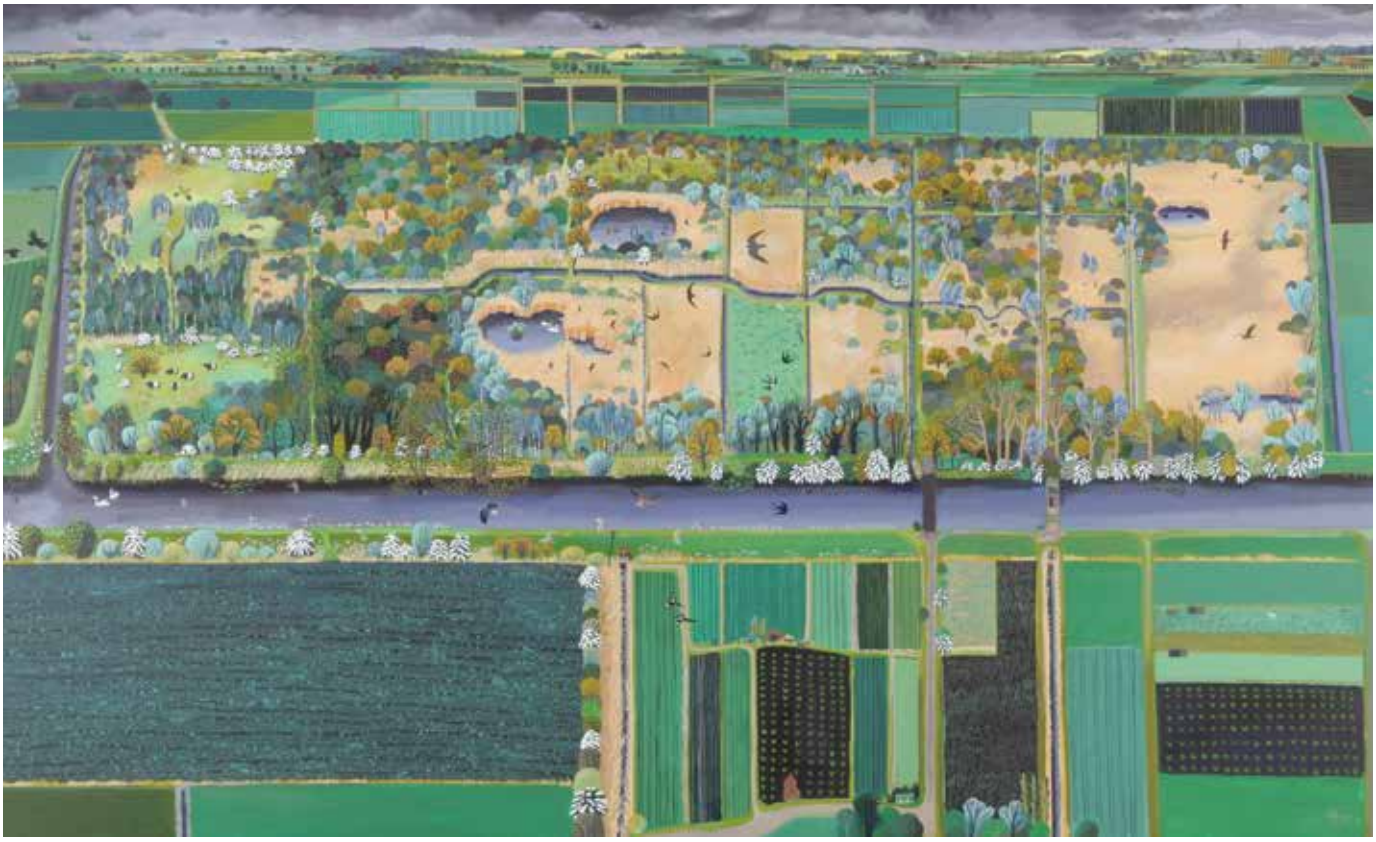


It has never been more necessary to invest in green infrastructure

The role of green infrastructure (GI) in addressing the challenges of the 21st century cannot be underestimated. We define GI as the network of natural and semi-natural features, green spaces, rivers and lakes that intersperse and connect villages, towns and cities. It is a natural, service-providing infrastructure that is often more cost-effective, more resilient and more capable of meeting social, environmental and economic objectives than 'grey' infrastructure.

We have seen a groundswell of support for GI since the publication of our 2009 Position Statement. As the projects in this publication demonstrate, landscape professionals are seeing among their clients a growing appetite for GI. Furthermore, there is increasing policy support for it, for example in the government's National Planning Policy Framework and Natural Environment White Paper, the second National Planning Framework in Scotland and Planning Policy Wales. The National Ecosystem Assessment has provided an evidence base for the multiple benefits that GI can deliver and our 2011 Local Green Infrastructure publication, which was designed to help communities make the most of their landscape, has proved hugely popular and influential.

Increasing recognition, however, needs to be matched with funding, and an approach to landscape that enables GI to flourish. In 2009, we advocated the use of GI in tackling a range of critical issues – from public health and wellbeing to social cohesion, food and energy security, carbon sequestration and climate-change mitigation and adaptation. These issues are now more acute than ever and a GI approach to the planning, design and management of our limited land resource is crucial.

This new edition of the Position Statement is an opportunity to showcase a range of successful strategic GI work and completed projects. The aim is to give public and private sector bodies, clients and natural and built environment professionals fresh insights into the benefits GI can bring by creating multifunctional landscapes and show how people can collaborate to deliver it. It is also a chance to take stock of significant planning reform across the UK. The radical shift from regional planning to the localism agenda in England, and the loss of topic-based planning-policy statements in favour of single, overarching guidance, has changed the context for GI delivery.

The landscape profession, with its proven track record of delivering GI at multiple scales, is ideally suited to lead on this. But delivering the next generation of GI requires a wider understanding of the GI approach, stronger policy support, a willingness to invest and more collaboration. This Position Statement acknowledges these challenges and, on page 17, sets out six recommendations for how to overcome them.

So what are we recommending? We want local authorities to ensure that GI is a core requirement in their policy documents, such as development plans and development briefs. By its nature, GI often crosses administrative and operational boundaries, and we believe that this should be addressed through joint-working between national bodies and local authorities. It is also important that GI is strongly embedded in plans that lead to future funding opportunities; for example, Infrastructure Delivery Plans in England, which set out an area's need for future funding through the Community Infrastructure Levy.

We recommend that developers be aware of an area's strategic GI goals and appreciate how those goals contribute to mitigating the environmental impacts of new development and creating beautiful places. We urge clients to champion GI that is part of a shared vision and that is planned, delivered and managed effectively from the start. And we encourage landowners to think creatively about how to generate capital and revenue to ensure that GI is well funded for ongoing management and maintenance.

The challenges we face today are too often approached as separate issues. There is insufficient consideration given to the complex interactions between, for example, housing, flood management, food growing and biodiversity. This approach prevents us from adopting more dynamic, integrated and forward-thinking solutions. GI offers an alternative to this narrow-minded approach – a way not only of tackling specific challenges head on, but of realising multiple secondary benefits at the same time. It is this integrated approach that will unlock the potential of our landscape.

The work of Allen Scott Landscape Architects at Woodberry Wetlands will bring 21 hectares, in the middle of one of the densest areas of London, into public use and protect special wildfowl habitats. *London Wildlife Trust*

The landscape profession is leading on green infrastructure

Landscape professionals are trained to take a holistic approach to the planning and design of development and to meet commercial and public objectives while delivering resilient landscapes. This makes them ideally placed to provide the vision, the technical expertise, the creative drive and pragmatism necessary to deliver a new generation of integrated GI. The projects in this publication demonstrate the many ways in which landscape professionals are already leading on GI

"People want to be reconnected with nature and they want to transform underused land to produce clean air and clean water, good micro-climates and good food. They recognise the urgent need to capture carbon and to create landscapes teeming with wildlife. At the same time, they want to be protected from flooding and they want access to land for health and wellbeing. The landscape profession is best placed to deliver these aspirations – it is what the profession is qualified to do."
Merrick Denton Thompson OBE, CMLI

"It is this integrated approach that will unlock the potential of our landscape"
Ian Phillips CMLI, MRTPI

Leadership
To be truly successful, GI needs to be part of a shared vision that permeates every level of the planning and design process, at every scale of development. Landscape professionals work with stakeholders to create a common vision for places that makes the best use of the land, using GI to provide for character and beauty as well as multifunctionality.

Planning
Landscape professionals assess GI assets and propose interventions in line with policy commitments and delivery strategies to enable GI to meet existing and future challenges. Including integrated GI principles as part of a development project helps to align a planning application with community expectations and wider economic, social and environmental benefits. Investing in GI now can also prevent unexpected expenditure in the future.

Design
Good design, at any scale, will achieve a balance between functionality, durability and delight. Landscape professionals understand the natural and cultural elements that define an area's special character and can integrate these into practical, resilient and deliverable design proposals. This approach results in cost-effective and sustainable solutions to the many challenges associated with new development, including visual impact and the management of flood risk.

Implementation
Landscape professionals can make key contributions to reducing construction costs, making more efficient use of land and devising new income streams by applying a holistic approach to project planning, design and management and ensuring high standards of delivery against objectives.

Management
Genuinely sustainable development depends on appropriate long-term management and maintenance of the site's assets, including the GI. Landscape professionals address this from the start and are experienced in preparing management plans. But even where GI interventions have been introduced on existing sites, a long-term management plan, accompanied by maintenance schedules, will help to ensure that these interventions continue to be effective in the future.

Green infrastructure terminology explained

GI is the network of natural and semi-natural features, green spaces, rivers and lakes that intersperse 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, the assets and functions have the potential to deliver a wide range of benefits – from providing sustainable transport links to mitigating and adapting the effects of climate change

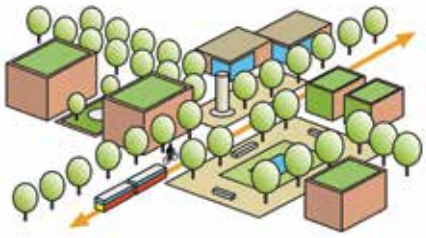
Green infrastructure assets

GI assets range from country parks, lakes and woodlands to urban interventions such as green roofs and street trees. They can be specific sites at the local level or broader environmental features at the landscape scale within and between rural and urban areas such as wetlands, moors and mountain ranges.

Green infrastructure functions

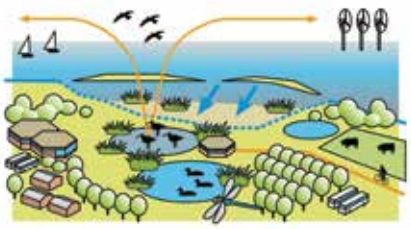
GI functions are the roles that assets can play if planned, designed and managed in a way that is sensitive to, and includes provision for, natural features and ecosystem services. They may have obvious primary functions, but each asset can perform different functions simultaneously – a concept known as multifunctionality. For example, street trees add aesthetic quality to an urban area, but will also reduce airborne pollution, provide shade, reduce urban heat island effects, mitigate wind chill and turbulence and increase biodiversity.

Ingrebourne Hill
Forestry Commission



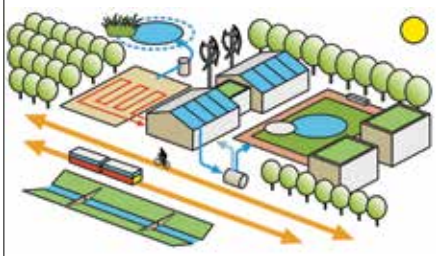
A Urban areas

Boulevards, plazas, green roofs and walls make attractive settings for shopping and leisure, improving the vibrancy of local economy. Street trees and green space make our settlements more liveable, provide cooling, shade and cleaner air, give us spaces for relaxation and healthy living, create distinctive places and deliver multiple economic benefits.



B Coastal zones

Managed coastal realignment reduces risk of flooding, provides potential sites for renewable energy and creates connected habitats for wildlife. Coastal areas provide opportunities for learning and leisure, and deliver economic benefits through the creation of distinctive places for tourism.

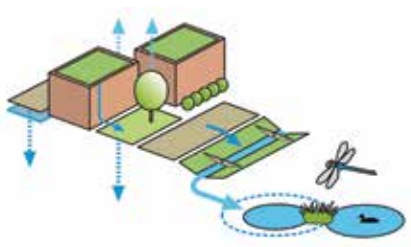


J Business park

Attractive settings encourage inward investment, incorporate sustainable transport, sustainable urban drainage, rainwater collection and waste-water cleansing. They create attractive and distinctive workplaces, contributing to a vibrant local economy, reducing flood risk and the impact of climate change, and creating space for nature.

I Suburban housing

Spaces for relaxation and healthy living encourage social interaction, neighbourhood events and food growing, building community cohesion and making settlements comfortable and liveable. These spaces also improve property values and reduce the effects of climate change through natural drainage, renewable energy use and building orientation that maximises solar gain and daylight.



H Sustainable drainage systems (SuDS)

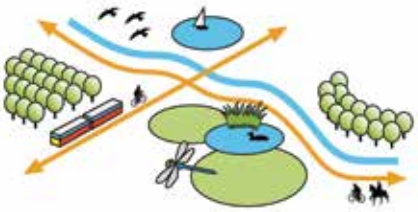
Attenuation ponds, swales and reed beds provide natural ways to reduce flood risk, provide temporary storage and improve water quality, while creating wetland habitats for wildlife in an attractive aquatic setting and additional potential for accessible leisure facilities.

C Upland areas

Agriculture, pasture, timber production and timber products including biomass for a local CHP plant and renewable power generation, all provide multiple economic benefits and contribute to reducing the impact of climate change. Areas set aside for extreme sports, relaxation and activities, contribute to a healthy lifestyle while protecting vulnerable wildlife habitats and retaining the essential natural character of the landscape.

D Community centre

Sustainable buildings with green roofs, geothermal heating and cooling, and rainwater collection, help reduce the impact of climate change and act as a neighbourhood hub. Associated green spaces caters for healthy-living activities including sports and opportunities for learning through connecting with nature and food growing, and employment in green space management.



E Main green spine

Trees, green spaces, river valleys and waterways, pedestrian and cycle routes, connect places, reflect local character, enable wildlife to flourish, offer sustainable transport routes and reduce the impact of climate change.

F Allotments, small holdings and orchards

These areas provide space to restore locally-sourced food production and to connect urban populations with the rural economy. They also offer opportunities to learn about and gain apprenticeships in gardening, vegetable and fruit growing, bee-keeping and horticulture, as well as providing for outdoor places and activities that help bring communities together and provide an active lifestyle.

G Country park

A range of accessible habitats and green spaces, which are managed for wildlife to flourish and people to enjoy, provide spaces for relaxation and active recreation. They also offer learning and employment opportunities through events, educational outreach and jobs as rangers and green-space managers.

Ecosystem services

Underpinning the multiple functions that GI assets perform is the concept of ecosystem services. Between 2009 and 2011, the UK National Ecosystem Assessment (UK NEA) analysed the natural environment in terms of the benefits it provides for society and economic prosperity. The UK NEA found that health, wellbeing and economic productivity depend on the range of services provided by ecosystems and their constituent parts, such as water, soil, nutrients and organisms. These services include: providing support necessary for all other ecosystem services, such as soil formation and photosynthesis; supplying food, fibre and fuel; regulating air quality and climate; controlling erosion; and non-material benefits for people, including aesthetic improvement and recreation.

According to the UK NEA, the benefits that inland wetlands bring to water quality are worth up to £1.5bn per year, while pollinators such as bees are worth £430m per year to the UK's agriculture. The amenity benefits of living close to rivers, coasts and other wetlands are worth up to £1.3bn per year.

Connectivity

Connectivity between different GI assets can help maximise the benefits that they generate. Well-connected GI assets create infrastructure that is adaptive and resilient to changes in climate, such as dramatic increases in rainfall. Physical connections make the most impact, often by creating ecological 'stepping stones' that encourage biodiversity migration and connect places with sustainable walking or cycling routes.

The green infrastructure approach

A GI approach to land-use planning, design and management enables us to demand and deliver more from the land in a sustainable way. By considering the widest range of functions an asset can perform simultaneously, GI can enhance the primary use of the land and unlock the greatest number of benefits. At its heart, the aim of GI is 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.

Whitehill and Bordon Eco-town

The Whitehill and Bordon Eco-town will embed a GI approach into proposals for a sustainable community in the heart of the Hampshire countryside. The South Downs National Park and the Wealden Heaths Special Protection Area are in the immediate vicinity, and the importance and sensitivity of these designated areas needs to be respected in developing the proposals.

With a long history as an army town, Whitehill and Bordon faces an uncertain future as a result of the Ministry of Defence's decision to leave. This is why sustainable regeneration is so crucial to the town, as it will kickstart the local economy. The local authorities and many local residents have shown support for the eco-town proposals, which will create 5,500 local jobs as well as 4,000 new homes and a new 30,000sqm town centre.

The regeneration proposals include 200ha of new open space, which will result in about 50 per cent of the town being allocated as GI. The eco-town vision sets challenging targets for carbon and water neutrality, a net increase in biodiversity and a substantial reduction in car use. GI is a key element in delivering these targets, as well as helping to attract new residents and high-quality employment to the town. The Green Infrastructure Strategy prepared by Halcrow, and the Green Infrastructure Management Framework prepared by GIDE Associates, informs the eco-town masterplan. The Enterprise M3 Local Enterprise Partnership has also recognised the role of GI in attracting new employers to the area.

Whitehill and Bordon Eco-town
Halcrow

The benefits of a green infrastructure approach

Forthquarter Park
Hyland Edgar Driver

A GI approach enables landscapes to deliver social, economic and environmental benefits simultaneously, and then looks at how those benefits can be multiplied by being connected to a wider network of spaces. This section demonstrates the benefits that GI can deliver, brought to life with examples of work undertaken by members of the Landscape Institute. A selection of nine projects is explored in more detail on pages 18–27

A former gas works site, Forthquarter Park lies 4km from Edinburgh city centre, with views across the Forth Estuary adjacent to the city's greenbelt. Hyland Edgar Driver created a multifunctional landscape that supports the urban environment and responds to issues of climate, drainage and ecology.

The main concept of the scheme has been to redirect the existing culverted water course through the park to create a wetland habitat and natural SuDS environment which includes natural treatment systems such as grass swales, wet grassland detention basins, constructed wetlands and storm water disposal systems. Major existing landscape elements within the site were sensitively integrated into the design and enhanced.

A cost-effective way to address essential infrastructure provision

Water management

According to Defra, an estimated 2.7 million properties in England and Wales lie in areas that are at risk of flooding. A GI approach to water management can reduce the number of properties at risk. Rather than taking space from water, it makes space for water and in doing so enhances biodiversity, recreation and local character.

Where impermeable paving and piped drainage used in 'grey' infrastructure increase flows into drainage systems and rivers, GI creates a simpler and cheaper system that is equivalent to natural percolation into the soil and groundwater. Healthy forests, woodlands, wetlands and floodplains also provide natural water storage and flood protection by slowing the passage of water to streams and reducing sedimentation.

In highly modified catchments, natural ground percolation in the system can be mimicked by artificially storing large volumes of water in the upper parts of a catchment or in urban green spaces. This GI approach also provides more resilience to droughts, as water is conserved on site where it will sustain vegetation rather than being removed.

Dealing with waste

Historically, waste has been placed in landfill sites, which have then been adapted for other GI functions, including wildlife habitats and leisure parks. Closed landfill sites are a legacy that could provide a much greater range of functions if their technical potential was more fully realised. GI assets can also deal with waste in a sustainable way. A good example of this is the use of reed beds, which remove pollutants from water.

At NATS Prestwick, landscape practice Terra Firma worked with the architect Crispin Wride on the design and construction of a new air-traffic-control facility on a former colliery. Working with sub-consultant Tim O'Hare Associates, Terra Firma successfully put together a strategy for the amelioration and re-use of soils on an area of former colliery waste, which avoided having to import large amounts of new materials for the 8ha planting design. The practice also designed and integrated swales and sustainable drainage systems as a key component of the site.

NATS Prestwick
Terra Firma

Cambridge Sustainable Drainage Design and Adoption Guide

The Cambridge Sustainable Drainage Design and Adoption Guide is a tool to help developers and consultants meet the requirements for sustainable urban drainage systems (SuDS) for public space in new developments. Created by landscape architects The Landscape Partnership, landscape-drainage consultants Robert Bray Associates and engineers the Environmental Protection Group for Cambridge City Council, the guide won the President's Award at the 2010 Landscape Institute Awards.

Water is an essential part of the Cambridge landscape, but with strains on historic systems and a need to prepare the city for the effects of climate change on water management, the council looked to SuDS for a solution. The award-winning guide promotes a GI approach, ensuring not only that SuDS reduce flood risk, but that they are easy to maintain and introduce appropriately designed water to the landscapes of new developments, bringing opportunities for biodiversity, leisure and education.

The guide explores in detail specific SuDS methods such as ponds and wetlands, retention and infiltration basins, swales and filter strips, filter drains, canals, rills and channel systems, as well as source-control methods for private householder SuDS.

Illustration of the SuDS train
Amanda Bainbridge, The Landscape Partnership

Funding for urban green infrastructure studies

As part of Transport for London's Clean Air Fund – a £5m package of innovative local measures to reduce particulate matter emissions and concentrations at identified hotspots in London – £1m was allocated for GI and testing green walls and screens. More than 600 large trees and a range of smaller trees and shrubs were planted along the Transport for London road network throughout 2011/2012. Tree species were selected according to the principle of 'right place, right tree'.

A 200m^2 green wall, designed to provide living cover in all seasons, was installed on the south-east facing walls at Edgware Road underground station, adjacent to Marylebone Road, in November 2011. A second 120m^2 green wall was created on the façade of the Mermaid Theatre building close to Upper Thames Street in July 2012.

Research to date has shown that selected shrubs and plants in the green wall at Edgware Road underground station have the ability to trap PM_{10}, but that ability varies with leaf characteristics. The results suggest that GI is best used as a supplementary measure to emissions reduction, but should be viewed in the context of the wider environmental benefits.

A green roof study carried out in Hong Kong by Urbis Limited revealed that the biggest benefits were in increasing the amount of useable green space, improving energy savings for buildings and reducing the urban heat island effect. To date, the study has helped the Hong Kong Special Administrative Region (HKSAR) government to formulate an internal strategy on the best way to implement green roofs in government buildings, as well as promote green roofs to private sector developers and the public. The study report is accessible through the HKSAR government's website and is listed as a key reference in all government building projects.

Edgware Road green wall
Transport for London

Hong Kong green roof study
Urbis Limited

Building resilience to climate change

Climate-change adaptation

Even modest increases in tree-canopy cover can significantly reduce the urban heat island effect through evapotranspiration and shading, as well as improve air quality, which often suffers because of higher temperatures, and lead to fewer deaths due to hot weather. Connected GI assets can create wildlife corridors to enable species movement and richer, more resilient biodiversity in the face of a changing climate. Green space designed as SuDS attenuate surface-water run-off and reduce the risk of flooding. Addressing and responding to the effects of climate change will increasingly require well-informed decisions on the design of structures, open space and planting choices.

Climate-change mitigation

Well-designed and managed GI can encourage people to travel in a more sustainable way, such as cycling and walking. In addition to acting as carbon sinks, trees and landform can reduce the energy used for heating and cooling buildings by shading them in summer. A GI approach to planning can also optimise the potential for efficient, decentralised, renewable energy, improving local energy security and providing space for ground-source heating, hydroelectric, biomass and wind power. Climate-change mitigation could also include planting trees to fix carbon in timber and then using this timber in construction or carbon-neutral heating schemes. See page 22 for how this approach has been included in the Great Fen masterplan.

Promoting economic growth and investment

Business benefits

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. High-quality, connected environments attract skilled and mobile workers that, in turn, encourage business investment – as demonstrated on page 21 by Crewe Business Park.

Can Business Improvement Districts (BIDs) offer a sustainable option for retrofitting urban green infrastructure?

A good example of businesses, local government and government agencies working together to deliver local business-led aspirations is the Greening for Growth project in London's Victoria Business Improvement District (BID). Victoria BID went live in April 2010 and set itself an ambitious programme to help boost the local economy, improve visitor experiences of the area and enrich the sense of place.

A GI audit for the BID area undertaken by Land Use Consultants identified a potential 1.25ha of new terrestrial GI, 1.7ha of enhancements to existing GI and suitable space for 25ha of green roofs. A significant environmental issue in the BID area is surface-water flooding, which has led to the temporary closures of Victoria Station and the underground in the past. But fitting 25ha of green roofs alone could deal with 80,000m^3 of rainwater each year. As a BID is valid for five years and all BID members make an annual contribution to the running of the programme, this model could provide a sustainable option for delivering urban GI in the longer term.

Victoria
Victoria BID

Local distinctiveness

GI assets that engage local communities and which relate to landscape character and heritage can enhance the local sense of place and foster community spirit. They can be a catalyst for regeneration and community ownership and can stimulate job opportunities by attracting investment and tourism.

Austin-Smith:Lord's masterplan and implementation for Parc Cybi, Holyhead AONB, which achieved the highest CEEQUAL (Civil Engineering Environmental Quality Assessment) assessment score awarded to date for sustainability, is an example of how to achieve local distinctiveness while building flexibility into the site for the future.

The masterplan provided a framework to support future economic and social sustainability while protecting the site's unique ecology and respecting its archaeology and cultural heritage. Austin-Smith:Lord also contributed to the design guide, which details specific approaches and performance benchmarks to achieve the Welsh Assembly Government's policy objective of 'zero carbon' developments from 2011.

Parc Cybi
Austin-Smith:Lord

Health benefits

Recreation and health

Ensuring that GI assets respond to the needs of local communities, are provided in close proximity to people's homes and are then well maintained is critical if they are to have a positive role in public health and wellbeing. One important role is in reducing health inequalities. According to Defra, people in deprived areas are six times less likely than those in affluent ones to describe their area as 'green'. A GI approach can help to lower stress levels and encourage exercise by providing local, safe and inspiring places for recreation. See how this approach has been included in the Royal Parks Management and Operational Plans on page 23.

At Redlees Quarry Park, TGP Landscape Architects revitalised space formerly on the derelict land register at Glasgow's urban fringe, bringing local people closer to nature, the site's history and providing a safe environment for recreation. Commissioned by South Lanarkshire Council, the landscape architects carried out a feasibility study of the site, recommended phasing and funding sources to the client, provided a sustainable design for the park and facilitated each phase of its construction.

Redlees Quarry Park
TGP Landscape Architects

Seven Lochs Wetland Park
GCV Green Network Partnership

Seven Lochs Wetland Park

Destined to become Scotland's largest urban wildlife site, the Seven Lochs Wetland Park is an exemplar of GI planning and delivery. A draft vision and masterplan for the park, prepared by AECOM and Collective Architecture, were published in September 2011, setting out how the park will support existing regeneration activity and become a focus for education and training and community participation. The masterplan also examines how future development can be integrated into the Wetland Park through a GI approach, creating high-quality places where people will want to live.

Social benefits

Education

There is an urgent need to transform school grounds to provide for experiential learning facilities and to reconnect children with nature. Natural environments that are connected to local communities can provide a range of educational opportunities and assist in reconnecting society with the natural environment. This is a fundamental prerequisite of living within environmental limits and a cornerstone of sustainable development.

Stronger communities

The spirit of the GI approach lies in unlocking landscapes' social, environmental and economic potential. GI can be a focus for community participation through public involvement in the design, delivery and management of new GI assets, as well as providing opportunities for education and training, volunteering and capacity building.

Food production

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

Ecological benefits

Enhancing biodiversity

The role of GI in providing wildlife habitat in both urban and rural areas is well established. 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. See how biodiversity has been enhanced through GI in the Olympic Parkon page 18 and at Ingrebourne Hill on page 24.

Ecos Centre

A 60ha urban park near Ballymena town centre in Northern Ireland has become a focus for the community since it opened in 2000 – it attracts 27,000 visitors every year, the vast majority of whom are local residents – and is a hub for sustainable design education.

Designed by the landscape architects WDR & RT Taggart, the Ecos Centre comprises a visitor centre with two interactive galleries, a nature park managed by the Ulster Wildlife Trust and a conference centre. The nature park offers riverside walkways and cycle paths, public art, rest areas and play features for the local community. SuDS and recycled materials are used throughout the site, while wetlands provide protection from flooding, foul water is treated by reed-bed water treatment technology and willow coppice is grown for biomass fuel.

WDR & RT Taggart

Key mechanisms for delivering green infrastructure on the ground

There is both explicit and implicit support for GI in national policy, which should encourage its delivery. The list of policies outlined here, which includes Europe, the UK and the devolved nations, is by no means exhaustive, but aims to highlight the most relevant and recent sources

European context

European Landscape Convention (2000)

The European Landscape Convention (ELC) came into force in the UK in March 2007. Its main objective is to promote landscape planning, management and protection across Europe. The ELC defines landscape as: "An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors." It also recognises that the quality of all landscapes matters – not just those designated as 'best' or 'most valued'.

Among other things, the ELC commits all signatories to: establishing and implementing policies aimed at landscape protection, management and planning; establishing procedures for the participation of the public and local and regional authorities; and integrating landscape into regional, town-planning, cultural, environmental, agricultural, social and economic policies.

Landscape professionals have worked with many local authorities throughout the UK to support the ELC through Landscape Character Assessments. These, in turn, are used to inform GI strategies and projects that address the factors that make each place special.

Where previously colliery waste was tipped on to the beach in enormous quantities, a costal path now leads through Durham Heritage Coast, a landscape of great natural, cultural and geological interest. The project was the winner of the UK Landscape Award 2010 and the restoration also won European recognition, having been awarded runner-up in the 2011 Council of Europe Landscape Awards.
Mike Smith

National level: England

National Planning Policy Framework (2012)

Under the National Planning Policy Framework (NPPF), local plans are required to incorporate policies addressing strategic priorities, with specific reference to the landscape. It also requires public bodies to cooperate on these priorities across administrative boundaries and to consult with Local Enterprise Partnerships and Local Nature Partnerships. The NPPF emphasises the importance of the multifunctional use of land, stipulating that planning should "promote mixed-use developments and encourage multiple benefits from the use of land in urban and rural areas, recognising that some open land can perform many functions (such as for wildlife, recreation, flood-risk mitigation, carbon storage or food production)".

The NPPF also encourages the use of GI in managing risks to new developments in vulnerable areas. The government therefore clearly recognises the role of GI – not only as a means of conserving the natural environment, but also as a tool that can be used to enable and progress genuinely sustainable development. The NPPF cites the adoption of Garden City principles as just one way of achieving this.

Natural Environment White Paper (2011)

The Natural Environment White Paper (NEWP), as a statement of adopted government policy, outlines the government's vision for the natural environment over the next 50 years. Included in this vision is explicit support for GI, particularly with regard to creating ecological networks through the establishment of Nature Improvement Areas. In an urban context, the NEWP advocates that GI is "one of the most effective tools available to us in managing environmental risks such as flooding and heatwaves". The NEWP also lends support to the importance and value of ecosystem services and the promotion of multifunctional land use and connectivity.

Localism Act (2011)

The Localism Act paved the way for abolition of Regional Strategies (and the policy support for GI contained within them) and makes local spatial plans the basis for local planning decisions. However, the introduction of the Duty to Cooperate provides an important mechanism for the delivery of GI, which, by its nature, often crosses administrative boundaries.

National level: Scotland

Scottish Planning Policy (2010)

The Scottish Planning Policy consolidates a series of topic-specific policy statements into a single, more concise statement. It states that decisions on the layout and design of new development should: encourage the use of active travel networks and public transport; encourage energy efficiency through the orientation and design of buildings, choice of materials and the use of low-carbon generating technologies; encourage the use of sustainable and recycled materials in construction and support habitat connectivity; and support sustainable water-resource management and waste management.

National Planning Framework 2 (2009)

The National Planning Framework 2 identifies the Central Scotland Green Network (CSGN) as a national development, recognising it as a form of GI of strategic importance. The CSGN promotes environmental quality and good connectivity, a strategic network of woodlands and other habitats, more sustainable and healthy patterns of travel, transport and land use and expanding opportunities for communities and businesses across the whole of central Scotland.

The following documents are also relevant to GI:

- Designing Places (2010)
- Designing Streets: A policy statement for Scotland (2010)
- Green Infrastructure: Design and Placemaking (2011)
- Planning Advice Note (PAN) 65: Planning and Open Space (2008)
- Planning Advice Note (PAN) 83: Masterplanning (2008).

National level: Wales

Planning Policy Wales (Edition 5, 2012)

This sets out the Welsh Assembly Government's objectives for sustainable development within Wales and a series of Technical Advice Notes (TANs) provides guidance to implementing the policy. GI is not explicitly referred to, but the principles underpinning GI are embedded in a number of policy areas.

In relation to good design, Planning Policy Wales states that landscape considerations are an integral part of the design process and can make a positive contribution to environmental protection and improvement, such as biodiveristy, climate change, air quality and protection of water resources. The role of accessible natural greenspace in improving health and wellbeing is also highlighted as is the importance of ensuring that development plans complement and improve ecological coherence.

TANs provide further guidance, including:

- TAN 12: Design (2009)
- TAN 16: Sport, recreation and open space (2009)
- TAN 22: Sustainable buildings (2010).

National level: Northern Ireland

Regional Development Strategy: Building a Better Future (2010)

The Regional Development Strategy (RDS) is the spatial strategy of the Northern Ireland Executive and provides an overarching strategic-planning framework to facilitate and guide the public and private sectors. It does not redefine other departments' strategies but complements them with a spatial perspective, suggesting that sectors should "conserve, protect and, where possible, enhance our built heritage and our natural environment" and "protect and encourage green and blue infrastructure within urban areas". As the RDS is part of the Spatial Framework Guidance, which deals with metropolitan areas, there is guidance to protect and enhance the quality of the setting of the Belfast Metropolitan Urban Area, its environmental assets and its network of open spaces.

The following Planning Policy Statements (PPSs) are also relevant to GI:

- PPS1: General Principles (1998) (although it does not use the term 'green infrastructure', this PPS covers some of the principles that GI embraces)
- PPS2: Planning and Nature Conservation (1997)
- PPS8: Open Space, Sport and Outdoor Recreation (2004)
- PPS15: Planning and Flood Risk (2006)
- Creating Places – achieving quality in residential developments, incorporating guidance on layout and access (2000). This document will be replaced in 2013 with the Urban Stewardship and Design Manual, which is expected to make significant reference to GI.

Funding

Green infrastructure can and should be funded through developer contributions, in order to reflect the additional pressures that development of all kinds places on the natural environment and existing infrastructure. By demonstrating GI's ability to deliver on wider policy objectives, it may also be funded by sources that will benefit from its wider application, such as the EU, UK or national agencies and health bodies, water companies, energy providers and highways authorities.

Even where initial capital for GI has been secured, it is critical that a funding plan for ongoing management and maintenance is factored in from the start, and GI aspirations designed accordingly. Local authorities should ensure that they include adequate capital and revenue provision for GI in their own budgets and that approved developments are adequately resourced by effective contributions, either in kind or through ring-fenced financial sums.

Sources of revenue funding can include opportunities to generate income from GI assets through franchising, licensing and entry fees, endowments, community trusts, commercial investment and traditional local authority funding. Alternatively, revenue could include direct income from renewable energy, food production, agricultural grazing, silage or events, or indirect savings from reducing flood risk.

Delivering green infrastructure

It is important to take a strategic approach to integrated GI because it provides a focus for multiple initiatives operating at various scales. Local or neighbourhood-level projects can contribute incrementally to the bigger landscape-scale picture, so that the whole becomes greater than the sum of its parts. Below are seven steps for developing a strategic approach to GI

1. Partnering and vision
- Develop and define a vision that is relevant to the area and commands wide support.
- Identify the geo-spatial extent of the project at a landscape scale, unconstrained by political or administrative boundaries.
- Establish a crosscutting steering group with authoritative leadership and key stakeholder and community representation, supported by appropriate expertise. See page 15 for how this played an important role in the development of the 6Cs Green Infrastructure Strategy.
- Promote collaborative working across political and organisational boundaries, multiple landowners, disciplines and scales. See how this been put to good effect in the South-East Dorset GI Strategy on page 15.

2. Contextual review
- Review and coordinate the national, local and community policy framework to provide a sound basis for formal planning intervention, development management, infrastructure provision and funding applications.
- Use a Landscape Character Assessment to understand and identify the features that give a locality its 'sense of place'. This will include an understanding of the site and its immediate context to assess geology, soils, hydrology, habitats and species.

3. Data audit and resource mapping
- Record green assets and identify ownership, primary uses and potential viability, using geographic information systems (GIS) where appropriate, to deliver multifunctional benefits.

4. Needs and opportunities assessment
- Identify local issues, challenges, risks and community needs using data audit and consultation, for example Arundel Square.
- Identify opportunities for GI to provide solutions to known issues. See page 16 for how this can be done using Trees in the Townscape: A Guide for Decision Makers.
- Evaluate and, where possible, quantify the current and potential ecosystem-services benefits from existing and proposed GI.
- Establish the resources and costs for successful, sustainable implementation and long-term management.

5. Design the planned interventions
- Prepare and communicate a draft strategy, plan or design, incorporating the vision and objectives. The Great Fen profile on page 22 is a good example of this.
- Use responses to refine and improve the plan, strategy or design and its delivery.
- Ensure that the plan, strategy or design meets requirements for function, durability and beauty.

6. Implementation
- Set design and management standards by establishing locally relevant criteria. See Cambridge Sustainable Drainage Design and Adoption Guide on page 8.
- Ensure the provision of adequate funding mechanisms for ongoing management and maintenance costs for example Potters Field Park, London on page 16.
- Build the project, launch the strategy and adopt the policies.
- Set the milestones, targets and programme.

7. Management and maintenance
- Monitor the strategy's delivery against its objectives regularly, using key performance indicators and stakeholder consultation. See the Royal Parks Management and Operations Plans on page 23.
- Deliver aftercare, management and maintenance to projects, for example Next Wave (Phase 1) Bexhill-on-Sea on page 16.

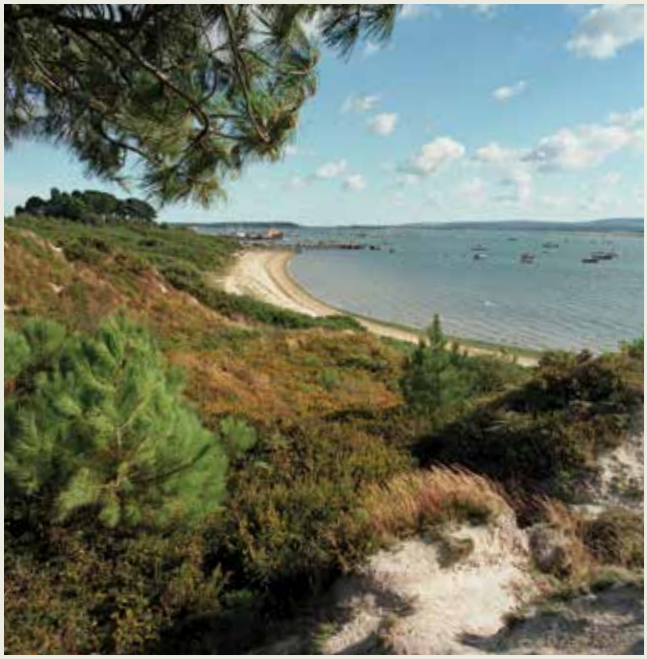
Remapp Landscape Architects were appointed to lead the design and community engagement process in the development of Arundel Square, London. The challenge was to resolve complex technical issues to integrate this newly created space with an existing nineteenth century square. The result is a new and unified single public space and one that meets the needs of a diverse inner London community.
Remapp Landscape Architects

South-East Dorset Green Infrastructure Strategy

South-East Dorset has a unique natural environment on which its economy relies. It includes a World Heritage Site coastline and internationally protected areas of nature conservation. Maintaining and improving this valuable asset is critical to the wider economic strategy for the area, as well as to social and environmental concerns – particularly as there is substantial growth planned for the area.

Councils across south-east Dorset worked in partnership with the Environment Agency, the Forestry Commission and Natural England, with enabling support from CABE Space, to prepare a strategy that supports a consistent, sensitive and practical approach to GI across local boundaries. Land Use Consultants was commissioned to produce a report that has provided a shared evidence base to support local plan policies and to inform the strategy's development. It is a good example of the Duty to Cooperate in action.

The South-East Dorset GI Strategy has three key roles: to promote the multifunctional approach of GI across a wide range of agendas; to set out an overarching strategy to deliver, manage and maintain current and future GI assets; and to guide a joint approach towards strategic GI for councils preparing local development framework documents.

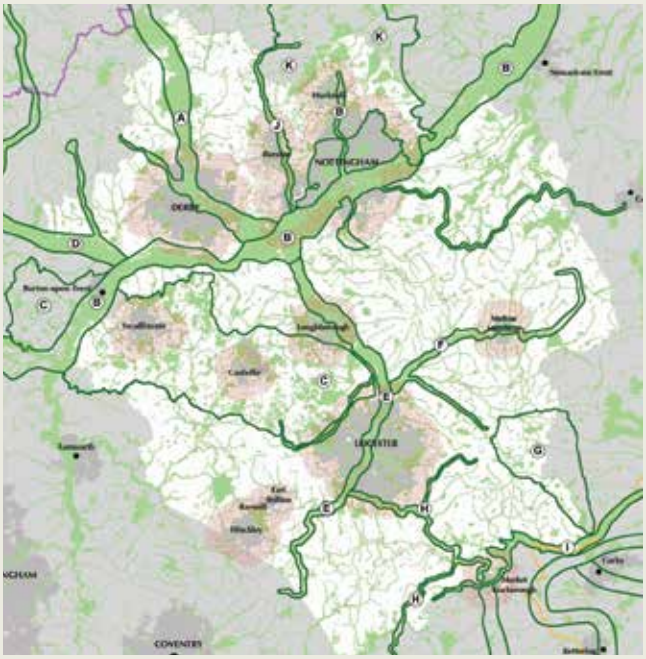


Dorset County Council

The 6Cs Green Infrastructure Strategy

The 6Cs GI Strategy is a long-term vision and strategic framework for implementing GI across the 6Cs sub-region, which comprises the three cities of Derby, Leicester and Nottingham plus parts of the three counties of Derbyshire, Leicestershire and Nottinghamshire. A 6Cs Strategic GI Project Board was set up with a core membership of principal local authorities and environmental organisations, supported by a wider reference group of delivery bodies, technical experts and sector representatives.

The strategy aims to maintain, enhance and extend networks of green spaces and natural elements in and around the three cities, connecting them with their surrounding towns and villages. It also aims to facilitate a major step-change in the scale, quality and connectivity of GI assets across the 6Cs sub-region, to match the scale of new growth proposed and provide a focus for attracting and retaining sustainable development and investment. The strategy recognises the need for Landscape Character Assessment to underpin GI provision. One of its objectives is to promote the protection and management of landscape character, so as to provide enhanced landscape settings for the built environment and to ensure that new development and GI relates to place and context. The strategy is now being used to inform local planning documents and large-scale development proposals.



Chris Blandford Associates

Trees in the Townscape: A Guide for Decision Makers
Trees and Design Action Group

Trees in the Townscape: A Guide for Decision Makers

Trees in the Townscape: A Guide for Decision Makers, produced by the Trees and Design Action Group, sets out 12 action-orientated principles for the 21st century urban forest. Trees are increasingly viewed as essential alleviators of many of the adverse effects of urbanisation. Storm-water management, urban cooling and microclimate control, air-quality improvement, visual amenity and carbon sequestration can all be addressed through better management of existing trees and the promotion of new planting.

The guide is aimed at all those whose actions and decisions may affect, both directly and indirectly, the management and planting of urban trees. It provides examples of good practice, explanations of delivery mechanisms and links to further references. It sets out the importance of having a comprehensive tree strategy and understanding the tree resource of a particular area and how multiple benefits are derived from trees.

This publication is particularly relevant for the management of trees in existing urban areas. Where space is at a premium and the built environment is dominant, trees provide significant natural assets that can be retrofitted into streets and other available spaces with relatively little disturbance to surrounding activities. In addition, the ecosystem services that these trees provide will increase as they grow. Urban tree planting therefore provides a significant opportunity to incorporate green infrastructure benefits into both existing and new built up areas.

Top
HTA played a key role in the development of the Next Wave (Phase 1) project of the West Promenade area of Bexhill-on-Sea, with careful planting selection resulting in a landscape that is biodiverse, beautiful, highly adaptable and low maintenance.
HTA

Above
Potters Field Park had to reconcile the needs of many different users in a small and intensively used space. GROSS.MAX introduced the idea of setting up a park trust which made it possible to appoint a head gardener, as the financial gain from using the park for a wide variety of commercial events directly funds its maintenance and management.
GROSS.MAX

Six recommendations for how to deliver the next generation of green infrastructure

1

Local authorities

Turn strategic GI thinking into reality

Ensure that GI is a core requirement in local authority documents, such as Local Plans, Infrastructure Development Plans and development briefs. Proper consideration should also be given to the potential for multifunctional GI to perform some of the roles that 'grey' infrastructure is used for, particularly water management and waste. Why? Not only does GI tend to be cheaper, but it also provides infrastructure that is resilient to an increasingly unpredictable climate.

2

Local authorities and Business Improvement Districts

Promote collaboration on GI across boundaries

By its nature, GI often crosses administrative and operational boundaries, so it should be addressed through the Duty to Cooperate between local authorities. It should also be part of the remit of business improvement districts and Local Enterprise Partnerships.

3

Developers

New developments should make a contribution to GI

Developers should be aware of an area's strategic GI goals and appreciate their role both in mitigating the environmental impacts of new development and in creating beautiful places. Even small interventions contribute to the overall success of GI, so developers should engage with local communities.

4

Clients

Champion GI that is planned, designed and managed effectively

Successful GI is part of a shared vision – one that appreciates landscape character, sense of place and functionality. Make sure that strategies clearly articulate the vision, priorities, responsibilities and actions needed to plan, deliver and manage GI projects, from the start. Public and private sector landowners and managers should be involved in the planning and design of GI, as their buy-in and expertise is vital to its long-term success.

5

Landowners

Ensure GI is well-funded for ongoing management and maintenance

Management and maintenance are critical if GI is to continue to deliver long-term benefits. By thinking creatively about how to generate capital and revenue, multifunctional land can be funded from several sources. These could include direct income from renewable energy, food production or events, or indirect savings by reducing flood risk and cutting the cost of cooling in urban areas during hot weather.

6

Landscape professionals

Raise awareness of how GI can deliver multiple benefits simultaneously, from boosting the bottom line to mitigating the effects of climate change

Landscape professionals need to appreciate what drives their clients. They advise clients, colleagues and decision-makers about the value of GI, from country parks and community woodlands, to development-specific interventions such as green roofs and sustainable drainage systems. The range of benefits that GI can deliver needs to be communicated to them in a way that resonates with their own objectives.

Olympic Park

The largest urban park to be built in the UK for over a century, Queen Elizabeth Olympic Park provides a valuable example of what can be achieved by establishing GI frameworks, putting landscape design at the heart of the process and taking an integrated approach to investment

The vision

The central approach of the park masterplan was to establish an exemplary 21st-century sustainable park through a strong focus on design, innovation and creativity. The initial design concept was developed around six principal design themes reflecting the resources within and adjacent to the site. These included water, infrastructure and urban form, connectivity, topography, vegetation and biodiversity and use and activity.

Leadership

Delivering fully functioning GI requires the contribution and coordination of a multidisciplinary team working towards a shared vision. Following the wider strategic masterplanning of the site by Aecom, landscape architects LDA Design and Hargreaves Associates led the landscape masterplanning and detailed design of the parklands and public realm. Arup and Atkins were the landscape engineers, and a number of other landscape firms including HED, Vogt Landscape, Macfarlane Wilder, Grant Associates, Michael Van Valkenburgh Associates and Place Design were also involved in the design of specific sites within and outside the park.

Delivering the legacy

The transformation and long-term legacy of the parklands was always the primary focus for investment. Of every £1 the Olympic Delivery Authority (ODA) spent on venues, transport and infrastructure for the Olympic Games, 75p was spent on legacy. Management responsibilities were clearly set out in the parklands' planning application in 2009, stating that the ODA would be responsible for operating the parklands through to their handover to the London Legacy Development Corporation after the Games. 'Towards a 10-Year Landscape Management and Maintenance Plan', prepared by the ODA, set out the principles required for the long-term management of the park.

Green infrastructure benefits

Creating natural connections

One significant planning achievement of the park has been to connect it with its wider environmental context and, in particular, extending the GI network in the Lea Valley, East London Green Grid (now part of the All London Green Grid) and the Thames Gateway Parklands.

Strategically, the parklands extend the north–south route of the Lea Valley Regional Park, a key ecological corridor for London, south towards the River Thames. They also provide a significant number of new connections to ensure easy, safe access to and from neighbouring residential areas and transport hubs. In legacy, the opening up of key west–east pedestrian routes will define two park hubs for the north and south, helping to remedy decades of poor connectivity between communities to the east and west of the strategic north–south route.

Improving water management

The design of the parklands will create more than 100ha of Metropolitan Open Land when transformed after the Games. This includes restoring the waterways by protecting, enhancing and revealing their visual presence within the north of the park and

Snapshot

In the Olympic Park, GI plays a crucial role in supporting the delivery of more than 75 per cent of the commitments set out in the Olympic Delivery Authority's (ODA's) Sustainable Development Strategy. These include:

- ensuring that all buildings are completely accessible by public transport, walking and cycling
- meeting biodiversity and ecology targets by creating a species-rich habitat of at least 45ha
- constructing the parklands with recycled aggregates and certified and legally sourced timbers
- conforming to all recognised inclusive design standards
- reducing carbon emissions through on-site renewables
- managing flood risk.

Top right
John Hyland
Middle
Peter Neal
Bottom right
LDA Design
Main
LDA Design

promoting access and recreation within and along existing waterways.

The functionality of the park landscape has been enhanced through better flood-risk management, water storage and cleaning. The wetland bowl and wet woodlands in the north help to manage floodwater, which protects about 5,000 existing homes around the park from a one-in-a-100-year storm. In the south of the park, adjacent to the Aquatics Centre, 800m of the Waterworks River has been widened by 8m. The majority of this extension has been planted with reeds to extend ecological connectivity southwards through the parklands.

Climate-change adaptation

Landscape management is seen as crucial, as design and the parklands are expected to change through human use, colonisation of native species and climate change. Greenways and green routes aid species movement that is triggered by climate change, while the re-engineering of waterways has increased peak flood capacity.

Better porosity of hard surfaces and improved sustainable drainage channels, rain gardens and swales mean that run-off can be absorbed to a far greater extent than previously. Better groundwater-infiltration rates will also increase local recharge of the water table and improve tolerance to periods of lower rainfall and drought. Local neighbourhoods will be better resourced to manage increased levels of peak rainfall and higher summer temperatures.

Enhancing biodiversity

The detailed design of the park delivers the Olympic Park Biodiversity Action Plan target of 45ha of new ecological habitat, ensuring that there is no net loss of biodiversity habitat. Small but important areas of existing woodland and waterside vegetation of ecological value were incorporated into the parklands design and flora and fauna were protected, including the collection of seeds and the reintroduction of rare native black poplar trees. The design of the park also enhances biodiversity by making connections to other important areas of habitat outside its borders.

Recreation, health and wellbeing

By reconnecting people with nature, the parklands provide better opportunities for physical activity, relaxation, mental wellbeing and healthy living. The parklands will also promote a large increase in regular informal and low-impact exercise in local communities, while improved connectivity should encourage walking and cycling as the preferred choices for making local journeys.

Sense of place

For the Lea Valley, the key natural signature is the marshes, the river itself and wetlands within its floodplain. The north of the park demonstrates how a striking and 'working' landscape can be achieved – one that has re-established a healthy and diverse population of plants and animals and is welcoming, attractive and inspiring for people.

Cross-border collaboration on GI Action Plans for Crewe and Flintshire

GI Action Plans for Crewe and Flintshire, as described below, have been developed as part of a wider GI Framework for north-east Wales, Cheshire and the Wirral. These areas share a distinctive natural environment in addition to a connective transport infrastructure and close economic links. Sustainable economic growth is a shared priority, and GI planning is a central component as a catalyst for growth while minimising environmental impact

Green Infrastructure Action Plan for Crewe

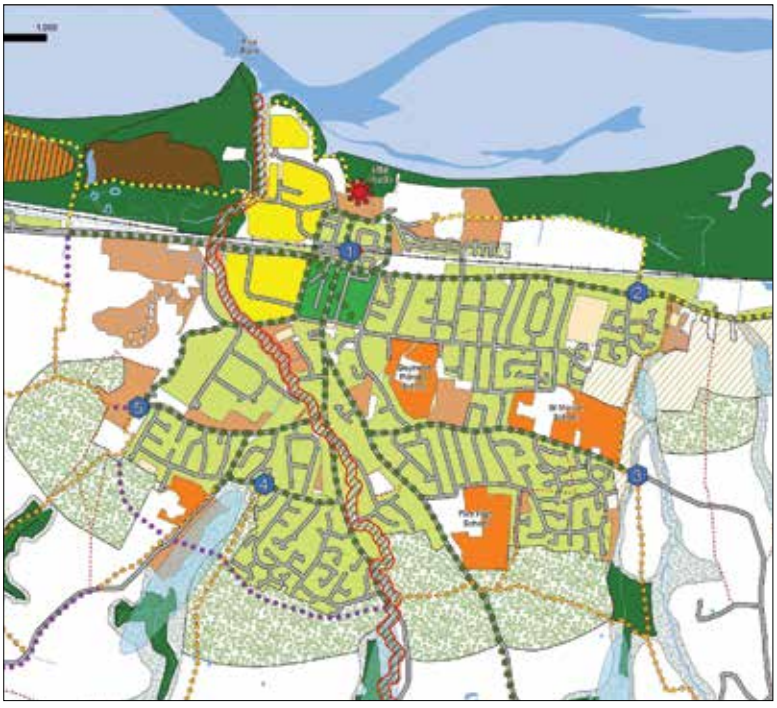
Future green infrastructure benefits

Crewe is expected to grow considerably in terms of housing and employment, with more than 20 per cent growth in population predicted by 2031. Cheshire East Council considers GI an essential infrastructure to enabling this growth and the GI Action Plan featured in the consultation on Crewe Town Strategy, which is part of the wider local plan consultation process.

The GI Action Plan for Crewe, which is due to be launched alongside the All Change for Crewe (Economic Strategy) Prospectus, proposes integrating GI within new and existing development and giving people better access to green spaces through a series of connected linear routes. Crewe's river corridors can be re-invigorated with opportunities for recreation, providing a setting for buildings and connected corridors for nature. Another unrealised asset is the countryside surrounding Crewe. The GI Action Plan proposes restoring its character to provide a quality setting for the town.

Snapshot

- Landscape practice TEP has prepared a GI Action Plan for Cheshire East Council to address Crewe's socio-economic and environmental needs.
- The Action Plan sets out more than 30 actions related to GI, many of which are developer-led and can be funded through Section 106 agreements or the Community Infrastructure Levy.
- The Action Plan has been explicit that responsibilities for maintenance and management of GI are established at the planning stage.



TEP Landscape Architects

Flintshire Coastal Park Green Infrastructure Action Plan

Future green infrastructure benefits

The GI Action Plan is one element in realising the vision for a Flintshire Coastal Park that will concentrate the activities of public, private and community partners and increase opportunities for securing funding for access, restoring heritage, setting up community projects and enhancing the natural environment. Following its endorsement by Flintshire County Council, the GI Action Plan will also inform the preparation of the forthcoming Flintshire Greenspace Strategy.

Snapshot

- The GI Action Plan was prepared by TEP Landscape Architects for Flintshire County Council and the Countryside Council for Wales.
- It sets out evidence for how to deliver the maximum public benefit from investment in GI, which will address past industrial activity that has left a legacy of contaminated land and dereliction along the Flintshire coast.

Crewe Business Park

A joint venture between the former Crewe and Nantwich Borough Council and the former Cheshire County Council, Crewe Business Park is an exemplar of how GI can deliver multiple business objectives

Annie Coombs

Leadership

The GI for all phases of the business park's development was part of a masterplan and landscape management was considered from the outset, with the local authority landscape professional involved at all stages.

Funding

The costs of the infrastructure and proceeds from disposals were shared on a 50/50 basis between the two local authorities. The capital input to include the land element and infrastructure amounted to about £1.75m. The intention behind Crewe Business Park was to provide B1 (office) employment for the borough and, in doing so, realise capital receipts from the disposal of plots on a 125-year lease, with a service charge for occupiers funding the ongoing maintence of the park.

GI benefits

Economic growth and investment

The business park has generated more than £4.5m in capital receipts and created more than 2,800 jobs. The high-quality office environment is the motivation for some businesses in their choice to locate here. The park has received local and national recognition and has been the catalyst for spin-off developments nearby, such as Manchester Metropolitan University's South Cheshire faculty. Crewe's ecological policy has been successful in attracting companies to the business park. One business, a precision-components firm, cited the quality of the environment as a primary reason for locating its European headquarters at Crewe.

Recreation, health and wellbeing

The Crew Business Park GI includes a series of interconnected paths through and around the site. Pedestrian connections, which have no cycling restrictions, are made with the adjacent university halls of residence and a health club and to the gate of the university and Quakers' Coppice, from which there are footpath connections south towards open countryside. Access improvements have also been made that help accessibility for wheelchair users and prams.

Enhancing biodiversity

The site is noteworthy for its species-rich grassland, which is integrated into the park wherever possible. The many hedgerows, which are valuable wildlife corridors for species migration, were retained as linear woodland belts in conjunction with new planting of thousands of native trees and shrubs.

Stronger communities

As well as attracting large blue-chip companies to the area, the management also aimed to maintain links with the local community. Even though it is private land, the public are welcome to enjoy the open spaces and country walks around the business park. Local school visits and pond-dipping events are organised by countryside rangers, while local agricultural students designed one of the park's roundabouts and a local school has its own wildflower garden there.

Annie Coombs

Snapshot

- The business park has generated more than £4.5m in capital receipts from the sale of plots and has created more than 2,800 jobs.
- The landscape structure has been planned to sustain wildlife and create an attractive setting, which has helped to raise the profile of the area.

The Great Fen

One of the most ambitious GI projects in the UK, the Great Fen, which is located between Huntingdon and Peterborough, will create a vast fen landscape for people and wildlife by restoring more than 3,500ha of intensively farmed arable land to natural wetland and low-intensity farming

LDA Design

Leadership

Landscape design and environmental consultancy LDA Design worked closely with the Great Fen's five project partners and stakeholders to shape a sustainable vision and spatial masterplan for the project area. This included extensive consultation with a range of public bodies, specialist user groups, local communities, schoolchildren, landowners and farmers. The masterplan zones key land uses and carefully sites routes, gateways and visitor facilities to provide people with safe access to the countryside while ensuring that areas of high conservation value are protected.

Delivery

An action plan has been developed to take the masterplan forward and work programmes are delivering the Great Fen vision on the ground. The project partners are continuing their dialogue with stakeholders, while the masterplan has already won accolades for excellence in planning, notably the Royal Town Planning Institute's 2010 National Award for Rural Areas and the Natural Environment and the Silver Jubilee Cup. It has also informed local planning policy, including the Huntingdonshire Core Strategy 2009 and the emerging Development Planning Document, which contains a specific policy for the Great Fen. The Cambridgeshire Green Infrastructure Strategy identifies the Great Fen as a target area, highlighting its strategic importance to GI in the county.

Green infrastructure benefits

Climate-change mitigation

The restoration of the Great Fen will play an important role in addressing one of the causes of climate change, by halting the process of peat degradation. It is estimated that the oxidisation of peat in the Great Fen area, which is a direct result of draining the land, releases 325,000 tonnes of carbon dioxide a year. Once the peat is re-wetted and oxidisation stopped, greenhouse-gas emissions are reduced. In fact, over 80 years, it is predicted that each re-wetted hectare of the Great Fen could result in an avoided loss of 10,000 tonnes of carbon dioxide. In addition, the scheme demonstrates the possibilities for managing flood attenuation and growing biomass crops for renewable energy production.

Economic growth and investment

The Great Fen project will contribute to the diversification and development of the local economy by creating jobs in land management, livestock farming and nature conservation, and it will also provide a boost to the tourism industry through visitor enterprises. New cultural, ecological and heritage attractions will be created in and around the Great Fen area, helping to extend the positive impact of the restoration into the sub-region.

Recreation and education

New, safe access to the countryside will be created in an area traditionally lacking public footpaths, cycleways and bridleways, meeting the needs of residents and the local workforce and new communities to come. At the heart of the Great Fen will be an inspirational visitor centre, which will provide a place to learn about the ecology and heritage of the fens and provide a starting point for exploration of the wider Great Fen.

Enhancing biodiversity

The Great Fen is one of the most important wildlife projects in Europe. Of the wild habitat of the fen basin, 99 per cent has been lost over time. Only precious remnants remain. Two of them, Woodwalton Fen and Holme Fen, lie at the heart of the Great Fen. The Great Fen seeks to link these two National Nature Reserves, and through careful land management increase biodiversity, enhancing the resilience to climate change of threatened species. The re-emergence of extensive wetland habitats will benefit fenland plants and animals, including rare birds such as snipe and lapwing.

Snapshot

The Great Fen vision and masterplan shows how a GI approach to environmental planning and land management can generate social and economic benefits for local communities, tackle climate change through mitigation and adaptation and protect habitats under threat.

Royal Parks Management and Operations Plans

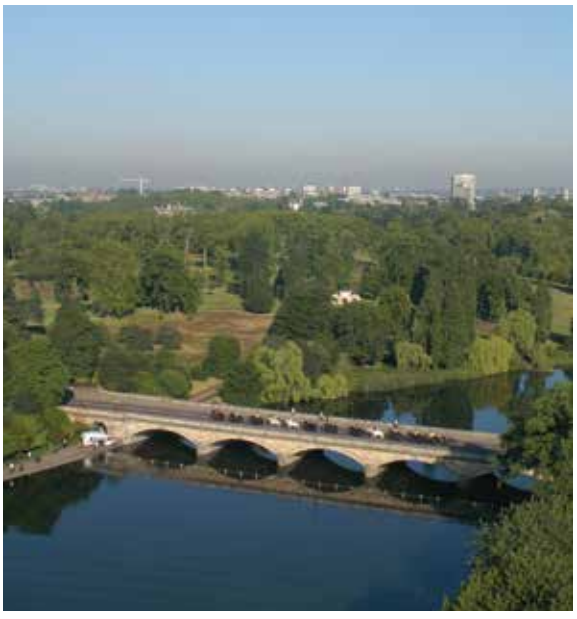
The long-term prosperity of the Royal Parks is down to a holistic approach to management and operations that conserve and enhance the varied character of each Royal Park, while recognising that each is part of a collection of green spaces

Max A Rush

Leadership

The Royal Parks' Head of Landscape ensures that the long-term and short-term management plans, strategies and action plans are reviewed regularly. Projects and activities are collated at a strategic level and work is shared with stakeholders, neighbours and partner organisations. For example, the All London Green Grid has helped to coordinate project work across land-ownership boundaries. Responses to changes in government or external policies and guidance are also incorporated.

Andy Lane



Funding

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. The Royal Parks is funded by central government with a requirement to generate additional income, and this is achieved through licences to cafes, sports and recreation businesses and events.

Management plans

These plans, produced for each of the Royal Parks, are used to capture the strategic vision and the way that is transferred to actions at a local level. Each management plan includes:

- the background of the park and a description of the wider environment and strategic framework of which it is part
- a short description of the park, identifying the main management issues
- a vision for the park
- objectives and actions that are intended to achieve the vision – some applying to the whole park, others to specific sites within the park
- an implementation summary, including systems monitoring.

Operations plans

Operations plans cover a two-year period and are reviewed annually. They contain the annual action plan for the park and a record of progress made in the previous year. The format covers the Green Flag Award criteria and was reviewed in autumn 2012. The plan includes information from the Management Plan, the Royal Parks Corporate Plan and other strategic documents.

A key feature of the plans is the stakeholder communication strategy, which aims to engage with friends' groups and interest groups, such as wildlife and cycling groups, and parks users about their satisfaction with the facilities provision, information and staff. This information 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.

Snapshot

— The 2,000ha of historic parkland that make up London's eight Royal Parks are among London's most well-known green spaces.

— As well as providing high-quality space for recreation and play for millions of people each year, the Royal Parks are a top draw for tourists and a catalyst for cafes and restaurants within and surrounding the parks.

— A good example of GI in action, the Royal Parks deliver vital benefits for the capital that often go unnoticed, including water management, important sites for biodiversity and climate-change adaptation and mitigation.

Ingrebourne Hill, London

Ingrebourne Hill shows how the restoration of a former landfill site and the creation of community woodlands can provide a focus for recreation and better connected neighbourhoods

Above
Forestry Commission

Right
J&L Gibbons

Leadership

From the outset, Forestry Commission landscape professionals were involved in options testing for drainage, public access, woodland design, recreation and habitat creation. Working with ecologists and soil scientists, the landscape professionals developed the masterplan, created the visual presentations that secured £1m of funding, collaborated on the detailed design and implementation and developed ongoing site-management plans.

Delivery and funding

The development of the forest is driven in part by the Thames Chase Plan, which provides policy framework and a forest strategy. Ingrebourne Hill was also identified as a phase-one project under part 3.2, 'Ingrebourne Valley and Quarry Landscapes', of the East London Green Grid area framework. It fulfills the aims of the East London Green Grid by helping to provide connectivity to surrounding sites within the Thames Chase Community Forest.

The Forestry Commission and its partners delivered the first phase (24ha) in 2003, and in 2006, Department for Communities and Local Government offered £1m for additional GI investment, over and above the requirements set by the planning conditions. The second phase (21ha) was completed in 2008 and a final phase (approximately 25ha) is due for completion within the next five years, subject to receiving planning consent.

Green infrastructure benefits

Recreation, health and wellbeing

Research has shown that more than 90 per cent of visitors come to the site to exercise. Public access is actively encouraged for walking, cycling, horse riding and playing, and a 2.1km mountain-bike trail has helped to engage teenage groups. There are 4.9km of stoned walking trails (0.9km of which are suitable for all abilities), linking to the neighbouring Hornchurch Country Park and surrounding green spaces. The site design also incorporates zoning to help separate 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.

Stronger communities

The site provides a focal point for meeting and engaging with other local residents. Research demonstrates that 77 per cent of visitors live within 3km of the site, and a further 20 per cent within 9km. Pathways have also been developed that link the site to surrounding residential communities.

Economic growth and investment

Tipping of inert waste to create landform over existing landfill has supported growth of local and regional economy by providing valuable and beneficial end uses for the waste materials created from large civil engineering projects. This in turn has given confidence to the local planning authority that landfill restoration to a high standard is achievable and confidence to land managers that community woodland creation and management is financially viable.

Snapshot

- Ingrebourne Hill is a 45ha site on former landfill in the London Borough of Havering, adjacent to the River Ingrebourne, Hornchurch Country Park and the communities of South Hornchurch and Rainham.
- The Forestry Commission and landowner Ingrebourne Valley Limited formed a partnership to create suitable new habitats adjacent to the Ingrebourne Valley Local Nature Reserve, a Site of Special Scientific Interest (SSSI), and develop recreational infrastructure to connect existing GI at Hornchurch Country Park.
- Research shows that 90 per cent of visitors now come to the site to exercise.
- Ingrebourne provides habitat connectivity to the Ingrebourne Valley SSSI, as well as acting as a robust buffer to the surrounding built environment.

River Ray Corridor, Swindon

A strategically important network in the north-west of Swindon, the River Ray Corridor is a good example of developing GI through partnership working, multiple funding streams and community involvement

Great Western Community Forest

Leadership

Swindon Borough Council's landscape professionals collaborated with the Forward Planning Section to deliver the GI strategy for the River Ray Corridor, and wrote the GI supplementary planning document as part of the emerging local plan. They have also written management and maintenance plans for areas of the site owned by the borough. The River Ray restoration was led by the Wiltshire Wildlife Trust in liaison with landscape professionals at Swindon Borough Council, the Environment Agency, Thames Water and local communities and volunteers. The Environment Agency's consultant Anthony Stiff Associates designed and administered the project.

Funding

The River Ray Corridor has not been funded as an entity, but has drawn on a diverse range of funding sources. These include England's Rural Development Programme, the Woodland Grant Scheme, the Countryside Agency Programme (Timberland Trail), developer contributions via Section 106, community-based grants, the third sector, Tipping Income and capital funding from local councils.

Swindon Borough Council

Green infrastructure benefits

Climate-change adaptation and mitigation

The connectivity between the GI assets will allow for species migration in the face of a changing climate. Trees provide natural carbon sequestration and, in 2005, the Tree for All programme saw more than 6,000 additional trees planted at Purton Woods, contributing to a total of approximately 90,000 new trees that have been planted there and at Shaw Forest Park, a former landfill site.

Resilient water management

The Wildfowl and Wetlands Trust at Slimbridge designed a reed-bed system for Swindon Borough Council to filter surface water containing low-level contaminants running off the urban forest, Shaw Forest Park. It has been used extensively since that time, and all monitoring has shown that it has reduced contamination in water passing through the landfill to safe levels suitable for discharging into the brook. This has saved in excess of £500,000 by providing an on-site solution to the contamination.

Recreation, health and wellbeing

Sustrans Route 45 follows the River Ray Parkway and links Swindon to the National Cycle Network. Sustrans volunteers and volunteering organisation 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 local primary care trust, connecting Swindon to Purton. These links between Swindon itself and the GI assets of the River Ray Corridor have reconnected local communities with natural environments.

Stronger communities

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, 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.

Snapshot

- Today, the River Ray Corridor connects Swindon to its rural fringes and settlements through four major open spaces and linear links.
- Green infrastructure has improved connectivity for walking and cycling both in Swindon and beyond.
- Community-based groups are self-sustaining and continue to take an active role in the management of several sites along the Corridor.

The Mersey Forest

By improving the image of surrounding towns and cities, the Mersey Forest has set the scene for growth in the region's £98bn economy

Mike Roberts

Leadership

Landscape professionals, landscape planners and landscape managers have had key roles in delivering Mersey Forest projects. Practices that have undertaken consultancy work include Cass Associates, TEP Landscape Architects, Gillespies, Land Use Consultants, Chris Blandford Associates, Casella Stanger and Randall Thorp.

Funding

Funding for the Forest Team and the delivery of the Mersey Forest Plan is complex. Local authorities provide 15 per cent of total funding (about 2 per cent each), and this helps to secure a wide and ever-changing range of funds from Europe, Lottery funding, landfill tax, charitable trusts, Defra, primary care trusts and Section 106.

Green infrastructure benefits

Economic growth and investment
The Mersey Forest has attracted £36m of new investment and has been responsible for the development of 150 new jobs. It is recognised as an important part of the region's tourist industry, contributing towards approximately 30 million visits to the north west's woodlands and forests every year.

The project has had a wider effect, in improving the region's image. This has largely been through greening the land alongside key transport routes and, by reclaiming land and persuading private landowners to establish new woodland on neglected sites, has used forestry to transform substantial areas of derelict land.

Improving health and wellbeing
By working closely with health agencies in the north west, the Mersey Forest Partnership is showing how forestry can help tackle rising coronary disease and obesity by encouraging people to take up walking, jogging and cycling. At least 20 per cent of the local population now visits the woodlands created by the project.

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 can also assist in climate-change adaptation by intercepting and allowing rainwater to infiltrate the ground. This helps to reduce the risk of flooding on agricultural land and in urban areas. In addition, the trees reduce air temperatures through shading and evapotranspiration.

Enhancing biodiversity
More than 2,900ha of new woodland and 800ha of wildflower meadow, wetlands and other habitats have been created to date. On top of this, more than 90km of hedgerows have been repaired or planted, and 110 ponds created. All of this is helping to restore the natural diversity of the region's wildlife and reach national biodiversity targets.

Green Apprentices

Snapshot

- The Mersey Forest is England's largest Community Forest and one of the leading environmental initiatives in the North West.
- Since 1994, it has transformed almost 5,000ha of land by planting more than eight million trees through a partnership of local authorities, landowners, the Forestry Commission, Natural England and businesses such as United Utilities.
- The Mersey Forest's 'more from trees' approach earnt it the Brian Redhead Award for Environmental Sustainability and has attracted £36m of new investment to the area.

Falkirk Greenspace Initiative

No matter how innovative the project, committed public and private partnerships are needed to deliver transformational landscape change

Falkirk Council

The vision

The Falkirk Greenspace Initiative began in 1993 to improve the quality of life in the area and encourage inward investment. It was a vision for a continuous, well-wooded parkland around Falkirk, with a circular walking and cycling route around and through the parkland. The ring around the urban area was to be created using new amenity woodland to connect existing and proposed recreational spaces, public parks, the corridors of the River Carron and two canals, nature reserves, green belt, former policy woodland and designated countryside.

Leadership

Delivered over 20 years, the Falkirk Greenspace Initiative began through a partnership between Falkirk District Council, Central Scotland Woodlands Countryside Trust, Central Regional Council and Forth Valley Enterprise. In-house landscape professionals, plus consultants including Ian McGowan and Associates, Ironside Farrar, TGP Landscape Architects and Land Use Consultants have been involved throughout. The emergent partners of Falkirk Council and Central Scotland Forest Trust have continued to implement the vision and over time the mosaic of woodlands, other habitats and path networks has achieved a coherent setting for major recreational, tourism and heritage projects.

Delivery and funding

Any long-term initiative requires sustained funding and professional support to develop and implement annual programmes of work, and this has been the role of Falkirk Council's planners. This has involved both local and strategic project development, working with local council services and, wherever possible, local communities, to identify, design and manage environmental resources.

Central Scotland Forest Trust's key role within this has been to provide the professional contract management and design resource needed to maintain a steady flow of project delivery over time. The trust has also been instrumental in raising wider partnership-funding support from a range of external agencies and adapting the strategic vision where necessary to succeed against a backdrop of changing national policy priorities.

Green infrastructure benefits

Recreation, health and wellbeing

To date, more than 260km of paths have been created or upgraded and, together with tree planting, have provided attractive corridors to facilitate movement by foot and bicycle between communities and urban centres.

Regeneration through tree planting

Planting more than 1.3 million trees has created accessible community woodlands, enhanced transport corridors, restored derelict sites, regenerated ageing plantations, diversified farms, enhanced habitats and provided a landscape framework for new business and recreational interests.

Stronger communities

Two Local Nature Reserves have been designated within the initiative area, significantly assisted by partnership inputs. Local management groups are ongoing in the Local Nature Reserves and in several of the community woodland and nature park project sites.

Inspiring wider development

The partnership has gone on to develop or support major associated projects such as the Millennium Link, the Falkirk Helix, the Falkirk Urban Woodland, the Woodland In and Around Towns Initiative, the South Falkirk Environmental Justice Project and the Bespoke Project, and has worked with wider partnerships to enhance the setting and improve access to the Falkirk Wheel and the Antonine Wall World Heritage Site.

As a partner to the wider Central Scotland Green Network, Falkirk Council is now preparing a new green network strategy to update the Falkirk Greenspace Initiative.

Snapshot

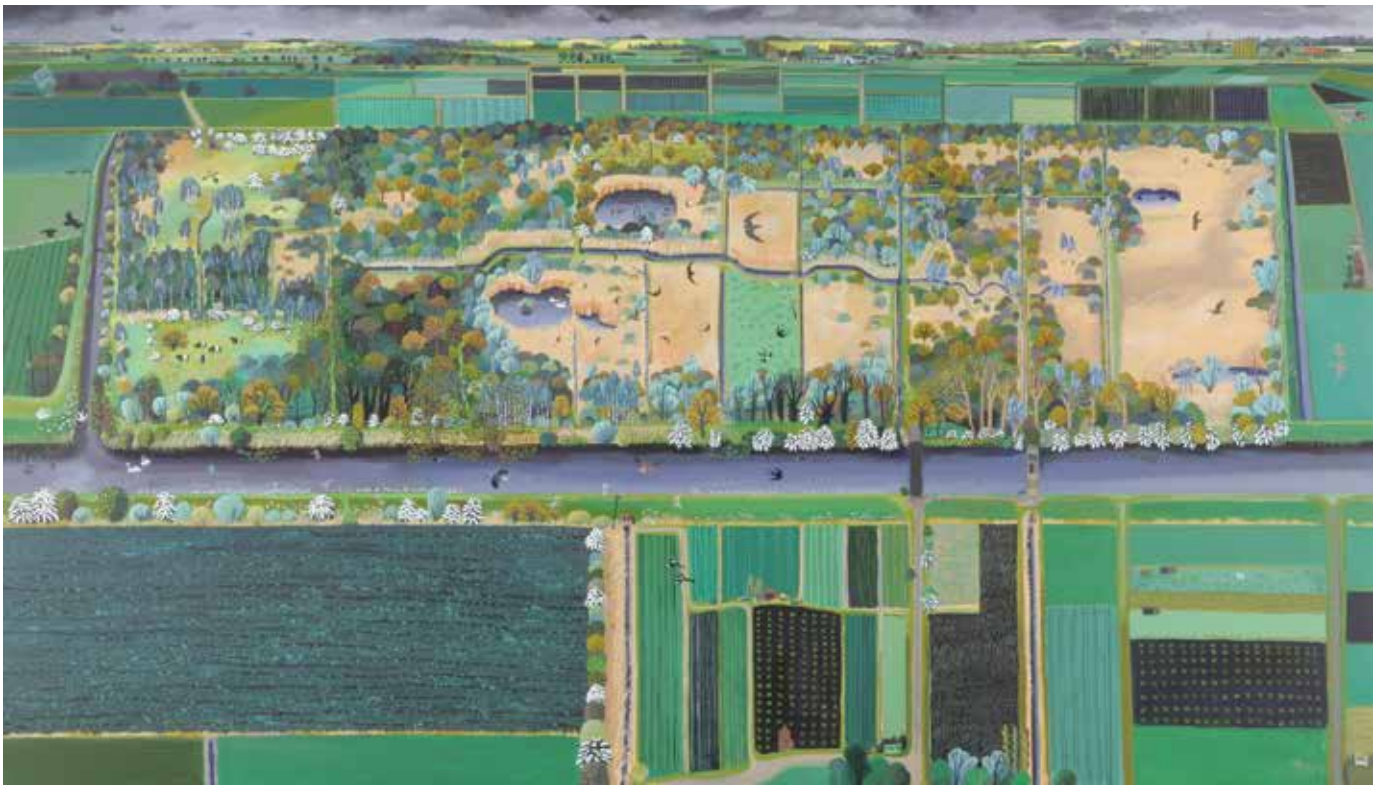
- The Falkirk Greenspace Initiative has delivered more than 100 green space projects, remediated 1,000ha of land and brought 400ha of woodland under management.
- The Falkirk Greenspace Initiative won the Overall Winner trophy at the 15th Scottish Awards for Quality in Planning.
- More than 340 community events have been held and 30,000 work days created as a result of the initiative.

Olympic Park
LDA Design

"The Park is a demonstration that the power of good design solves so many problems. It's a multifunctional landscape. There is the ability through great design to weave together the needs of wildlife with the needs of people"
John Hopkins FLI, Project Sponsor Olympic Delivery Authority 2007-2011

Green Infrastructure

An integrated approach to land use



Great Fen Landscape
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Landscape Institute
Inspiring great places

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Front cover images:

Redlees Quarry Park *TGP Landscape Architects*		
Moorgate Crofts Business Centre *RMBC*	Victoria Business Improvement District *Victoria Business Improvement District*	Adapting the Landscape *URS Infrastructure and Environment/Barnes Walker*
Priory Green Estate *Farrer Huxley Associates*	Regents Park *Max A Rush*	George Bancroft Park *AECOM Design and Planning and Dixi Carillo*
Griffin Woods *The Mersey Forest Team*	Green infrastructure scales *TEP Landscape Architects*	The Great Fen *David Holliday*