green infrastructure by design
adding value to development

a guide for sustainable communities in milton keynes south midlands
This guide is about embedding high quality, sustainable and multifunctional GI into the design or ‘place-making’ process at a site level to add value to development.
mksm as the biggest Growth Area in the country has challenging ambitions. These challenges cover both the quantity and quality of new development and our partners are committed to delivering sustainable communities as part of the growth of mksm.

I am therefore delighted that Natural England, the Environment Agency and the Green Infrastructure partnerships across mksm have worked closely with local authorities and private developers to produce this guide. It will, I hope, be a useful tool to support local authorities, developers and house builders alike, in planning for high quality development which integrates green infrastructure alongside other infrastructure needs, and the overall quality of place for mksm.

Hilary Chipping
Director of mksm

Highlighting green infrastructure as a core component of new development in mksm will ensure that the growth area does its part in delivering sustainable communities. Everyone involved in delivering quality places will be able to use this guide to find out how to better integrate green systems into their designs, making sure that green infrastructure delivers the ecological, social, and environmental benefits which are at the core of the sustainability agenda.

This guide recognises the important role green infrastructure has to play in adapting to climate change, improving health and well being, and increasing habitat. I hope it enables best practice in the integration of green infrastructure for future development so that the legacy of mksm is one of which we can be proud.

John Weir
Chairman of Transform MKSM
setting the scene
1.1 Importance of Green Infrastructure

1.1.1 Green infrastructure (GI) is the network of multifunctional green space, both new and existing, both rural and urban, which supports the natural and ecological processes and is integral to the health and quality of life of sustainable communities (PPS12). This green infrastructure network is designed, developed and managed to meet environmental, social and economic needs.

1.1.2 Milton Keynes South Midlands (mksm) is the largest and most successful of the growth areas identified by the Government’s Sustainable Communities Plan. High levels of growth are projected for the Sub-Region, and by 2021 the population is expected to grow by a further 750,000 people. This increase in population and the planned new housing, employment and ‘grey’ infrastructure requirements will not only put pressure on existing GI, which is essential for quality of life, but will require new GI provision to ensure that all residents and visitors have access to GI of all types (see Box 1).
1.1.3 National policy and regional strategic thinking is increasingly recognising the benefits of investing in GI from a physical, economic and social perspective and the critical role this GI plays in the creation of sustainable communities. The concept of GI is embodied in the Government’s Planning Policy Statements and in the relevant Regional Spatial Strategies, and is being reflected in the emerging Core Strategies of Local Development Frameworks within the Sub-Region (see Box 2).

1.1.4 In particular, the role of GI in helping achieve sustainable communities is endorsed by the mksm Sub-Regional Strategy. This requires that provision of GI should be addressed in planning developments throughout the Sub-Region so as to ensure a net gain to meet the needs generated by growth and, where relevant, help to address deficiencies. The Sub-Regional Strategy includes specific policy references to providing GI for existing and expanding communities as a key principle for implementation of development.

1.1.5 Investment in well designed and connected multifunctional GI networks can provide benefits that will help achieve many of the Government’s sustainable development policy priorities (see Box 3).

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**BOX 1 GREEN INFRASTRUCTURE TYPES**

GI refers to many different types of greenspaces, in public and private ownership, with and without public access, in urban and rural locations:

- **Parks and Gardens** – urban parks, pocket parks, Country and Regional Parks, formal gardens and country estates.

- **Amenity Greenspace** – informal recreation spaces, children’s play areas, playing fields, communal green spaces within housing areas, domestic gardens, village greens, urban commons, other incidental space and green roofs.

- **Natural and Semi-natural Greenspaces** – woodland and scrub, nature reserves, grassland, heath or moor, wetlands, open water bodies and running water, wastelands and disturbed ground, bare rock habitats.

- **Green Corridors** – rivers/canals including their banks, road and rail corridors/verges, hedgerows, ditches, cycling routes, pedestrian paths and rights of way.

- **Other Greenspace** – allotments, community gardens, city farms, cemeteries and churchyards, registered commons, village and town greens, heritage sites, development sites with potential for open space and links, land in agri-environmental management.
BOX 2  GREEN INFRASTRUCTURE PLANNING POLICY FRAMEWORK

Government Planning Policy Statements:
- PPS1 Delivering Sustainable Development (2005)
- PPS1 Supplement Planning and Climate Change (2007)
- PPS12 Local Spatial Planning (2008)
- Planning for a Natural and Healthy Environment (draft)

Regional Spatial Strategies:
- East Midlands Plan (East Midlands Regional Assembly, 2009) - policy 28
- East of England Plan (East of England Regional Assembly, 2008) - policy ENV1
- South East Plan (South East England Regional Assembly, 2009) - policy CC8

Sub-Regional Strategy:
- Milton Keynes and South Midlands Sub-Regional Strategy (2005) - Strategic Policy 3

LDF Core Strategies:
- Milton Keynes Core Strategy - pre-submission strategy policy CS20
- West Northamptonshire Joint Core Strategy - emergent strategy sections 6.10.3.9 and 6.10.3.10
- North Northamptonshire Core Spatial Strategy - adopted policy 5
- Aylesbury Vale Core Strategy - proposed submission policy CS12
- Bedford Borough Council Core Strategy - adopted policy CP22
- Mid Bedfordshire Core Strategy - adopted policy CS17
- Luton and Southern Bedfordshire Joint Core Strategy - preferred options policy CS14

Typically, the aim of the core strategy policies is to contribute to the integrity of the overall GI network by:
- protecting existing GI corridors/areas of local and strategic importance from development
- requiring development to provide different types of GI in accordance with local standards to address deficiencies in provision
- using developer contributions towards future management and maintenance costs to facilitate improvements to the quality and robustness of the GI networks

BOX 3  SUSTAINABLE DEVELOPMENT POLICY PRIORITIES

Economic priorities
- economic growth and employment

Environmental priorities
- climate change adaptation and mitigation
- protect and enhance the landscape, geodiversity and natural environment
- biodiversity conservation and enhancement
- protect and enhance cultural heritage

Social priorities
- community cohesion, life long learning and volunteering
- healthy communities, health and well being

Source: Adapted from Green Infrastructure Guidance, Natural England (2009)
1.1.6 GI provision is an integral aspect of, and can add value to, the ‘place-making’ process (see Box 4). The incorporation of high quality, sustainable and multifunctional greenspace can provide a range of economic, environmental and social functions (or services) that are essential in creating and sustaining well-designed places for living, work and play (see Box 5). This applies equally to regeneration of urban areas and sustainable urban extensions in the Sub-Region.

**BOX 5 GREEN INFRASTRUCTURE FUNCTIONS**

GI performs a variety of functions at all spatial scales, from individual sites within urban centres through to the landscape scale in the wider countryside. GI can deliver a wide range of benefits for society through the range of functions or services it can fulfil, such as:

- Landscape setting and context for development
- Habitat provision and access to nature
- Access, recreation, movement and leisure
- Energy production and conservation
- Food production and productive landscapes
- Flood attenuation and water resource management
- Countering the ‘heat island’ effect of urban areas

Source: Adapted from Green Infrastructure Guidance, Natural England (2009)

**BOX 4 PRINCIPLES OF SUCCESSFUL PLACE MAKING**

The multifaceted aspects that make places successful are:

- the quality of the buildings and spaces and their management
- the way these come together to create unique places
- built form in relation to history, culture and landscape and the provision of services
- the engagement of local people and users in defining and being involved in the process of change
- the economic and financial realities
- the role of different agencies in delivering investment and change

1.1.7 GI Functions should not be seen in isolation but as a set of interrelated functions that complement one another. It is important, when considering GI functions, that the economic, environmental and social benefits are maximised and linked together in the creation of multifunctional GI (see Box 6).

1.1.8 Importantly, consideration of GI requirements within the place-making process should go beyond the ‘red line’ boundary of a development site and consider its landscape/townscape context and setting, and the connectivity of greenspaces with the wider GI network.

1.1.9 There is increasing evidence to support the economic case for GI which demonstrates that investment in GI makes good business sense for developers. For example, well-designed and managed GI can help reduce costs of energy and water resource use in response to the increasing need to mitigate and adapt to the effects of a changing climate in the UK. GI can also help increase the potential for increased land and property values by creating and sustaining attractive places for living and working, and to visit.

1.2 This guide

1.2.1 Guidance outlining principles for the strategic planning and delivery of GI within mksm is already available, and should be read in conjunction with this guide (see Box 7).

1.2.2 This guide is about embedding high quality, sustainable and multifunctional GI into the design or ‘place-making’ process at a site level to add value to development. It encourages developers and designers to fully consider the opportunities and benefits for incorporating GI within their schemes that connects to the wider GI network beyond the site. The guide seeks to reflect some of the key issues frequently experienced by stakeholders involved in the design and development process, including private sector developers, masterplanners, local planning authorities and environmental agencies.

1.2.3 The guide is structured around the three main phases of the masterplanning process (see Box 8). Section 2.0 explores how GI should be considered from the earliest preparatory stages. The main body of the guide (Section 3.0) highlights key design considerations in respect of opportunities for designing-in different types of GI functions/services into the masterplan. GI considerations in relation to the implementation process are considered in Section 4.0.
1.2.4 Signposts to useful sources of guidance and references to case studies are provided throughout the guide. Case studies of current best practice illustrate the range of opportunities for incorporating GI into sustainable urban extensions. The selected case studies and sources of guidance are not exhaustive, but highlight how different types of GI can be designed into such developments.

1.3 Green Infrastructure Plans in mksm

1.3.1 Strategic GI plans have been developed for the whole mksm area (see Box 9). Collectively, these plans set out opportunities for creating a proposed network of multifunctional greenspace and interconnecting links. These proposed networks are priority areas for investing in GI to meet the needs of new and existing communities. These GI plans are informing a range of policies and plans across mksm. They provide an essential reference point for masterplanners of large scale developments.

**BOX 7 GREEN INFRASTRUCTURE PLANNING AND DELIVERY PRINCIPLES**

- **Landscape character** – GI should contribute to the management, conservation and improvement of the local landscape
- **Historic environment** - GI should contribute to the protection, conservation and management of historic landscape, archaeological and built heritage assets
- **Biodiversity** - GI should maintain and enhance biodiversity to ensure that development and implementation results in a net gain of Biodiversity Action Plan habitats and species
- **Woodland** - GI should be delivered through the enhancement of existing woodlands and also by the creation of new woodlands and forest areas and linking existing woodlands
- **Waterways** - GI should improve corridors along waterways and encourage increased access both on and by the water
- **Sport and recreation** - GI should create new recreational facilities, particularly those that present opportunities to link urban and countryside areas
- **Natural process and environmental systems** - GI should take account of and integrate with natural processes and systems
- **Managing urban greenspaces** - GI should be managed and funded in urban areas to accommodate nature, wildlife and historic and cultural assets, and provide for sport and recreation
- **Design** - GI should be designed to high standards of quality and sustainability to deliver social and economic, as well as environmental benefits
- **Community involvement** - GI should provide focus for social inclusion, community development and lifelong learning

Source: Planning Sustainable Communities – a Green Infrastructure Guide for Milton Keynes & the South Midlands (mksm Environment & Quality of Life Sub Group, 2005)
BOX 8  THE MASTERPLANNING PROCESS

The masterplanning process can be grouped into three basic phases as follows:

Prepare
• developing an understanding of the context for the development and setting the strategic framework/vision for the masterplan (the brief)

Design
• an iterative process involving thorough analysis, consultations, testing and refinement to evolve the spatial masterplan which identifies (i) the layout of street grids and blocks, movement routes, public spaces and soft landscape/greenspace and (ii) defines in three-dimensions the massing, heights, densities and orientations of buildings

Implement
• as an ongoing process in conjunction with the prepare and design phases, considering the processes and strategies required for successful implementation and delivery of the masterplan’s aspirations in light of social, economic, political and economic realities

Source: Adapted from Creating Successful Masterplans, CABE (2004)

BOX 9  GREEN INFRASTRUCTURE PLANS

• Milton Keynes Green Infrastructure Plan (Feb 2008)
• Northamptonshire Green Infrastructure Strategy (Nov 2006)
• Buckinghamshire Green Infrastructure Strategy (Apr 2009)
  — Aylesbury Vale Green Infrastructure Strategy (Jun 2009)
• Bedfordshire & Luton Strategic Green Infrastructure Plan (Feb 2007) – provides the framework for:
  — Bedford Green Infrastructure Plan (Nov 2009) – covering Bedford borough
  — Mid Bedfordshire Green Infrastructure Plan (Sep 2008) – covering Ampthill, Biggleswade and Sandy
setting the scene
BOX 10 THE NATURAL DEVELOPMENT PROJECT

Natural England’s ‘Natural Development’ project seeks to work with key players from the development sector to demonstrate how to value, design and create high quality GI in development projects. The project’s website contains useful information and case studies drawn from development schemes largely within the south east of England’s growth areas that illustrate how different types of GI have been designed into masterplans. See the Natural Development website for more information.

SIGNPOSTS FOR FURTHER INFORMATION ON PLANNING POLICIES

**National Policy:**
Planning Policy Statement 1 - Delivering Sustainable Development
Planning Policy Statement 1 - Supplement-Planning and Climate Change
Planning Policy Statement 12 - Local Spatial Planning
Planning for a Natural and Healthy Environment (draft)
Natural England Green Infrastructure Guidance

**Regional and Sub Regional Policy:**
East Midlands Regional Plan (RSS)
East of England Plan
South East Plan
Milton Keynes South Midlands Sub-Regional Strategy

**Local Policy:**
Milton Keynes Core Strategy
West Northamptonshire Joint Core Strategy
North Northamptonshire Core Spatial Strategy
Aylesbury Vale Core Strategy
Bedford Core Strategy
Mid Bedfordshire Core Strategy
Luton and Southern Bedfordshire Joint Core Strategy
preparation
2.1 Embedding GI into a design brief

2.1.1 GI requirements should be considered from the earliest preparatory phases of the masterplanning process, rather than as an afterthought or add on. Ideally, this should happen as part of the initial strategic thinking and research carried out by a developer to define needs, objectives and the key parameters for the development. Incorporating GI into the masterplan at the start allows the developer / design team to think about what type and how much GI is actually required, how it compliments and relates to the existing GI and how it can be integrated to create multifunctionality. This early consideration of GI allows the developer to meet many of the statutory requirements within a development scheme whilst benefitting many other social, economic and environmental objectives.

2.1.2 A review of the mksm GI planning policy framework, together with the relevant strategic GI plan prepared by the local stakeholder partnership, provides the starting point for developing an understanding of the GI context for the development (see Box 2 and Box 9 in Section 1.0). This will help identify GI considerations that may need to be embedded into the components of the strategic framework or brief for the masterplan (see Box 11).

**BOX 11 MAIN COMPONENTS OF A STRATEGIC FRAMEWORK**

- physical parameters of the project: condition, constraints, opportunities, base data
- vision and its rationale – what kind of place and why
- analysis of the potential catalysts for change
- outline business case
- identification of strategic delivery issues and options
- identification of key stakeholders – roles and responsibilities
- how the framework will inform design

2.2 Client team and roles

2.2.1 It is essential for the value of GI to be understood and supported throughout all levels of the client team to ensure the success of the masterplan in GI terms.

2.2.2 The project champion will promote the importance of GI in the masterplanning process, bringing together different professional specialisms and promoting a cross discipline approach. The project champion should demonstrate the client’s commitment to investing in GI provision, and effectively communicate, both within and outside of the organisation, how GI thinking has inspired the vision for the project and can influence the quality of the outcome.

2.2.3 Commitment to planning and delivering high quality GI needs to be demonstrated at the highest level. Therefore high level support should be reflected by the approach of the immediate client, or project sponsor, with responsibility for preparing the brief, consulting with stakeholders and selecting the specialist masterplanning team. Where established, the steering group also has an important role to play in ensuring that any relevant knowledge and expertise of stakeholders within the client organisation with respect to GI design and delivery is incorporated into the process.

2.3 Involving stakeholders in GI design

2.3.1 During the preparation process, early contact and consultation with as many relevant stakeholders as possible is essential. Information from such consultations is important for developing an understanding of the needs
and opportunities for GI provision in and around the site, which may be critical in defining the key parameters for the development. Where relevant, the stakeholders highlighted in Box 12 may need to be identified and consulted in respect of GI considerations.

2.4 **Design team and GI**

2.4.1 Selecting the right skills within the masterplanning team is essential for embedding high quality, sustainable and multifunctional GI into the place-making process.

2.4.2 Landscape architects, ecologists and other professional specialists have an important role to play in working alongside the lead masterplanners on sustainable urban extension projects. This ‘cross discipline’ approach to the design of GI networks both within the site and its context is essential to the overall success of a masterplan and the sense of place.

2.4.3 The integration of landscape design and urban design is particularly critical in achieving a coherent masterplan that captures opportunities for GI as an integral part of the original vision for a site.

2.4.4 At the start of a masterplanning project the design team needs to fully consider the on site reality of their design proposals in terms of how it will be implemented, how the subsequent management and maintenance regimes will operate and how it will all be adequately funded.
design considerations
3.1 The design process

3.1.1 The design phase of evolving the spatial masterplan is an iterative process. It involves a wide range of analysis, consultations, testing and refinement as outlined by the steps identified in Box 13.

3.1.2 For sustainable urban extension masterplanning projects, the design of GI networks should be considered as an integral element of the vision for the site’s overall layout and design. Importantly, a network of well-designed and managed greenspaces and links can make a significant contribution to creating a distinctive identity and sense of place for the development.

3.1.3 Opportunities for incorporating GI provision through the evolution and testing of the masterplan should be considered alongside options for the layout of street grids and blocks, movement routes, public spaces and soft landscaping areas. In addition, GI thinking can also influence proposals for the massing, heights, densities and orientations of buildings in respect of creating optimum micro-climatic conditions for green roof systems and roof gardens, and/or green walls to provide insulation or shading and cooling for example.

**BOX 13 THE DESIGN PHASE**

- Test strategic framework/vision
- Prepare and test land use and plan layout options
- Test against potential implementation models and options
- Stakeholder consultation and feedback
- Prepare draft spatial masterplan/3-D urban design proposals
- Development capacity analysis and testing
- Urban design refinement
- Finalise spatial masterplan/implementation

Source: Adapted from Creating Successful Masterplans, CABE (2004)
design considerations
3.1.4 It is important that sufficient time is spent studying and understanding how a place ‘works’ before starting to design.

3.1.5 Studies involving urban design, site planning and infrastructure/connectivity analysis should consider the current GI in a holistic way. It should identify what functions existing GI assets within and around a site are providing, where it is functioning well and needs to be maintained, and where it functions less well and would benefit from improvement.

3.1.6 This section of the guide highlights key design considerations in respect of opportunities for designing-in different types of GI functions/services into masterplans, illustrated by case studies. It aims to provide a stimulus for inspiring thinking about how to reflect GI needs and opportunities in the design of sustainable communities. It is not intended to be treated as prescriptive or rigid guidance.

**design considerations**
GI function
landscape setting & context for development

Properties close to quality greenspace command price premiums of 5-15% Source: Natural England

GI benefits

economic benefits
Attractive places to live, work and visit are economically more successful places with the potential to increase property values

environmental benefits
Opportunities to enhance the landscape setting and relate the development to the local character, place and context

social benefits
Places for meeting and events creates social cohesion, community involvement and a sense of place and identity

case study: Priors Hall

Priors Hall currently on site to the East of Corby is a large scale urban extension of over 5000 dwellings. The landscape setting and character have been major factors in the development of the masterplan proposals and aim to embed the proposed development within the existing community taking a holistic approach to helping regenerate the eastern edge of Corby. The existing landscape setting, established landscape elements such as woodland blocks, hedgerows and water bodies, existing ecology and footpaths and bridleways have all been used to inform the creation of a series of new neighbourhoods creating a distinctive sense of place and identity. This blending of the existing and proposed has created a robust landscape character allowing Priors Hall to integrate positively into the wider landscape setting.

key facts:

Location: Corby, Northamptonshire
Client: Bee Bee Developments
Masterplanner: David Lock Associates
Site Area: 394 hectares
Number of Dwellings: 5100

Key GI Components: Integrating the development area with the existing town and surrounding countryside; new urban edge; three distinct character areas with the unifying concept of creating a new ‘parkland’ setting.

Status: Under construction
key design considerations

How does the site respond positively to the adjacent landscape character and context whilst complementing existing GI functions?

How will the scheme connect with the wider GI network identified in the relevant GI strategy in visual terms?

Have existing landscape and historic features been incorporated into the proposed GI and are there opportunities to conserve and enhance the setting of these features within the site?

Have existing views into and out of the site been safeguarded and are there opportunities to create new views and vistas within the proposed development?

What landscape edge treatments have been considered for the site boundary and do they provide sensitive and appropriate levels of integration to the surrounding area?

Has an overarching landscape framework been developed and does it respond in design terms to local landscape character assessments?

What design measures have been incorporated into the masterplan to protect and preserve the surrounding landscape setting and enhance the distinctiveness of existing settlements?

Does the provision of GI within the masterplan create lasting value, identity and a distinct sense of place for the scheme?

signposts for further information

www.naturalengland.org.uk
www.cabe.org.uk
www.landscapeinstitute.org
www.forestry.gov.uk
www.tcpa.org.uk
GI benefits

**economic benefits**
Attractive open spaces incorporating a range of ecological habitat areas provide a strong sense of place, making schemes commercially more attractive.

**environmental benefits**
Creates opportunities to alleviate pressure on sensitive wildlife sites through provision of alternative access to nature, increased biodiversity and habitat networks enabling species movement and associated ecosystem resilience.

**social benefits**
Community involvement and participation in habitat creation and ongoing maintenance and management.

Urban green infrastructure is now vital for biodiversity, with species such as hedgehogs, frogs, songbirds and butterflies thriving in leafier parts of towns and cities. 

**case study: Cambourne**

Cambourne is a 400ha new settlement, 7 miles west of Cambridge. The original masterplan drawn up by an integrated design team in the 1990’s envisaged up to two thirds of the site to be dedicated to green infrastructure. The masterplan vision recognises that the natural environment has a vital role to play in creating a sustainable development by integrating habitat provision and access to nature. Existing landscape and wildlife features are preserved and enhanced and the green infrastructure network has been designed to incorporate multifunctionality including; ecology, water management, waste management, education, shelter and a range of formal and informal recreation. A network of routes provide convenient access for residents to a range of green infrastructure assets including; village greens, water bodies, country park, woodland and grassland. The GI network is managed by the Wildlife Trust.

**key facts:**

<table>
<thead>
<tr>
<th>Location</th>
<th>Cambridgeshire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>Taylor Wimpey and Bovis Homes</td>
</tr>
<tr>
<td>Masterplanner</td>
<td>Randall Thorpe</td>
</tr>
<tr>
<td>Site Area</td>
<td>400 Hectares</td>
</tr>
<tr>
<td>Number of Dwellings</td>
<td>4250</td>
</tr>
<tr>
<td>Key GI Components</td>
<td>Retaining key habitats (hedgerows, tree belts, ponds, watercourses and ditches), flood control system incorporating lakes and wetlands, green corridors, substantial new woodland and hedgerows.</td>
</tr>
<tr>
<td>Status</td>
<td>Under construction, partially complete</td>
</tr>
</tbody>
</table>

Source: RSPB
key design considerations

- How will the scheme connect with the wider GI network identified in the relevant GI strategy in ecological and habitat terms? Has potential damage and impacts on designated sites and protected species been considered and necessary mitigation been considered?

- Has an Ecological Appraisal been carried out and used to inform the master plan and does it take into account the habitats beyond the site boundary?

- What existing habitats and landscape features such as hedgerows, tree groups, water bodies and corridors such as rivers and canals have been integrated into the scheme and how has the balance between accessibility and preservation been addressed?

- Have new accessible areas of habitat been created and do these contribute to local targets e.g. Biodiversity Action Plans / Green Space Strategies?

- Have native species of local provenance been specified within the landscape proposals?

- What local wildlife groups and other stakeholders have been consulted and have they informed the masterplan?

- How have natural play, education or interpretation opportunities been incorporated into the scheme to connect people to nature?

- Have robust funding, management/maintenance and conservation plans been produced for the scheme?

signposts for further information

- www.naturalengland.org.uk
- www.wildlifetrusts.org
- www.forestry.gov.uk
- www.environment-agency.gov.uk
- www.woodlandtrust.org.uk
- www.cabe.org.uk
- www.cambourne.net
Contact with the natural environment is shown to improve mood in 88% of people, reduce stress, blood pressure and muscle tension. Source: World Health Organisation.

**GI benefits**

**economic benefits**
Attractive and convenient pedestrian and cycling routes between existing and proposed settlements can support the local economy.

**environmental benefits**
Improvement of rights of way networks can help reduce car journeys and provide recreational opportunities.

**social benefits**
Footpath and cycle network creates opportunities for social interaction and improved health and wellbeing of residents.

**case study: Kings Reach**

Construction of Kings Reach started on site in January 2010 and is a new sustainable urban extension on the eastern edge of Biggleswade. The proposals include 2100 dwellings and associated community facilities to serve both existing and proposed communities. The vision was to create a natural urban extension that integrates the new residents into the established neighbouring residential areas. To achieve this, the existing footpaths and bridleways have been retained and incorporated into the masterplan creating a series of green links and wildlife corridors that connect the town and the scheme to the wider countryside. These connections also promote habitat establishment, cycling, walking and recreational opportunities.

**key facts:**
- **Location:** Biggleswade, Bedfordshire
- **Client:** Taylor Wimpey, Martin Grant Homes and David Wilson Homes
- **Masterplanner:** PRP Architects
- **Site Area:** 100 hectares
- **Number of Dwellings:** 2100
- **Key GI Components:** Linear Park, multi-modal public rights of way, green corridors, recreation / sports areas, play areas, tree lined streets and waterbodies
- **Status:** Under construction
key design considerations

How will the scheme connect with the wider GI network identified in the relevant documents such as GI strategies, Rights of Way Improvement Plans, Rights of Navigable Waters and Green Space Strategies?

What provision has been made within the scheme to connect beyond the red line boundary into the wider route and spatial network and do these links also connect into other off site community facilities and open spaces offering opportunities for the wider community?

Has an audit of existing GI assets on and off site been undertaken and do proposals complement and support these assets supplementing and strengthening them?

What consideration has been made between balancing the need for access and protecting areas of ecological and biodiversity value and how will this be managed?

What consideration is there for ‘access for all’ and is it possible for all residents to access a range of GI from their home easily and conveniently?

Have opportunities for providing a range of functions, facilities and activities been considered in relation to local needs for accessible greenspace? For example, recreation grounds and sports pitches can incorporate ecological areas can be used by both school and public users as part of the wider GI network.

Have connections and linkages been made between the scheme and any existing settlements and do these promote a reduction in car use and safe routes to school as well as contributing to the health and wellbeing of its residents?

Has a management and maintenance plan been produced and is it funded robustly so the long term quality of the GI is ensured?
**GI benefits**

**economic benefits**
Opportunities are created for the local green economy and potentially with local landowners through long term supply agreements.

**environmental benefits**
Reduction in carbon emissions and opportunities for climate change adaptation in the future.

**social benefits**
Improvements to air quality through green energy solutions and provision of jobs to manage and maintain equipment in the future.

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**case study: Woodbrook, Brokerstown**

Woodbrook is a new village providing in excess of 2000 homes, on the edge of the City of Lisburn in Northern Ireland. Its vision is to use the highest standards of planning and design to create a sustainable development with real character and identity incorporating the highest levels of sustainability. The 1st phase of development has a biomass district heating system fuelled by locally sourced woodchip provided by local landowners on long term supply agreements. The benefits include; reduced bills and energy usage, home owners pre-pay for energy at the local shop, reduction in CO\textsubscript{2} emissions and the support of local businesses. The Carvill Group has a target for a 75% reduction in CO\textsubscript{2} emissions on site.

**key facts:**

- **Location:** Lisburn, Northern Ireland
- **Client:** Carvill Group
- **Masterplanner:** Llewelyn Davies Yeang / Tribal
- **Site Area:** 85ha
- **Number of Dwellings:** 2300
- **Key GI Components:** Village green, retained trees and hedgerows, wildlife areas and corridors restored water courses and wetland environments, SuDS system, wildlife corridors, recreational areas, playing fields and the use of native species for planted areas
- **Status:** 1st Phase Complete / Under construction

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Carbon dioxide (CO\textsubscript{2}) levels in the atmosphere have gone up 38% since 1750 - the year the industrial revolution started. Source: Department for Energy and Climate Change.
key design considerations

Do proposals for the site make best use of off site places nearby where energy or fuel is produced? i.e. short rotation coppice, bio fuels and wind generation?

How has existing or proposed woodland been incorporated into the scheme? Woodland can provide many benefits including carbon sequestration, habitat creation and wood chip production for renewable energy.

Have green / brown roofs been incorporated into buildings within the scheme as these provide insulation and cooling benefits?

Does structural planting create shelter from prevailing winds in winter and shade in summer, improving the usability of public open spaces whilst promoting walking and cycling locally?

What opportunity is there to combine local food production, composting and waste recycling with the potential for energy from waste?

Have street trees of an appropriate species and size been incorporated into the scheme to provide urban cooling and carbon sinks?

Has built form been orientated to maximise solar gain whilst creating sheltered and sunny open spaces?

Does the scheme incorporate solar water heating and solar electricity on roof space?

signposts for further information

www.ciria.org
www.communities.gov.uk
www.bre.co.uk
www.energysavingtrust.org.uk
www.sustainablecities.org.uk
www.carvill-group.com
GI function
food production & productive landscapes

There are 100,000 people on the waiting list for allotments in the UK. Source: National Trust

GI benefits

economic benefits
Food production contributes to the green economy whilst also making attractive and sustainable place to live

environmental benefits
Contributes to a carbon efficient approach to living through the reduction of food miles

social benefits
Allotments provide opportunity for people to gather and interact building social wellbeing whilst also providing opportunities for education and health improvements

There are 100,000 people on the waiting list for allotments in the UK. Source: National Trust

case study: Sherford

Sherford is planned as a new market town on the eastern edge of Plymouth. The development proposals aim to enhance the beautiful natural setting for the development, and to become a model for town planning in the 21st Century. The masterplan includes the retention of many existing features on the site, and integrates them into the planned network of green corridors and open spaces. A large community park is central to the scheme; it will be the largest habitat creation scheme in the south-west, and will also provide sports facilities, community gardens and allotments, and space for an organic farm. Every other part of the town will feature open spaces within walking distance of homes, from watercourses and wildlife corridors to greenways, urban parks and play areas.

Key facts:

Location: Plymouth
Client: Red Tree LLP
Masterplanner: The Prince’s Foundation
Site Area: 485 Ha
Number of Dwellings: 5,500
Key GI Components: 200 Ha Community Park providing sports facilities, community gardens, allotments and plans for an organic farm. Every home will be within walking distance of a network of green corridors and open spaces. A Community Trust will be set up and involved in managing community facilities and promoting sustainable living.

Status: Planning
**key design considerations**

1. Do the proposals for the site make best use of offsite places nearby where the production of food can take place and is this close to where people will live?

2. Have adequately sized rear gardens been provided to allow small scale domestic food production?

3. What opportunities are there to explore the potential for locally grown food to be used by local schools and other community facilities?

4. What opportunity is there to combine food production with other GI functions such as energy production, access and recreation?

5. Has a shortfall in allotments been identified in the area outside the site and if so is there potential to provide new allotments as part of the scheme that allow existing communities to use this space.

6. What is the potential for community orchards, city / school farms and other edible landscapes such as hedgerows to be incorporated into the scheme?

7. Has the use of livestock been considered to reduce / maintain management costs within the GI network?

8. Has a site-wide composting strategy for garden and food waste been developed? Garden and food waste can be utilised as compost for allotments and renewable energy production.

**signposts for further information**

- [www.cabe.org.uk](http://www.cabe.org.uk)
- [www.defra.gov.uk](http://www.defra.gov.uk)
- [www.nsalg.org.uk](http://www.nsalg.org.uk)
- [www.sustainweb.org](http://www.sustainweb.org)
- [www.allotment.org.uk](http://www.allotment.org.uk)
- [www.redtreellp.com](http://www.redtreellp.com)
GI function
flood attenuation & water resource management

On average, every £1 invested in improved flood protection in England, reduces the long term cost of flooding and coastal erosion by £8. Source: Environment Agency

GI benefits

economic benefits
Reduced economic and insurance costs associated with improved water resource management

environmental benefits
A range of water bodies have created new wetland areas incorporating habitat connectivity and enhanced biodiversity

social benefits
Opportunities for people to access water for formal and informal recreation, and a decrease in the likelihood of flooding, reduces psychological impacts on communities living in a vulnerable area

case study: Upton

Upton was granted original planning permission in 1997 as phase 1 of the strategic urban expansion within the South West District of Northampton. The principal aim of the project was to create an integrated urban extension promoting the best practice in sustainable urban growth, creating a distinctive sense of place and a test bed for environmental technologies. Central to this was the concept of a sustainable water management system being fully integrated into both the landscape structure and a key component of the masterplan. Key elements of the integrated sustainable urban drainage system (SuDS) are: street and courtyard SuDS, green swales, balancing ponds, wetland areas and reedbeds.

key facts:

Location: Northamptonshire
Client: HCA / Northamptonshire Borough Council / Paul Newman New Homes / Taylor Whimpey / David Wilson Homes / Barratt
Masterplanner: EDAW/AECOM/Princes Foundation
Site Area: 44 hectares
Number of Dwellings: 1020 Phase 1
Key GI Components: Integrated SuDS system, woodland blocks and hedgerows, public squares, long distance footpaths, Upton Country Park, Upper Nene Valley Country Park, green corridors, recreation / sports areas, play areas, tree lined streets and green roofs
Status: Under Construction
key design considerations

Have sustainable drainage systems been linked together to provide water resource management, increased biodiversity and an accessible recreational resource?

Has an assessment of the ground water and water resource of the site taken place and what measures have been identified to improve the quality and quantity of water?

What provision has been made for water balancing measures such as storm water ponds or lagoons to replace groundwater levels and have sustainable drainage systems either as permeable paving or swales been considered?

Have relevant flood strategies been identified and do they inform the design and approach to on site water management and the wider masterplan?

Have rainwater harvesting systems been incorporated to provide water for irrigation of gardens, public open spaces and use within ponds and other water features?

Have rainwater harvesting systems been incorporated to provide grey water for non potable uses such as WCs?

Have a variety of water elements to ‘tell the story’ of water from collection to discharge been included? These elements could include vegetated swales, wetlands, reed beds, flood meadows, lakes and ponds.

Have green roofs been provided to slow the rate of runoff?

Have the Water Framework Directive and relevant River Basin Management Plan(s) been taken into account with appropriate measures incorporated into the development?

Have studies of groundwater, contaminated land etc been undertaken to determine the suitability of the site for sustainable drainage systems?

signposts for further information

www.environment-agency.gov.uk
www.ciria.org
www.bre.co.uk
www.decc.gov.uk
www.tcpa.org.uk
www.homesandcommunities.co.uk
GI benefits

**economic benefits**
Industries providing solar energy and green roof technologies can create high value, high skilled local employment

**environmental benefits**
Increased urban cooling due to large scale use of vegetation, tree planting and green / brown roofs also provides new habitats and biodiversity benefits

**social benefits**
Creation of a cooler and more comfortable urban environment during hot summer months and improvements to air quality through a reduction in particulates

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**case study: Vauban**

Planning for the Vauban sustainable urban extension started in 1993, and the project was completed in 2006. The main aim of the project was to create a city district in a co-operative and participatory way, meeting ecological, social, economic and cultural requirements. The landowner, the City of Freiburg, was responsible for the planning and development of the site which allowed a flexible, ambitious and unique design response with all aspects of sustainability considered with a strong emphasis on low energy principles and sustainable transport solutions. Key elements of the scheme contributing to a reduced urban heat island effect are: widespread use of green and brown roofs, Passivhaus / low energy housing, large scale solar panel installation, district CHP, a largely car free development, light rail and a network of green street and public spaces.

### key facts:
- **Location:** Freiburg, Germany
- **Client / Project Team:** Forum Vauban, Buergerbau - Citizen’s Building Stock Corporation, Baugruppen - Building Co-Operatives, Genova Housing Association, Students Union / SUSI
- **Site Area:** 38 hectares
- **Number of Dwellings:** Approx 1200 residential units and 600 student rooms
- **Key GI Components:** Green roofs, tree lined streets, communal gardens, allotments, woodland blocks, integrated SuDS system and parks and recreational areas
- **Status:** Construction complete

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Tree lined streets provide both urban shading and a pollution filter - filtering out up to 70% of air pollutants

*Source: Natural England*
key design considerations

Has structural planting been proposed to enhance the local microclimate across the development site?

Have street trees been proposed within the masterplan to create shade and cooling in external areas during summer months and reduce rainwater runoff?

Have green / brown roofs been incorporated into the scheme to increase energy efficiency, conservation and provide shade?

Has planting been used to minimise solar glare on buildings?

What local provenance species have been chosen and are they the correct species to achieve objectives of cooling in summer, solar gain in winter and increased biodiversity?

Have water bodies such as ponds and lakes been created to provide microclimatic cooling during the summer months?

Have building roofs in the scheme been used to incorporate solar water heating and solar electricity?

signposts for further information

www.sustainablecities.org.uk
www.rtpi.org.uk
www.cabe.org.uk
www.bre.co.uk
www.ciria.org
www.vauban.de
implementation
4.1 Early implementation of large-scale GI

4.1.1 Implementation of the GI aspects of a masterplan should be considered as an ongoing process in conjunction with the prepare and design phases. This involves considering the processes and strategies required for successful implementation and delivery of the masterplan’s aspirations for GI (see Box 14).

4.1.2 In relation to implementing GI within development sites, the issues identified in Box 15 are particularly relevant considerations for the masterplan’s overall implementation strategy to address.

4.1.3 The developer should be engaged in early discussions with local authorities over on site GI provision so the costs of the expected high standards of quality and quantity of GI can be accounted for by the developer in his negotiations for buying the land.

4.1.4 GI should be seen as critical infrastructure in the same way as utilities or local transport networks. If it can be incorporated at the start of a project it is possible to achieve substantial cost savings through combining uses and creating multifunctionality. It is also important to understanding what types of GI are specifically required for an individual site and its context to avoid either over provision or unnecessary GI.

BOX 14 THE IMPLEMENTATION PHASE

- Start implementation strategy during preparation phase, to cover:
  - Timetable
  - Funding sources
  - Delivery vehicles or agency
  - Partners in local delivery
  - Marketing
  - Management and maintenance strategy
  - Risk analysis
- Establish mechanisms for delivering design quality in projects, e.g:
  - Design briefs
  - Design guidelines
  - Design codes
  - Team of architects and designers
  - Competitions
  - Design advisory panel
- Market the development opportunities/find development partners
- Monitor proposals against masterplanning key principles
- Review and amend if baseline conditions change

Source: Adapted from Creating Successful Masterplans, CABE (2004)
4.2 Funding, Management and Maintenance

4.2.1 Funding, management and maintenance are interconnected and will vary depending on the funding approach and management structure chosen. The choice will depend on the specific characteristics of the site, the type of GI, whether the GI is on or off site as well as the aspirations of the developers, stakeholders, residents and local authority. Potential management and maintenance structures are outlined in Box 16. A combination of different organisations or mechanisms may be the best approach.

4.2.2 Some types of GI have the potential to raise revenue i.e. for food or energy production. Additionally, some GI can lower costs over the long term i.e. reducing outfall costs of surface water by managing it on site through a SuDS scheme.

4.2.3 The funding for creating green infrastructure on site will generally be paid for by the developer. In the long term, there are various sources of funding for green infrastructure including planning obligations (e.g. S106 agreements, or the proposed Community Infrastructure Levy). Other sources are listed in Box 17.

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**BOX 15 GREEN INFRASTRUCTURE IMPLEMENTATION ISSUES**

- Early establishment of large-scale GI provision (e.g. tree planting, SuDS, etc)
- Identifying sources of funding for creation and ongoing management of GI
- Finding appropriate implementation mechanisms and delivery vehicles
- Ongoing GI management and maintenance strategy
- Delivering detailed GI features through design codes and standards

**BOX 16 MANAGEMENT AND MAINTENANCE STRUCTURES**

- Local Authority
- Charitable-status Management Trust e.g. Wildlife Trust and Park Trusts
- Community Development Trusts
- Management Companies
- Co-operatives and partnerships
- Voluntary organisations

For more information see the following reports:

- ‘Paying for Parks’ (CABE 2006)
- ‘Community Greenspace and New Development’ (Hertfordshire County Council)
BOX 17 LONG TERM FUNDING SOURCES FOR GI

- Planning Obligations
- Community Infrastructure Levy (proposed)
- Endowments
- Public sector grants (e.g. from local councils, government departments, government agencies)
- Local delivery vehicles and partnerships
- European Funding
- National Lottery
- Renewable energy grants schemes
- Roof Tax
- Environmental stewardship scheme funding
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