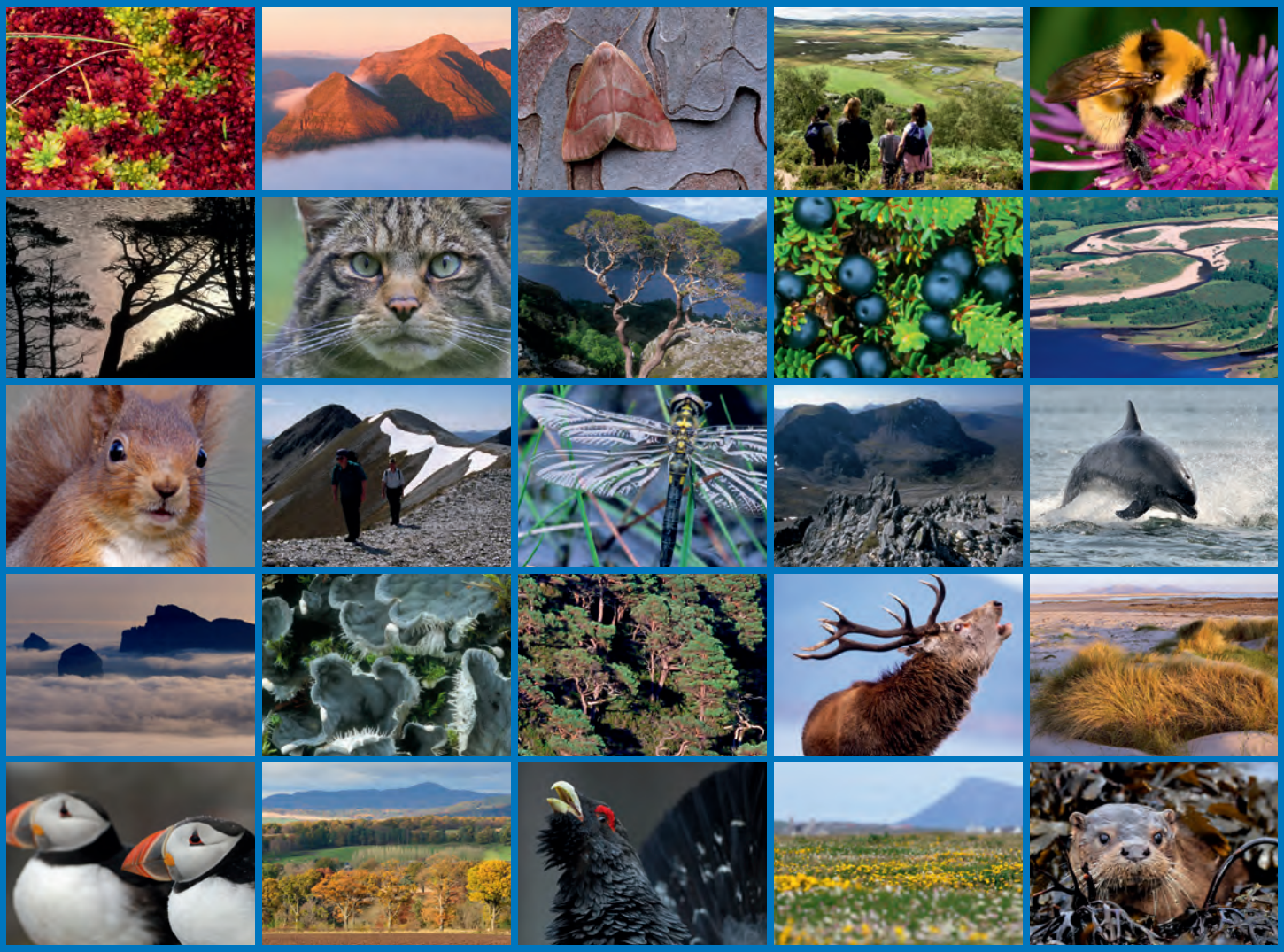
Scottish Natural Heritage
Commissioned Report No. 490

Green networks and people: A review of research and practice in the analysis and planning of multi-functional green networks



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COMMISSIONED REPORT

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Green networks and people: a review of research and practice in the analysis and planning of multi-functional green networks.

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COMMISSIONED REPORT

Summary

Green networks and people: a review of research and practice in the analysis and planning of multi-functional green networks.

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Background

The emerging policy context for the integration of urban green networks into spatial planning (*e.g.* National Planning Framework 2, Planning Policy Guidance 17) provide an opportunity to improve the planning and management of urban Scotland and people's quality of life. The concept of green networks seeks to recognise the importance of greenspaces and associated green networks as an essential component of more sustainable urban environments.

This review examines current approaches to assessing green networks and green infrastructure within the UK and examines how these can support planning and management. Many approaches to greenspace provision may have application for developing multifunctional green networks. Thus the principle aim of the 'Green Networks and People' project is to examine how a range of data sets and analytical tools can be applied to the development of new approaches to support the planning and management of multi-functional green networks. Evidence for the key functions and issues affecting use of green networks is presented, focussing upon: green networks and health; active travel; accessibility and barriers; and understanding social values.

Main findings

- All local authorities use an approach to manage greenspace and/or green infrastructure within their region, but many seem to focus on the provision and management of individual greenspace elements rather than considering greenspace as part of a network.

- Practical approaches to incorporating social data sets onto greenspace / green network planning and provision are scarce, which many studies focussing upon barriers and accessibility to greenspaces, particularly for minority groups.

- Data on use of core paths and greenspace have been utilised to model green networks to promote active travel (utilitarian user), to increase leisure activities (leisure user), and to examine overall green network provision (generalised user). Details can be found within the associated Green Network Framework Practitioners Report and Technical Report.

- Actively planning greenspace as a green network will help to reverse the effects of greenspace fragmentation and is likely to increase opportunities for the everyday engagement of people with greenspace and promote active travel.

- Future research priorities need to focus on how people use green networks and what their motivations are for using (or not using) green networks.

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1 INTRODUCTION

1.1 Scope of review

This review examines current approaches to assessing green networks and green infrastructure within the UK, supported by non-UK examples and examines how these can support planning and management. Many approaches to greenspace provision may have application for developing multifunctional green networks. Thus the principle aim of the 'Green Networks and People' project is to examine how a range of data sets and analytical tools can be applied to the development of new approaches to support the planning and management of multi-functional green networks. The project will build on previous research on 'Urban Networks for People and Biodiversity' (see: Moseley *et al.*, 2008) to look specifically at how green networks can support biodiversity conservation while also delivering other functions, specifically;

- increased participation in outdoor recreation across a range of social groups;
- creating health promoting environments; and
- more sustainable patterns of travel.

The objectives of the study are to:

- review current approaches from the UK and elsewhere to assessing green networks, and supporting better decision making on its planning and management, focussing on the functions set out above;
- review and scope data and modelling approaches that could be used to develop new approaches to assess the functionality of green networks and inform its planning and management;
- investigate opportunities to test these approaches in practice at a range of spatial scales.

1.2 Background to the review

There is a range of evidence that suggests greenspaces and green networks or green infrastructure can provide significant physical, psychological and physiological benefits (see, for example, Mitchell and Popham, 2008; Morris, 2003; Tzoulas *et al.*, 2007 and reviews from Croucher *et al.*, 2007; Bell *et al*., 2008; Department of Health, 2009; CABE, 2010; O'Brien *et al.*, 2010). In 2003, Morris stated that a lack of physical activity increased the risk of coronary heart disease for around two-thirds of Scottish adults (citing Physical Activity Task Force, 2002; Cox, 2002; Central Scotland Countryside Trust, 2001). Cohen *et al.* (2007) believe that encouraging people to become physically active is essential for improving overall population health (2007:514). More than 80% of Scotland's people live in towns and cities and the greenspaces in and around these towns and cities provide a wide range of goods and services – including opportunities for physical activity and mental refreshment, enhancing landscape quality, supporting biodiversity conservation, improving water and air quality and offering sustainable travel options. The concept of green networks seeks to recognise the importance of greenspaces and associated green networks as an essential component of more sustainable urban environments, and improve the functionality of these networks through improved protection and management. Yet, according to Bell *et al.* (2007) there is a lack of baseline data on how people perceive and use greenspaces. They state: "*It includes who does and does not use greenspace, categorised by social group, age group, ethnic groups and what are the patterns of use over time and in relation to age/life stage. It needs to include a longitudinal component so that changing patterns can be assessed, in part to see how demographic changes impact greenspace policies and provision but also to see how policy and practice affect greenspace use*". They also identify a lack of baseline data on presence of biodiversity and changes over time.

The emerging policy context for the integration of urban green networks into spatial planning (*e.g.* National Planning Framework 2, Planning Policy Guidance 17) provide an opportunity to improve the planning and management of urban Scotland and people's quality of life. Effects of urban densification increasing the pressure on existing greenspace means that careful spatial planning is required if targets for having small areas of accessible greenspace within a short distance to residents' homes are to be met (Box and Harrison, 1993). Infill housing is often proposed to achieve sustainable development targets by reducing local energy and transport costs (Tyrvainen *et al.*, 2007), but can lead to reduced (and fragmented) green infrastructure in urban areas. Pressure on green areas (and the greenbelt) means there is a need to construct spatial plans to identify current green network linkages in order to highlight vulnerable areas. Moreover, a greater understanding of the ways in which networks of greenspace support a range of social, environmental and economic outcomes and recent developments in data and modelling tools will support decision making on green network planning. Green infrastructure, planned through a green network approach can support opportunities for active travel, health inequality initiatives and a range of ecosystem services. This approach can address the fragmentation of greenspace, which reduces opportunities for movement and disturbs perceptions of space (Van Herzele *et al.*, 2003).

1.3 Green Networks and Green Infrastructure

The terms green infrastructure and green networks are often interchangeable, with both aiming to focus on social, biological and physical environment functions. The term green infrastructure has its origins in North America; Sandstrom (2002) cites Little (1990) as introducing the concept of green infrastructure while the concept of greenways began in large urban centres of the USA (Ahern, 2004) to address the need to create connections and paths for people to access the American countryside. An important quality of the greenway is that it is essentially a multi-benefit device and, whilst the initial design is based on environmental features such as rivers and benefits such as pollution buffering, the motivation is to increase access to recreation and visual amenity for city dwellers. European approaches, on the other hand, initially focused on ecological networks as a conservation tool for species and habitats but with the later recognition that networks should also meet the needs of humans (Jongman and Pungetti, 2004).

The concept of Green Infrastructure in urban and peri-urban areas emphasises the quality as well as quantity of greenspaces, connectivity between these spaces and their multifunctional role (Tzoulas *et al.***,** 2007 citing Turner 1996 and Rudlin & Falk, 1999). Benedict and McMahon (2002) define green infrastructure as *"an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife".* Many approaches tend to focus on individual greenspaces but as Tzoulas and James (2010) point out green networks are more functionally and/or physically integrated, and, therefore may provide more recreational opportunities.

Although the emphasis is often put upon the green component of green infrastructure or networks, many definitions refer to the green but also blue spaces in and between towns as this emphasises the role of terrestrial and aquatic habitats in providing ecosystem services. Other definitions make reference to the linkage of green infrastructure with urban areas, *e.g.* Tzoulas *et al.* (2007) "*all natural, semi-natural and artificial networks of multifunctional ecological systems with, around and between urban areas, at all spatial scales*".

Planning that utilises green infrastructure differs from conventional open space planning because it examines conservation values along with land development, growth management and built infrastructure planning (Benedict & McMahon, 2002). However, while the term green infrastructure may be useful to professionals, it may mean little to others, whereas the term green networks is more likely to suggest connection with the surrounding greenspaces.

The relationships between greenspaces, green networks and green infrastructure can be summarised in terms of their functions and spatial considerations. Greenspaces are the individual publically accessible spaces that form the components of a network. Green networks can be viewed as a strategically identified system of publically accessible green spaces and linkages allowing movement around the network for people and providing habitat for wildlife. Green infrastructure (and GI strategies) is concerned with issues of greenspace functionality within an area. Assessment of GI needs can spatially inform Local Development Plans and Community Strategies.

2 CURRENT APPROACHES TO ASSESSING GREEN NETWORKS

This section examines current approaches to assessing greenspace and its planning and management as part of a green network or green infrastructure.

2.1 Policy context

The importance of greenspace has long been recognised and has been the focus for many policies, *e.g.* National Planning Policy Guidance 14 (NPPG 14), Scottish Planning Policy 11 (SPP 11): Planning Policy Guidance 17 (PPG 17), Physical Activity and Open Space, Planning and Open Space (PAN 65), Enhancing Urban Green Space, Nature Conservation (Scotland) Act 2004, and the European Landscape Convention. Networks of linked, good quality greenspace are considered to be important in urban areas for their positive visual impact and their contribution to biodiversity, recreation, education, and outdoor access (Scottish Executive, 2006).

National Planning Framework 2 (NPF 2) highlights the potential to establish multi-functional green networks, and there are opportunities to incorporate these in the new strategic plans in the four city regions and local development plans elsewhere. Scottish Planning Policy 11 – Open space and Recreation (now incorporated within the revised Scottish Planning Policy document) recognises the importance of green networks to the urban landscape, biodiversity and people's quality of life. It requires all councils in Scotland to develop an open space strategy based upon a comprehensive audit of open space and encourages councils to consider opportunities to identify and enhance green networks. The aspirations to plan and manage greenspace as part of a green network will be taken forward at a range of scales, *e.g.* cross-regional (Central Scotland Green Network and South East Scotland Strategic Plan), Regional (Edinburgh), and sub-regional (local plans); each aims toward the strategic planning of greenspace to provide multiple benefits.

The strategic objectives of the Scottish Government are for a Greener (*i.e.* to 'improve Scotland's natural and built environment and the sustainable use…"), and Healthier (*i.e.* to "help people to sustain and improve their health, especially in disadvantaged communities…") Scotland. Undertaken through public programmes, the aim is to provide *'an environment which contributes towards well-designed, sustainable places with access to amenities and services'* and *'strong, resilient and supportive communities in which people take responsibility for their own actions and how they affect others'* (Scottish Government National Outcomes).

Further references to elements of green networks are made within the Scottish Government's National Outcomes, including:

1. We live in well-designed, sustainable places where we are able to access the amenities and services we need
2. We value and enjoy our built and natural environment and protect it and enhance it for future generations
3. We live longer, healthier lives
4. We have tackled the significant inequalities in Scottish society
5. We live in a Scotland that is the most attractive place for doing business in Europe.

24 of the 29 mainland authorities in Scotland have references to greenspace and/or open space in their Single Outcome Agreements, with majority of mentions towards the first and second objectives in the list above.

Green networks also feed into other policy areas focussed around health and physical activity including:

- Woods for Health Strategy (Forestry Commission Scotland, 2009)
- Let's Make Scotland More Active: a strategy for physical activity (Physical Activity Task Force, 2003)

- Scotland's National Transport Strategy (Scottish Executive, 2006)
- Good Places Better Health (Scottish Government, 2008a)
- Towards a mentally flourishing Scotland (Scottish Government 2009)
- Healthy Eating, Active Living: an action plan to improve diet, increase physical activity and tackle obesity 2008-11 (Scottish Government, 2008b).

2.2 Current approaches to assessing green networks

Examination of greenspace provision often focuses on the quantity and type of greenspace present, in relation to a local or regional population. A separate consideration may be given to how people move around using paths (in Scotland through the development of Core Path Plans), cycle routes, rights of way and public transport. There is some evidence that planners do not always explicitly think of urban greenspace as a multifunctional system (*e.g.* Sandstrom, 2002) but consideration should be given to the defining of greenspace, particularly larger elements such as public parks, as hubs with core path networks as the linkages between greenspace and also to and from peoples homes.

There are a number of papers exploring methodologies to assess and plan greenspace, often targeting particular elements of society (*e.g.* Comber, 2008; Gobster, 2002; Tyrväinen *et al.*, 2007). The approaches used by Local Authorities are often based on pragmatism (ease of use, availability of data and resources) and tend to focus on the wider public in the first instance. These approaches can be categorised into the following:

- Greenspace and open space standards
- Greenspace and open space strategies
- Green infrastructure strategies
- Green networks.

Approaches that aim to target specific groups are often undertaken as research projects and will be considered with research papers under:

- Research approaches.

2.3 Greenspace and open space standards

2.3.1 Description

Greenspace and open space standards indicate requirements for the minimum size of green or open space that should be reached within a prescribed distance from residential homes. Assessment of greenspace provision forms the basis for identification and quantification of the greenspace resource through the examination of two criteria:

1. The quantity of greenspace available to a population measurement *e.g.* per 1000 people (although this ignores the spatial availability to users)
2. The quantity of greenspace that should be available within a range of distances, *e.g.* 2 ha within 500 m.

These standards are used to produce map outputs to identify areas that lack accessible greenspace, *i.e.* outside the catchment areas of the qualifying greenspace areas.

2.3.2 Examples of green and open space standards

ANGSt (English Nature's Accessible Natural Greenspace Standard)
The ANGSt standard, also referred to as a toolkit and a model for the assessment and planning of accessible greenspace, is used by a number of planning authorities in England and has been adopted by Scottish Wildlife Trust and East Dunbartonshire Council in Scotland. A review of ANGSt use within English Local Authority greenspace and green infrastructure strategies found a considerable variation in the scope of the two types of approaches and concluded that in reality the distinctions between the two are blurred

(Natural England, 2008). The range of approaches used by different planning authorities suggests that, despite recommendations that certain standards be adopted (such as ANGSt), there is no standard methodology being consistently employed, perhaps due to a lack of statutory agreement. However, there is an aspiration to audit the quantity and quality of different types of open space provision for the general public and also for certain societal groups.

National Playing Fields Association (NPFA) Six Acre Standard

The Six Acre Standard aims to help land use planners ensure a sufficient level of open space to enable residents of all ages to participate in sports and games with an emphasis on access for children to play grounds and other play space. The standard is commonly used as a quantitative assessment of greenspace provision within catchment areas and also as a qualitative standard for the provision of sports and play provision.

The standard specifies there should be a provision of 2.4 ha (6 acres) of greenspace per 1000 residents, and that this should comprise of:

- 1.6 ha (4 acres) for outdoor sport and recreation space (including parks)
- 0.8 ha (2 acres) for children's play, with about 0.25 ha of this equipped playgrounds

In its publication *The Six Acre Standard*, the NPFA outlines a more detailed breakdown including a hierarchy of child play space.

Greater London Authority's Open Space Standards

The London Plan (Greater London Authority, 2004a) sets out size and distance guidelines in relation to a hierarchy of open space categories. Focusing largely on parks, Greater London Authority (2004b) recommend defining catchments to identify areas deficient in terms of access to public open space. It also suggests a refinement to distance criteria and a more detailed assessment to identify sites where local circumstances such as the location of entrance gates, street patterns, the severance effects of railway lines or heavy traffic flows impede access. Large physical barriers such as a railway line without any means of crossing should limit the catchment area and provide catchment edges and, if time and resources permit, actual walking distances and barriers could be assessed on a case by case basis. It also recognises that catchment areas will be smaller in practice for some groups, for example disabled people, children and parents with young children and that the accessibility of open spaces will be affected by the design of entrances as well as their location.

The Greater London Authority (2004b) guide to preparing open space strategies states that, in addition to categorising open space used for PPG 17 typology, an audit should also identify points of access, functions, present level of use and access and facilities for disabled people. The importance of cross-boundary open space provision is recognised (Greater London Authority, 2004b), with a recommendation that study areas should be extended by a minimum of 1.2 km. Reference is made in the London Plan (Greater London Authority (2004a) to Green Chains: *'areas of linked but separate open spaces and the footpaths between them which are accessible to the public and provide way-marked paths and other pedestrian and cycle routes'*. These Green Chains are considered important linkage elements in London's open space network and the Plan states that, due to their London-wide significance, they should be designated as Metropolitan Open Land and protected from development in the same way as the Green Belt.

Qualitative standards

Quality standards are used to determine existing greenspace quality and to identify areas needing improvement. They are deemed aspirational for existing provision and in terms of requirements for new provision (CABE, 2004). The Civic Trust encourages Councils in England and Wales to manage all of their parks and greenspaces in accordance with the

Green Flag standard, to qualify for the Green Flag Award scheme. Generally, the award is applied to larger, publicly accessible open space with a site-specific management plan. In Scotland a toolkit for assessing the quality of greenspace has been developed by Greenspace Scotland and the Glasgow & Clyde Valley Green Network Partnership (Greenspace Scotland, 2008). This approach is being adopted by the planning authorities in Scotland, using five criteria:

- accessible and well connected
- attractive and appealing places
- biodiverse, supporting ecological networks
- active, supporting health and well being
- community supported.

A recent report on the amount and types of urban greenspace in Scotland indicates that 19 or the 32 Local Authorities have already begun collection of qualitative data (Greenspace Scotland, 2009). SNH plan to review the quality standards in the near future.

2.3.3 Review of greenspace size and distance criteria

The minimum size of greenspace and distance criteria form an important factor in the spatial planning of greenspace, but the figures used can often be relatively arbitrary, *e.g.* a ten minute walk (Barker and Graf, 1989) or a 500 ha area of greenspace, and do not take into account regional (or even urban – peri-urban) variations. However, Box and Harrison (1993) recognised that minimum targets for accessible greenspace were required to prevent the loss of greenspace and indeed targets have importance for determining current greenspace provision and where there may be inequalities.

This review has identified that most of the approaches used by planning authorities to assess and plan green networks use criteria based on those suggested by Box and Harrison (1993), as before this publication there was little guidance available.

Some planning guidance has focused upon particular types of greenspace. Since 1976, the London Boroughs have used a distance of ¼ mile to small and local parks, with ¾ mile as the maximum distance expected to walk to a larger district park. The National Playing Fields Association (NPFA) *Six Acre Standard* uses a quantitative approach to help land use planners ensure a sufficient level of open space to enable residents of all ages to participate in sports and games (6 acres per 1000 population) and specifies maximum distances to sites for sports, recreation and children's play. In its publication *The Six Acre Standard* (NPFA, 2002), the NPFA outlines a more detailed breakdown including a hierarchy of child play space.

Many of the studies that use a criteria for minimum distance to greenspace relate back to Hart's (1979) study undertaken in a small New England town, and Matthews' (1987) paper investigating the influence of gender-related differences in home range experience on cognitive mapping ability. The latter study sampled 166 children aged between 6 and 11 from a suburban school and asked each child to draw a map of their journey to school and home area. Hart (1979) showed differences in the home range limits (how far children will range from home with permission of their parents) between boys and girls. These studies specified minimum criteria for how far you would expect someone to walk from their home to get to their nearest area of usable greenspace (often a play park for children). According to Coles and Caserio (2001) areas of greenspace should ideally be so close (to homes) that they are accessed within 5 minutes walking time. Coles and Bussey (2000), questioning 592 local residents on use of local woodlands in the Redditch area of the West Midlands, defined walking distance to woodlands of up to 400 m, or between 6 and 8 minutes. However, this figure may have been influenced by 75% of the local population living within a 275 m radius of an accessible woodland.

It is common for standards to use a straight-line distance to define catchments where residents have access to green or open space, with areas outside the catchments being considered deficient. A field and desk study of the distances and times taken to walk to local parks indicated that critical distances relevant for defining accessible local open spaces are smaller than those assumed by earlier studies (LPAC, 1992). The distance that people were prepared to travel was reduced by severance factors, *e.g.* busy roads, private land, undesirable areas, and constraining factors, *e.g.* slope and terrain. To compensate for this, a modified 280 m rather than 400 m straight line radius to define catchments for local and district parks and local wildlife sites, taken from known access points, was recommended by the London Planning Advisory Committee (1992) and Harrison *et al.* (1995). CABE (2004) suggest that public consultation should inform local standards, to ensure local validity of accessibility standards, an approach undertaken, for example, in the Slough Sport, Recreation and Open Space Study.

2.3.4 Minimum greenspace size

In their review of greenspace standards, Harrison *et al.* (1995) states that the minimum size of 2 ha for greenspace mapping has no basis in theory but is instead based on practical considerations such as mapping and identifying sites on Local Plans. As there is no strong evidence to suggest a size class below which sites should be excluded from an inventory, the authors recommend detailed survey of all areas. This should be possible; all planning authorities now use Geographic Information Systems (GIS) to map all spatial components within their boundaries, so all areas of green and open space should, theoretically, be recorded. ANGSt plus – recommends mapping all accessible greenspace over 0.25 ha (Natural England, 2008), although the reason for their choice of 0.25 ha is not specified. Guidance for the London boroughs suggests that a minimum mapping of all open spaces over 0.4 ha and sites of less than 0.4 ha should be included at the discretion of the borough due to their contribution to the provision of public open space, especially in areas of deficiency (Greater London Authority, 2004b). The GLA Open Space and Habitat Survey for Greater London covers all open spaces of 0.25 ha and above

Box and Harrison's suggestion of a minimum target for neighbourhood provision of 2 hectares of accessible greenspace provides an operational goal for planners and designers to work towards. Such a target may not be readily achieved in many inner city or high-density residential areas, but it provides a target to work towards when negotiating and deciding upon future development proposals. Such a target could also be used as an indicator of local sustainability. However, Harrison *et al.* (1995) conclude that *size* and distance criteria on their own are not sufficient for identifying safe natural sites while Croucher *et al.* (2007) note that access to greenspace is an important factor in its 'usability' but this should not only be measured in terms of distance and could include features such as ease of access and connectivity between greenspaces. Consideration also needs to be given to the maximum size of greenspace, as some sites (that are relatively open) may be considered too big, with the suggestion that, in sites larger than 2 ha, extra boundaries may be required to produce a series of smaller environments (Harrison *et al.* (1995) citing Holloway).

In a review of minimum standards for open space it was suggested that Local Authority open space standards could utilise: the Greater London Standards for public parks & Gardens; NPFA 6 Acre Standards for playspace; ANGSt and Woodland Trust Standards (at least 2 ha of accessible woodland within 500 m and 20 ha within 4 km) for natural and semi-natural space, and deal with sports areas on a demand-led basis (Scottish Executive, 2005). Delegates at a Scottish Government workshop to discuss open space standards considered the provision of 1 ha of local nature reserve per 1,000 population, accessible 20 ha sites within 2 km from home, a 100 ha site within 5 km and a 500 ha site within 10 km to be unrealistic and not achievable (Scottish Executive, 2005). It was concluded that the standard may be useful to assess the quantity and accessibility of existing semi-natural open space, rather than setting minimum standards for new developments.

Green and open space distance criteria are summarised in Table 1.

Table 1. Summary of green and open space maximum distance criteria for access to greenspace.

Study / Standard	**Maximum distance to greenspace**	**Greenspace size & type**
London Boroughs (since 1976)	¼ mile ¾ mile	to small and local parks to district parks
London Planning Advisory Committee (1992)	Direct line radius of approximately 280m	
National Playing Fields Association (NPFA) 6 Acre Standard (1992)	100 m (1 minute walk) 400 m (5 minute walk) 1000 m (15 minute walk)	local areas for play local equipped areas for play neighbourhood equipped areas for play
Box & Harrison (1993)	0.5 km 2 km 5 km 10 km	natural greenspace of at least 2 ha natural greenspace of at least 20 ha natural greenspace of at least 100 ha natural greenspace of at least 500 ha minimum 1ha LNR in every urban area per 1000 population
ANGSt (English Nature's Accessible Natural Greenspace Standard (1996)	Every home should be within 300 m of 2 km of 5 km of 10 km of	an accessible natural greenspace of at least 2 ha, plus: at least one accessible 20 ha site at least one accessible 100 ha site at least one accessible 500 ha site Provision of at least 1 ha LNR per 1000 population
De Vries (2003) (Netherlands study)	3 km radius around the centre of the neighbourhood	
London Plan (2004) London's Public Open Space Hierarchy	8 km 3.2 km 1.2 km 400 m (280 m*) 400 m (280 m*) 400 m (280 m*) Where feasible *adjusted to take into account barriers	Regional (over 400 ha) Metropolitan (60 – 400 ha) District (20 – 60 ha) Local parks (2 – 20 ha) Small local parks (0.4 – 2 ha) Pocket parks (less than 0.4 ha) Linear open spaces (variable)
Maas *et al.* (2009) (Netherlands study)	1 km or 3 km radius around homes	Metropolitan

2.4 Greenspace and open space strategies

2.4.1 Description

City or regional strategies employ standards to plan and manage green or open space and help identify deficiencies. CABE (2004) suggest that there is a blurring between what open space and greenspace strategies cover, with some focusing on core elements of greenspace, including parks, sports grounds and play areas, whilst others are more comprehensive, including other amenity areas, allotments, cemeteries and churchyards, woodlands and nature conservation areas. Generally, open space strategies also include civic spaces and other public spaces in the urban realm, *e.g.* Greater London Authority (2004b), and, for consistency, use the typology of common types of greenspace and civic space in urban environments specified in PPG 17.

CABE (2004) describe a greenspace strategy as setting out "*an authority's vision for using its greenspace and the goals it wants to achieve, plus the resources, methods and time needed to meet these goals*". It further suggests that other authority strategies, such as

biodiversity and recreation can feed into the greenspace strategy and enable decision-making, assessment of plans, resource allocation and the setting of priorities.

Greenspace strategies frequently:

- Have a policy setting at a range of scales
- Contribute to the local authorities local plan
- Are designed to meet current and future needs
- Have a spatial context to facilitate strategic planning
- Incorporate an action plan, including monitoring and review.

Physical Activity and Open Space, Planning and Open Space (PAN 65) (Scottish Government, 2008c) states that an open space strategy should be a corporate document that both informs and is informed by other strategies and plans, including Development Plans, the Core Paths Plan and the Community Plan. Core paths should *'satisfy the basic path needs of local people and visitors for recreation, exercise and transit, and to provide key links to the wider path network'* and it is considered that core paths *'are likely to form the major links for people to access a green network'.* It should also influence decisions on spending and investment. The Spatial Development Strategy for Greater London (Greater London Authority, 2004b) states that London boroughs should undertake audits of existing open space and assessments of need in their area in accordance with the guidance given in PPG 17.

2.4.2 Guidance

CABE (2004) suggest a greenspace strategy should include an analysis of issues, opportunities and priorities through the following steps:

- analysis of supply and demand (quantitative, qualitative and accessibility)
- identification of catchment areas and deficiencies
- establishment of local standards for quality and quantity
- assessment of value
- prioritisation of issues and areas for improvement
- identifying human resources and skills

PAN 65 suggests that building a sustainable greenspace network involves the following:

- Promoting diversity of type and size of spaces
- Improving the presentation and appearance of the space
- Ensuring they are accessible to all those who may wish to use or visit them
- Provision of an adequate number of open spaces for users
- Developing a hierarchy of spaces, large enough to accommodate their full potential use
- Positive management practices
- Optimising biodiversity

and that an open space strategy should comprise four elements:

- a strategic framework and vision for open space;
- an audit of existing open space provision;
- an assessment of current and future requirements; and
- a strategy statement with a clear set of priorities and actions.

When undertaking the planning of open space, consideration should also be given to areas of water such as rivers, canals, lakes and reservoirs which provide recreational opportunities and also visual amenity (Department for Communities and Local Government, 2002a).

Planning authorities in Scotland have an obligation to produce an open space audit under NPF 2. Several Authorities have worked with Greenspace Scotland to create digital maps

of greenspace using PAN 65 typology, aerial photographs and local authority data sets (Scottish Government, 2008c). For example, South Ayrshire Council has now developed GIS tools to allow staff to update the data set for use in open space audits and strategy work throughout Ayrshire.

2.4.3 Case studies

East Dunbartonshire District Council Greenspace Strategy

"*The East Dunbartonshire Greenspace Strategy focuses on the regeneration and management of urban greenspace to ensure that people can access greenspaces to meet their physical, social and psychological needs by protecting, enhancing and creating important landscape, recreation and wildlife features*." (East Dunbartonshire Council, 2005). The aim is to provide "*a network of well designed multi-functional, clean, safe and accessible greenspaces that are well resourced / managed and meet the needs and aspirations of the community*".

Approach used
The strategy uses the ANGSt approach involving the following steps:

- An audit of existing greenspace using a GIS in conjunction with a community consultation, *e.g.* citizen panels and questionnaires, on greenspace use and requirements
- A focus on ensuring that greenspace development optimises links with East Dunbartonshire Council Core Path Network
- Commonly used 'distance thresholds' were adopted, to inform the development of locally sensitive greenspace standards during the life of this Strategy
- Standards were developed for each level of the hierarchy to identify the facilities required and the distance they should be from people's homes
- Analysis of the provision of public greenspace and identify deficiencies at a strategic and a local level, in terms of both quality and quantity
- The preparation of greenspace masterplans for each settlement, identifying opportunities for the development of locally accessible spaces, ensuring that the space maximises benefit for the local community.

Tools identified
GIS audit of greenspace
Core Path Network
ANGSt distance thresholds
Community consultation
Key data – Greenspace quality data, citizen panel and questionnaire data on current greenspace use and future requirements.
Analysis methods – GIS least-path analysis of distance from greenspace areas to homes to determine catchment areas and greenspace provision.

Edinburgh (draft) Open Space Strategy

In 2009 Edinburgh City Council began the first stage of their city-wide open space strategy by undertaking an open space audit. This information will be used to guide priorities for changes in open space within a long-term, strategic context for 12 open space action plans, each relating to neighbourhood partnership areas. When finalised, the audit will inform the open space strategy and will be used to help interpret the Council's planning policies on the provision of open space in new development and on proposals which involve the loss of open space.

Approach used
The aim is to classify open space using PAN 65 typology and compare provision of different types of open space against commonly used standards, such as the NPFA 6 Standard as well as providing information on trends in loss and gain in open space. An assessment of the quantity and distribution of publicly-accessible open space has been undertaken using walking distance access. This has been calculated along actual pedestrian routes, rather than straight-line distances, by using a path function within a GIS. A public consultation was undertaken during May to July 2009 to gain further information on the quality and use of open spaces directly from the relevant communities. This information will be taken into account in the finalisation of the audit and the preparation of the draft strategy and action plans.

Tools identified
GIS audit of greenspace
GIS path analysis
NPFA 6 Standard
Community consultation
Key data – Greenspace quality data, community consultation data on current greenspace use and future requirements.
Analysis methods – GIS least-path analysis of distance from greenspace areas to homes to determine catchment areas and greenspace provision.

Dundee Public Open Space Strategy 2008 - 2011

The Dundee Public Open Space Strategy aims to ensure that the City has an adequate provision of open space in and around communities that meets the needs of all. The main focus of the Strategy is on open space that is managed for public use, but it recognises the contribution of other greenspace to other objectives such as biodiversity and landscape character.

Approach used
The development of a Public Open Space Hierarchy is loosely based on the London's Public Open Space Hierarchy, ranging from spaces with a city-wide function to those serving neighbourhood and local requirements. The hierarchy comprises:

- Country Parks. A family day out in a countryside setting
- City Parks. Parks of city-wide importance, providing something for everyone
- Neighbourhood Parks. A range of parks and open spaces across an area, tailored to local needs
- Local Parks and Open Spaces. Safe, accessible greenspaces and play areas close to people's homes.

Accessibility standards and management objectives have been developed for each level of open space provision and a vision for connectivity - 'the Dundee Green Circular' - in the form of a landscaped footpath and cycleway is underway to provide citizens and visitors with safe and attractive links to parks, places of interest and open countryside. The Public Open Space Strategy has been incorporated into the Local Plan, establishing a legal basis and providing a valuable tool for decision making (Scottish Executive, 2005).

Tools identified
Public Open Space Hierarchy
Core path network
Accessibility standards
Community consultation
Key data – Greenspace quality data, community consultation data on current greenspace use and future requirements.
Analysis methods – GIS analysis of distance from greenspace areas to homes to determine catchment areas and greenspace provision.

2.5 Green infrastructure and green networks

2.5.1 Description

Green infrastructure (GI) builds on greenspace strategies by also considering the different functions of greenspace, *e.g.* environmental protection / benefits, biodiversity, and their contribution to social inclusion and sustainable development although GI strategies can often focus more on ecological functions than social, (*e.g.* Rapid assessment of green infrastructure, Kent Country, Delaware, USA - Conservation Fund, 2006). Green networks not only consider the different functions of greenspace, but also how these areas interconnect to form networks of greenspace and facilitate movement of people, biodiversity, and other elements of greenspace.

Physical Activity and Open Space, Planning and Open Space (PAN 65) states that local authorities should aim to maintain or form networks of green and civic spaces which:

- contribute to the framework for development
- maintain and enhance environmental qualities
- provide a range of opportunities for recreation and leisure
- link and create wildlife habitats; and
- encourage walking and cycling and reduce car use.

2.5.2 Case studies

Peterborough Green Grid

The overall objective of the Peterborough Green Grid is to provide safe and attractive links to landscapes, habitats, initiatives and attractions in the wider context of Peterborough, which are of landscape, greenspace, ecological or cultural value. A consultant was appointed by the Peterborough Green Grid Partnership to analyse existing greenspace assets and the opportunities for greenspace provision within the potential new growth locations surrounding Peterborough.

Approach used
The following stages were used to develop an overarching strategy and ensure that all the information gathered had been incorporated:

- Identifying strategic context, *e.g.* other initiatives in the surrounding area
- Identifying ecological, visual and planning opportunities and constraints in broad terms
- Identifying other existing and potential developments in the surrounding area
- Exploring linkages to all of above
- Identifying separation of settlements that needs to be maintained, *e.g.* Peterborough and Yaxley, Norman Cross, Eye and Glinton
- Plotting key linkages

- Buffering key sites (ecological, visual, heritage)
- Emphasising primary strategic routes with planting of woodland, to allow carbon mitigation, *etc.* – these will not necessarily be pedestrian routes, but may be more for visual containment and ecological corridors.

Tools identified
GIS audit of greenspace
GIS buffering of key sites
Providing Accessible Natural Greenspace in Towns and Cities – English Nature.
PPG17
Greenspace Strategies – A good practice guide – CABE Space
Biodiversity by Design - TCPA
Phase 1 habitat survey
Key data – landscape and ecological data.
Analysis methods – SWOT analysis of each site's biodiversity, greenspace and landscape constraints and opportunities.

Glasgow & Clyde Valley Green Network

The Glasgow and Clyde Valley (GCV) Green Network is a 20 year programme, which will link parks, walkways, woodlands and countryside along miles of path and cycle routes bringing a range of social, economic and environmental benefits to the Glasgow metropolitan region. The GCV Green Network Partnership encompasses eight regional local authorities, with the aims of:

- increasing the attractiveness of the region as a location for business
- creating opportunities for health improvement
- building stronger better connected communities
- and protecting and enhancing wildlife and the environment, through provision of accessible, quality greenspace.

Approach used
- Delivery of the network is planned through projects at a range of scales, including the creation of new greenspace infrastructure through: large-scale redevelopment; recognised 'growth corridors' that will connect communities and habitats into the wider Green Network, providing new green infrastructure for people and wildlife; and encouraging the creation and improved management of greenspace linked to housing 'neighbourhoods'
- Support is also provided through individual and community development and the promotion of more active lifestyles, especially in areas of deprivation
- A landscape ecology least-cost approach (Integrated Habitat Networks) was undertaken to assess current extent and connectivity of terrestrial habitat across the Glasgow and Clyde Valley area. The outputs can be used to help the targeting of resources for habitat enhancement and expansion in key areas through the planning process
- Development of guidance and a common approach to, qualitative assessments of Local Authority greenspace resources to meet planning policy requirements.

Tools identified
GIS audit of habitats
GIS quality audit of greenspace
GIS least-cost analysis
Key data – Greenspace quality data, habitat and landcover data.
Analysis methods – GIS least-cost analysis of habitat networks for woodland, grassland, wetland and raised bog.

Green Infrastructure for the East Midlands – a public benefit mapping project

The aim of the study was to produce a spatial framework to allow the assessment of the potential public benefit of green infrastructure in the East Midlands using the Public Benefit Recording System (PBRS). A further aim was to integrate the provision or enhancement of GI with the East Midlands Integrated Regional Strategy (IRS), which outlines 17 objectives for the region across social, economic and environmental themes.

Approach used
The study used four steps to map public benefit:

1. Identifying how GI can deliver public benefit
2. Identifying appropriate indicator data sets
3. Benchmarking and ranking indicators in order to provide a robust regional focus
4. Identifying where there is greatest need for GI and/or greatest opportunity for GI to deliver IRS objectives

A series of maps were produced to identify areas of the region where Green Infrastructure is a priority. The priorities include:

- Provision of new or enhanced GI for areas of present and future deficit
- Management of existing GI resources to increase their usefulness (multi-functionality)
- Conservation of key GI resources which contribute to the region's environmental infrastructure
- Improving connectivity of existing GI resources where they are presently fragmented
- To identify relevant indicators of need and opportunity by which public benefit can be assessed, and map these indicators in a GIS
- To identify those areas where needs and opportunities overlap to the greatest extent - in relation to social, economic and environmental benefits.

Data sets were used where they fulfilled most of the following criteria:

- Relevance to the particular public benefit being mapped
- Available consistently across the region
- Available in digital format
- Available at a fine-grain, preferably more focused than Local Authority boundaries
- Capable of benchmarking against national data sets
- Available as "public domain" material.

Tools identified
GIS audit of open space
Identification of Indicator data sets
Public benefit recording system
Key data – Open space data, census 2001, index of multiple deprivation, flood data, air and water quality data.
Analysis methods – GIS audit of open space, GIS mapping of public benefit indicators indicating areas of need and, in some cases ranking as a 'depth of need'. Scoring system to rank each indicator data set.

Green Infrastructure Northwest

North West Green Infrastructure Guide was prepared to "support GI policy in the North West Regional Spatial Strategy (RSS) by providing more detailed information on the concept of Green Infrastructure (GI) than appears in RSS and to provide initial guidance on producing a Green Infrastructure Plan.

Approach used
The Green Infrastructure Northwest approach was first set out in 2006 in the NW GI guide which sets out a conceptual framework for green infrastructure planning framed around a 5 step approach:

1. Priorities
2. Data audit
3. Functionality assessment
4. Needs assessment
5. Intervention plan

The Guide was based on early experiments between 2003 to 2005 and has been subsequently refreshed and expanded by further work and recently (and for the first time) been fully employed to develop the Liverpool Green Infrastructure Strategy. This employs the approach that GI can be assessed as a spatial matrix of different sorts or types, which perform a set of (currently 28) functions from which a variety of benefits can be derived (these can be related to local policy needs). The approach attempts to show what the role of GI could be in delivering the spatial planning aspirations of an area.

Further work is also ongoing to look at how it might become possible to undertake a "valuation" step as well through a experimental prototype GI valuation toolkit. Whilst it is not considered a robust toolkit and cannot be used in formal project appraisal or cost benefit assessment, it does provide an interesting insight to the area of valuation if viewed in its broad and indicative context.

Tools identified
GIS audit of GI types and location
Identification of functional and needs indicator data sets
GI valuation toolkit
Key data – Open space data, census 2001, index of multiple deprivation, development, climate change adaptation data.
Analysis methods – 5 step approach to identify priorities, capture data, assess functionality, identify needs, create an intervention plan.

2.6 Research approaches

A number of research papers explore how greenspace can be assessed and / or managed to meet societal requirements. To assess greenspace provision and planning, some approaches relate human and neighbourhood characteristics within a defined radius without directly considering individual movement within the area. For example, de Vries *et al.* (2003) defined the environment of a neighbourhood as a circle with a 3 km radius around the neighbourhood centre and used this area to extract environment and human health survey data based upon postcodes. Regression analysis was then used to examine relationships between people's health and percentage of green and blue space within their neighbourhood. Other approaches determine movement using routes, such as that undertaken by Comber *et al.* (2008) who undertook a network analysis in a GIS to determine urban greenspace accessibility for different ethnic and religious groups. A network analysis employs linear features such as roads and footpaths to calculate distances between points, in this case greenspace access points and the centres of population census output areas, and can be used to determine supply and demand of a resource. Output areas were grouped by population size and socially homogeneity and

ANGSt standards applied to determine provision at different levels. Generalised linear models were developed to estimate likelihood of access for religious or ethnic groups. More recently, Millington *et al.* (2009) have developed a walkability tool, to *'objectively record aspects of the physical environment believed to be related to walking in urban Scotland'*.

Some approaches to examining greenspace planning are further refined by taking into account public views to greenspace. Tyrväinen *et al.* (2007) created social value maps (see Section 3.0) whilst Balram and Dragicevic (2005) explored collaborative GIS techniques to provide insights into spatial and non-spatial factors influencing attitudes towards urban greenspaces. The research demonstrated the usefulness of integrating local residential views into the planning of greenspace using a GIS.

Some studies focus more on integrating greenspace into the planning process. For example, using ecological principles and Li *et al.* (2005) propose the establishment of an urban greening plan at regional, city and neighbourhood levels. Through this approach city level planning would incorporate a green network system of green wedges, parks and green corridors, supplemented by green extensions along rivers and roads extending into built-up areas.

3 GREEN NETWORKS FOR PEOPLE; KEY FUNCTIONS

This part of the review will focus on approaches from research and practice to address social issues in relation to:

- Greenspace and health
- Encouraging more sustainable patterns of travel
- Greenspace accessibility and barriers
- Approaches to understanding social values.

Wooley *et al.* (2004) highlight that as over half the UK population (approximately 33 million people) make 2.5 billion visits to urban greenspaces it is not surprising that people become attached to these places and what they can offer. In the 2007 Greenspace Scotland survey of Scottish public attitudes ('Health impact assessment of Greenspace: a guide' 2008:2) found that 58% use greenspace at least once a week and over 75% visit their local greenspace at least once a month. They show that greenspace is used for a range of different activities such as walking (49%), taking children out to play (26%), taking the dog for a walk (16%), to relax (11%), to exercise (9%), to spend time with the family (8%), to pass through (5%), to socialise with friends (3%) and to have contact with other people (1%). The repeat survey in 2009 found that 63% of the sample reported that they used their greenspace at least once a week with 80% visiting their local greenspace at least once a month. The primary uses of greenspace remain to go for a walk (49%) and a place for the children to play (27%). The aim of the Greenspace Scotland survey is to gain a better understanding of how the public use greenspaces as well as their attitudes and expectations (2009:2). The research objectives are worth repeating here as they may provide a useful framework for thinking about the types of social data that could be collected around use of greenspace and green networks:

- Determining how frequently greenspaces are used by people living in urban areas
- Understanding how this differs by different demographic groups or areas
- Exploring the ways in which people use greenspaces (are they easy to get to?)
- Exploring the qualities and features which people seek from greenspaces (What should a greenspace provide to the community)?
- Examining attitudes towards existing local greenspaces and the extent to which they satisfy community needs (in what ways are the local greenspaces meeting needs?)
- Exploring health and wellbeing and greenspaces
- Understanding overall satisfaction with the quality of local greenspaces
- Exploring how important the general public consider greenspaces in their local area
- Understanding what would make people use their greenspace more often.

The social benefits of greenspace have been documented widely in the literature (see for example Greenspace Scotland, Korpela and Hartig 1996, Urban green Spaces Task Force 2002, Morris 2003, Croucher *et al.* 2007, Tzoulas *et al.* 2007, Mitchell and Popham 2008, O'Brien *et al.*, 2010). Examples of the social benefits of green networks and green infrastructure have been identified by Kirklees Council, Yorkshire (www.kirklees.gov.uk/.../greennetwork/ DevelopingAGreenNetwork.pdf) who state that green networks provide:

- a greater sense of public ownership and pride in the local area;
- an increase in public understanding of the natural environment;
- an opportunity to create social cohesion through local practical community projects;
- the creation of a physical link between urban and rural communities, reducing isolation;
- better access to facilities for disabled people and non-car owners.

Similarly, the North West (England) Green Infrastructure programme (http://www.greeninfrastructurenw.org.uk/) suggest that green infrastructure facilitates:

- economic growth and investment, improving regional image and a local sense of place;

- an increase in property and land values;
- attraction and retention of people ensuring stable populations and labour supply;
- social inclusion, education, training, health and well-being;
- the safeguarding and enhancement of natural and historic assets;
- contact between people and nature;
- cohesive partnership working across disciplines and sectors.

A network of high quality greenspaces that links residential areas with leisure, business and shopping opportunities can improve the accessibility and attractiveness of local areas (van Leeuwen *et al.* 2006). Several sources have identified critical factors that shape whether and how people use greenspaces or green networks. Smith *et al*. (2009 cited in Tzoulas and James 2010) suggest that the three most important design criteria influencing physical activity in urban spaces are *walkable spaces*, *outdoor amenities* and *available seating*. When choosing what greenspace to use, Keep Britain Tidy (2010) state that *activity*, *company* and *availability* are important features in the decision-making while Pikora *et al.* (2003) note that key determinants influencing walking in the outdoors include *aesthetics* (*e.g.* parks, trees, shade), *safety* (lighting traffic control) and *presence of destination*. They suggest that the liveability of a neighbourhood is related to how convenient it is to walk and cycle in the areas and thus continuous and linked routes to frequently visited destinations such as public transport, shops and parks are an essential component. However, reasons why people might not visit urban greenspaces include lack of leisure opportunities in parks, access difficulties, other priorities such as shopping or other leisure activities and failed promotional efforts (MacDonald and Price, 2009 cited in Tzoulas and James, 2010).

3.1 Greenspace and health

Much work has been done on linking greenspace to physical and mental health benefits. The WHO (1948) defines health as being a "*state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*". One emphasis of the 'Green networks and people' project is to assist in the planning and management of multi-functional green networks to facilitate people being physically active. The salutogenic health impacts of contact with and/or interaction with the environment have been highlighted by several authors including Brown and Grant (2005:329) who maintain that cancer, coronary heart disease, accidents and suicide are the four main causes of preventable premature death and all have strong environmental connections. Access to the natural environment can facilitate increases in regular physical activity, which can reduce the risk of cancer, cardiovascular disease, diabetes and osteoporosis. Bell *et al.* (2008:28) note that greenspaces can reduce heat stress in the summer (see also Tzoulas *et al.*, 2007).

In her review on 'Health, well-being and open space' Morris (2003:17) observes that "*physical activity in the natural environment not only aids an increased life span, greater well-being, fewer symptoms of depression, lower rates of smoking and substance misuse but also an increased ability to function better at work and home*" (see also Brown and Grant, 2005). In response to concerns over the increase in obesity and inactivity in the UK a number of key initiatives have emerged such as health walks and green gyms (see also Wooley *et al.* (2004) and Natural England's 'Our Natural Health Service' www.naturalengland.org.uk/Images/nhsmanifesto_tcm6-12022.pdf). A heavily cited study from Takano *et al.* (2002) provides evidence from research in Tokyo, Japan that 'walkable greenspaces'[1] influences the longevity of urban senior citizens independent of a range of demographic variables (*e.g.* age, sex, socio-economic status), particularly in densely populated urban areas. Citing Barton and Tsourou (2000), they advocate that greenspaces "*provide settings for healthy exercise and that they induce citizens to walk*" (2002:917).

[1] Defined by Takano *et al.* as, "greenery filled public areas that are nearby and easy to walk in such as parks and tree lined streets" (2002:913-914).

Indeed, CABE (2006:2) maintain that parks and greenspaces are "*crucial in making our neighbourhoods more walkable*".

There is, however, some concern over the general lack of empirical evidence linking use of greenspaces and improved physical health. For example, a study carried out on a sample of middle-aged adults in Norwich (Hillsdon *et al.*, 2006) found no clear links between access to greenspace and recreational walking. The authors did cite a number of caveats in that the study was based on self-reported physical activity data (linked to an investigation on the relationship between diet and risk of cancer) and did not look at other variables affecting use of greenspace such as aesthetics, fear of crime and traffic. A similar lack of positive association between access to greenspace and walking for recreation was reported by Foster *et al.* (2009). A current research project being undertaken for the Scottish Government on "Greenhealth – The contribution of green and open space in public health and well-being" states that, "*At present there is a lack of evidence at a national level on the relationship between the quality, quantity and accessibility of greenspace and people's health and well-being. Existing studies tend to be localised, often urban, and fail to provide robust explanations for links between available greenspace and patterns of health and well-being"* (Scottish Government, 2008d:2. See also Tzoulas *et al.*, 2007). There are difficulties in proving that greenspace contributes to an increase in physical activity but there is evidence that attractive greenspaces can provide an incentive to continue exercising (Croucher *et al*., 2007:16). Greenspace also promotes positive emotional experiences and are more likely to be valued for their 'destressing' effects than as places to exercise (Croucher *et al*., 2007:3. See also Grahn and Stigsdotter, 2003), or places where people engage in sedentary behaviour such as socialising (Cohen *et al.*, 2007). With reference to Kaplan and Kaplan (1989), Giles-Corti *et al.* (2005:173) suggest that restorative environments allow people to gain positive experiences from natural beauty, wildlife or the sense of 'getting away from it all'. However, they also indicate that these satisfying experiences may encourage greater use of 'natural' environments helping to promote regular walking (see also de Vries, 2003).

Aspects of health, such as health-related behaviour, physical and mental health, and life expectancy will vary among social groups and in different settings (Macintyre, 2007:1). According to O'Brien *et al.* (2010 citing Bajekal and Osbourne, 2006) the causes of urban health inequalities are associated with socio-economic status, low incomes, poverty and deprivation levels; unemployment or incapacity/worklessness; skills and educational level/attainment; housing conditions/tenure; social mobility and life chances. Health inequalities are typically measured through mortality and morbidity with Scotland facing particular challenges with life expectancy in both men and women (ibid). Vulnerable groups are identified by key variables such socio-economic status, age, gender, ethnicity and place of residence (Macintyre, 2007:1, O'Brien and Morris, 2009). In the UK the most disadvantaged communities face greater health problems and are likely to be living in the lowest quality environments (CABE, 2006:2). Sooman and Macintyre (1995) make the connection between people's experiences of living in particular places and their health. Many groups will also be less physically active. For example, surveys on health undertaken by Kirklees council (www.kirklees.gov.uk/.../greennetwork/DevelopingAGreenNetwork.pdf) have shown low levels of activity amongst the adult population with those on low incomes and from the South East Asian ethnic groups least likely to be active. However, in the US, parks have been shown to facilitate physical activities in minority groups (Cohen *et al.*, 2007:513) while Maas *et al.* (2009) established that the relationship between greenspace and health is stronger for people who are more likely to spend a lot of time at home or in areas surrounding their homes and have low socio-economic status, are young or elderly (2009:587).

The Marmot Review (2010) set up by the government to review health inequalities, has specified a role for greenspaces in reducing health inequalities. Mitchell and Popham (2008:1655) believe that (green) environments can help reduce health inequalities by promoting good health stating, "*We know, for example, that people with low socioeconomic*

status are less likely to exercise…than are those with high socio-economic status, partly because the environments in which they live are less conducive to it". In a Dutch study de Vries writes that "*when it comes to health, all types of green seem to be equally 'effective'*" providing physical and mental benefits (2003:1726). However, more evidence is needed on the relationship that different types of greenspace have on the health of different social groups (Croucher *et al.* 2007:26 citing Bell *et al.* 2006). The 'Greenhealth' project observes that the quantification of "*the relationships between quality and extent of greenspace, proximity to and use of such areas, and health outcomes and the underlying mechanisms remain poorly understood*" (Scottish Government, 2008d:2).

3.2 Encouraging more sustainable patterns of travel (Active travel)

Activities such as walking can improve physical health and contribute to overall well-being (Morris, 2003). According to the NHS Health Development Agency (2005) adults who are active reduce their risk of premature death by 20-30%. Walking is considered by some to be a 'near perfect' exercise that is popular, convenient, free, is suitable for all ages and can be incorporated into everyday life (Ogilvie *et al.*, 2007). 'Walkable' neighbourhoods can promote health benefits and typically include good connectivity and accessibility to a variety of destinations (O'Brien and Morris, 2009. See also Leyden, 2003; Pikora *et al.*, 2003). Indeed, 'functional' neighbourhoods are associated with more walking such as walking to work, walking for leisure or utility walking (O'Brien and Morris, 2009).

The coalition 'Take Action on Active Travel' emphasise that "*people who are active have significantly lower risk of heart disease and stroke, many types of cancer, non-insulin-dependent diabetes, depression and other mental illnesses, osteoporosis and falls in later life*" (www.adph.org.uk/downloads/.../Take_action_on_active_travel.pdf p2. See also Wooley, 2004). Increasing physical activity in children and adults is an important factor in national health standards. CABE (2006:2) maintain that people exercise most when undertaking everyday activities such as walking to the shops or travelling to work. They state, "*It makes sense, therefore, that our built environment should provide a network of routes and destinations that maximise the potential for activity on foot or by bicycle, rather than motorised transport*". L'DGO consortium (Inclusive design for getting outdoors) comprising OPENspace, Oxford institute for Sustainable Development and Surface Inclusive Design Research Centre and funded by EPSRC is examining ways to ensure that the outdoor environment is designed to improve the quality of life for older and disabled people. The research has found that people living in supportive environments tend to spend a longer time outdoors. The perceived quality of paths (e.g. easy and enjoyable to walk on with no obstacles) facilitates walking as a form of transport. The Paths for All partnership also has two main initiatives: (1) the promotion of volunteer-led health walks and (2) path network development. The partnership have developed a range of measures to monitor its outcomes against national strategic objectives in Scotland (Healthier, Greener, Safer and Stronger) and to ensure it delivers on its aim of reducing the proportion of the population that are inactive and increase the number, quality, accessibility and multi-use of paths (http://www.pathsforall.org.uk/about/article.asp?id=772).

Although Britain has one of the lowest rates of cycling in the EU, constituting only 2% of all journeys (Environmental Audit Committee, 2006), the Scottish Government supports active transport (*e.g.* walking and cycling) through a number of organisations and initiatives as a mean of easing congestion, reducing noise pollution, cutting exhaust emissions and improving public health. These include grants to Sustrans, Cycling Scotland, Living Streets, Energy Savings Trust and Transform Scotland. Sustrans Active Travel initiatives take a three strand approach (1) strategic tie-in: encouraging and supporting development of transport, planning and spatial strategies that take a fuller consideration of children and young people's play and access needs, beyond just the school journey; (2) Changes to the built environment: Developing traffic free walking and cycle routes as both 'routes to play' and play spaces themselves, using initiatives such as Art and the Travelling Landscape, providing secure cycle parking to Children's centres and supporting infrastructure development, (3) Behavioural interventions: Providing a Bike It officer to work with primary

schools to increase levels of cycling, setting up focus groups and providing local information such as promotional materials and local walking and cycling maps. Local Authorities are also encouraged to develop active travel in local transport strategies. For example, the Smarter Choices, Smarter Places programme (http://www.scotland.gov.uk/Topics/Transport/sustainable-transport/home-zones) is designed to support sustainable travel and promote environmental and health benefits. The School Travel Plans (STP) initiative seeks to reduce car journeys to school in favour of safe walking, cycling and use of public transport. Other initiatives such as 'GoSmart Dumfries' include green commuter routes linking the town centre to residential areas and other services. Further exploration is possible of schemes/concepts such as 'Intelligent Travel' (using individualised marketing to offer incentives and personalised travel information to change behaviour), 'Invisible Infrastructure' (policies that contribute to sustainable travel e.g. cycle-friendly environments without being specific) and Social Marketing (a framework for understanding and influencing behaviour change – see Whitelow *et al.* 2010). The 'Take Action on Active Travel' Coalition also lists the existing policies and guidance for active travel in the UK, many of which will include or support the provision of green networks. These include:

- Healthy weight, healthy lives: A cross Government Strategy for England, Dept. of Health 2008
- Choosing Activity: a physical activity action plan. Dept. of Health 2005
- Promoting and creating built or natural environments that encourage and support physical activity. National Institute for health and clinical excellence 2008
- Let's Make Scotland More Active: a strategy for physical activity, Scottish Government 2003
- Better Health, Better Care: Action Plan, Scottish Government 2007
- Climbing higher – a strategy for sport and physical activity, Welsh Assembly government 2005
- Fit Futures: Focus on Food, Activity and Young People, NI Dept. of Health, Social Services & Public Safety 2006
- Walking and cycling: an action plan, Dept. for Transport 2004
- Design to Delivery: eco-towns transport worksheet, Communities and Local Government/Town and Country Planning Association 2008
- Manual for Streets, Dept. for Transport 2007
- Fair Play, the national play strategy, Dept. for Children, Schools and Families 2008
- National Transport Strategy, Scottish Government 2006
- People, Places, Futures – The Wales Spatial Plan, Welsh Assembly Government 2004 (in revision).

(www.adph.org.uk/downloads/.../Take_action_on_active_travel.pdf p7).

3.3 Greenspace accessibility and barriers

How greenspaces are used depends on individual preferences, needs and personal experience as well as age, ethnicity and gender (Cohen *et al.*, 2007; Tyrväinen *et al*., 2007). Citing a number of references, Giles-Corti *et al.* (2005:170) suggest that the attributes of what they call 'public open spaces' will influence how it is used and by whom such as perceived proximity, size, accessibility (*e.g.* absence of major roads), aesthetic features such as presence of trees, water and wildlife, park maintenance (*e.g.* irrigated lawns), and availability of amenities such as paths for walking. There are a number of papers that refer to the size of, and distance from, greenspace in relation to how often people visit and what they do during their visit. While researching the links between 'public open space and walking' in Perth, Australia, Gile-Corti *et al*. (2005:173) established that "*Larger parks tend to have more attributes that provide more satisfying experiences for the user*" while a study of 8 parks in minority communities in Los Angeles found that people who live closer to the parks tended to visit more often (Cohen *et al.* 2007:512). A Dutch study (Maas *et al*. 2009:591) reports that more people who have access to a greener

environment within 1 to 3 km of their home perceived themselves to be healthy than those who do not have access although in heavily urbanised areas having greenspace close by became more important. A similar finding was made by van Herzele and Wiedemann (2003) in Belgium who note that easily accessible greenspace is crucial for less mobile people while a study in Norwich, UK revealed that residents living near a park were four times more likely to walk or cycle to work (CABE, 2006. See also Coles and Caserio, 2001). Research has suggested that unequal distribution of, and access to, public greenspaces are evident in many urban residential environments with low socio-economic groups more likely to live in areas with fewer trees, private gardens or green/open spaces (Johnston and Shimada, 2004; Maas *et al.*, 2009). People in more deprived areas are also more likely to be living next to sources of potential negative environmental impact such as industrial pollution and poor river quality, *etc.* (Health Scotland *et al.*, 2008).

Scottish Planning Policy (2010) states that "There are two main constraints on accessibility – physical constraints such as distance, degree of personal mobility and severance by roads, railways or other barriers, and social and cultural constraints such as fear of crime and other concerns over personal safety." Physical barriers (*e.g.* through entry points) to greenspace is widely covered in literature. For example, van Herzele and Wiedemann (2003:123) question the assumption that it is possible to access greenspace from any direction. They emphasise that while a residence might be located near to a greenspace, entry points may be further away. Busy roads, private land and railway lines may all provide physical barriers to greenspaces (Harrison *et al.*, 1995) but other types of non-physical barriers and equity of access are equally important. The National Urban Forestry Unit (NUFU) maintains that "[g]*reen spaces near where people live are an underused asset. They are often poorly maintained, disconnected, difficult to reach and perceived as unsafe. As a result, millions of people are unwilling or unable to walk in the greenspaces on their doorstep*" (National Urban Forestry Unit, 2002). Greenspace Scotland's public attitudes survey (2009:7) highlights that a large proportion of the Scottish population have access to local greenspaces (*e.g.* 80% within 10 minutes walk and 50% within 5 minutes walk of their home). Findings from the survey also suggest that "*there do not appear to be any obvious barriers preventing the public from using greenspaces, with over one in ten stating they would use their local greenspaces more 'if it was better maintained'. Other barriers related to more children's play facilities (10%), if it felt safer (9%) and if the respondent had more time (7%)"* (p27). Croucher *et al.* (2007:22 and references therein) add that "*Apart from fear of assault or violence, incivilities (debris from drug use, dog fouling, litter, graffiti, vandalism, poor maintenance, and in country parks and woodlands, fly tipping, use of off-road motorbikes and 4x4 vehicles) are also frequently reported as negative aspects of greenspace*". Dunnett *et al*. (2002:11) identify five main barriers deterring people from using urban greenspaces: (1) Lack of, or poor condition of, facilities – including play for children, (2) Other users, including undesirable characters, (3) Concerns about dogs and dog mess, (4) Safety and other 'psychological' issues, (5) Environmental quality issues such as litter, graffiti and vandalism.

Bell *et al.* (2008) comment on the lack of evidence on specific use of greenspaces by different ethnic groups although the authors (citing Ravenscroft and Markwell, 2000) do suggest that there is apparent segregation in the use of neighbourhood parks. In the U.S. parks can act as barriers between communities that vary according to race and class (Lindsay *et al.*, 2001 citing Solecki and Welch, 1995). The emphasis on encouraging greater participation of under-represented 'target groups' in accessing the natural environment as a means of addressing social exclusion is outlined in DEFRA's (2008) recent publication 'Outdoors for all'? and, for example, Forestry Commission Scotland's 'Woods for Health' Strategy. Key target groups regularly cited in the literature as infrequent or non-users of the natural environment include people on low income, people with disabilities, women and girls, BME groups, children and young people and older people (see The Countryside Agency's Diversity Review, Uzzell *et al.* 2005a, 2005b). Specific barriers such as fear of crime can deter people from using greenspace. For example, Johnston (2004:185) notes that in deprived areas, "*high levels of crime, anti-social*

behaviour and racial harassment may discourage residents from putting themselves in what they regard as exposed positions in public openspace or woodland". Wooley *et al.* (2004) suggest that, "*Children and young people, for example, are often prevented from using our parks, squares and streets because of their parents' fears about crime, whilst women often also face particular concerns*" (see also Wridt 2010). Several reviews and papers have addressed the fact that people from black and minority ethnic groups, disabled people and other vulnerable groups such as the elderly and young people are less likely to visit urban greenspaces frequently (Croucher *et al.* 2007, Kirklees Council). For example, CABE (2010) found that among BME groups the most significant barrier to accessing urban green space was concerns over safety.

Barriers deterring people from using greenspaces can fall into two broad groups. Personal issues include such factors as lack of time, poor health and/or mobility, working unsocial hours and preferences for visiting other places (Dunnett *et al.* 2002). Nevertheless, when probed further the authors found that the majority who cited these reasons conceded that decisions on using greenspaces were a conscious lifestyle choice (p17). It would be difficult for local authorities to influence these issues although making urban greenspaces attractive to visit could have some impact. Issues such as accessibility, quality of greenspace and user experience are perhaps easier to address where resources allow. According to Ambrose-Oji (2009) work by the Sensory Trust (The Countryside Agency, 2005) recommends the need to think about access along a chain of activity starting with the decision to visit a site, through to reaching a site, and then routes to coming home.

Dunnett *et al.* (2002:40-41) also highlight the benefits that different groups derive from parks, play areas and greenspaces. During a series of focus groups (see Methods in Appendix I) all groups stated that open spaces provided a 'green' and sometimes 'wild' experience and that the dominant reason for visiting a greenspace was to take children to play. Experiencing fresh air was identified as important by disabled participants and those from ethnic minority backgrounds. The existence of wildlife and opportunities for education featured highly with children and were specifically mentioned by women, disabled people and people from ethnic minority backgrounds. In their household survey of 500 participants, many of whom from BME groups, in six case study areas CABE (2010) found that local parks mattered most to people. Weldon and Bailey (2007) provide several recommendations that can facilitate overcoming of barriers including the need for community engagement to better understand people's needs and provide relevant information where needed. Linking places and services through safe, accessible routes is considered an important attribute in reducing barriers to greenspaces. However, the authors maintain that building local capacity and a sense of ownership is essential for ensuring the sustainability of any initiatives and that good communication and press coverage is one way to encourage a change in attitudes towards outdoor access. Ambrose-Oji (2009) suggests that undertaking accessibility audits and consultation to improve infrastructure and design can help overcome physical and structural barriers while outreach strategies, organisation of appropriate events, development of information focussing on the concerns of target groups and awareness raising can go some way to addressing perceived, social or emotional barriers.

Table 2 below is not intended to be exhaustive but uses several reports to illustrate the range of 'under-represented' target groups and the barriers they may face to accessing and using greenspaces and green networks. However, it is important to note that people often fall into more than one target group and that there are huge variations within targets groups, *e.g.* there are different disabilities which will require different measures and approaches. Moreover, Macintyre (2002:6) warns that not all deprived people live in deprived communities. Thus, these categories should only be used as an aid to identifying and understanding barriers faced by people in communities. Note that the barriers identified may have been influenced by the questions that were asked and so are not necessarily comparable across authors. The list is not intended to be exhaustive but methods used to derive these findings are provided in Appendix I.

Table 2. 'Under-represented' target groups and the barriers they may face to accessing and using greenspaces and green networks.

	Low income groups	Women	BME/non-European/Ethnicity	Over 45s/Elderly	Disabled	Young	Faith groups
O'Brien and Morris 2009 [Report on Active England: Woodlands Project]	• Lack of transport • Health problems • Restricted mobility physically and mentally • Financial constraints • Lack of information on where to go/what to expect • Embedded deprivation restricting social and actual mobility and motivation • Being moved on by police (adolescents)	• Lack of transport • Loss of greenspace to development (business or housing) • Lack of facilities for children • Safety • Work patterns and time constraints • Littering	• Wet/bad weather • Lack of transport • Confidence to access the site and feel that one does not stand out • Cultural norms	• Wet/bad weather • Lack of transport • Confidence to access the site and feel that one does not stand out • Safety • Lack of information on where to go/what to expect • Littering • On own e.g. bereaved/divorced/single			
Dunnett et al. 2002 [Report for		In order of priority: • dog mess • vandalism/graf	In order of priority: • dog mess • poor	In order of priority: 55-65 years old: • vandalism/graffiti	In order of priority: • dog mess • vandalism/graff	In order of priority: 12-15 year olds: • dog mess	

DTLR on improving urban parks, play areas and Green spaces]		fiti • safety fears • poor maintenance, • lack of facilities • other preferences • poor access • poor health • not enough to do • too far away	maintenance • lack of facilities • vandalism/graffiti • safety fears • work unsociable hours • not enough things to do • poor health • poor access • too far away	• dog mess • safety fears • poor maintenance • lack of facilities • other preferences • disability • poor access • poor health • work unsocial hours 76 years and over: • dog mess • vandalism/graffiti • disability • safety fears • too far away • other preferences • poor health • poor access • lack of facilities • poor maintenance Other issues: • Access to and within greenspace • Undesirable characters • Bad reputation of park, play area, greenspace • Teenagers and youths	iti • lack of facilities • safety fears • disability • poor health • poor maintenance • too far away • other preferences • not enough to do Other issues: • Access to and within greenspace • Undesirable characters • Bad reputation of park, play area, greenspace • Teenagers and youths	• poor maintenance • not enough to do • safety fears • lack of facilities • vandalism/graffiti • poor health • disability • poor access • too far away 16-19 years old: • dog mess • work unsocial hours • poor facilities • poor maintenance • not enough to do • safety fears • vandalism • too far away, other • preferences • poor health Other issues: • Undesirable characters • Bad reputation of park, play	

						area, greenspace • Teenagers and youths	
Ambrose-Oji 2009 [Evidence review on equality and inclusion of social diversity in woods and forests in the UK]	• Access to woodlands and forests • Unable to pay entrance fees • Paucity of information at point of decision • Poor marketing and disseminati on of site information • Features of site condition and design • Fear of teenagers • Social stigma • No interest • Safety • Lack of welcome	• Access to woodlands and forests • Features of site condition and design • Fear of teenagers • Safety	• Access to woodlands and forests • Poor provision of signage and information boards suited to needs of particular group • Need for appropriate language • Paucity of information at point of decision • Poor marketing and dissemination of site information • Fear of teenagers • Fear of other user groups e.g. dog walkers • Social stigma • No interest • Lack of welcome	• Access to woodlands and forests • Poor provision of signage and information boards suited to needs of particular group • Need for appropriate language • Paucity of information at point of decision • Physical limitations of site • Features of site condition and design • Need for facilities • Fear of teenagers • Fear of other user groups e.g. dog walkers and horse riders • Safety	• Access to woodlands and forests • Poor provision of signage and information boards suited to needs of particular group • Need for appropriate language • Paucity of information at point of decision • Poor marketing and dissemination of site information • Physical limitations of site • Features of site condition and design • Lack of tolerance or provision of disability aid	• Access to woodlands and forests • Unable to pay entrance fees • Physical limitations of site • Features of site condition and design • Need for facilities • Fear of being labelled with an ASBO • Fear of other user groups e.g. dog walkers, motorbikes • Social stigma • No interest • Safety	• Poor marketin g and dissemin ation of site informati on • Need for facilities • No interest

					e.g. assistance dogs, interpreters, mechanised scooters • Need for facilities • Fear of other user groups e.g. cyclists, dog walkers, horseriders • Social stigma • Safety • Lack of welcome		

Approaches to understanding social values

Greenspace Scotland (2007) highlight that it is important not only to have good quality information on where people live and their access to the natural environment but also an understanding of the profile of those people. Yet, while mapping research priorities for green and public urban space Bell *et al.* (2007) record a lack of baseline and longitudinal data on people's use of parks and other greenspaces and the quality of these spaces in terms of biodiversity. They identify the type of basic research that is needed (possibly at all scales) including "*who does and does not use greenspace, categorised by social group, age group, ethnic group and what are the patterns of use over time and in relation to age/life stage".* They argue for longitudinal studies to assess how demographic changes impact on greenspace policy and provision but also how these policies subsequently impact on greenspace use. They also note a general concern in research with how social groups are classified.

The following examples of research or evidence reviews (See Appendix I) provide an insight into the sorts of approaches being taken and types of questions being asked. Tyrväinen *et al.* (2007), as highlighted in 'Research Approaches', used 'social values mapping' during an applied research project in Helsinki, Finland to address the following questions: (i) What kinds of green area benefits are important to people? (ii) How can the green area qualities experienced be identified and linked to particular areas for planning purposes? (iii) What kinds of quality do the current green areas provide? (p6). Participants in the study were asked to identify with positive (*e.g.* peace and quiet) and negative (*e.g.* noise) values associated with their greenspaces to discover what they felt about the quality of the places (p8). They were also asked to name their favourite and most used greenspaces and to describe the qualities of these areas. This type of social information is then mapped onto to existing land cover maps to indicate where the most valued greenspaces are and what people feel about the current provision (p16). According to the authors, the advantages of using social values mapping is that it will allow planners to get a better insight into local values relating to use and perceived quality of greenspaces (p16). The disadvantages are the costs involved in designing, distributing, collecting and analysing questionnaire data. The authors also noted the problems in accessing hard-to-reach groups via questionnaire surveys, *e.g.* young people, and understanding how different life stages can influence a person's values and relationships with greenspaces (p17).

An interim report (Coles and Caserio, 2001) from an EU funded project 'URGE' (Urban Green Environment www.urge-project.ufz.de/default.htm) looked to develop social criteria, indicators and benchmarks for the performance of urban greenspaces to improve the quality of life for EU citizens. According to the authors, social criteria are encompassed within three main areas of interaction: (1) Location of site and access, (2) Quality of experience, and (3) Functional aspects (*e.g.* what people actually do in the greenspace). The 'Location – Experience – Function' model operates at a range of levels, *e.g.* individual, family and community, and at different scales. They note that "*integrating greenspaces with existing walking routes or everyday activities will enhance the opportunities for access*". Methods include interviewing visitors to the greenspaces, questionnaire surveys, *e.g.* on-site and off-site, and observation. The authors add that greenspace users will leave their mark on sites, which can provide further evidence such as wear and tear on paths (indicating high usage), number of access and exit points and presence of dens (used by children). The following social criteria were proposed:

- Promoting high quality living and working conditions
- Daily recreational needs
- Life strategies (strategies to derive full pleasure from greenspaces)
- Emotional well-being
- Retreat against stress and Pace of urban life
- Exploration of the natural world
- Understand urban environments

- Educational and school resource
- Optimise local use
- Location
- Community ownership
- Local identity
- Fear of crime/safe use
- Social inclusion
- Recreation network
- Sports facilities
- Family or community events
- Management regimes
- Support and training (for greenspace providers and managers)
- Financing.

In Glasgow, a study gathered largely quantitative data on categories such as local amenities, local problems, areas reputation, neighbourliness, fear of crime and satisfaction with the area. The study also asked participants to self-report on their health to identify if there are links between health and perceptions of local environments (Sooman and Macintyre, 1995:18). Barbosa *et al.* (2007) used Experian's mosaic UK geodemographic database (www.business-strategies.co.uk) to classify social diversity and access to greenspace across Sheffield. Mosaic's classification is based on a hierarchical cluster analysis of 430 social, economic and demographic variables which are derived from the 2001 census and other sources (p.188). According to the authors, Mosaic can also provide an insight into the people lifestyles. Households are assigned to one of ten groups such as 'symbols of success' (there are also 61 sub-classes). The team then ordered the Mosaic groups by deprivation, wealth and age and matched household addresses in Sheffield to their specific group. Mosaic is intended to complement the UK government's Index of multiple deprivation, which takes into account indicators such as average household income, employment levels, health, education, geographical access to services, social environment and housing (Ambrose-Oji, 2009:6).

Doick *et al.* (2009) provide a methodology for producing socio-demographic profiles of catchment areas in order to identify which groups are under-represented in specific woodland sites. The overall aim of the project was to capture the benefits and contribution that trees, woods and forests make to the quality of life of people living and working in the vicinity of three case study forestry sites. Indicators for measuring the impact of trees, woods and forests on people's quality of life relate to use, engagement, quality of experience and personal and social benefit and are applicable at a range of different scales. On-site surveys were used to gather data from visitors, but a catchment survey also included the opinion of non-or infrequent woodland users and potentially excluded groups. To produce a socio-demographic profile of the catchment areas the team used available statistics on population, gender, age, ethnic group, religion, disability, health, social grade, household income and Index of Multiple Deprivation score. Two main sources of data were utilised – Census of Population 2001 and Indices of Deprivation. Catchment areas were defined by buffers of 500 m and 4 km around woodland sites. Statistics related to each catchment area were then extracted to 'best-fit' that area.

Keep Britain Tidy (2010), in collaboration with BTCV, Greenspace and communities and local government have developed a segmentation approach to identify and target park and greenspace users. The segments are based on the type of experience that users are seeking with the authors emphasising that who people visit greenspaces with tends to influence what type of experience they are seeking. Research identified five greenspace segments:

- *Great Outdoors* – comprised 40% of participants who visit greenspace because they feel happier and healthier after a visit and they enjoy fresh air and exercise

- *Sanctuary* – comprised 25% of participants who are seeking peace and tranquillity in their greenspaces
- *Playground* – here participants (19%) utilise greenspaces primarily to share experiences with, and entertain, children and grandchildren
- *Team spirit* – participants (15%) seek the hustle and bustle of an actively attended greenspace. Typical users participate in team sports or socialise and bond with family and friends
- *Resistors* – 10% of respondents stated that they had not used a park or greenspace in the last 12 months. The authors suggest that resistors are a fairly disparate group who state that they see the benefits of greenspace but do not feel the need to utilise the spaces available to them possibly because of fear of crime, litter and lack of things to do.

While noting that there are considerable overlaps between segments in terms of requirements and that individual's straddle and migrate between segments depending on occasions or even life stages, the authors do identify the types of activities associated with each segment. They are:

Great Outdoors	walking, dog walking, reading, jogging, cycling, yoga/meditation
Sanctuary	walking, birdwatching, cycling, horse riding
Playground	playing with children, general socialising, feeding ducks, picnics/barbecue, unorganised sports, attending an event, fishing
Team spirit	general socialising, feeding ducks, picnics/barbecue, unorganised sports, jogging, organised sports, sunbathing, fishing, horse riding.

Encouraging Resistors to use greenspaces can be challenging. The authors' emphasise that meeting the universal needs of a safe and clean space is necessary but that any local improvements should be proactively communicated to facilitate confidence building and positive motivations. They also suggest that prominent activities and events as well as good facilities could provide a positive reason for visiting greenspaces.

There are many initiatives that are carried out at regional and local levels to encourage greater interactions with green and open spaces and encourage more physical exercise, *e.g.* walking bus, exercise referral schemes, patch walks, Living Streets 'walking works' *etc.* For example, a health and openspace project carried out in Auchenback, East Renfrewshire (Halcrow, 2008) used a form of 'audience development plan' to understand local people's views of barriers to accessing outdoor spaces and developing actions for increasing their access. Residents were invited to take photos of outdoor activities and also what discouraged them from being active. These were supplemented with an open exhibition and informal discussion and interviews. As part of a major regeneration project in the area, creating attractive outdoor spaces to support health will include a range of council services including community services, education, environment and community health and care partnerships as well as roads and transport, housing, youth services and planning and regeneration.

Despite a range of approaches highlighted above and in Appendix I there are few qualitative social data sets on the perception and use of greenspace and little available on specific approaches taken by local authorities beyond their green networks / green infrastructure strategies. Lack of data may be reflected in the fact that it is more difficult and time consuming to measure social values in relation to a network of greenspaces, as highlighted by Lindsay *et al.* (2001:338) who discuss access to greenways in the U.S. They state, *"measuring equity of access to linear features such as greenways is less intuitive than measuring access to facilities that occupy a particular parcel or group of parcels in a discrete location".* Potential sources of quantitative and qualitative social data sets collected at the national and/or regional level could include:

- Census of population 2001
- Scottish Index of Multiple deprivation
- Scottish neighbourhood statistics
- Scottish crime and justice survey
- Scottish Health Survey
- Scottish Recreation Survey
- Local health and lifestyle surveys
- Scottish Morbidity Linked Data set
- Scottish Social Attitudes Survey
- General (Scottish) Household Survey
- Scottish census maps
- Social inclusion data sets (electoral statistics)
- Scottish Longitudinal study
- Labour force survey
- Local area statistics
- Health and greenspace impact assessments
- Greenspace quality audits
- Local public Openspace audits
- Public benefit recording system
- Community consultation results (e.g. core path planning)
- Housing Association data
- Local plans
- Visitor survey information
- Citizen panels

However, it is likely that the most accessible, robust and useable datasets in the context of the Green Networks and People project are the Census of population survey (2001) and the Scottish Index of Multiple Deprivation but local and other datasets, *e.g.* household survey, Scottish Recreational Survey, will be included where available.

4 GREEN NETWORK ASSESSMENT AND PLANNING; DATA SETS AND ANALYTICAL TOOLS

The review has highlighted tools and some of the data sets that may have potential application for green network assessment and planning. This section provides a summary guide to the tools, ordered as a series of steps:

4.1 Development of a greenspace / open space data set

Many of the approaches reviewed start with a guide to develop a greenspace data set, which can then be used as a decision-support tool to aid greenspace planning, and development. Open space and greenspace audits are reliant on the use of accurate green / open space data, best complied within a GIS, using OS MasterMap as the base layer. Recommended data sets and coverage (Scottish Executive, 2005) are:

- OS MasterMap topography layer
- OS address point or OS MasterMap address layer
- Full spatial coverage of the area
- Digital aerial photography
- Existing local authority data sets, including greenspace data, core path network data, habitat survey data, and sports facility assessment.

SNH recommends a minimum mapping size of 0.2 ha for greenspace, although all greenspaces should be included within OS MasterMap. It may be likely that there is a trade-off of local authority resources between quantity and quality of audit. Many approaches reviewed fail to account for the unique attributes of individual greenspaces, considering all areas of greenspace falling into a single typology uniformly.

Greenspace Scotland and Glasgow & Clyde Valley Green Network Partnership have produced a toolkit *'Greenspace quality – a guide to assessment, planning and strategic development'* for assessing the quality of greenspace using five criteria:

- accessible and well connected
- attractive and appealing places
- biodiverse, supporting ecological networks
- active, supporting health and well being
- community supported.

4.1.1 Greenspace typology guidelines

- Physical Activity and Open Space, Planning and Open Space (PAN 65) (Scotland)
- Planning and Policy Guidance note 17 (England)
- Greenspace mapping and characterisation - Greenspace Scotland

4.1.2 Tools and standards to assess greenspace quality

Greenspace Scotland and Glasgow & Clyde Valley Green Network Partnership have produced a toolkit 'Greenspace quality – a guide to assessment, planning and strategic development'

NPFA (National Playing Fields Association 6 Acre Standard) is used by a number of Local Authorities to assess provision of greenspace for play and sports.

Urban Design Alliance's Placecheck Toolkit is a questionnaire-led approach to assessing the qualities of a place, indicating what improvements are needed, and gathering together a group of people to work together to achieve them. http://www.placecheck.info/

4.1.3 Assessment of Greenspace access and provision

The next stage is to determine whether people can access greenspace, particularly locally. Tools to spatially assess greenspace access can be used to target the provision of greenspace for either the whole population in the area of consideration, or to target specific requirements, *e.g.* addressing social deprivation. Tools with potential for development are highlighted below:

Greenspace project decision-support tool

The EU funded 'Greenspace project' developed a decision-support tool (DST) to assess greenspace provision in relation to a number of identified parks, nature reserves and forests. Although it uses a limited greenspace inventory, it has been used by Aberdeen local authority to inform the development of new, statutory local plan, which discusses the requirement of and public access to the greenspace network in Aberdeen. The City Council also uses the DST to test policy options to tackle social exclusion from greenspaces. Whilst the approach is useful for identifying access to greenspace entry points, but does not consider greenspace as a network, rather as individual areas.

ANGSt

Provides a step by step practical guide (although it refers to itself as a model) for assessing and implementing greenspace provision and planning greenspace. In their review of the ANGSt, Handley *et al.* (2003) found that, following the suggestion in PPG 17, many development plans to promote natural greenspace in towns and cities are based around the London approach and have historically used the National Playing Fields Association standard. A survey of local authorities conducted for this project confirmed this to be the case and found very low usage of the ANGSt model or of any other system for managing the provision of natural greenspace. Assessing Needs and Opportunities: A Companion Guide to PPG 17 (DCLG, 2002b) suggests a detailed methodology for determining distance thresholds (effective catchment of a particular open space or facility). For an example of the ANGSt approach undertaken in a study of the South East AONBs Woodlands Programme, see www.forestry.gov.uk/forestry/INFD-7D4MGD.

Sport England Facilities Planning Model

A computer-based tool which calculates the demand for sports facilities and compares it with the capacity of existing facilities to accommodate that demand. As it would be unrealistic to assume that users can travel long distances to facilities, the model links demand and supply using catchment areas. All of the parameters used in the model have been derived from user and household surveys. Model outputs identify areas that don't meet the calculated demand, together with a quantification of unmet demand and facility requirements. The model operates at the strategic level rather than as a local assessment of needs. No account is taken of the social characteristics of the local population, usually ignores quality considerations and is based on very high capacity parameters.

Social outcomes through Investment in Forestry Tool (SIFT) (Forestry Commission)

A GIS-based tool to aid decision-making about prioritising investment in woodland creation and woodland management for social benefits. Spatial data sets are given a score according to their relative potential benefit, then combined and analysed using GIS. The potential social benefits are grouped according to six possible outcomes:

- improved health and well-being
- woodland to benefit people from deprived areas
- more use of woodland for access and recreation
- more woodland-based outdoor education (all ages)
- more woodland-based outdoor education (Secondary)
- more woodland-based outdoor education (Primary).

Public Benefit Recording System

Operates in a similar way to SIFT by examining the attributes of a particular location www.pbrs.org.uk

Urban networks for people and biodiversity

Utilises least-coast network planning and social profiles to model networks of greenspace within the urban environment www.sniffer.org.uk/urbannetworks

4.2 Planning guides and strategies

Greenspace, openspace and green infrastructure strategy and guidance documents provide the beginnings of a framework for planning greenspace as a Green Network. Those approaches with potential use for planning Green Networks are listed.

4.2.1 Open space strategies

City of Edinburgh Council Open Space Strategy
Macaulay Institute study using a path distance analysis, presenting the results as a traffic light system to indicate if residences do have access within a certain distance.

4.2.2 Green infrastructure planning guides

Green infrastructure planning guide (north east England)
Provides reference standards from a range of publications and is useful in setting out definitions, scales of GI approaches and how to develop a GI plan. Spatial identification of GI is limited to simple buffers and indications of where to undertake improvement are not really spatial, rather they use some rules based on existing and desired greenspace.

http://www.greeninfrastructure.eu/ has a detailed green infrastructure planning guide focusing on the building and querying of a greenspace dataset, although it claims not to provide a prescriptive methodology.

Maryland's green infrastructure
Provides a very detailed methodology for the assessment of green infrastructure, involving identification of: the resource, important hubs (key areas, *e.g.* greenspace over a certain size), important connecting corridors, and ranking these according to ecological importance and risk by development. Whilst the methodology is very thorough, it is beyond the capacities of anyone who is not well versed with GIS procedures. http://www.dnr.state.md.us/greenways/gi/gi.html

http://www.greeninfrastructurewest.org/ has a web-based GI tool, although this is mainly a typology of GIS-based polygons

http://www.living-places.org.uk/ focuses on arts, sports, public space, heritage, etc. Has a culture and sport planning toolkit which, at a cursory glance appears to consist of sub-pages on guidance and steps to take. The information within is quite dense and it would be easy for user to be put off.

People profiling

People profiling is useful for determining greenspace requirements at a range of scales. A technique called geodemographic segmentation is a multivariate statistical classification approach for people. Experian's Mosaic UK geodemographic database classifies the UK population into 11 main socio-economic groups and, within these, 61 different types.

4.3 Data sets

Moseley *et al.* (2008) that identified that social data sets often provide valuable information that can be used directly or indirectly to qualify other data sets, but are not always in a format that is readily usable in a GIS. Larger scale data sets, *e.g.* the Scottish Index of Multiple Deprivation (SIMD) are particularly useful for modelling Green Networks for People as they allow quantification of characteristics of the catchment populations. Such data sets are incorporated into some of the tools identified within this review, *i.e.* Public Benefit Recording System (PBRS) and Forestry Commission Scotland's Social outcomes through Investment in Forestry Tool (SIFT). This review has found that many social data sets are held locally and are often based on community consultations. Data sets identified as being more widely available have been summarised in Appendix II.

5 DISCUSSION

Many local authorities recognise the importance of greenspace provision and use targets for achieving this. Often this takes the form of a census of existing greenspace in conjunction with a survey of local residents and their current (and desired) use of greenspace. Analyses of greenspace provision is often undertaken using calculation of access to nearest greenspace, which may involve a straight-line calculation or Euclidean distance measurement, both of which do not take account entry points, routes, short cuts and barriers such as busy roads without crossing points. Some local authorities have classified areas of greenspace they deem to be accessible and have indicated entry points, *e.g.* Significant Open Spaces in Edinburgh. These minimum standards are an important first step, which can be used to determine whether the greenspace meets the requirements of the local (and visiting) publics in terms of indicators such as facilities, accessibility, diversity, and biodiversity. Whilst the research approaches provide very useful information to aid greenspace planning for particular societal groups, some of the methodologies employed would be overly complex for most planning authorities to use.

The scale of application of approaches is important, with most of those reviewed considering the regional scale for the strategic planning of greenspace provision through a hierarchy of standards relating to size and type of greenspace and the proximity to residents homes. However, many approaches seem to focus on the provision and management of individual greenspace elements rather than considering greenspace as part of a network. There are some exceptions, *e.g.* Dundee Public Open Space Strategy, that are planning linear features to facilitate public access to greenspace, but most use a catchment approach, perhaps because this provides a reporting mechanism for greenspace provision. However, all Local Authorities in Scotland must now have a Core Path Plan produced to meet local and visitor requirements for recreation, exercise and transit, and planning core paths as part of greenspace management will provide a more holistic, green network, approach.

Practical approaches to incorporating social data sets onto greenspace / green network planning and provision online have not been easy to find. While mapping research priorities for green and public urban space Bell *et al.* (2007) record a lack of baseline and longitudinal data on people's use of parks and other greenspaces and the quality of these spaces in terms of biodiversity. Busy roads, private land and railway lines may all provide physical barriers to greenspaces (Harrison *et al.*, 1995) but we are also concerned with other types of non-physical barriers and equity of access. Several reviews and papers have addressed the fact that people from black and minority ethnic groups, disabled people and other vulnerable groups such as the elderly and young people are less likely to visit urban greenspaces frequently. There are difficulties in proving that greenspace contributes to an increase in physical activity but suggest that there is evidence that attractive greenspaces can provide positive emotional experiences, place to socialise and an incentive to continue exercising, Aspects of health, such as health-related behaviour, physical and mental health, and life expectancy will vary among social groups (Macintyre, 2007:1). Key variables include socio-economic status, gender, ethnicity and place of residence (ibid). In the UK the most disadvantaged communities face greater health problems and are likely to be living in the lowest quality environments (CABE, 2006:2). Mitchel and Popham (2008:1655) believe that (green) environments can help reduce health inequalities by promoting good health. CABE (2006:2) maintain that people exercise most when undertaking everyday activities such as walking to the shops or travelling to work. They state, "*It makes sense, therefore, that our built environment should provide a network of routes and destinations that maximise the potential for activity on foot or by bicycle, rather than motorised transport*".

Actively planning greenspace as a green network will help to reverse the effects of greenspace fragmentation and is likely to increase opportunities for the everyday engagement of people with greenspace and promote active travel, incorporating

greenspace into people's lives rather than being a place to visit occasionally. Perhaps then the vision of green networks and green infrastructure as *"an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits to people and wildlife"* (Benedict and McMahon, 2002) can be realised.

6 RESEARCH PRIORITIES

The development of Green Networks for People has highlighted the lack of spatially referenced social data on how people use green networks. Priorities for research to address these issues are:

1. How people move through the landscape and how they use green networks

2. Motivations for using (or not using) green networks

3. How to balance competing needs, interests and priorities for different user groups

4. Monitoring and evaluation of effectiveness of green network improvements.

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APPENDIX I

Approaches tables

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
Keep Britain Tidy	People, Places and their Green Spaces [Report: Green Flag]	2010	England and Wales	Segmentation of people	• Provide a more detailed breakdown about why people use parks and what facilities might encourage them to visit more often. • Aim is to identify groups and target marketing activity	Focus groups in three locations in North, Midlands and South England. *Stage 1* – Focus groups in 3 locations representative of general public (age, gender, ethnicity, socio-economic groups). At least one group of older family (empty nesters) and pre-or young family. *Stage 2* – 8 focus groups in 2 locations. Representative sample recruited to fine-tune and confirm segmentation model. Based on answers to series of statements. *Stage 3* – survey of representative sample of c 900 adults, interviewed at home in 140 locations during July-August 2009	Five greenspace user/non-user segments: *Great Outdoors* – enjoy fresh air and exercise *Sanctuary* – seeking peace and tranquillity *Playground* – entertain and share experiences with children or grandchildren *Team Spirit* - team sports, socialise with friends and family *Resistors* – see no reason to use greenspace. Frequently cite fear of crime, litter, boredom as reasons for not using	• Activity, company and availability are three critical factors when choosing what green spaces to use • Great Outdoors and Sanctuary segments are more introverted, have a personal or emotional relationship with greenspaces and desire to get close to nature • Playground and Team Spirit segments are more extrovert with a social or rational relationship to green spaces. More likely to visit greenspaces to meet the needs of others • Survey results reveal the types of activities most popular with different segments and their needs (e.g. Great Outdoors require expanse of

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
								greenspace with variety and depth and possibly equipment for activity) although there will be overlap and movement between segments
Tzoulas and James	Peoples' use of, and concerns about, green space networks: A case study of Birchwood, Warrington New Town, UK [Urban Forestry & Urban Greening 9:121-128]	2010	Birchwood, Warrington, UK	Observation of park activities and content analysis	• Understand patterns of recreational use of urban green space networks • How is the urban green space network used by the local community? • What are the local community's concerns about its green space network?	• Unstructured observations to establish possible activity hotspots and variety of activities that took place in case study. All main routes and paths walked in April 2003 on different days and times. • Structured observations to capture the variety of day time recreational activities. 136 visits between May 2003 and February 2005. Study area divided into 25 ha squared. Each 25 ha square	• Unstructured observations grouped into two broad categories of activities: utilitarian (walking and cycling) and leisure (20 types of pursuits grouped under recreation, sport and play) • An observation comprised an individual being involved in a recreational activity. • Content analysis revealed five categories of concern:	• 1825 observations were made • 19-39 years old used Birchwood forest park more than any other group. • People over 60 years least observed group • 47.2% of the activity observed was for utilitarian purposes such as walking, cycling to, or returning from, local shops or another destination • Most frequent recreational activities were dog-walking and walking for leisure • Most frequent types of sport observed were football and golf

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						divided in 100 equal sized smaller squared. Then a table of random digits used x and y sub-coordinates to identify a random point in the each 25 ha square. • 23 random points connected to form two routes. • Content analysis of local documents to explore local community's concerns about its green space network. Included archives of local newsletters and meetings minutes.	facilities maintenance, woodland maintenance, litter, paths and dog mess.	• 234 quotes about concerns relating to the case study were found in local archives. Most common concerns were: • Maintenance and restoration of vandalised park facilities • Overgrowth of trees and shrubs affecting lighting and safety • Litter, dog mess and poor path conditions • Findings from content analysis of documents is limited and could be supplemented with interviews, focus groups to get more detailed data.
Wridt, P.	A qualitative GIS approach to mapping urban neighbourhoods with children to promote	2010	Denver, Colorado, USA	Participatory GIS with children in low income community	• To understand what children think, feel, value, know, and care about in their neighbourhood and how	• Children aged 10-12 years • 32 children volunteered for the study (20 girls, 12 boys): 16 African-American, 14 Hispanic and 2	• Topics that were mapped by children included: their homes; their perceived neighbourhood boundaries; places where	

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
	physical activity and child-friendly community planning [Environ-ment and Planning B 37:129-147]				these perceptions and behaviours relate to their physical activity levels • Produce a children's guide to the neighbourhood to promote community awareness about barriers and supports to children's physical activity	white • A variety of methods used including photography, drawing, time diaries, focus groups, and cognitive mapping • Community mapping method used to enable children to articulate their use and perception of their neighbourhood that could be translated into a GIS database • Students worked in small groups using 1:1000 resolution 1.3m x 1.5m aerial photographs of their neighbourhood to map themes relating to their neighbourhood	they play and 'hang out'; places where they get food; bad places; people they know; routes to school	
Milling-ton, C. et	Develop-ment of the	2009	West Glasgow,	Walkability Assessment	• To develop an audit tool that	• Sample drawn from men and	• Final audit tool can be	• Built on Pikora *et al.*'s SMART tool

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
al	Scottish walkability Assessment Tool (SWAT) [Health and place 15:474-481]		Scoland	Tool	could help with planning active travel to improve walkability • Identify areas in need of intervention and areas of the environment that could be modified to greatest effect	women (18-65) who are not achieving recommended 30 minutes of moderate intensity physical exercise 5 days a week. • Sample recruited through distribution of leaflets to all households in the study area advertising the project plus other community locations • Physical activity assessed objectively using pedometer counts and subjectively through International Physical Activity Questionnaire • Psychological processes measured using three questionnaires on	obtained from corresponding author. • SWAT applied to an area that can be accessed within 30 minutes walk of participants home (recognised that all or some participants in sample may have a more limited range	developed in Australia to measure physical environment for walking and cycling • Items that could be measure objectively ask for presence or absence of a feature e.g. road-crossing aid or trees. • Subjective elements such as feelings of personal safety were more difficult to measure objectively and within the tool these aspects showed poor reliability

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						Transtheoretical Model of behaviour change, mood and quality of life • Neighbourhood quality of life survey also used for subjective assessment of environment in relation to physical activity • Local environment assessed using GIS on land use mix, building density, access to services, density of road intersections and traffic accidents. • Qualitative assessments • 112 items were included in the audit under 4 key themes: functional, safety, aesthetics and destination		
O'Brien, L. et al	Active England: The	2009	Five woodland sites in	Spatial profiling	• Develop monitoring and	• 2898 onsite questionnaires across 8 sites	• A focus on 2 community forests and 3	• There were significant increased in engagement in

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
	Woodland Projects [Report for Forestry Commission]		England		evaluation framework for each of the woodland projects to gauge whether target groups have increased activities	• 114 people participated in qualitative research through organised activities and discussion groups • Three phases of the M&E framework: - *Phase 1* baseline survey of existing users and then on-site surveys to monitor changes in visitors and frequency/type of visitor activities - *Phase 2* – spatial analysis to produce catchment profile of surrounding population of each site (20 mile radius reflecting the distance people might reasonably be expected to travel for purposes of regular activity). Census data and	woodland sites. Community forest projects not based at single sites but organised activities and events across a range of sites • Funded by Big lottery and Sport England • Catchment profiling includes: - Basic spatial analysis of current visitors within catchment (using people's postcodes from the on-site survey) - Spatial representation of Census (2001) data relevant to each target group - Spatial	activities such as cycling, use of play areas and mountain biking at the site-based projects, largely attributable to the investment made in infrastructure and equipment. These activities are more likely to attract people from the target groups than more traditional sports. • Two primary motivations for people to get involved: (1)socialising and meeting new people; (2) the chance to become more active to improve health. • Barriers for non-users include lack of transport for low income groups, safety concerns for females visiting alone or with children, lack of confidence and absence of cultural norms for BME

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						Index of Multiple Deprivation used - *Phase 3* – qualitative research to explore benefits and barriers of using green spaces for physical activity (users and non-users) plus interview with project staff to explore challenges and successes of each project.	representation of visitor profile data provided by the baseline surveys based on responses to questions about income, health, activity and fitness levels, gender, ethnicity, age and employment. • Individual site reports can be found at http://www.forestresearch.gov.uk/activeengland	groups • Led-activities and facilitated access are critical to reaching under-represented groups and encouraging physical activity and use of greenspace. • On-site surveys of general users are not the best approach to take in identifying small changes in use by target groups. Qualitative research is also needed to provide a more holistic picture
Doick, K. et al.	Monitoring and Evaluating Quality of Life for CSR 07 Appendix report – Chapter 7 {by David Cross]	2008 2009	Selected woodland sites in England	Socio-demo-graphic profiling of catchment areas	• Develop a methodology to measure an increase in visits to and engagement with local woodlands, quality of experience, and personal and social	• Indicators relate to use, engagement, quality of experience and personal and social benefit. • research methods include national survey, catchment survey, on-site	• Report provide examples of on-site and catchment questionnaires • National – statistically relevant telephone or postal survey to get a snapshot of	• Why 500 m and 4 km selected as catchment areas not discussed in this report • Principal methodological issue encountered in the production of the profiles is how data should be best-fitted to catchment areas.

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
	[Annual report. Forest Research]				benefit • producing socio-demographic profiles of catchment areas	survey, site management records • For catchment surveying authors used the census of population 2001 at output level where available • Additional use of National Statistics Area Classification (summarises census variables in a single classification of Output Areas) and Rural and Urban Area Classification of Output Areas and Indices of Multiple Deprivation • Woodland sites given buffers of 500 m and 4 km to derive catchment areas. • Statistics relating to catchment area extracted by selecting data	national opinion of impacts, benefits and accessibility of woodland resource • Catchment-face-to-face or telephone interviews or postal survey at local level. Includes opinions of those non or infrequent users and potentially excluded groups. A sample of >_ 380 per catchment to be statistically relevant • On-site survey must be representative of the total user population although accurately determining	Approach used to allocate Output areas to catchment areas if their geographic centre falls within the catchment area. However, there are residual overlaps and underlaps so the figures at output area level should be regarded as 'estimates'

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						building blocks for each topic that 'best-fit' that catchment area e.g. by selecting Output Areas or LSOA etc. that had geographic centre within catchment areas	the total number of site user is notoriously difficult for most sites.	
Comber, A. et al.	Using a GIS-based network analysis to determine urban greenspace accessibility for different ethnic and religious groups [Landscape and Urban Planning 86:103-114]	2008	Leicester, U.K.	GIS network analysis with regression approaches to socio-economic data	• Quantitatively analyse greenspace provision to assess how accessible greenspaces are to different ethnic and religious groups and identify which areas need to have greenspace provision enhanced	• Population census data - a network analysis performed to measure distances between greenspace access points and the centres of 2001 population census output areas at output areas scale. Linked to distribution of ethnic and religious groups • Network analysis of linear networks such as roads, railways, rivers, facilities and utilities	• Network analysis involves 4 stages: 1. Digitising the greenspace access points. 2. Creating Output Area centroids. 3. Calculating the distances between the access points and output area centres. 4. For each output area, calculating the distance to each greenspace and storing it in a database. 5. Analysing the database for access to greenspaces and in terms of the	• The majority of the population (89.7%) lack provision of small local greenspaces less than 300 m from their home. Lack of provision is relatively uniform across ethnic and religious groups. • Despite much accessible greenspace in Leicester it is not evenly distributed. • The analysis does not include data from outside the city and presence of greenspace outside the city would affect results. • This analysis can be thematically

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						undertaken using SANET • Use of mosaic plots to show which groups are under-or over-represented	ethnic and religious make up of each output area. • Uses the ANGSt recommendations for distance and provision of greenspace • The study explored in greater depth the '20 ha within 2km' as these showed the most variation and inequitable access amongst different social groups.	extended to consider some wider issues relating to access such as travel times to different services and accessibility modelled by analysing public transport provision. • Authors note that this quantitative analysis needs to be augmented with qualitative local research into needs of different groups.
Halcrow Group Ltd	Auchen-back Health and Open Space Project [Report]	2008	Auchenback East Renfrewshire Scotland	Participation research techniques and development of a toolkit of transferable measures	• To understand local views on barriers they experience to accessing outdoor space; what they think stops them getting out	• Recruitment was carried out via contacts from individual residents (who passed details to friends and relatives), community groups, schools, council and other	• The toolkit of actions includes: • Measures to improve the outdoor environment and facilities - Activities/groups/events/ social capital	• Barriers were categorized under: - physical barriers and the state of the outdoor environment - facilities, opportunities, activities and services - Perceptions and behaviour-social,

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
					and being active • Develop practical ways to remove barrier and encourage more extensive use of local outdoor space	contacts • People were invited to borrow a camera and take 10 photos of their outdoor activities and asked what made them active an also what discouraged them • Informal discussions and interviews (e.g. home visits, visits to group meetings, setting up a stall in the community café, discussion sessions at the primary school council, informal discussions with parents at school gate) • An exhibition of resident's photos creating further opportunities to hear people's views • All attendees were encouraged	- Providing education, raising awareness and increasing motivation - Shape policy/organisation objectives to include health and physical activity	cultural, emotional barriers - Organisational barriers • This study did not analyse the many complex social, psychological, economic and cultural reasons which may stand in the way of an individual taking exercise

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						to fill in a questionnaire		
Central Scotland Forest	Attitudes and Perceptions Study: On-site survey report	2008	Scotland	On-Site survey	• Find our more about how people who inhabit the Central Scotland Forest feel about their local environment and how they use the forest as a resource.	• 252 random adult individuals interviewed within 6 specified central Scotland forest locations • Researchers also asked to record observational data on people visiting the site to provide information on all visitors and not just people who took part in the survey. Although the data collected is not representative information includes (1) number of people, (2) time of day, (3) weather conditions, (4) main activity, (5) mode of transport to forest site	• The survey included 10 value statements with answers on a five point Likert scale. The value statements were related to forests: - Make me feel healthier - Make me feel more relaxed - Increases my awareness of nature and the environment - Generally makes me feel good - Provides me with a choice of things to do - Give me opportunities to meet people - Is good for my children - Screens out local road/factories/	• Over one third of visitors are in parties of 3 or more. Thus it appears that people are using CSF sites as a venue for social interaction (although observation data differs from survey data where more people who participated in the survey were alone) • From the interviews (note: 63% of respondents were male) - Bike access was highest amongst males - A high proportion of older people arrived at the site on foot - Car use is highest amongst young age band and those in employment • The two most popular activities were walking a dog (60%) and walking or strolling for pleasure (56%)

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							eyesores - I feel safe on this site - Raises pride in the local area	
Weldon, S. et al	New pathways to health and well-being: Research to understand and overcome barriers to accessing woodland Report for Forestry Commissio n Scotland	2007	Scotland with case studies in Motherwell, Galashiels, Drumchapel, Dundee and Sunart Oakwoods	Review and qualitative action research	• To target under-represented groups and explore people's perceptions, expectations and understanding of access to and use of, local green spaces.	Lit review plus In each case study interviews, focus groups, organised greenspace activity and observation of use of site	•	• Recommendations for widening access: - Engage communities - Build local capacity - Link places and services - Provide mediation - Develop codes of conduct - Contribute to a new cultural identity - Encourage changes in attitude to outdoor access - Evaluate outcomes of projects - Leave a sustainable legacy
Tyrväinen et al	Tools for mapping social values of urban woodlands and other green areas Landscape and Urban	2007	East Helsinki, Finland	Postal questionnaire	• Compile social value maps to understand: • What kinds of green area benefits are important to people? • How can the green area	• Postal questionnaire sent to 1000 residents aged 15-75-randomly sampled by the Finnish Population Register Centre • The social values section included	• The questionnaire was developed in cooperation with the Helsinki Green Area Division to provide information for the ongoing strategic green	• Over 80% of respondents thought that green areas made a very important contribution to the quality of the environment. • The most important benefits were outdoor recreation

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
	Planning 79:5-19				qualities experienced be identified and linked to particular areas for planning purposes? • Quality of current green areas	a map of the case study area with pre-identified and numbered green areas • Respondents were asked to identify areas with positive and negative values (words rather than pictures) • Respondents were asked to write down the number of the area to which they felt the value was applicable. • Respondents were also asked to identify their favourite and most used areas and key qualities • Results were analysed via SPSS • Scores compiled into a database per unit area and imported into GIS • Synthesis maps show the highlights and	area planning process in the case study area. • Positive values included : beautiful landscape, valuable nature site, the feeling of forest, space and freedom, attractive park, peace and quietness, opportunities for activity and history and culture. • Negative values involved unpleasantnes s, scariness and noise	opportunities, contact with nature, stress relief and aesthetic experiences • Women and newcomers and the better educated resident emphasized recreational and health benefits more than other groups. • The most frequently identified positive values were ‘opportunities for activity’ and ‘beautiful landscape’. • Dissatisfaction with green areas is usually caused by untidiness, in particular litter and dog faeces, but vandalism and noise are also problematic

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						most unpleasant and problematic green area sin the study		
Barbosa, O. et al	Who benefits from access to green space? A case study from Sheffield, UK [Landscape and Urban Planning 83:187-195].	2007	Sheffield, UK	Classifies social diversity using Experian's Mosaic UK geodemogra-phic database.	• Measure access to public greenspace available to households in Sheffield and how this varies across different sectors of society • Compare levels of provision of public greenspace with availability of private green space	• Ordered Mosaic groups by deprivation, wealth and age • Mosaic complements IMD, a set of continuous indicators reported at super output area level covering seven deprivation domains. An average score for each of the government's deprivation domains was computed for each discrete Mosaic group • Wealth rank based on the average position on the axis for households of a given Mosaic group • Age ranking based on the	• The Mosaic classification assigns households to 1 of 11 groups and 61 sub-classes. As well as spanning economic and demographic gradients, Mosaic provides an insight into the lifestyle of people in different neighbourhoods	• There is enormous variation in access to greenspace across Sheffield. Irrespective of whether one scores all green space or only municipal parks, many households do not enjoy government recommended levels of access to public greenspace (based on distance) • This study only considered access. The authors recommend follow – up work to examine actual usage of green space and how this varies across urban areas and social groups

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						average age UK-wide of individuals found within that category (derived from census data and Experian's own lifestyle database) • Household addresses matched to Mosaic group		
Van LeeuwenE .S., et al.	A framework for quality of life assessment of urban green areas in Europe: an application to District Park Reudnitz Leipzig. [Environ-ment Technology and Manage-ment 6(1/2):111-	2006	District Park Reudnitz, Leipzig, Germany	Multicriteria evaluation method using the FLAG Model	• Develop an evaluation framework to assess the contribution of urban green spaces to quality of life	• Use of the multi-criteria analysis method Flag Model • Uses critical threshold values (CTV) to assess quality of life. A critical threshold value can be defined as the numerical normative value (or benchmark) of a quality of life indicator. • For each selected indicator, a separate benchmark is determined so	• Results from the EU URGE project • The FLAG model evaluates the degree to which an urban greenspace can optimise or comply with multiple objectives. • It can be used to test one single greenspace to see whether to complies with specified policies or the	• A problem faced in practice is that a benchmark value is not always unambiguous and can be open to subjective interpretation by decision-makers. • The FLAG model is easy to use where values can be assigned but has difficulties in applying 'yes-no' answers or criteria where possible answers cannot be ranked

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
	122]					that the entire set of indicator and benchmarks ct as a reference framework for judging urban green spaces on quality of life aspects • The impact matrix is an important input for the FLAG model and is a table that contains the values of indicators as well as the a priori specified benchmark values. • In the evaluation of the Park, the authors used 8 ecological indicators, 5 economic indicators and 12 social and planning indicators. Data and associated benchmark values were	model can compare different alternatives or greenspaces. • Indicators divided into 'cost' and 'benefit' e.g. if an indicator is characterised by a 'lower value is better', a score above the benchmark signals a problem with regards to QOL or a 'cost' • The critical threshold scale incorporates four colours or flags. Green= no reasons for specific concern. Yellow = be alert. Red = reverse trends. Black = bad development	

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						available for all of these indicators		
Balram, S. et al	Attitudes toward urban green spaces: integrating question-naire survey and collabora-tive GIS techniques to improve attitude measure-ments [Landscape and Urban planning 71:147-162**.**	2005	West Island, Montreal, Canada	Qualitative: integration of collaborative GIS and interviews Quantitative: Self-administered mail questionnaire	• To design and develop a valid and reliable survey instrument to measure attitudes towards urban green spaces by integrating traditional survey methods with collaborative GIS	• Semi-structured interviews (random sample of 135 residents) relating to conservation and management of greenspaces in their surroundings and wider area and notions of urban greenspace • Collaborative GIS workshop (10 participants) to identify spatial and temporal concerns of citizen groups. • Interviews represent individual interests while GIS workshop represent community interests. • Qualitative categories were generated by affinity analysis (representing the	• The collaborative GIS process allowed participants to identify common goals and strategies for urban green space conservation. Groups discussed a series of focussed questions and presented their response maps in a plenary sessions. • Participants in the workshop were representatives municipality, business and commercial interest, environmental NGOs and citizens • In estimating	• Qualitative analysis grouped into three dimensions using affinity analysis. - first dimension 'behaviour toward urban green spaces' and relates to stated behaviour responses - second dimension 'affection/feeling towards urban greenspaces' and deals with emotional attachment to urban green spaces - third dimension 'usefulness of urban green spaces' related to personal or collective worth and value of urban green space • Knowledge about the specific preferences of age groups can inform more effective education and awareness strategies about greenspaces

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						range of issues associated with greenspace attitude). These categories used to formulate the questionnaire items. • Questionnaire survey explored the dimensions of attitude towards green spaces. Sampling based on household income and estimated amount of greenspace. • Communities were defined through the selection of a random point on the map and 1km circle drawn around that point. • 7 sites chosen – 46 questionnaires distributed on either side of randomly selected street in each of the sites.	amount of greenspace, a high distribution of greenspace for a particular community was identified as an estimated 3% of a circle of radius 1km. Low greenspace distribution occurred when 1% or less of 1km circle was covered with greenspaces • 4 of the sites were in unique municipalities and covered entire range of possibilities of interaction between income and green space. 3 others were randomly selected regardless of income or	

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						• Factor analysis used to explore questionnaire data	greenspace.	
Pikora, T. et al	Developing a framework for assessment of the environ-mental determi-nants of walking and cycling [Social science and medicine 56:1693-1703]	2003	Australia	Review of literature and policies, interviews, Delphi exercise with experts	• Develop a framework of the potential environmental influences on walking and cycling	• First phase- Semi-structured interviews with 31 local experts from urban planning/local government, transport, public health, pedestrian, cycling and disability advocacy groups. • Second phase- Delphi panel of 34 local, national and international experts (urban planning and design/local government, transport, public health/physical activity and user groups) to identify and rank environmental variables to include in frameworks and relative	• Framework includes four physical environmental features: - *Functional* – physical attributes - *Safety* – includes personal and traffic safety - *Aesthetic* – walking and cycling influenced by access to an interesting and pleasing physical environment - *Destination* – relate to availability of community and commercial facilities • Developed four conceptual	• The level of satisfaction with the walking and cycling environment is determined by physical and visual experience. If a neighbourhood is pleasant, relatively quiet, landscaped, well-maintained and well-lit, people will take pleasure in it • Results from interviews suggest that personal safety, aesthetics and presence of destination is important for walking in the local neighbourhood. For cycling, a continuous route and traffic safety were important • Delphi results – continuity of the walking or cycling surface is more important for

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						importance	frameworks relating to walking and cycling for recreation and transport	transport journeys than recreational trips • Further empirical work is needed to identify which factors are important
Leyden, K.	Social capital and the built environ-ment: The importance of walkable neighbour-hoods. [American journal of public health 93(9):1546-1551.]	2003	Galway Ireland	Questionnaire survey	• Study whether the built environment (i.e. the way we design and build our communities and neighbourhoods) affects the degree to which people are involved in their communities and with each other. An assessment of walkability	• 750 households surveyed by mail in 8 sample neighbourhoods. In 6 of the neighbourhoods a survey delivered to each household. In other 2 a portion of the neighbourhood sampled at random. 279 surveys returned • All survey respondents asked to rate the degree to which their neighbourhoods were pedestrian oriented and mixed use	• Neighbourhoods divided into 3 ideal types: - city centre/near city centre neighbourhoods - older, mixed-use suburbs - modern, automobile-dependent suburbs • Further measures of social capital included: how well residents knew their neighbours, their political participation, their trust and faith in other people, and their social engagement.	• Results show the more places respondents report being able to walk to in their neighbourhood, the higher their level of social capital • Residents living in high-walkability neighbourhoods (many in this category reported walking to work) were likely to score higher on all measures of social capital

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
Coles, R. et al.	Social criteria for the evaluation and develop-ment of urban green spaces. [Interim report for the EU URGE project]	2001	European project	Social Criteria through survey and catchment profiling	• Develop methodologies for assessing social use of urban green spaces using social criteria	• Methodologies Site Assessment techniques (walking is preferred mode of access): - *On-site survey* of use of site e.g. observation of wear on paths indicating high usage, number of access and exit points, the presence of dens indicating use by children - *on-site surveys of users* e.g. observation of users and identification of user profile (sampling at different times of day throughout week. Interviews/questionn aire of users based on representative sample of user profile - *catchment profiling through household surveys* (which can be checked against the profile of users from the site survey). Under-represented groups may be	Social criteria: • *QOL* - Promotion of high quality living & working conditions - Daily recreational needs - Life strategies • *Health and well-being* - Physical & emotional well-being - Retreat against stress & pace of urban life • *Education and life skills* - Exploration of the natural world - Understand urban environments - Educational resource • *Community and local identity* - Optimise local use	• Three main areas of interaction are identified: (1) Location of site and access (basic relationship which allows or promotes everyday user access), (2) Quality of the experience (defined by pleasure that user derives from the site, (3) Functional aspects (defined by the user activities) • The 'location – experience – function' model works across a range of levels providing outputs at individual, family and community levels. • The authors suggest that user –based information should be gathered by local authority during their public consultations.

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
						accessed through the use of focus groups	- Location - Community ownership - Local identity • *Security and social inclusion* - Fear of crime and safe use - social inclusion • *Recreation and sport* - recreation network - sports facilities - family/community events	
Dunnett, N. et al DTLR	Improving Urban Parks, Play Areas and Green Spaces	2002	England		• Develop typology of open spaces and users including different categories of users and how they use a range of types of green space (includes estimation of number of visits) • Examine	• Literature review • Telephone survey of 50 local authorities • 15 case study authorities which included: • Structured interviews with managers and other staff • Collation and analysis of existing survey data on users and uses • Telephone		• Informal or passive activities are the main reasons that people visit urban green spaces • Under-represented groups include: women, 12-15 years olds, 16-19 year olds, Non-European, 56-65 year olds, 76 years and over, disabled people • The telephone survey revealed seven factors that are likely to

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
					barriers which deter different user groups • Assess local authority practices for planning, providing, managing and maintaining urban green spaces and identify range of innovative models which are developing for management etc.	survey of 515 non-or infrequent users • 43 focus groups with sectors of the population identified as under represented as users of urban greenspace		encourage people to use urban green spaces more. In approximate order they are: removal of dog mess, followed by improved safety, better maintenance, better facilities, more events/activities, more staff, making spaces easier to get to and having a space that is nearer. • Provision of dog litter bins, litter bins, information centre/boards, children's play area and sports areas as facilities that would encourage more use • Concerns fall into two broad groups. Personal issues such as poor health, mobility, lack of time and personal preference for visiting other places are factors that green space planners and managers are less able to influence.

Authors	Title	Date	Location	Approach	Aim	Methods	More…	Findings/problems
								However, results show that the five main barriers are resource issues and could be tackled

Appendix II – Spatial and other data sets available for network modelling.

Category	Data set	Description	Format	Resolution	Value	Reference
Landcover	Land Cover Scotland 1988 (LCS88)	Remote sensed data set derived from aerial photography taken in 1988; provides broad habitat definitions at 1:25 000 scale	Vector polygons	-0.1 ha resolution	Covers the whole of Scotland focusing on semi-natural habitats, is out of date, but currently being updated ("New Image of Scotland")	
	Land Cover Map 2000 (LCM2000)	Satellite derived remote-sensed data sets providing broad habitat definitions	Vector polygons	-0.1 ha resolution	Covers the whole of Scotland, but there are problems with accuracy in mapping some habitat types	www.countrysidesurvey.org.uk/land_cover_map.html
	Land Cover Map 2007 (LCM2007)	Update of LCM2000, utilising OS MasterMap and agricultural land parcel data sets.	Vector polygons	-a 'field by field' resolution of approx 0.5 hectare	Covers the whole of the UK. Release due late 2009	www.countrysidesurvey.org.uk/land_cover_map.html
	Ordnance Survey Pan-Government product portfolio	Products include: 1) for large scale mapping - OS MasterMap; Land-Line; 1:10 000 Scale Raster; 2) for small scale mapping – 1:50 000 Scale Colour Raster; 1:50 000 Scale Gazetteer; 1:250 000 Scale Colour Raster; Strategi; Meridian 2	Vectors – lines & Polygons, Rasters	Variable, dependent on product	MasterMap is the new, more definitive, large-scale digital map of Great Britain, containing information on roads, tracks, paths etc. Gives accurate representation of woodland areas and boundaries and can identify linear features which can act as barriers to dispersal or as corridors	www.ordnancesurvey.co.uk
Woodland	National Inventory of Woodlands and Trees (NIWT)	Derived from LCS88 data set plus updated to 1995 from FC sources; provides information on broadleaved/conifer woodland > 2ha	Vector polygons	-2 ha minimum patch size Scale 1:25 000	Baseline data source on woodland for Scotland, 10% minimum canopy cove	

Category	Data set	Description	Format	Resolution	Value	Reference
		and small woods and trees (0.1-2ha)				
	Forest Enterprise (FE) sub-compartment database	Database of all FC woodlands	Vector polygons	-0.5 ha in most cases	Detailed woodland information, but only small amount of FC ownership within Lothians	FC Scotland
	Woodland Grant Scheme 3 (WGS3), Scottish Forestry Grant Scheme (SFGS)	Regularly updated records of new planting	Vector polygons	-0.1 ha resolution, Qualifying size for schemes is 0.25 ha	Gives composition and extent of new woodland areas which can give indication of habitat value	www.forestry.gov.uk
	Scottish Semi-Natural Woodland Inventory (SSNWI)	Constructed over the period 1995-2001 using interpretation of aerial photographs taken in 1988. Map of all woodlands > 0.1 ha classified according to degree of semi-natural character	Vector polygons	-0.1 ha minimum mapping unit	Identifies all semi-natural woodland, useful when combined with NIWT to locate sites of high conservation importance. Canopy cover can be used to identify sites where the tree component is a minor element.	www.scotlandswoods.org.uk
	Ancient woodland Inventory (AWI)	Map of all ancient (existing since 1750) woodlands over 2 ha in size	Vector polygons	-2 ha minimum mapping unit	Identifies areas of key importance for woodland biodiversity	
All habitat types	Phase 1 Habitat Survey	Broad scale field mapping approach giving information on the extent and distribution of natural and semi-natural habitats	Vector polygons	-Mapped at 1:10,000 with 0.25 ha resolution	Ideal source of good quality habitat information, but limited in coverage to specific regions	Surveyed Digitized 2000 Hutcheon Bros.
	National Vegetation Classification survey data	Various surveys covering SACs, SSSIs and other habitats of high conservation value in Scotland	Vector polygons	-	Coverage is geographically limited and information is often too detailed to make meaningful links with species	

Category	Data set	Description	Format	Resolution	Value	Reference
					requirements	
	SNH BAP priority habitat report and maps	Maps and description of UK BAP priority habitats summary of all previous phase 1 and phase II survey information in Scotland			Provides information on location of key habitats in Scotland	
	Scottish Integrated Agricultural Control System (SIACS)	Contains information on field sizes and crop types for very field in Scotland	Vector - polygons		Aggregated statistics available at parish level but data from individual land holdings are covered by the Data Protection Act	www.scotland.gov.uk/Topics/Agriculture/grants/18148/11836
Species	Biological records centre data	Locations of species from recording systems and public submissions	Vector - points	Variable, 10 m to 1 km depending on submission	Allows coincidence mapping as a measure of biodiversity	Lothian Wildlife Information Centre
Greenspace and open space	Greenspace characterisation	Customised MasterMap polygons using PAN 65 typology data set to indicate areas of useable greenspace, *i.e.* accessible of the general public.	Vector - polygons		Provides detailed information regarding which greenspaces are usable by the public. However, the MasterMap data set has a large number of very small areas of discrete open space of limited amenity value and no lower limit to the size of discrete polygons of open space shown in the audit maps. As a consequence, there is a danger of over-estimating the provision of meaningful 'human-scale' open space in terms of accessibility and	City of Edinburgh Council

Category	Data set	Description	Format	Resolution	Value	Reference
					distance.	
	Local public open space audits				Public views on local open space	
	Greenspace quality audits				Qualitative valuation of all greenspace	
	Public parks assessment	Unitary authorities condition of their greenspaces	Held by Unitary Authorities		Qualitative valuation of greenspace	
	Green flag awards	Award for recognising and awarding best greenspace sites based on criteria including sustainability, maintenance & safety.	Identified on website		Identification of high quality managed greenspace sites in England & Wales, however, pursuit of award may divert resources away from other greenspace	www.greenflagaward.org.uk/
Boundaries	SAC, SPA, NNR and SSSI boundaries	Boundaries of protected areas/sites	Vector - lines		Give indication of areas of high conservation value in general	www.snh.gov.uk
	Core Development Areas	Designated core development areas for each Unitary Authority	Vector - polygons		Provides an indication of where development is planned	Unitary Authorities
	Green belt boundaries	Outline of green belt extent			Provides an indication of where greenspace falls within areas designated as green belt	City of Edinburgh Council
Biogeophysical	Scottish National Digital Soil Map (MLURI)	Broad-scale mapping of soil series at 1:250000 scale (1:50000 and 1:25000) soil maps occur for some lowland areas)	Vector - polygons		Of limited value in predicting soil type unless combined with other information (*e.g.* Digital Elevation Model; LCS88)	

Category	Data set	Description	Format	Resolution	Value	Reference
	British Geological Survey 1:625 000 digital maps, (BGS)	Maps of geological series across Britain	Vector - polygons		Can help with predicting soil type and hence soil quality in ESC (see below)	www.bgs.ac.uk/geoindex/home.html
	Ordnance Survey Digital Elevation Model (DEM)	Digital elevation data for whole of the country	Raster - grid	50 m and 10 m	Allows construction of elevation maps aiding in deriving ESC climatic and soil quality indices.	www.ordnancesurvey.co.uk
Social	Space for people	Accessible woodlands of over 2 ha and over 20 ha within a distance of 500 m and 4 km respectively	Vector - polygons		Identified communities that meet criteria for accessible woodland	Woodland Trust
	Woodland in and around towns (WIAT)	Woodlands created to address lack of woodlands around settlements	Vector - polygons			FC
	Scottish index of multiple deprivation	Identifies small area concentrations of multiple deprivation across all of Scotland	Vector - polygons		Identification of deprived areas	Scottish Government
	Crime deprivation	Derived data set linking crime ratings to population	Vector - polygons		Identification of potential areas that people perceive as 'no-go'	Scottish Government
	Housing deprivation	Derived data set showing housing to population	Vector - polygons		Type of housing may be useful in determining the garden biodiversity	Scottish Government
	Scottish census data	Population and household data	Vector - polygons		Calculation of population size per ward and household data to weight data sets	General Register Office for Scotland
	Scottish census maps					
	Census of population 2001					

Category	Data set	Description	Format	Resolution	Value	Reference
	Scottish neighbourhood statistics					
	Scottish health survey					
	Health and greenspace impact assessments					
	Local health and lifestyle surveys					
	Scottish Morbidity Linked Data set					
	Social inclusion data sets (electoral statistics)					
	Scottish crime and justice survey					
	Scottish Social Attitudes Survey					
	General (Scottish) Household Survey (could also look at ACORN classifications)					
	Scottish Longitudinal					

Category	Data set	Description	Format	Resolution	Value	Reference
	study					
	Labour force survey					
	Local area statistics					
	Community consultation results (*e.g.* core path planning)					
	Housing Association data					
	Local plans					
	Visitor survey information					
	Citizen panels					
Access	Greenspace access	Entrance points to greenspace areas of Edinburgh	Vector - points		Identification of the point of entry for greenspace, allowing determination of areas with access within a given distance to be determined	CEC
	Core path networks	A system of routes to provide reasonable access for walking, cycling, horse riding and access to inland water. Criteria vary within each Unitary Authority, but focus on access and usefulness.	Vector - lines		Identification of all accessible non-vehicle routes. In general terms, core paths will need to be promoted, signposted and free from barriers and impediments to movement.	Unitary Authorities

Category	Data set	Description	Format	Resolution	Value	Reference
	Spokes	Cycle path network for Edinburgh & the Lothians	Paper		Identification of all known cycle routes in Edinburgh & the Lothians	www.spokes.org.uk
Aerial photography	Ordnance Survey aerial photography	Aerial photography covering the majority of Edinburgh & the Lothians	Digital imagery	25 cm	Photo-interpretation to confirm land cover type	www.ordnancesurvey.co.uk
Assessment tools	Ecological Site Classification (ESC)	A tool for predicting suitability of areas for creating/restoring woodland and open-ground habitats based on climate and soil variables			Allows construction of suitability maps for different habitat types across the whole of Scotland	
	Native Woodland Model	A tool for predicting woodland type	Vector polygons	-1:50 000		Towers *et al.*, 2002
	Local Biodiversity Site Assessment	Tool to assess the site biodiversity based on a number of criteria, including species, habitat, and access	Vector polygons	-Uses Phase 1 data, so 0.25 ha	Allows a qualified assessment of the biodiversity value of areas by applying rules and weights to site data.	Lothian Wildlife Information Centre
	Landscape character assessment	A methodology for scoring areas based on geology, landform, river & drainage systems, soils, landcover, land-use, settlement pattern, patterns of field enclosure, historic dimension of the landscape			Useful for determining how the different components of the landscape come together and create patterns of landscape character. May be of limited use in urban environment.	www.landscapecharacter.org.uk/
	Public Benefit Recording System	Multiple benefit analysis scoring areas based on access, social, economic, & environment factors			Used to rank the potential benefit of sites within an area	www.forestry.gov.uk/pdf/PBRSMethodology.pdf/$FILE/PBRSMethodology.pdf

Category	Data set	Description	Format	Resolution	Value	Reference
	Social outcomes through Investment in Forestry Tool (SIFT)	(GIS) based decision support tool that helps prioritise investment in woodland management and/or woodland creation in Scotland for delivery of desirable social outcomes	Vector - polygons		Prioritises areas for investment in woodland management and/or woodland creation. Restricted to consultation with FC Scotland	FC
	Walkability audit tool					www.sparcoll.org.uk/SPARCollPublications.aspx
	Sport England Facilities Planning Model	A supply:demand model what calculates the demand for sports facilities and compares it with the capacity of existing facilities to accommodate that demand			Assessment of sporting facilities to meet regional demands.	www.sportengland.org/facilities_planning/putting_policy_into_practice/assessing_need_and_demand/facilities_planning_model/facilities_planning_model.aspx

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