AN EVIDENCE BASE FOR GREEN INFRASTRUCTURE IN YORKSHIRE AND HUMBER

This paper explains the rationale behind the green infrastructure evidence base work produced by Natural England in the Yorkshire and Humber Region.

Aim

To produce a consistent evidence base for green infrastructure in the Yorkshire and Humber Region, which is available as GIS layers and can be used to inform policy and investment decisions.

Why has Natural England produced this work?

The Yorkshire and Humber Regional Spatial Strategy includes a core policy YH8 on green infrastructure (see annex 1). This instructs local authorities through their Local Development Frameworks to define corridors and networks of green infrastructure, identify their functions and develop policies to protect and create new green infrastructure. Natural England has taken the lead in developing a green infrastructure evidence base because it wants to ensure a consistent approach to delivering policy YH8. In particular mapping and interpretation of the functions of green infrastructure across the Region to increase opportunities for investment. Natural England has acted as a regional facilitator working together with organisations to identify strategic green infrastructure which runs across administrative boundaries.

The results of the process of evidence gathering and interpretation have been to:

- Create a GIS evidence base of green infrastructure assets using national, regional and local data
- Provide mapped green infrastructure corridors placed in hierarchy

This information should enable local authorities, statutory agencies, voluntary sector organisations and the private sector to:

- Protect strategic and local green infrastructure corridors and networks
- Focus green infrastructure enhancement in areas where gains will be maximised
- Increase awareness of which green infrastructure functions exist where and how they complement one another
- Establish a baseline of green infrastructure information from which change can be measured

Further drivers for this work are:

- The proposed growth points in the Leeds City Region and South Yorkshire. Both are required to produce green infrastructure strategies. This work has been submitted to the consultants producing these and will form both part of the evidence base and as a means to help focus green infrastructure initiatives.
- Nationally, Natural England has produced Green infrastructure guidance. This provides a detailed approach for local authorities to producing their own green infrastructure guidance and delivery plans. This work forms a strategic context for local authorities to develop these.
- The Integrated Regional Strategy will replace the Regional Spatial Strategy. This green infrastructure work will form part of the wider infrastructure evidence base for this Strategy.

Who was involved?

Natural England acted as lead organisation for mapping the data. A total of 70 organisations have been involved across the whole Region and from neighbouring regions. Their involvement can been split between full engagement including participation at workshops as well as provision and analysis of data; provision of data only; contact and advice but no provision of data. The full list of participating organisations is given in Annex 2.

The project has taken almost 2 years to complete and involved the collection of around 800 datasets of which about 600 were actually used. Several million individual pieces of data were analysed and mapped. A pilot phase was undertaken in Calderdale, Kirklees and Bradford. This highlighted the need for strong partnership working, provision of a wide range of datasets, commitment from a range of disciplines within organisations to cover the full range of green infrastructure functions and the value of local knowledge of sites.

The process

A. Data collection

There is no single agreed methodology for collecting and analysing green infrastructure data. Therefore the process began by examining relevant research and strategies involving green infrastructure both in the UK and overseas. It is worth noting that to date existing strategies in the UK have covered sub regions, towns and cities, none have tackled a whole region. From these strategies a methodology was developed which would work at both a regional and local scale.

B. The Methodology

The following steps were used to create a regional data set for green infrastructure:

STEP 1 Mapping of existing physical green infrastructure assets
The process started by creating a baseline dataset of existing green infrastructure assets. This was achieved by pulling together GIS greenspace and green infrastructure data from Natural England and partner organisations. This covered sites already in existence such as open space, nature reserves and woodland (the full list is given in annex 3). All available green infrastructure datasets were included. This asset database included data which covered the whole Region and data which was only available at local level. This meant that there was both universal regionally consistent data and locally relevant data. All possible green infrastructure sites, with their exact location and boundaries were collected.

STEP 2 Mapping sites with potential for introducing green infrastructure
Next, sites which did not constitute green infrastructure assets in themselves but might have potential to introduce it, such as derelict land, were collected and mapped (see annex 4). Additional data which helped with understanding the functions of green infrastructure, but was not site based, e.g. area health statistics was also collected (see annex 5)

STEP3 Mapping of green infrastructure corridors
The next stage involved holding joint workshops with participants from adjacent local authority areas. This enabled green infrastructure to be examined across administrative boundaries. The workshops included the relevant local authorities and organisations with a close interest such as Forestry Commission, Pennine Prospects, the Wildlife Trusts and Leeds City Region. The staff involved were invited from a wide variety of disciplines to reflect the multifunctional nature of green infrastructure including Greenspace/Parks & Countryside, Forward Planning, Forestry, Tourism, Nature Conservation/Ecology, Rights of Way, sport and recreation, Geographic Information and historic environment.

Participants at the workshops are asked to examine maps which included all the data collected from stages 1 and 2 and use their local knowledge of land use, land ownership, planning policy and local initiatives, to develop corridors and networks of green infrastructure. The functionality and connectivity between different green infrastructure assets was considered. Firstly in terms of how single functions of green infrastructure can be linked, for instance connecting public open space together into corridors (detailed information on the functions is included in annex 6). Secondly linking multifunctional assets together such as connecting a designated nature area, to a lake, to a woodland, to a historic tourism site. Participants were also asked to consider realistic opportunities to increase green infrastructure based on known proposed initiatives such as major redevelopment schemes. These were considered over the full Local Development Plan timescale to ensure that not just immediate opportunities for green infrastructure were included. Corridors were defined on maps using physical boundaries on the ground such as roads and rail lines to define the edges and to ensure future legibility. These maps were then digitised and sent to the organisations involved at the workshops for them to check the boundaries and any omissions.

STEP 4 Creating a hierachy of corridors

The next stage involved the workshop participants coming back together to look again at the green infrastructure corridors they had defined in the first workshop to:

1. Check the corridor boundaries
2. Agree the green infrastructure functions that each corridor contained
3. Place the green infrastructure corridors into a hierachy.

Natural England examined various studies which included definitions of green infrastructure functions and agreed a list of fifteen functions to work with in the corridor analysis.

These are listed below with key indicators:

Open space – Contains open space assets such as parks and woodlands

Biodiversity – Contains one or more site of significant wildlife value

Landscape – Contains at least one landscape feature worthy of protection or enhancement

Products from the land – Includes areas in agricultural or food production

Mitigating flood risk – Contains floodplain, areas at risk from flooding or areas where green infrastructure could be used to reduce run off into flood risk areas

Contribution to mitigating climate change – Contains areas which are, or could be, managed for non flooding climate change mitigation through, carbon sequestration in areas such as peatlands, managed woodlands or locations for energy crop production

Health – Includes Air Quality Management Areas or locations with populations with poor health where green infrastructure can be used to increase outdoor activity or address pollution issues

Accessibility – Contains rights of way allowing access by foot, cycle or horse riding along the corridor

Recreation – Contains formal and informal outdoor recreational assets such as golf courses, play areas and sports pitches

Education – Visitor centre or site already used for environmental education

Cultural – Contains gardens, cemeteries, historic features or buildings with public access

Tourism – Includes tourism assets which would form part of at least a day trip for people from outside the immediate area

Poor quality environment – Contains existing poor quality environments which could be improved with investment in green infrastructure

Land and property values – Areas where investment in green infrastructure would be likely to positively affect local land and property values

Economic growth – Includes areas where development is proposed and increased green infrastructure is likely to attract further economic investment e.g. higher value industry

Participants considered each corridor in turn and agreed which functions were present. A strategic approach was taken therefore functions provided within the corridor had to be significant to be considered. Sites providing very localised green infrastructure functions, were not scored as having strategic functionality e.g. incidental open space. Depending on how many functions were present a category for each corridor was determined. This was based on the number of functions present, the corridor size and local knowledge of initiatives and likely opportunities for interventions. The corridor categories are given below:

Corridor categories

Strategic/Regional – Likely to cross several local authority boundaries and demonstrates 13 to 15 functions.

Sub-regional – Likely to cross two or more local authority boundaries and has 10 to 13 functions.

District – Likely to be contained within a single local authority or simply connect two localities across a boundary and demonstrates 8 to 11 functions.

The number of functions in each category overlaps i.e. a corridor scoring 11 functions could be both subregional and district. In the pilot work it was found that having absolute number of functions for each category was too rigid. This was because a few corridors demonstrated a high number of functions but were too small in scale to be considered as being categorised at a higher level. In these cases these corridors were examined in great detail to place them in the right category taking into account their scale and the degree to which each function was present.

Two maps were produced one showing the corridor boundaries at 1:50,000 scale. A second diagrammatic corridors map was produced to place emphasis on the hierarchy and strategic linkages.

Some local level corridors were identified during the process which were small scale, contained within a defined locality and had 7 or less functions. These were not taken forward within the mapping process as they were not considered strategic enough to appear on a regional or sub regional map. However the local authorities were encouraged to log these and consider them further for inclusion in Local Development Frameworks, particularly where they linked to more strategic corridors.

STEP 5 Corridor descriptions

In order to provide a robust evidence base justifying the functions identified in the corridors and the hierarchy of each corridor a table was developed. This included:

- A description of each corridor explaining the main features and key future opportunities for green infrastructure
- Evidence against each function to justify its inclusion. For example if the biodiversity function had been identified then sites such as SSSIs were named.

This process was undertaken using evidence chiefly from local authorities. Not all sites in the corridors were listed as this would have resulted in an unmanageably large amount of data. However sufficient sites and opportunities were included to ensure justification for each function.

OUTPUTS

The outputs from the five steps are:

1. A mapped dataset of green infrastructure assets e.g. all parks and nature areas etc. with their location and boundaries defined using national, regional and local data.

2. A regionally consistent mapped dataset of green infrastructure corridors showing boundaries accurate to 1:50,000 scale.

3. A diagrammatic map of green infrastructure corridors for the region.

4. A detailed description of all 136 green infrastructure corridors

Presentation of the mapping results

Natural England is aiming to produce all the data as a series of GIS maps in a pdf format. These will have an Ordnance Survey base and will be set up so that layers of data can be switched on and off. It is intended to house this information on the Yorkshire and Humber pages of the Natural England website.

Further phases of green infrastructure work

The following areas of work are happening or planned:

1. To support Local authorities to use the results of the mapping process and principally to integrate the maps and associated policies into LDF core strategies and supplementary planning documents. In tandem with this Natural England may help local authorities to develop further local, small scale green infrastructure corridors.
2. To use the maps and data to inform green infrastructure strategies for the new Growth Points in the Leeds City Region and South Yorkshire. Natural England will then support the development of initiatives and strategic projects which are adopted as part of these strategies.
3. Natural England Yorkshire and Humber has committed to working with South Yorkshire Forest as a sub partner on the VALUE Interreg project which links the UK with Germany, the Netherlands, Belgium and France to deliver a green infrastructure investment based project. This builds on the previous Interreg project Creating a Setting for Investment which examined the connection between green infrastructure and economic investment.

Conclusion

The work carried out by Natural England in partnership with many different organisations should provide the evidence necessary to take green infrastructure a step forward in the Region. However much more needs to happen to ensure that the evidence base is used to best effect to raise the quality of existing green infrastructure, introduce new green infrastructure and protect it for future generations.

Annex 1

Yorkshire & Humber Plan policy YH8: Green infrastructure

A: Areas and networks of green infrastructure will be identified, protected, created, extended, enhanced, managed and maintained throughout the region to ensure that an improved, accessible and healthy environment is available for the benefit of present and future communities whilst protecting the integrity of internationally important biodiversity sites.

B: LDFs should:
1.   Define a hierarchy of green infrastructure, in terms of location, function, size and levels of use, at every spatial scale and across all areas of the region based on analysis of existing natural, historic, cultural, sport and playing field, and river and landscape assets, including the identification of new assets required to deliver green infrastructure;
2.   Identify and require the retention and provision of substantial connected networks of green infrastructure, particularly in urban, urban fringe and adjacent countryside areas;
3.   Ensure that policies have regard to the economic and social as well as environmental benefits of green infrastructure assets; and
4.   Identify the functional role of green infrastructure in supporting the provision of renewable energy, urban microclimate control, and flood risk management.

C: Assets of particular significance for the protection and enhancement of green infrastructure include national and inter-regional trails, floodplains, woodlands, biodiversity and heritage and distinctive landscapes.

The Yorkshire and Humber Plan: Regional Spatial Strategy to 2026 (May 2008)

Annex 2 – Organisations involved

Agencies and Statutory Bodies

Government Office, Yorkshire and Humber Assembly, Forestry Commission, Environment Agency, British Waterways, English Heritage, Yorkshire Dales National Park, North York Moors National Park, Defra, Welcome to Yorkshire, Natural England (East Midlands, North East, North West)

Local Authorities

Kirklees, Calderdale, Bradford, City of York, Leeds, Wakefield, Barnsley, Sheffield, Rotherham, Doncaster, Craven, Harrogate, Selby, Ryedale, Hambleton, Richmondshire, Scarborough, North East Lincolnshire, North Yorkshire County Council, Lancashire County Council, Oldham, Rochdale, North Lincolnshire, Hull, East Riding of Yorkshire

Voluntary Sector

Sheffield Wildlife Trust, CPRE, Heywoods, Dreamweavers, South Pennines Association, RSPB, Yorkshire Wildlife Trust, Sustrans, National Trust, Woodland Trust, Wheatlands Educational Community Woodlands

Private Sector

Ecotec, ARUP, Knight Kavannah Page, Yorkshire Water, CUDEM

Representative/other

Pennine Prospects, White Rose Forest, West Yorkshire Ecology, South Yorkshire Forest, South Yorkshire biodiversity, Leeds City Region, Forest of Burnley, Airedale Partnership, Bradford Environment Forum, Natural Economy North West, Pennine Heritage, Places for People, Nidderdale AONB

Annex 3 - List of all mapped green infrastructure assets – green sites and designated land:

- Wildlife Trusts sites
- Local Authority greenspace, parks, sports pitches, recreation grounds, allotments and UDP/LDF information including village greens
- Designated Sites (SPA, SAC, Ramsar, SSSI, NNR, LNR, SEGI, SINC, RIGS)
- Countryside Rights of Way open access land
- Registered Common Land
- Woodland sites (FC Land, Woodland Trust Land, Ancient Woodland)
- Yorkshire Water accessible land holdings
- BAP Habitats
- RSPB Reserves
- National Trust land
- National Parks & Heritage Coast
- Country Parks
- Areas of Outstanding Natural Beauty
- Rivers, Floodzone, Washlands, waterlogged ground, lakes, waterbodies, canals
- Public Rights of Way, National Trails, Cycleways and Greenways (existing and proposed)
- Cemeteries & Churchyards
- Historic Data (Historic Parks & Gardens, SAMs, Historic Environment Record, World Heritage Sites)
- Indicative habitat network
- Air Quality Management areas
- Outdoor tourist attractions
- Conservation areas
- Group tree preservation areas
- Schools and colleges with grounds

Annex 4 – List of all mapped data which may have potential for green infrastructure

- Previously Developed Land
- Housing Market Renewal Areas
- Mineral sites
- Regeneration Zones (local)
- Proposed new greenspaces (local)
- Disused railways
- Historic Landfill sites
- Coalfield sites

Annex 5 – Other data

Agric Land Class - indicates soil type which can infer likelihood of different habitat expansion success

Health - Combined Health Index (Obesity, Mental, Coronary Heart Disease, Chronic Obstructive Pulmonary Disorder)

Integrated Access/Access Network mapping

Sport England active citizen participation survey

Education - School results data – Key stage 4 average uncapped GCSE and post 16 average 3 point score per student

Index of Multiple Deprivation

There are a number of caveats for all site based data used:

- The sites included have not been individually assessed as part of the mapping process for quality, accessibility, safety for use, environmental/ecological value or similar.
- Areas which are not included in the "Green Asset" layer cannot be assumed to not be green and/or don't have green infrastructure value - just that those areas are not available in GIS mapped form.
- Individual areas of farmland and private gardens have not been included as the volume of information would have taken the project considerably longer and the value of including it was considered limited.

Annex 6 Green infrastructure functions

The contribution of each function to green infrastructure is as follows:

Function	Issues	Benefits	Justification	Source
Open space	Loss of open space creating a negative image with consequent impacts on the fear of crime, lack of investment and pressure to leave areas.	As far back as the garden city movement the role in creating a positive working and living environment has been recognised. Open space creates opportunities for social interaction for all ages and serves to create identity and pride of place.	The government acknowledges that the decline of urban greenspaces has helped weaken community cohesion in many deprived areas Creative approaches to land ownership and management, such as community management, can offer cost savings for landowners and local authorities, encourage a local sense of community and help cut crime rates. A study in Chicago looked at the difference between areas with trees and areas that were	DETLR Final report from the Urban Green Space Task Force 2002 CABE Does Money Grow on Trees? 2005 Taylor , Wiley, Keo, Sulivan Growing up in the inner city 1998

			predominantly barren. The effect of vegetation was significant for the number of children playing and the type of creative play. One possible criticism is that green space attracts more children whether playing or not. However the non playing numbers were significantly lower, demonstrating that vegetation actually increases play.	
Biodiversity	Biodiversity loss can result in fragmented habitats, isolated species, and vulnerable sites of decreasing quality. Loss of ecosystem services critically decomposition, pollination, nutrient recycling, detoxification of pollutants and hydrological cycling can have negative impacts on both natural and human activities	Planning for biodiversity within green infrastructure can facilitate the local survival of species, strengthen links between habitat networks and agriculture and create and retain jobs maintaining the land.	Fragmented populations may have reduced population mean fitness and suffer increased extinction rates because of increased expression of in-breeding, depression, decreased levels of genetic diversity and higher probabilities of fixing deleterious mutations. In a fragmented habitat: Individual animals may not have access to an area holding habitat necessary for their survival; Migratory animals may be unable to move to those areas where they would normally stay for part of the year; Natural populations and communities may be unable to move across the	Young, Clarke - Genetics, Demography and Viability of Fragmented Populations – 2000 Bonin, Bruszik, Delbaere, Lethier, Richard, Rientjes, van Uden, Terry The Pan – European Ecological Network 2007

			landscape in response to changing environmental conditions; Genetic exchange between different local populations may be prevented; A patch of habitat in which a species has become locally extinct cannot easily be re-colonised by another local population of the same species	
			Over the last 65 years there has been an extensive loss of semi-natural habitat beyond protected areas in the UK which has been documented in a series of publications which have been described by some as a "grim litany of outrage and complaint"	Catchpole Planning for biodiversity 2006
Landscape	The Region has diverse landscapes, however not all are valued and well looked after. Many do not provide a diverse range of services and benefits. Some are not effectively planned, designed or managed.	Green infrastructure provides opportunities to implement the European Landscapes Convention, by identifying key stretches of landscape that form the settings for our everyday lives, and to ensure that they are managed in such a way as to strengthen and improve the key features and	Four of the Yorkshire and Humber Regions National Character Areas have been assessed as neglected	Countryside Quality Counts survey 2003
			In the Yorkshire & Humber region, 30% of landscapes were judged to be 'neglected', while a further 20% were classified as 'diverging'.	Countryside Quality Counts survey 2003

		retain and develop their distinctiveness		
Products from the land	Parts of the rural landscape are unproductive or not fulfilling their full potential, particularly in urban fringe areas	Green infrastructure offers opportunities for productive landscapes at local scales such allotments and community orchards and larger scales with forestry and farmland integrated into corridors	Woodlands in the UK are under exploited - the drive for renewable energy could unlock the potential for woodfuel. A 60% increase in domestically grown wood is possible with significant opportunities to create jobs in woodland management and product processing	Forestry Commission A woodfuel strategy for England
Flood risk	Many areas of the region already flood and climate change predictions indicate that winter rainfall will increase and summer rainfall will decrease to create greater flood and water shortage risks.	Green infrastructure investment can reduce water volumes and speeds into catchments and store water. Sustainable Urban Drainage, selective tree planting on floodplains, flood retention ponds and water management can all reduce the impacts of flooding on the built environment. Local authorities can reduce clean up costs from flooding and create long term security for inward investors. Insurance premiums may also be kept	Riparian woodland can increase flood storage and hold back flood waters through the formation of large woody debris dams within headwater streams. Tree rooting also strengthens river banks and reduces channel erosion and downstream siltation. Woodland shade may also become increasingly important for protecting freshwater life from rising water temperatures due to climate change. Forest Research, the Forestry Commission's research agency, has been exploring the potential of floodplain woodland to help	Forestry Commission Forestry and flooding briefing note, Dec 2007 Environment Agency 'Making Space for Water' Programme R&D Update review of the impact of land use and management on flooding. Environment Agency, March 2007

		lower.	manage flood flows and reduce flood risk. Under contract to the Environment Agency, they undertook hydraulic modelling work on a section of the River Cary, a tributary of the River Parrett in Somerset. This demonstrated that the creation of a 50 hectare floodplain woodland had the potential to increase the temporary storage capacity of the floodplain by 14% and to delay the passage of floodwaters by 30 minutes.	
			Hydraulic modelling work on the River Laver, west of Ripon, suggests that the creation of a 15 hectare floodplain woodland could increase temporary storage capacity in planted reaches by 50% and delay the passage of floodwaters by up to 30 minutes. These are potentially very significant results and suggest that floodplain woodland could be used to help reduce flood risk by 'managing' the transfer of flood waters downstream;	Ripon Multi-Objective Project

			delaying and desynchronising the flood peaks of different tributaries.	
Climate change	Climate change is projected to significantly raise temperatures particularly in urban areas and place residents and vegetation under considerable stress.	Green spaces and trees can provide shading and evaporative cooling thereby lowering temperatures and reducing energy costs. Green infrastructure can also help species to migrate and adapt to climate change	It is estimated that adding 10% green cover in urban areas is projected to keep temperatures at or below 1961 – 1990 levels until the 2080's. Energy reductions from green roofs are estimated at savings of £5.20 per m^2 per year	Gill, Handley, Pauliet – Adapting cities for climate change, The role of green infrastructure
Health	Heart disease, diabetes, obesity, pulmonary diseases and asthma, some cancers and mental health are directly associated with low rates of exercise, high stress levels and polluted environments	Green infrastructure can create opportunities for both gentle and active exercise and human contact with nature.	Populations in areas with higher levels of greenery have higher levels of physical activity and lower level of obesity; "Green" exercise can provide enhanced mood, improved self esteem and lower blood pressure more effectively than exercise alone and reduce stress and improve recovery from stress. It also improves mental alertness, attention and cognitive performance and reduces levels of depression, aggression and violent behaviour. In Holland a study of 250,000 people has shown that the perception of health was related to the percentage of green space within a 3km	Newton Well being and the natural environment 2007 Maas et al – Green space urbanity and health how strong is the relation? 2005

			radius. Those with more green space felt the most healthy, with the strongest results amongst the poorest people	
Accessibility	Accessing the countryside requires using motorised transport for many urban dwellers causing congestion.

Countryside trips for low income households without private transport is problematic.

School runs block local roads at morning peak | Footpaths, cycle paths and bridleways offer opportunities to encourage non-vehicular transport. Particular gains are possible using green infrastructure corridors to link homes to schools and urban areas to the countryside. Local reduced noise and pollution are possible as well as fewer road accidents. | People surveyed that had access to a car were more likely to have made a leisure visit to the countryside in the last week: 22% of respondents that had access to a car had made a leisure visit to the countryside in the last 7 days whereas only 9% of those without a car had made a leisure visit to the countryside in the last 7 days.

A nationwide survey of 50,000 children found that 31% would like to cycle to school but only 3% were able to do so. | Natural England - England leisure visits survey 2005

Workpole No place to go? 2003 |
| Recreation | Countryside recreation is popular but largely limited to certain sections of the population, resulting in a lack of awareness around environmental issues in the general public. | Increasing demand for experience based leisure time can be matched with opportunities for recreation, bringing increased revenue. Widening the appeal of outdoor recreation can also increase the experience of under represented groups. | In 2006, 3 out of Yorkshire's top 8 visitor destinations were country parks and the Trans Pennine Trail attracting over 1.8 million visitors

Visitors to the countryside are older, white affluent, car owning and in better health than the general population

Over 103,000 people visited the RSPB reserve at Fairburn Ings in 2007 with over 70% | Yorkshire Tourist Board

Natural England – State of the Environment 2008

RSPB |

			coming back for repeat visits	
Education	Urban children are often trapped in environments that provide little opportunity for self discovery and natural environmental experience. This has resulted in children now spending less time outdoors and in particular playing with friends in green areas. Consequently their appreciation and understanding of the natural world has reduced in recent years. Play in unnatural environments can have a significant impact on anti social behaviour And child development	Greater appreciation of the natural environment can reduce vandalism, littering and dumping with consequent reductions in costs to the public purse. Environmental education can bring enjoyment to children in a way that other forms of education cannot. Play in natural environments can bring positive social interactions in young people and improve creative skills	A study from 2002 compared knowledge of Pokemon card characters with British wildlife pictures. 53% of 8 years olds were successful in identifying wildlife but over 78% were able to identify Pokemon characters.

A playground design study from 2003 concluded most bullying occurred in plain tarmac areas, particularly where space was limited. The school with the least bullying was a Steiner school where children were encouraged to relate to nature and playtime was an extension of learning and exploration in a natural environment, often resulting in children getting dirty.

In contrast to man-made environments, a natural setting can create more imaginative play and so prevent the dominance hierarchy based on physical strength that encourages bullying.

Natural vegetation and other natural features can create | Balmford, Clegg, Coulson Taylor University of Cambridge 2002

Malone, Tranter Children's environmental learning 2003

GHK - Social and economic benefits of the natural environment:

Review of Evidence 2006 Play naturally |

			enclosed areas to help different groups play together and create varied activities suitable for different age groups leading to overall concentration and motor skills	Children's play council 2006
Cultural	The Region's cultural assets are largely unprotected or lack sufficient funding to be preserved. Many such as historic houses lie within a green infrastructure context. Others are not easily recognised by the untrained eye and therefore require interpretation to maximise their public benefit.	Linking cultural and historic assets through green infrastructure will bring benefits in terms of better understanding, protection and public access	The 2,600 scheduled ancient monuments in the Yorkshire and Humber Region represent just 3% of the total archaeological resource, one third of these are at risk. Of the Region's 72 historic parks and gardens, 30% are at risk. Six of the Region's seven registered Battlefields are at risk.	English Heritage
Tourism	Well managed green tourism assets can bring visitor revenue to an area and help widen trip opportunities.	Green infrastructure can engender green tourism and in particular low impact leisure trips. It can also play a part in education about the natural environment	An additional 330,000 visitors to the National Forest since 1995 have contributed an additional £128 million annually, creating and supporting more than 500 fulltime equivalent jobs. Woodland recreation in England has a value of between £1.66 and £2.78 per visit	AMION Economic value of green infrastructure 2008
Poor quality environment	Poor quality open space can blight housing, commercial and industrial	Housing with good green infrastructure provides communities with positive	Studies on inner city areas indicate 50% less crime and domestic violence with views of increased	Kuo and Sullivan Environment and crime in the inner city 2001

	areas and foster a negative atmosphere resulting in a lack of investment in buildings	views, fresh air and identity	vegetation in a poor housing estate compared to identical blocks with no vegetation.	
Land and property values	Property values are suppressed by a lack of green infrastructure. Treeless environments and lack of greenspace deter investment particularly in housing stock	Uplift in property values following green infrastructure investment can make areas with low occupancy rates more attractive for investment and sales	CABE have suggested that property values are on average 8% higher near parks and house prices increase with proximity to green space	CABE – Does Money grow on trees? 2005
Economic growth	Poor green infrastructure can suppress the type and value of industrial investment. Low value polluting industries tend to locate in areas with weak green infrastructure	Raising the quality of green infrastructure can attract higher value industry to an area, particularly knowledge based, blue chip and white collar businesses	Green infrastructure investment in Riverside Park Industrial Estate in Middlesborough attracted new high profile businesses, occupancy grew from 48 to 78% and levered in over £1 million of private investment	CLES/Groundwork, 2007