



Natural Economy Northwest

The economic benefits of Green Infrastructure: The public and business case for investing in Green Infrastructure and a review of the underpinning evidence

Commissioned from ECOTEC by The Mersey Forest on
behalf of Natural Economy Northwest



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Ministerial Forward

There is a growing understanding that successful regions require a healthy presence of green infrastructure for sustainable economic development, and that a healthy environment underpins the well-being and prosperity of all our communities, urban and rural; and as we stated in *Securing the Future* (the UK Sustainable Development Strategy);

“Our goals are a strong economy and decent homes in places with clean, safe and green public spaces, where people are able to lead healthy lives, and enjoy the environment around them.”

Green Infrastructure is fundamental to meeting these goals, and as vital as all the other forms of infrastructure. It can underpin local economies and help increase GVA, just as it can create healthier, more cohesive, sustainable communities.

However, as vital as the natural environment is to our communities, if it is poorly planned, piecemeal or badly managed, it will fail to deliver against its huge potential, and the benefits that Green Infrastructure can deliver will not be realised.

For Green Infrastructure to be truly of value it requires co-ordination and co-operation across political and administrative boundaries. Quality also matters if Green Infrastructure is to deliver significant returns. It must be strategically planned, invested in and managed on scales ranging from the local to the regional, and in settings from urban centres to the open countryside.

In short, Green Infrastructure needs to be planned, developed and managed just like all other forms of infrastructure, if society is to thrive and prosper.

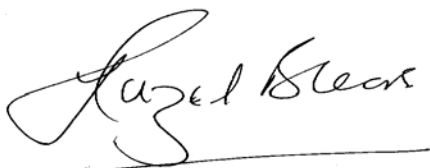
Previously, evidence of the economic benefits delivered by Green Infrastructure has been spread across myriad reports. By commissioning this report, Natural Economy Northwest and partners have drawn together and synthesized current evidence, to create a benchmark for all future work– the ‘11 sets of economic benefit’ allow us, for the first time, to articulate the true economic and social benefits, and learn from previous work to continue to raise the standard of Green Infrastructure work across the board.

The next step is to ensure that the benefits of Green Infrastructure, as identified in this report, are rooted at the heart of all future planning and development.

Natural Economy Northwest is currently working with the Northwest Regional Development Agency, Government Office North West and Natural England amongst others, to build on these foundations. To secure the investment to maximise these benefits on the ground the partners are working to develop operational methodologies to demonstrate and assess the value of specific Green Infrastructure proposals, from the different perspectives of the key potential investors.

I am confident that the future wellbeing, regeneration and growth of our communities will be secure and sustainable, if Green Infrastructure, valued in the way that this report suggests, is at the heart of future planning and development. I commend this report to all involved in making decisions about investing in our future.

Rt Hon Hazel Blears MP

A handwritten signature in black ink, reading "Hazel Blears". The signature is written in a cursive style with a long horizontal line extending from the end of the name.

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Preface

This is one in a series of reports produced between 2007 and 2009 within the Natural Economy Northwest (NENW) programme. NENW is a Regional partnership programme led by Natural England, the North West Development Agency and the SITA Trust on behalf of a wide range of economic and environmental partners. The main focus is to deliver priority action 113 in the Regional Economic Strategy, to optimise the natural environment's contribution to the Regional economy and quality of life.

The programme also includes the Enriching Nature SITA Trust biodiversity programme and the aspirations of Natural England and other environmental and economic partners to mainstream the natural environment within sustainable economic development. Key work areas within the programme are to:

- increase awareness of the value of the natural economy;
- commission and disseminate research;
- provide direction to promote effective use of limited financial resources;
- contribute to the development and delivery of Regional and sub Regional strategies;
- facilitate natural economy project development and encourage project delivery;
- promote and facilitate Green Infrastructure and Natural Tourism;
- encourage strategic investment in natural economy projects; and
- facilitate training, skills innovation and advice to business.

This report reviews and summarises the evidence showing that Green Infrastructure does have a significant economic value, and it classifies the ways in which the functions of Green Infrastructure deliver this economic value under eleven thematic headings. This work underpins much of the NENW programme and it also complements Defra's important work to try and ensure that the value of ecosystems is built into public decision-making.

It will be taken forward by further work, with the NWDA, which will seek to quantify this economic value, using different approaches to suit different purposes and audiences. It will also help the environment sector to position itself within the broader agendas of sustainable economic development, quality of life and community benefits.

This is one of a series of three companion reports considering (and entitled) "The Economic Benefits of Green Infrastructure" (see footnote for full titles of the companion

reports)¹: this particular report was prepared by ECOTEC Research and Consulting, with valuable input from the NWDA, North West Green Infrastructure Think Tank, Paul Nolan of the Mersey Forest Partnership, the NENW Green Infrastructure Steering Group and Malcolm Barton of Ibis Environmental and Design Consultants.

This work, along with other NENW information and publications, is available on our website – www.naturaleconomynorthwest.co.uk . You can contact us through our website. We are interested in the ways that this report has been of use to you so that we can take into account in the further development of the programme.

Dr Will Williams

Programme Director, Natural Economy Northwest, April 2008

¹ The Economic Benefits of Green Infrastructure: developing Key Tests for evaluating the benefits of Green Infrastructure, ECOTEC Research and Consulting for NENW (2008).

The Economic Benefits of Green Infrastructure: an assessment framework for the NWDA, AMION Consulting for the NWDA (2008).

Executive Summary

This report, produced by ECOTEC Research and Consulting for Natural Economy Northwest (NENW), sets out to establish the clearest possible links between planning, managing and/or investing in Green Infrastructure and generating economic benefit for a locality, district, sub Region or Region. It seeks to summarise the evidence base that exists, showing that Green Infrastructure does have tangible economic value and proposes a framework of eleven key thematic headings under which these benefits are delivered. This report will be complemented by a companion report, which will outline a menu of approaches to quantification of the value of investments in Green Infrastructure, taking account of the range of potential interventions possible and the considerations, interests and appraisal techniques used by the different potential investors.

The report is guided by the following definition of Green Infrastructure:

"Green Infrastructure is the Region's life support system – the network of natural environment components and green and blue spaces that lies within and between the North West's cities, towns and villages and which provides multiple social, economic and environmental benefits".¹

Green Infrastructure in its practical application is the creation or maintenance of a series of interlinked green assets, all of which have particular identities and characteristics and each of which are, to a greater or lesser extent, multi functional. For maximum and most efficient benefit, investment in Green Infrastructure needs to be strategically planned at a spatial scale which recognises the interdependencies and transference that exist across and between administrative and political boundaries.

The Environmental Economy of the North West already supports a wide and diverse range of jobs and businesses – worth up to £2.6bn GVA and 109,000 jobs² – as well as underpinning the quality of the Region as a place to live, work and do business in. Increasingly, therefore, investing in Green Infrastructure should be of direct interest to agencies concerned with economic regeneration. This report seeks to demonstrate that economic benefit can be linked directly to investment in the enhancement and management of Green Infrastructure. It defines four types of economic benefit that flow from these investments:

¹ North West Green Infrastructure Guide, North West Green Infrastructure Think Tank, (2007) - www.greeninfrastructurenw.co.uk/resources/GI_Guide_Sept_07.pdf

² Environmental Economy Report for the North West, Bridge Economics, for the Environment Agency, (2006)

- ▶ Direct economic outputs.
- ▶ Indirect economic outputs.
- ▶ Cost reductions to the public and private sectors.
- ▶ The management of risk.

These benefits can be delivered in both monetary and non-monetary forms. Many are currently hard to quantify but outputs would include job creation, raised land and property values, new inward investment and the reuse of derelict, under utilised and neglected land.

The eleven key economic benefits of Green Infrastructure identified in this report are:

- Climate Change adaptation and mitigation.
- Flood alleviation and Water management.
- Quality of Place.
- Health and Well-being.
- Land and Property values.
- Economic growth and Investment.
- Labour productivity.
- Tourism.
- Recreation and Leisure.
- Land and Biodiversity.
- Products from the land.

The report concludes by strongly recommending that, based on the evidence presented, economic development agencies in the North West should grasp the opportunities presented by the Green Infrastructure agenda, for the range of benefits the report demonstrates and for the following two key reasons in particular:

First, to secure the maximum sustainable economic benefits to the Region by planning, managing and enhancing our Green Infrastructure: to enhance quality of place, create the best possible setting for both home-grown and inward investment, and to develop the North West as a green and healthy Region, attractive to tourists, entrepreneurs, investors and the skilled workforce necessary in today's knowledge economy.

Second, to address the global issue of climate change at a Regional level, using Green Infrastructure to provide a range of adaptation services to enable our urban and rural areas to remain habitable and economically viable as weather patterns change and to provide for greater carbon capture and storage, along with the raw materials for renewable energy.

1.0 Introduction

1.1 Aims and objectives

This report, commissioned by the Natural Economy Northwest Steering Group and undertaken by ECOTEC Research and Consulting, is designed to review the evidence base relating to Green Infrastructure and its economic benefits and to illustrate how economic benefit flows from Green Infrastructure investment. The second part of this work, to be published in a companion report, will show how this might be best assessed, and, where possible, will seek to attach real monetary value to these benefits.

The report is developed from the perspective that Green Infrastructure needs to be properly understood in terms of how it delivers benefits and impacts – in particular with regard to economic growth. As explained further in section 2.2, Green Infrastructure itself is a mosaic of physical entities and sites. Each of these has one or more functions and it is these functions which deliver the benefits. This report will focus on the economic benefits but, clearly, there are social and environmental benefits as well.

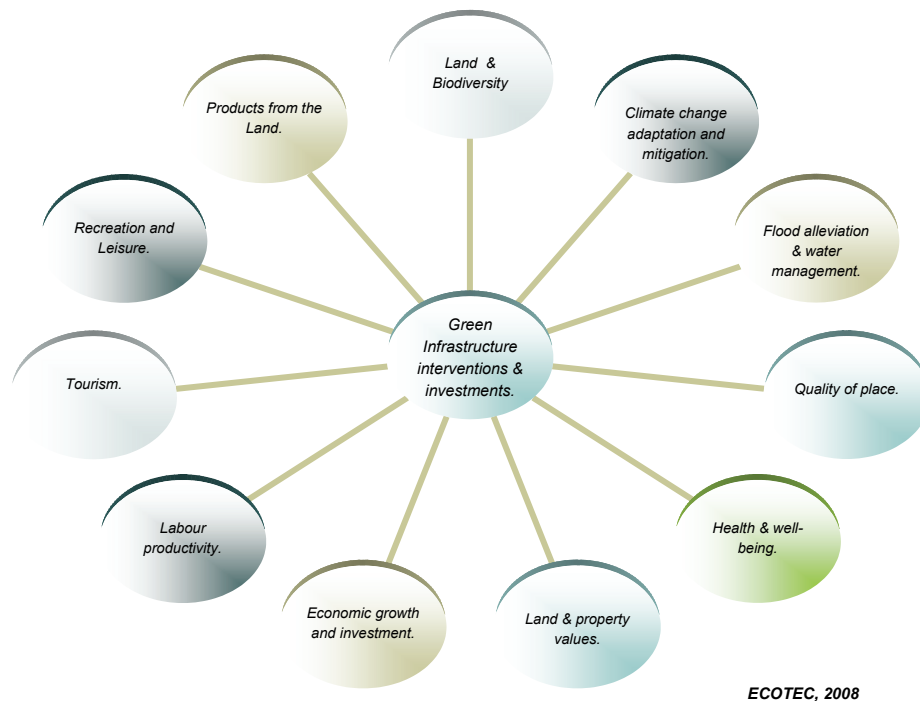
The economic benefits of Green Infrastructure are set out in chapter 3 where the report summarises each in turn. Annex One presents the evidence supporting each benefit in detail and seeks to illustrate which investments primarily contribute towards these benefits and their likely outcomes.

The report, then, aims to provide a sequential logic chain from the rationale for investment, through the benefit this investment creates to the Regional economy, and, critically, provides the evidence base which justifies the investment.

Finally, in chapter 4, the report summarises the menu of key economic tests to be developed further in the companion report, illustrating a range of methodologies which may be adopted and utilised by partners in undertaking Green Infrastructure investments.

This report has identified eleven key economic benefits related to Green Infrastructure, illustrated below in Figure 1, which when taken cumulatively, provide a significant yet under valued contribution to the economic activity and the economic offer of the Region.

Figure 1: The economic benefits of Green Infrastructure



The report is not intended to develop a linear progression from a typology of Green Infrastructure, through to function(s) and then onto benefit of each type/function. Whilst the report does provide a degree of information regarding the types of Green Infrastructure investment relevant to achieving each benefit, located within Annex One, it is not the prime purpose to analyse types and functions of Green Infrastructure, rather to indicate the generic benefits of investment.

There is a need in due course to drill below this analysis, to specify types and functions in relation to benefit. However, the recently published Regional Green Infrastructure Guide¹ provides key information in relation to this and the development of strategic interventions for Regional and sub Regional agencies and should be regarded very much as a complementary resource to this Report.

1.2 Target audiences

The primary audiences for this work are three fold

First, those organisations involved in economic development and regeneration who require the evidence for the economic benefits of Green Infrastructure investment. The paper provides the evidence for the economic benefits of investment in Green

¹ North West Green Infrastructure Guide - The North West Green Infrastructure Think Tank (2007) – www.greeninfrastructurenw.co.uk

Infrastructure in its many forms and argues that these benefits are well evidenced and can, increasingly, be quantified reliably. Also, that reliable quantification allows for meaningful baselines to be created and monitoring and evaluation of the impact of investments to be undertaken.

Second, those individuals and organisations involved in developing projects which are either Green Infrastructure specifically or involve elements of Green Infrastructure, where project managers need to demonstrate economic value to funding bodies, investors or planners to support and add value to their proposals.

Third, the environment sector so that environmental investment is positioned for its contribution to sustainable economic growth, economic security and ecosystem services.

1.3 Methodology

The ECOTEC team undertook this work using the following key methods:

- A comprehensive review of literature (see Annex Two) which revealed where work had already taken place and the extent to which the results of this prior research can be relied upon to provide a convincing answer to the question of monetary value attribution.
- Interviews and meetings with key stakeholders in the North West Region.
- Analysis of key strategies and policies, national and Regional, relevant to the progression of Green Infrastructure in the Region.
- The development of a framework which identifies the key components of Green Infrastructure in relation to economic benefit and the key indicators which can be used against these in order to measure activity, impact and progress.
- A progressive and systematic assessment process designed to establish causal links between economic impacts and Green Infrastructure assets, investments and interventions.
- Interaction with the NENW team, the NENW Steering Group, the NENW Green Infrastructure Steering Group and the Green Infrastructure Think Tank.

1.4 Report structure

The remainder of the report is set out as follows:

- **Chapter 2 – Setting the scene** provides the context for the report by defining Green Infrastructure and analysing the key drivers for intervention in this sector;
- **Chapter 3 – Defining the economic benefits of Green Infrastructure** develops the case for intervention through the range of benefits that can be accredited to Green Infrastructure, setting out the key benefits, necessary interventions and supporting evidence.
- **Chapter 4 – Valuing the economic benefits of Green Infrastructure** points towards the menu of Key Tests to be developed further in the companion report to this.
- **Chapter 5 – Key conclusions** summarises the report's key findings and seeks to relate these to the interests of potential investors, especially the NWDA.
- **Annex 1** – sets out in detail the eleven identified key benefits, with supporting rationale, intervention types and evidence.
- **Annex 2** – summarises the state of the evidence base and suggests directions for further research.
- **Annex 3** – details the literature reviewed for this report.

2.0 Setting the Scene

2.1 Introduction

This chapter of the report sets out our understanding of what Green Infrastructure is, its definition and how it is important to the regeneration of our communities and economies within the wider framework of delivering the Regional Economic Strategy. Equally, it is necessary to demonstrate the links between Green Infrastructure and the wider sustainable communities agenda and where it sits within the overarching programme of activity being undertaken in the Region under the Natural Economy Northwest programme.

2.2 Green Infrastructure in context

2.2.1 Defining Green Infrastructure

The report takes as its starting point the definition for Green Infrastructure as defined by the North West Green Infrastructure Guide, prepared by the North West Green Infrastructure Think-Tank in support of the draft Regional Spatial Strategy:

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

Green Infrastructure takes in land that is broadly characterised as the physical environment, in both the public and private realm, with and without public access. Green Infrastructure is both an environmental resource that must be nurtured for its quality and health but importantly too because it serves to provide for additional social and economic benefits through its multifunctionality, ranging from adapting to climate change at the macro scale to providing the setting for attracting investment at the micro scale.

Typically, Green Infrastructure is described in the following terms:

- **Types** – the component parts of Green Infrastructure, defining and describing the assets that comprise it, as shown in Table 1 below.
- **Functions** – building upon the simple typology, it is then possible to assign a variety of functions to those forms: in other words, the key roles that individual and networked Green Infrastructure assets perform in relation to the economy, society in general and to the natural environment – the latter including the ecosystem services that it incorporates and provides.

- **Benefits** – moving further from the description of functionality of an asset or assets, it is then possible to ascribe certain benefits that the functions of Green Infrastructure bring to the three 'pillars' of sustainable development - economy, society and environment.

Green Infrastructure as defined above may include the following types of land and assets:

Table 1: Green Infrastructure typology

Type of Green Infrastructure	Sub sets (examples)
Parks and public gardens	-
General amenity space	Village greens, doorstep greens.
Outdoor sports facilities	Golf courses, sports pitches, playing fields.
Woodland	Copses.
Water and wetland	Rivers, streams, canals, wetlands, lakes and ponds.
Mountain, moor, heath and down land	-
Coastal habitat	Dunes.
Agricultural land	Arable, pasture, horticulture, meadows, non food crops.
Allotments	Community gardens/orchards and urban farms.
Cemeteries	Churchyards and burial grounds.
Derelict land	Derelict, under utilised and neglected land.
Private gardens	-
Street trees	Trees with Tree Preservation Orders.
Transport corridors	Roadside verges, railway embankments, canals.

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For the benefits of this Green Infrastructure agenda to be optimised, there is a need for it to be strategically planned for, invested in and managed at all spatial scales from the Regional to the local and from urban centres through to the open countryside around and between our towns and cities. It is critical to recognise that Green Infrastructure networks and systems operate across political and administrative boundaries and across diverse landscapes where the character of an area must be central to understanding the role that Green Infrastructure can perform and the form it may take.

Green Infrastructure is also concerned with linking people with the places in which they live, with providing for vital ecosystem processes and services, such as flood alleviation and micro climate control, which relate directly to quality of life, and with the maintenance of biodiversity through wildlife habitat and corridor conservation and creation.

Central to our understanding of Green Infrastructure is its interconnected nature: the individual components such as parks, streetscape trees, river and canal corridors, private

gardens and land in agricultural production, together should be viewed as a holistic and inter-related resource, and planned for as such.

Planning at the different spatial scales referred to above enables the different benefits to be optimised in three ways:

- **Firstly**, by enabling previously separate interventions or investments to be aligned and coordinated, thus saving resources, delivering the agreed priorities in Regional and sub Regional strategies and achieving an improved cost-benefit ratio as a result.
- **Secondly**, by enabling the functions (and thus the benefits) of any one 'piece' of Green Infrastructure to be optimised through proactive management, thereby delivering a wider range of benefits from an investment.
- **Thirdly**, by enabling the functions of Green Infrastructure as a system to be maximised (which is how for example the flood risk of an urban areas may be reduced through upstream interventions).

2.2.2 Green Infrastructure and sustainable communities

Increasingly, in the UK the debate surrounding Green Infrastructure and how it is best conceptualised and practically implemented has moved rapidly from a position of being ecology driven, to that of being economy driven. This evolution has been forced in the UK by the emergence of the concept of sustainable communities, with quality of place and quality of life as key drivers of regeneration and economic renewal.

The sustainable communities argument for Green Infrastructure investment links the value that people place upon greenspace, in terms of opportunity for recreation, improved image of place, attractiveness to visitors and increased community cohesion and civic pride, with the additional value upon land and property that well planned and high quality Green Infrastructure brings. Higher land and property prices can in turn be shown to attract new investment to an area in terms of new employment opportunities, visitors and inward investment attracted by a more attractive townscape. Furthermore, Green Infrastructure is well linked to the increasing need to ameliorate the effects of climate change both through adaptation and mitigation.

Early successes for the proponents of Green Infrastructure have been seen in the Growth Areas of the south of England with both the Thames Gateway¹ and Milton Keynes/South Midlands² having developed Green Infrastructure strategies. This has been followed more recently by the City Regions of the Northern Way being encouraged by the Northern Way secretariat to develop Green Infrastructure strategies (to cover, for example, the City

¹ Creating sustainable communities: Greening the Gateway, a greenspace strategy for Thames Gateway – ODPM and Defra (2004)

² Planning sustainable communities: A green infrastructure guide – Milton Keynes and the South Midlands (2005)

Regions of Leeds, Liverpool, Newcastle and Manchester)¹. The first of these Strategies are now being prepared for the Central Lancashire and Tees Valley City Regions, the former, for example, advocating the development of a "Green Grid" approach through its City Region Development Programme (2006)².

The following quote from the Northern Way report "City Region Green Infrastructure" illustrates the perceived horizontal linkages that Green Infrastructure investment and planning can bring at a City Regional scale, although it is clearly equally applicable at virtually any spatial scale from neighbourhood to global:

"...When taken together, the benefits of Green Infrastructure can be seen to have a considerable and measurable impact upon quality of place and liveability at a local neighbourhood level. When strategically planned and measured (across a City Region), Green Infrastructure can be seen to have the potential to create a truly sustainable community by integrating environmental assets and processes with key elements of economic renaissance such as housing renewal, inward investment, site and infrastructure development..."

Most recently, the Growth Points Initiative and associated proposals for 'eco towns' have been encouraged by government to incorporate a strong Green Infrastructure element in their strategic planning, resulting in, for example, district level Green Infrastructure strategies to be developed in East Staffordshire and Coventry in the West Midlands.

2.2.3 Supporting cohesion policy for growth and jobs

The Community Strategic Guidelines 2007-13 of the European Union³ provide guidance to member states for taking forward programmes to support growth and jobs. These guidelines stress the need for an integrated approach to encourage growth and jobs alongside pursuing social and environmental objectives and key headings within the guidelines provide clear opportunities for Green Infrastructure investment to contribute towards this growth agenda:

- Making Europe and its Regions more attractive places in which to invest and work:
 - ▶ Strengthen the synergies between environmental protection and growth.
 - ▶ Address Europe's intensive use of traditional energy sources.
- More and better jobs:
 - ▶ Attract and retain more people in employment.
 - ▶ Help maintain a healthy workforce.
- The contribution of cities to growth and jobs.

¹ City Region Green Infrastructure Strategic Planning: raising the quality of the North's City Regions – the Northern Way (2006)

² Central Lancashire City Region Development Programme: The City with Room to Breathe – Lancashire Economic Partnership (2006)

³ Community strategic guidelines 2007-13, European Council Decision, (2006).

- Support the economic diversification of rural areas.

Even greater specificity is provided by a communication from the European Commission regarding the contribution of urban areas to growth and jobs¹ which highlights the role of the natural and physical environments in supporting the growth of 'attractive cities' through:

- Rehabilitation of derelict brownfield sites.
- Managing urban sprawl.
- Investing in air quality, water waste treatment, waste management, water supply and noise.
- Active management of transport to improve air quality, reduce noise and encourage physical activity.
- Effective energy use.

2.2.4 Green Infrastructure and ecosystem services

Historically, there has been a lack of understanding by society about the role that the natural environment plays in their everyday life. However, as public debate has grown concerning the on-going impacts of climate change, or the need to identify and use alternative forms of energy as fossil fuels continue to dwindle, communities and business have begun to recognise the value of the natural environment, its direct and indirect benefits and the services it provides.

These 'ecosystem services' include climate regulation through absorbing CO₂ in the atmosphere and natural 'air conditioning', and improved water quality through natural filtration². Green Infrastructure is the strategic approach that brings together conserving and enhancing the natural environment and its underpinning ecosystem services, whilst providing greater socio-economic benefits through improvements and investment into climate control, pollution attenuation, water purification, flood control, nutrient cycling and soil formation, without which human social and economic activity would not be possible.

Work recently published by Defra³ on assessing the economic value of terrestrial ecosystem services argues that our health and well-being depends upon the services that are provided by the components of ecosystems – water, soil, nutrients and organisms.

¹ Cohesion policy and cities, communication from the Commission to the Council and Parliament, (July 2006)

² Valuing the Benefits of Biodiversity, Economics & Funding SIG, (June 2007)

³ An introductory guide to valuing ecosystem services, Defra, (2007)

It takes as its starting point the Millennium Ecosystem Assessment¹ which classifies ecosystem services as:

- **Supporting services:** the services that are necessary for the production of all other ecosystem services, including soil formation, photosynthesis, primary production, nutrient cycling and water cycling.
- **Provisioning services:** the products obtained from ecosystems, including food, fibre, fuel, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources and fresh water.
- **Regulating services:** the benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination and natural hazard regulation.
- **Cultural services:** the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences.

Defra are seeking to ensure that the economic value of these services is built into all public decision making². Recent steps in this direction are evident with government's decision to build carbon costs into assessment criteria for public decision, stemming from the report of Sir Nicholas Stern³ into climate change and its key findings.

2.2.5 Green Infrastructure and the environmental economy

The economic benefits which are provided through creating Green Infrastructure and improving local and Regional environmental quality have become more understood and documented over recent years. The environment underpins substantial economic activity, providing a range of goods and services that are essential to economic activity. The environment can help to enhance the performance and competitiveness of other sectors through improved environmental management systems providing reduced cost to business. Conserving and enhancing environmental assets can help to attract people and investment into a Region and physical and environmental improvements lie at the centre of many economic and community regeneration programmes within urban and rural areas.

The Environmental Economy report for the North West⁴ provides an understanding of the contribution this sector makes towards the Regional economy in terms of jobs and

¹ Health and Human well-being, Millennium Ecosystem Assessment, (2005)

² Securing a healthy natural environment: an action plan for embedding an ecosystems approach, Defra, (2007)

³ The Stern Review: the economics of climate change, HM Treasury, (2006)

⁴ Environmental Economy of the North West, Environment Agency, (August 2006)

Regional Gross Domestic Product (GDP). The report highlights that the environment sector, combined with the land based and environmental tourism sectors in the Region:

- Sustains an estimated 109,300 direct jobs.
- Generates £2.6bn GVA annually.
- Has an estimated £6bn of associated gross expenditure.

Similarly, the report states that, on a national scale, **"...economic activities that are connected with the management of the natural environment (both directly and indirectly including agriculture and food processing), contribute £67.9 billion per annum in Gross Value Added to the economy, and support 2.68 million full time equivalent jobs..."**

Recent parallel work in Wales undertaken by the Valuing our Environment Partnership, led by the National Trust Wales¹, estimated that:

- £6bn of GDP in Wales is directly dependent on the environment (9% of Welsh GDP).
- 1 in 6 Welsh jobs are supported by the environment.
- The environment contributes £1.8 billion in wages to the economy of Wales annually.
- Work directly associated with the management, use and appreciation of the natural environment in Wales supports 117,000 jobs.

2.2.6 Green Infrastructure – delivering for the sub national agenda

This report presents the strong evidence linking Green Infrastructure to economic value. A key aspect of this is a need to recognise that sometimes the value is concerned with risk management or downstream economic impacts, both of which are long term in nature, and cut across government departmental agendas and responsibilities. This makes it difficult for outputs to be properly attributed or claimed and creates difficulties where the benefits accrue to different authorities from those responsible for the investments.

The recent government Review of Sub-National Economic Development and Regeneration² will change the way Regional Development Agencies (RDAs) report outputs to the Government in the future (and therefore how 'progress' and value for money are measured). RDAs will now have the responsibility for delivering a single outcome – increasing Gross Value Added (GVA) per capita. The way that this is achieved, and therefore the outputs set by RDAs to demonstrate and measure this GVA growth, will be the responsibility of each individual RDA. Currently the new Outputs Framework is undecided, and hence there is an opportunity to influence the decision process involved in establishing these outputs to advocate the role that Green Infrastructure has to play in increasing GVA in the North West. This document can therefore play a key role in

¹ Valuing the environment of Wales – a review, National Trust Wales, (2006)

² Review of Sub National Economic Development and Regeneration, HM Treasury, (2007)

advocating a more flexible approach which is sensitive to the many impacts and benefits Green Infrastructure investment can have and the wider quality of life benefits investment in the natural environment can bring.

2.2.7 The North West Regional Economic Strategy (RES)¹

The North West Region is fortunate in enjoying a policy framework which is broadly supportive of the aims and objectives of the Green Infrastructure agenda. Green Infrastructure is able to deliver considerable benefits for the implementation of the RES which provides ample opportunity to promote Green Infrastructure from concept to reality, particularly by enabling the delivery of Transformational Action 113. The key aspects of the RES are summarised below in Table 2. A fuller explanation of how Green Infrastructure is linked into the RES, draft Regional Spatial Strategy and sub Regional economic strategies for the North West Region is contained in a sister report² to this publication, also available from the NENW website.

Table 2: North West RES environmental objectives

North West Regional Economic Strategy, NWDA (2006)		
Environmental policy references	Strategic objectives relevant to Green Infrastructure	Targets and outcomes relevant to Green Infrastructure
<p><i>Transformational Actions linked to drivers for growth:</i></p> <p>113. Develop the economic benefit of the Region's natural environment through better alignment of environmental activities and economic gain.</p> <p>115. Deliver sustainable growth through use of the Region's heritage environments and assets especially World Heritage Sites, the cities of Chester, Lancaster</p>	<p><i>Reason why North West should have environmental actions:</i></p> <p>113. A key under-exploited economic resource for the Region and part of our quality of life. It is important to nurture the natural resources of the Region and to develop a strategy for transport corridors.</p> <p>115. A key under-exploited economic resource for the Region which delivers tourism, regeneration and image benefits. Current World Heritage Sites are Hadrian's Wall and Liverpool Waterfront.</p> <p>116. Delivers image and regeneration benefits. Regional parks at Croal Irwell, Morecambe Bay and West Cumbria should also be further developed.</p> <p>Sustainable Development Principle:</p> <p>Living within environmental limits - respecting the limits of the planet's environment, resources and biodiversity, to improve our environment and ensure</p>	<p><i>Key social and environmental outcomes as a result of the implementation of actions:</i></p> <p>Climate change and energy:</p> <p>Promotion of quality in design and construction, including environmental design, should reduce energy use. Protection of existing areas of high economic value from flooding should minimise the impacts of climate change.</p> <p>Recognition of the need to adopt 'softer' techniques to adapt to climate change should also be considered, including Green Infrastructure. Actions to increase additional visitors to the Region could increase carbon dioxide emissions from transport, although the emphasis on the cultural offer of major towns and cities should ensure visitor development in the most accessible locations. Support for</p>

¹ Northwest Regional Economic Strategy 2006, North West Regional Development Agency (2006)

² The policy framework for Green Infrastructure in England's North West and the opportunities for Green Infrastructure to contribute to sub Regional economic growth, NENW, (2008)

North West Regional Economic Strategy, NWDA (2006)

Environmental policy references	Strategic objectives relevant to Green Infrastructure	Targets and outcomes relevant to Green Infrastructure
<p>and Carlisle and the Lake District</p> <p>116. Create and manage the following Regional Parks:</p> <p>Mersey Waterfront</p> <p>East Lancashire</p> <p>Weaver Valley</p> <p>Ribble Estuary</p> <p>NW Coastal Trail</p> <p>Wigan Greenheart</p> <p>Further develop proposals for Regional Parks at:</p> <p>Croal Irwell</p> <p>Morecambe Bay</p> <p>West Cumbria</p>	<p>that the natural resources needed for life are unimpaired and remain so for future generations.</p>	<p>the Regional Forestry Framework should provide a 'carbon sink'.</p> <p>Natural resource protection and environmental enhancement:</p> <p>Actions that recognise natural and built heritage assets and the improvement of the physical environment will improve existing environmental resources. The creation and management of Regional Parks, together with the promotion of sustainable farming and food production, should promote better environmental management. Generic skills development for regeneration professionals should result in better identification and delivery of those elements that make for a healthy and well-managed environment.</p>

3.0 Defining the economic benefits of Green Infrastructure

3.1 Introduction

This chapter of the report sets out the benefits of Green Infrastructure, summarising the key economic benefits of investment and relating these to the evidence that has been gathered in relation to that benefit. The eleven key benefits of investment that have been identified and developed for this report are as follows:

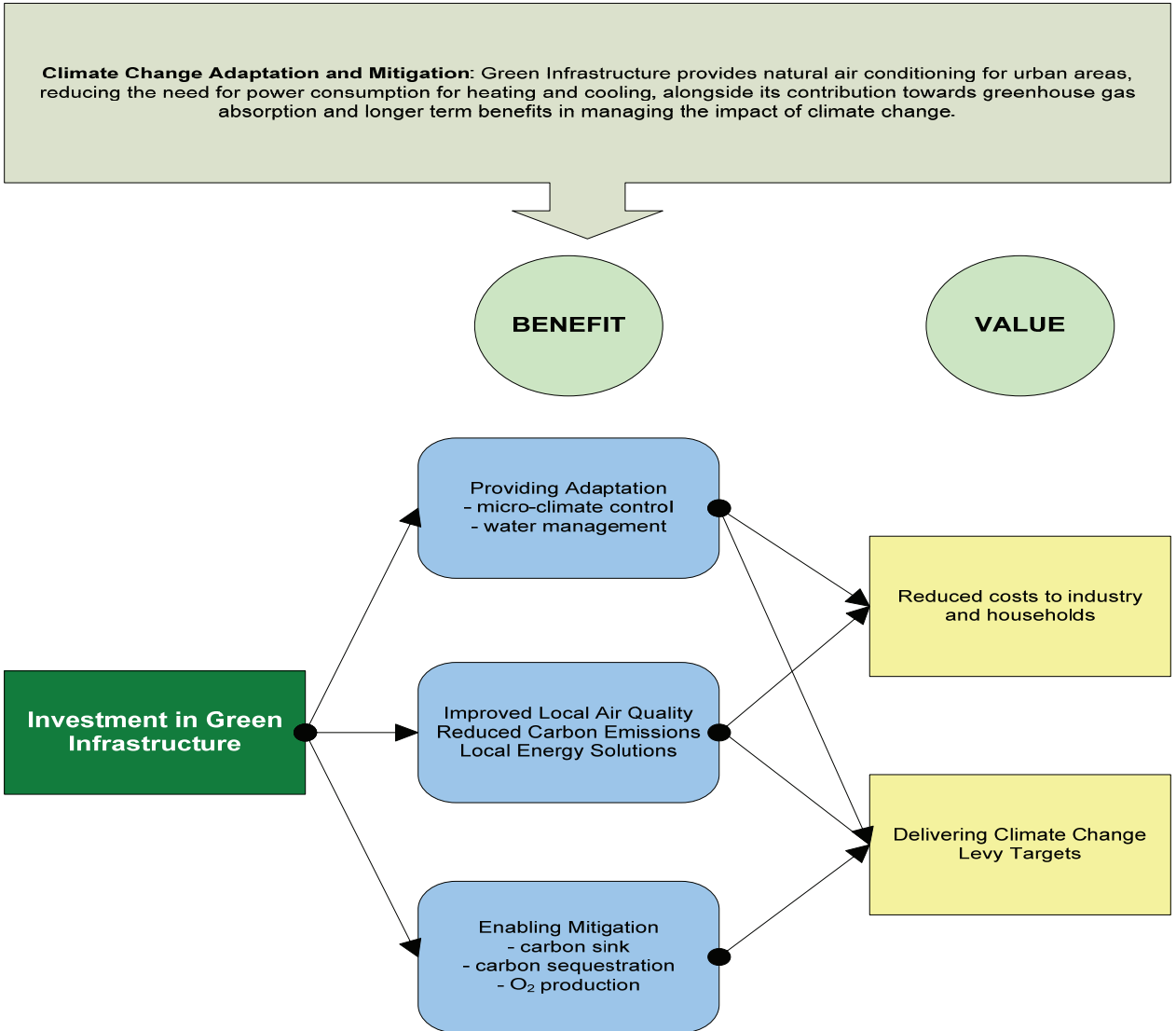
- Climate Change adaptation and mitigation.
- Flood alleviation and Water Management.
- Quality of Place.
- Health and Well-being.
- Land and Property values.
- Economic growth and Investment
- Labour productivity.
- Tourism.
- Recreation and Leisure.
- Land and Biodiversity.
- Products from the land.

This chapter of the report and Annex One describes each benefit in depth in terms of:

- Its value to the economy, described in terms of its:
 - ▶ direct value - for example jobs created, land brought back into economic use;
 - ▶ downstream value - for example the induced and indirect impacts of investment upon visitor spend, employment in supply chain industries;
 - ▶ cost reduction value - for example in relation to costs to health services, government and employers in managing the effects of ill health; and
 - ▶ risk management value – for example through reduced insurance premiums for homes and business where investment has lowered flood risk.
- The potential investments and interventions that are required to realise the benefits described.
- The success measures which will enable evaluation to be undertaken.
- The key evidence that exists to support the case, identifying where possible economic values which can be attributed to Green Infrastructure investment.

3.2

Key benefit 1 – Climate Change Adaptation and Mitigation



The net present value of carbon storage of woodlands has been estimated for different English Regions; this varies from £601 million in the North West to £2,684 million in the South East, £114 million in the East Midlands to £492 million in the South West, (EFTEC, 2005). Carbon capture and storage (CCS) is currently being strongly promoted by the EU following the 2007 Spring European Council as one of a raft of measures to deliver a low carbon economy.

However, despite such measures, projections are for considerable urban heating over the next 50 years, resulting in temperature differentials between town and country of up to 12%. Greenspace and trees offer a way to cope with hot weather (through shading and evaporative cooling) and adding 10% green cover is projected to keep maximum surface

temperatures in high density residential areas and town centres at or below the 1961-1990 levels up until the 2080s.

Green Infrastructure investment provides natural air conditioning for urban areas (adaptation), reducing the need for power consumption for heating and cooling, alongside its contribution towards greenhouse gas absorption (mitigation) and longer term benefits in terms of managing the impact of climate change. Reclamation and in particular reforestation of derelict sites and land that is not in productive use can provide new CCS.

Finally, the use of Green Infrastructure as a mechanism for managing flooding as changes in rainfall patterns emerge through sustainable drainage schemes (SUDS) investment in peri-urban areas and upland areas where water storage can be enhanced through active management of the peat resource.

Example of Economic Value:

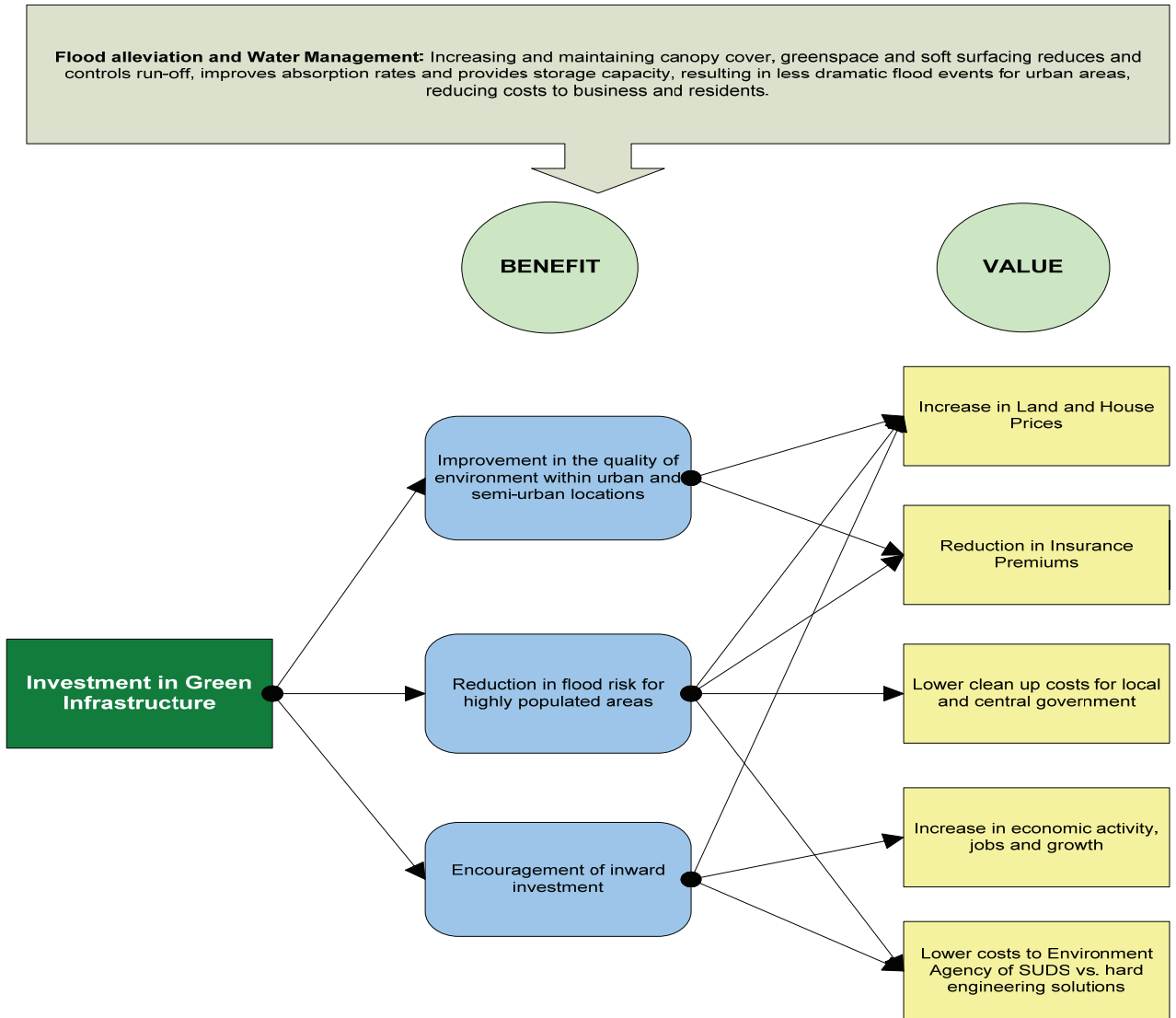
£x investment in urban greenspace and street trees = £y savings to industry and householders through reduced heating / improved air conditioning.

£x invested in Sustainable Drainage Schemes in vulnerable (flood risk) areas = £y savings in hard engineering solutions + reduced insurance premiums for householders and business + increased investment levels/employment creation in previously vulnerable communities.

£x invested in greenspace and trees = £y of Carbon Capture and Storage.

3.3

Key benefit 2 – Flood Alleviation and Water Management



The Environment Agency estimates that, by 2080, if we continue to discharge greenhouse gases at current rates then in the North West it is possible that winter rainfall could increase by 30% and summer rainfall decrease by 50%. Sea levels could rise by 67cm, threatening 430km of low lying coastline and the 95,000 people living in the coastal floodplain. Today, approximately 212,500 properties in the Region are at risk of flooding.

Green Infrastructure investment can result in increased canopy cover, increased greenspace and 'soft surfacing' and SUDS, acting to reduce and control run off, improve absorption rates and provide storage capacity; resulting in less frequent and less dramatic flood events for urban areas, thereby reducing costs to business and residents.

The benefit of investment extends beyond that which is immediately measurable economically, for example the cost to homeowners, businesses and authorities in dealing

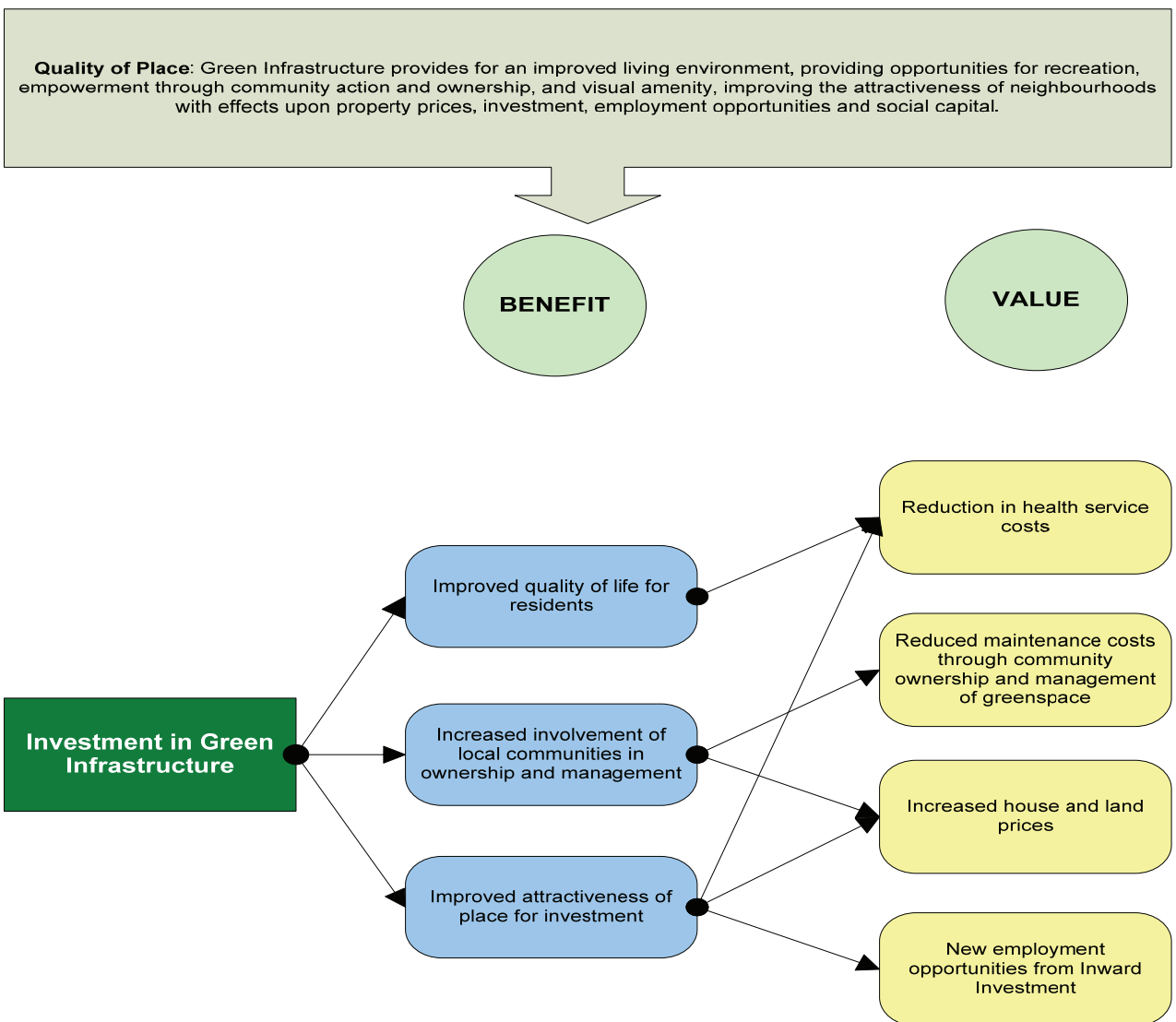
with the remedial costs of flooding, through to image of the Region, or specific locations within the Region associated with flooding, for example Carlisle and Preston.

Example of Economic Value:

£x invested in Sustainable Drainage Schemes in vulnerable (flood risk) urban areas = £y savings in hard engineering solutions + reduced insurance premiums for householders and business + increased investment levels/employment creation in previously vulnerable communities.

Key variables include a. Degree of vulnerability; b. Extent and cost of most recent flood event.

3.4 Key benefit 3 - Quality of Place



The Generalised Land Use Database (GLUD 2005) shows that 83% of the North West is classified as greenspace, compared to 88% for England. In addition, 17% of the Region is Green Belt but has less than 7% tree cover. The Region has had a consistently high level of derelict land (and buildings) over the past ten years and has ranked 9th (out of the 9 English Regions) since 2001 against the indicator. This demonstrates that the North West, despite world class assets such as the Lake District, has a significant and persistent problem relating to quality of place, with knock on impacts upon the attractiveness of the Region as a place to live in, do business in and visit.

Green Infrastructure investment creates an improved sense of quality of place, providing opportunities for recreation, empowerment through community ownership, and visual amenity, improving the attractiveness of a neighbourhood with effects upon property prices, land values, investment, employment opportunities, social capital and social equity.

Investment can be targeted both at physical renewal of the landscape as well as at the social capital of a community, addressing cohesion, crime and anti social behaviour.

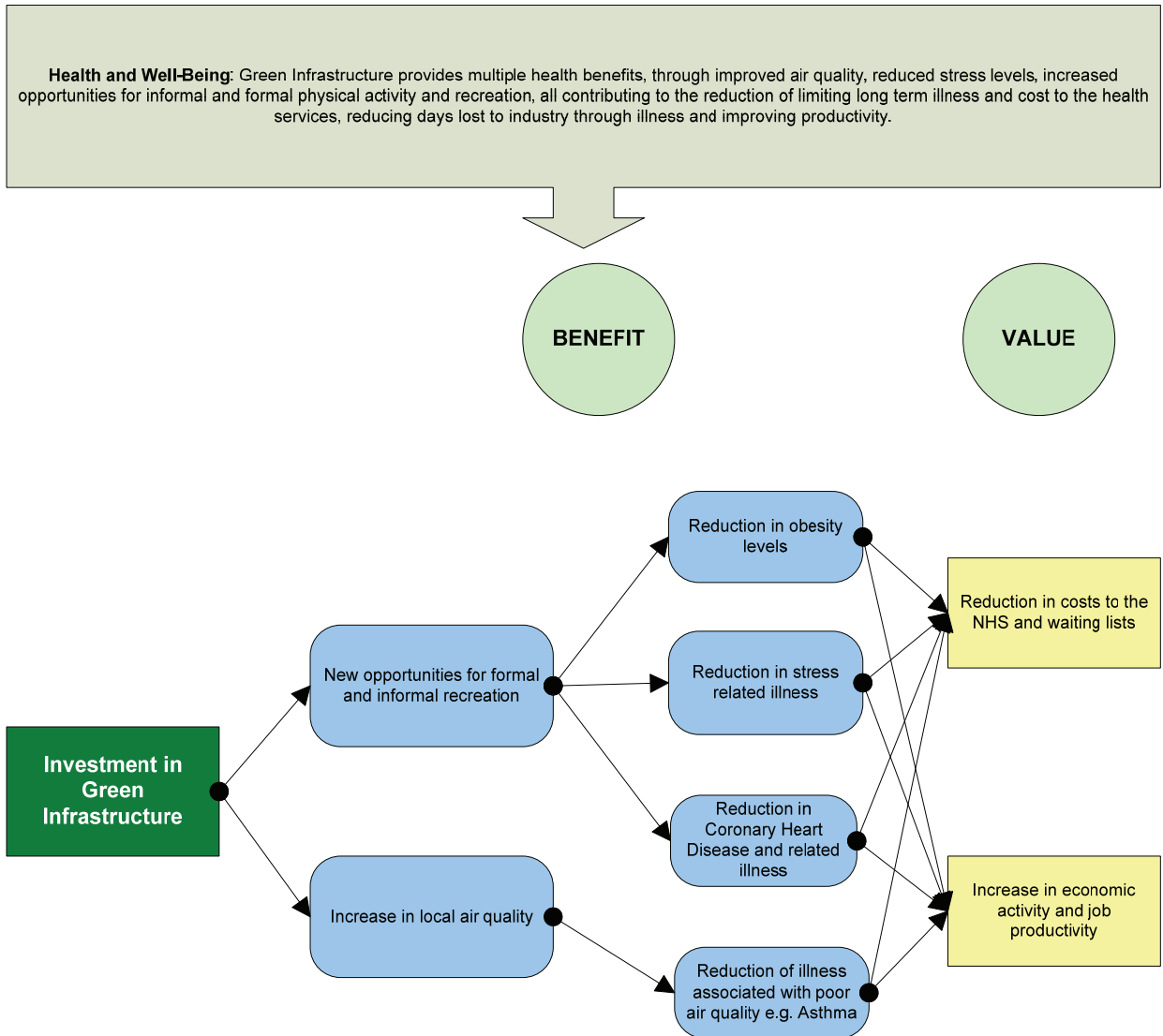
Example of Economic Value:

£x investment in accessible greenspace = £y uplift to property prices + new investment (job creation).

Community ownership/management of greenspace assets = £y savings to property owner (Local Authority, RSL etc).

3.5

Key benefit 4 - Health and Well-being



Office for National Statistics figures show that 20% of the population in the North West Region have a limiting long term illness, compared to 17.3% average for England. At a national level, the Department for Culture, Media and Sport indicates that a 10% increase in adult physical activity would benefit England by £500 million per year, saving 6000 lives. The situation is further compounded by projections made in a recent report by the British Heart Foundation (Tackling Obesities: Future choices, British Heart Foundation, 2007) that the majority of Britons will be obese by 2050 if weight gain in the population continues at the current rate (60% of men, 50% of women, 25% of children). Increasing physical activity levels will help prevent or manage over twenty conditions and diseases, including coronary heart disease, diabetes, some cancers and obesity. It can also improve mental health and help older people maintain independent lives (Public Health Guidance 8, NICE, 2008).

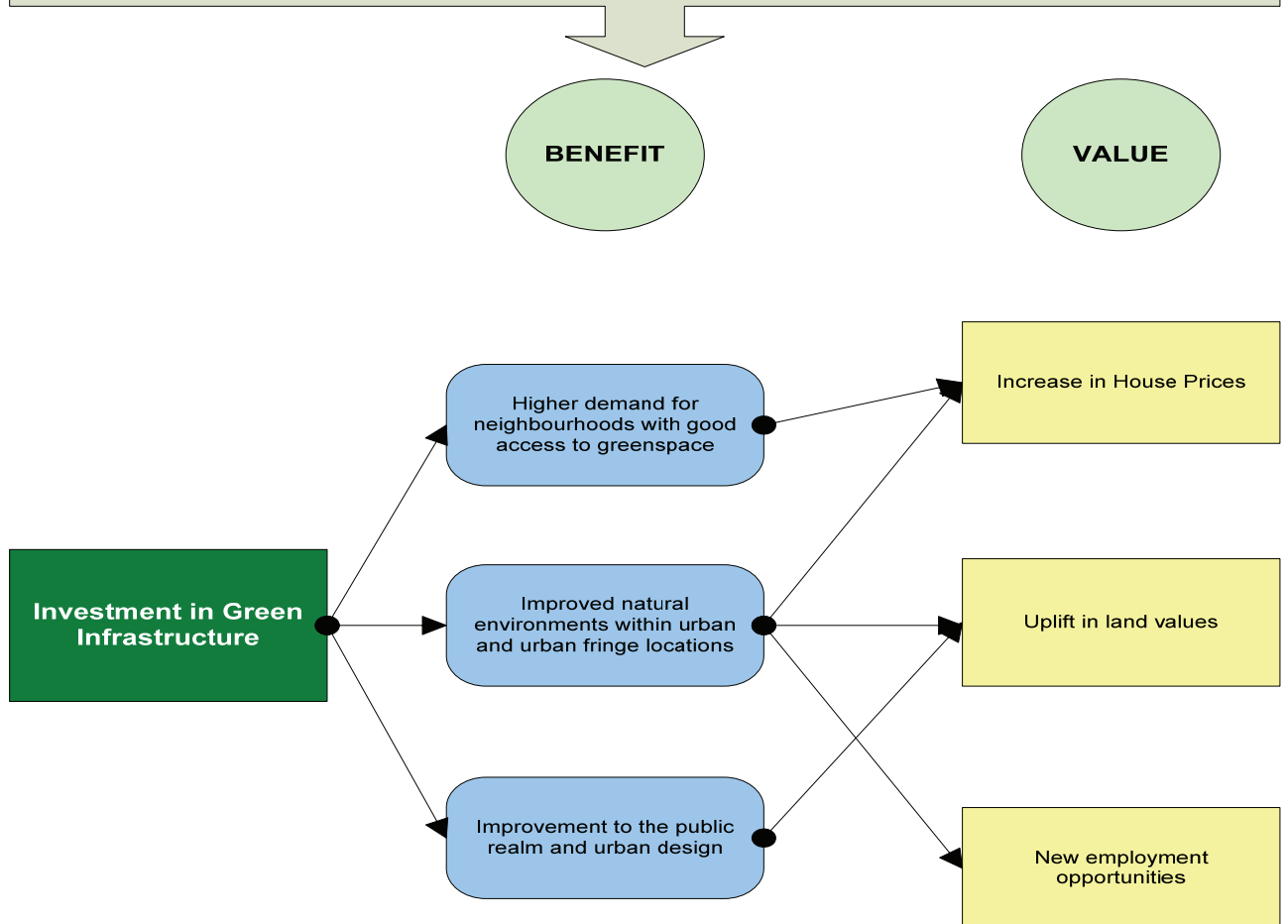
Green Infrastructure investment in the form of high quality, accessible greenspace provides multiple health and consequent economic benefits, through reduced stress levels, increased opportunities for informal and formal physical activity and recreation, all contributing to the reduction of limiting long term illness, and cost to the health services, reducing days lost to industry through illness and improving productivity. Furthermore, investment in urban areas can lead to cleaner air and impacts upon asthma, for example.

Example of Economic Value:

£x investment in accessible/accessibility to high quality multifunctional greenspace = £y savings to NHS + £y savings to employers through reduced sick pay and increased productivity + £y savings to exchequer through reduced incapacity benefit payments.

3.6 Key benefit 5 - Land and Property Values

Land and Property values: Developing green space and undertaking environmental improvements in key locations within urban and semi urban areas has significant benefits for housing and land values. Proximity to high quality and accessible greenspace directly impacts positively upon house prices.



Although it cannot be regarded in strict terms as an economic benefit in itself, increases in land and property values can be regarded as a useful proxy measure of the relative prosperity of a place or neighbourhood, either in terms of the income levels of those living there, or in terms of the rental levels affordable by businesses wanting to locate there.

A CABE study in 2004/05 into the impact of park improvements on house prices found that, following improvements, houses near parks were, on average, 8% more expensive than comparable houses further away, with the highest increase seen at 36%.

Green Infrastructure investment can provide environmental improvements in key locations within urban and semi-urban locations, having significant benefits for housing and land values. Proximity to high quality and accessible greenspace directly impacts upon house prices. Greener cities can increase visitors and spend in city centre retail and leisure, improving rental values and increasing employment opportunities.

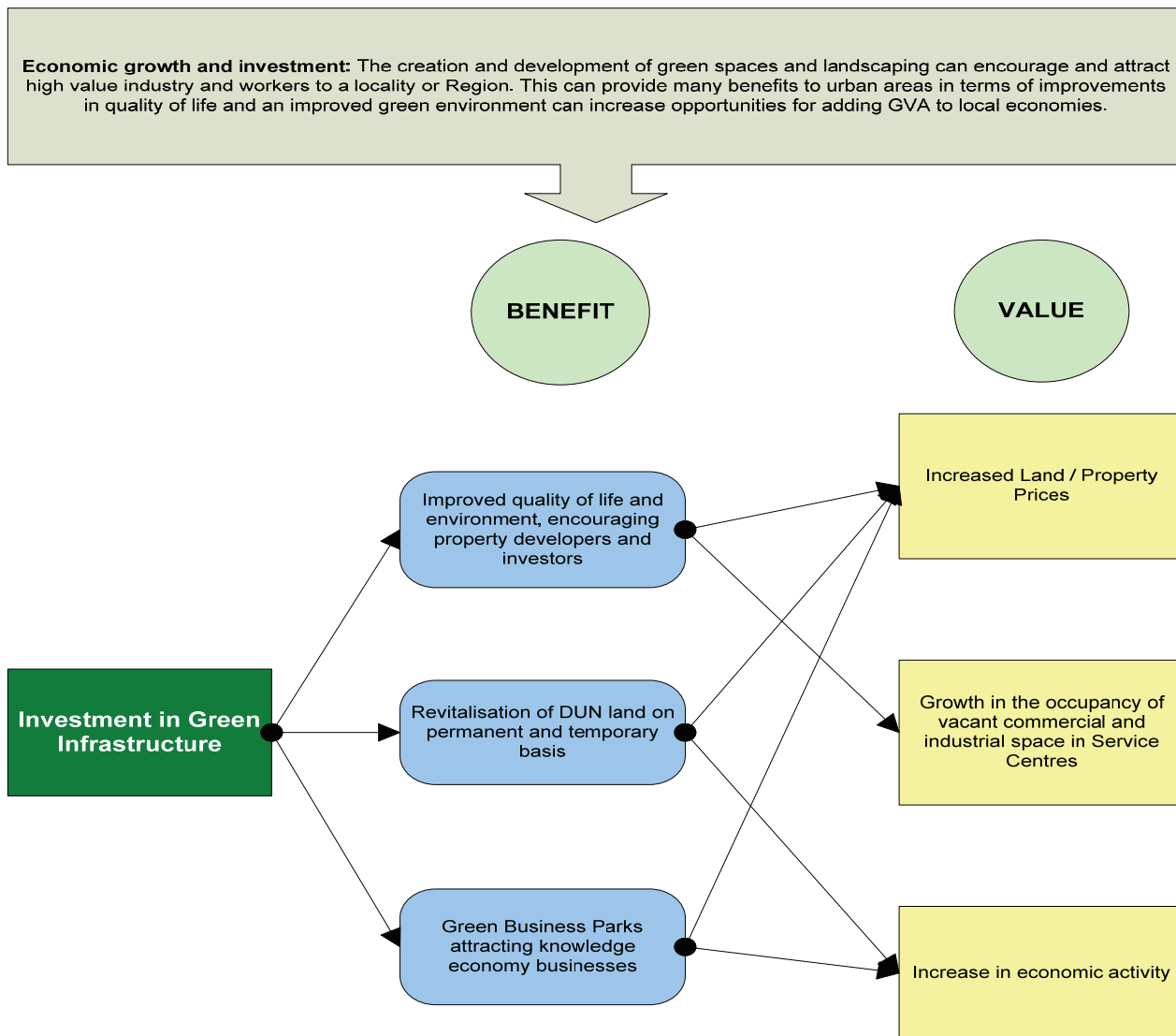
Example of Economic Value:

£x investment in publicly accessible greenspace = £y increase in property prices.

Key variables include a. proximity to greenspace; b. accessibility of greenspace; c. quality of greenspace; d. functionality of greenspace

3.7

Key benefit 6 – Economic Growth and Investment



Evidence suggests that perceptions of the Region can be a barrier to recruitment for businesses within the Region, especially in relation to highly qualified staff. This appears to be a particular issue for businesses recruiting to higher paid positions on a national and international basis, some of whom have already indicated that perceptions of the North West are often poor amongst people living in London, the Home Counties and overseas (The Northern Way/Llewelyn Davies Yeang, 2006).

Green Infrastructure investment can act to encourage and attract high value industry, entrepreneurs and workers to a locality and Region through the maintenance and creation of high quality, landscape sensitive, environmentally friendly living and working environments. This can provide multiple benefits to urban areas in terms of improvements

in quality of life and an improved green environment can increase opportunities for adding GVA to local economies.

A strong example of this from the north of England is that of Riverside Park Industrial Estate in Middlesbrough where investment in the Green Infrastructure of the park created a setting for stimulating business growth and investment. The redeveloped site attracted new, high profile, occupants and saw occupancy grow from 40% to 78%, and levered over £1 million of private investment (CLES/Groundwork, 2007).

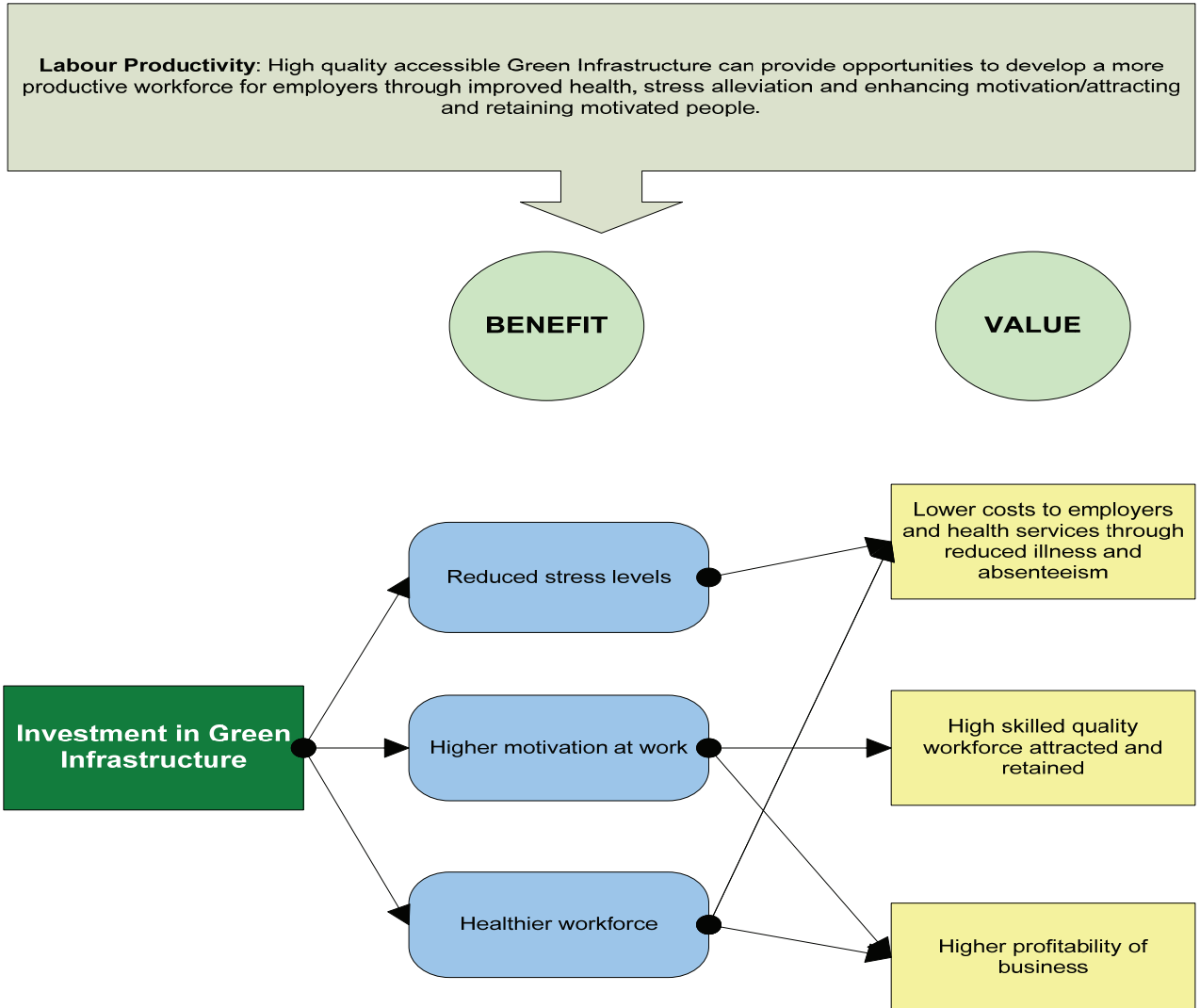
Example of Economic Value:

£x investment in urban greenspace = £y new investment from business + new job creation.

£x investment in greening business parks = £y from higher occupancy rates + higher rental levels + higher value industry paying higher wages.

3.8

Key benefit 7 – Labour Productivity



Green working environments have been shown to reduce stress amongst workforces and to stimulate higher productivity. In addition, higher quality work environments attract and retain higher calibre staff.

Business and commercial areas can be designed or 'retro-fitted' to incorporate strong Green Infrastructure – for example, greenspaces for employees to take exercise, enjoy fresh air and a pleasant environment outside of the workplace.

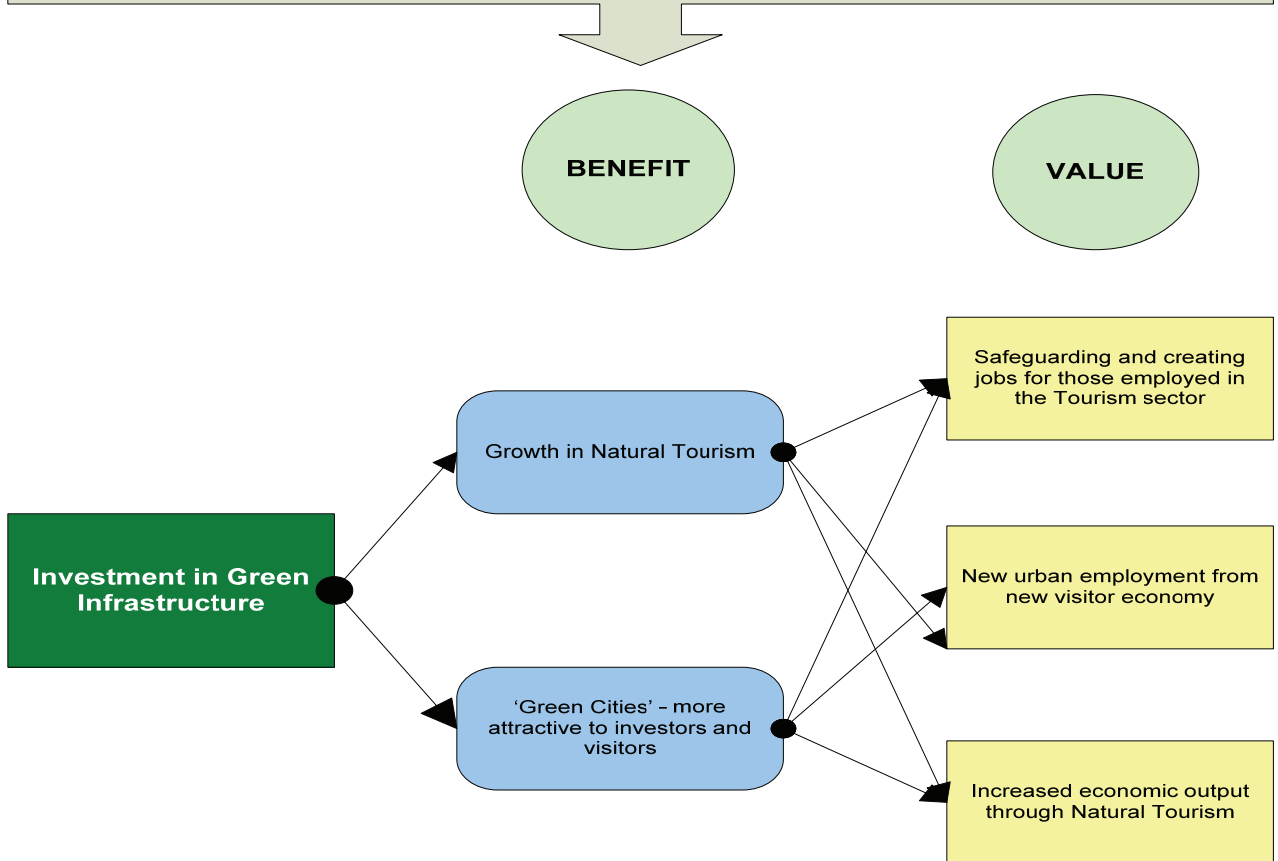
Additionally, the health and well-being benefits of access to Green Infrastructure are well evidenced and discussed elsewhere in this document, with benefits to employees in terms of personal health and benefits to employers in terms of reduced absenteeism and consequent costs.

Example of Economic Value:

£x investment in Green Infrastructure integrated with workplaces = £y saving in costs to employers resulting from sickness + £y gains in productivity from a less stressed, higher motivated workforce.

3.9 Key benefit 8 – Tourism

Tourism: Green Infrastructure plays a strong role in the generation of new tourism opportunities in town and country, as well as stimulating economic activity within agriculture, forestry and public services. There is potential to invest in maintenance of key environmental assets, creation of new assets (for example community forests) and greening city centres, attracting new visitors, in turn supporting urban retail and tourism sectors.



Significant sectors of the rural economy of the North West depend upon the high quality of the countryside to attract visitors – for example, the Lake District National Park, Forest of Bowland AONB and 'Pennine Lancashire' more widely. Investment in maintaining these key Green Infrastructure assets and developing a wider portfolio of such assets is critical to the sustainability of sub Regional economies.

The visitor economy is worth £10.9bn to the North West Region, supporting 200,000 FTE jobs (NWDA). As a sub set of this, rural tourism alone (used here as a proxy indicator for

tourism which places a high value upon the natural environment) is calculated to be worth £770 million per annum to the Regional economy. Greening city centres also attracts new visitors, in turn supporting urban retail and tourism sectors.

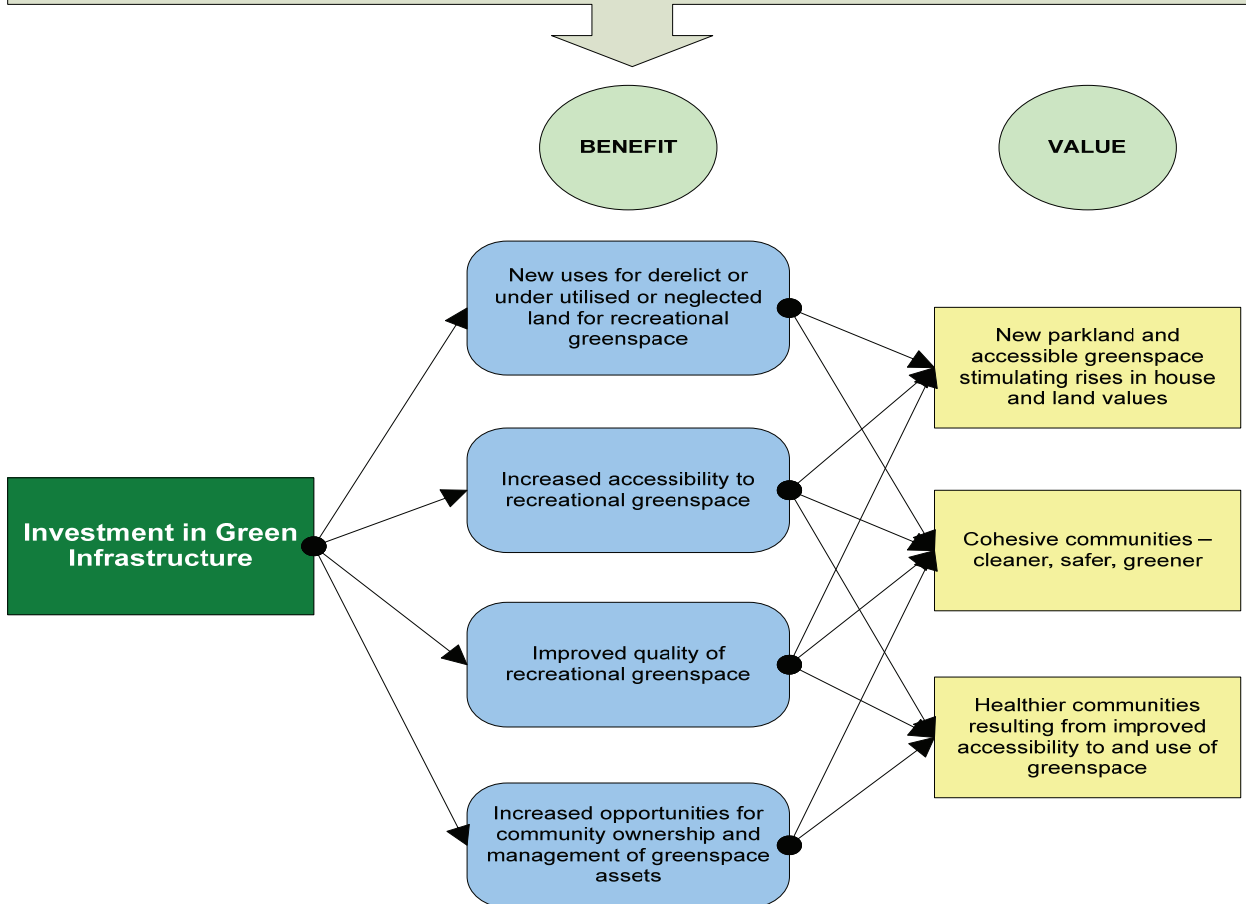
Example of Economic Value:

£x investment in natural tourism assets + new/maintained greenspace + investment in improving multifunctionality of greenspace = £y increased visitor spend in local economies + new job creation.

£x investment in greening city centres = £y increased retail and leisure spend by visitors + job creation.

3.10 Key benefit 9 – Recreation and Leisure

Recreation and Leisure: Green Infrastructure generates the provision of new leisure and recreational opportunities, stimulating investment in rights of ways and publicly accessible greenspace and woodlands. Community involvement in neighbourhood projects, including ownership/management of greenspace assets, can encourage cohesion and develop a renewed sense of local identity.



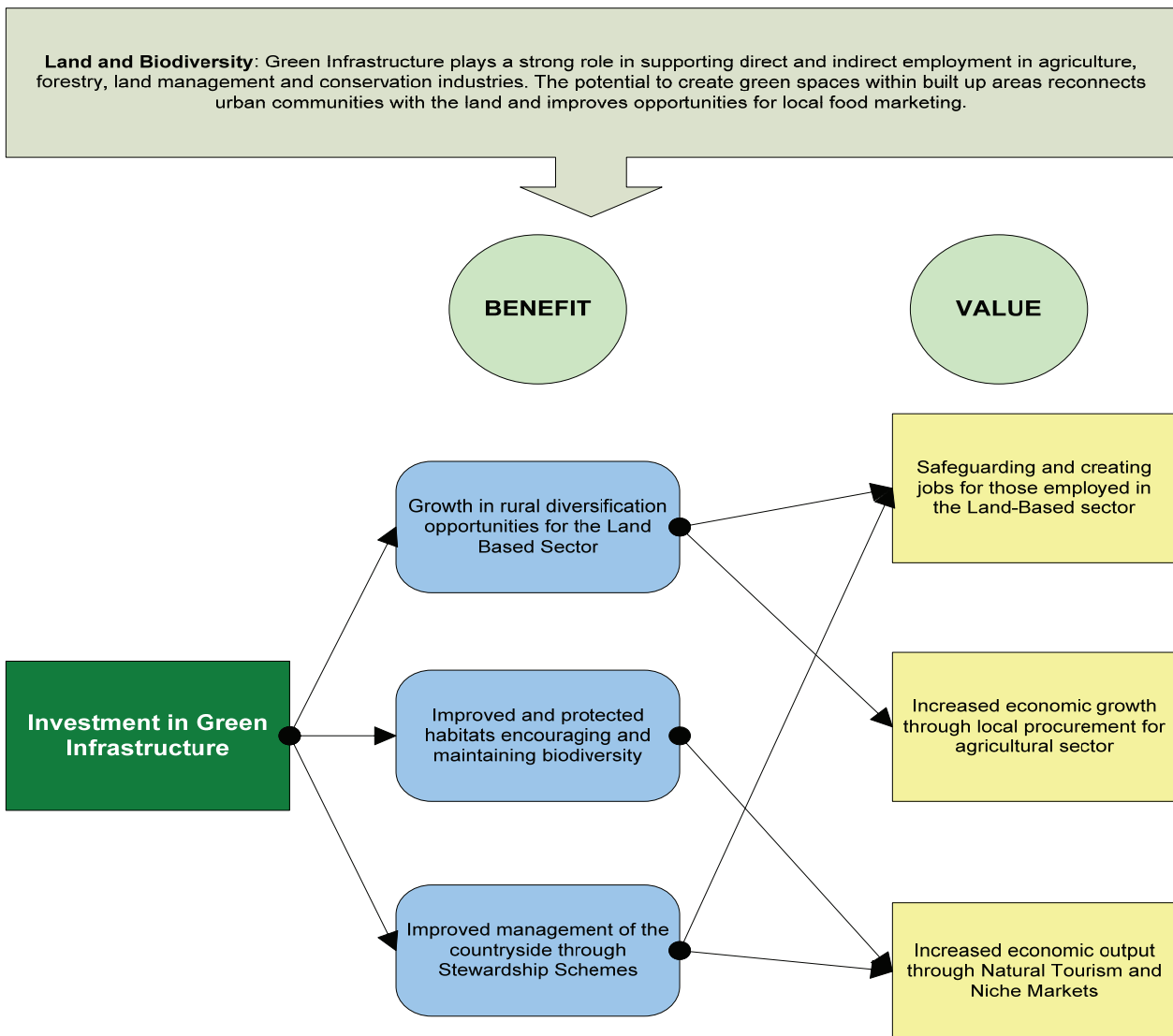
Green Infrastructure investment provides for the generation of new recreation and leisure opportunities and also stimulating economic activity within agriculture, forestry, and public services. This ranges from investing in a high quality and extensive Public Rights of Way network, linking people with green spaces, through to the renovation of DUN land for new greenspace and woodland. Where new investment can be combined with stimulating community ownership, involvement and management, additional outcomes may be realised in the form of enhanced community cohesion and an improved sense of place.

Within urban areas, there is the potential to maintain and create green spaces within city centres and neighbourhoods which reconnect urban communities with the land, as well as providing opportunity for healthy outdoor leisure. Green corridors reaching into town centres from the surrounding countryside provide infrastructure for non motorised transport and access to healthier environments.

Example of Economic value:

£x invested in new greenspace, rights of way, improving accessibility and improving quality of the existing asset base = £y savings to local authorities in management costs through local ownership arrangements + £y reduced costs to service providers as communities become more cohesive and attractive places to live.

3.11 Key benefit 10 - Land and Biodiversity



Further opportunities for economic activity are presented by Green Infrastructure investment in the form of land management and conservation projects, particularly where these are combined with a visitor/education focus, alongside traditional country sports and new opportunities relating to eco tourism.

Green Infrastructure investment creates and maintains direct and indirect employment in forestry, land management and conservation. There is potential to create green spaces within built up areas reconnecting urban communities with the land and improve opportunities for local food marketing, alongside the maintenance of allotments and urban farms and private gardens.

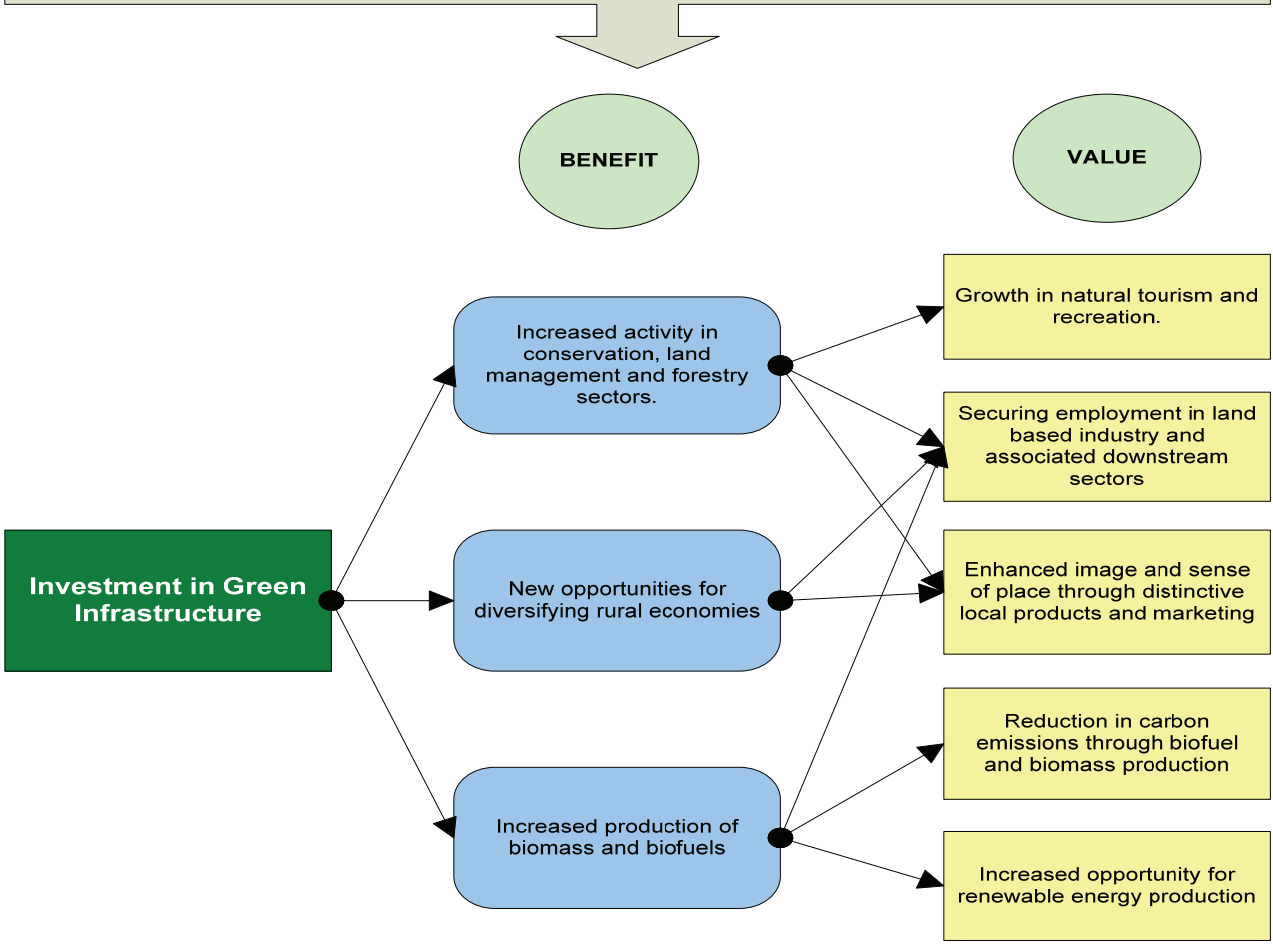
Example of Economic Value:

Jobs maintained and created in arboriculture, conservation, land management and 'countryside sports'.

£x investment in new market development and diversification opportunities = y new jobs created + increased industry GVA.

3.12 Key benefit 11 – Products from the Land.

Products from the Land: The vast majority of existing Green Infrastructure takes the form of land in productive use in the countryside: agricultural/horticultural/managed woodland and managed moorland. Increased benefits may be realised through investment targeted at diversification activities, creating added value from land based products, including renewable energy resources.



The North West is still a highly rural Region in character, despite the dominance of the Merseyside-Manchester conurbation. Agriculture accounts for 2% of workforce and 2% of GDP nationwide. 80% of the land in the North West is designated as agricultural, with

10,000 farm holdings involved in livestock. Overall, 40,000 are employed in agriculture in the North West Region and a further 2,800 in forestry.

Energy from biomass currently supplies 83% of renewable energy nationally, with the contribution from wood being 10%. If the 2Mt target set by the Forestry Commission is realised this would rise to 16% - a significant contribution to achieving renewable energy targets as set out in the Energy White Paper. However, at present, only around 40% of the annual increment in England's woodlands is harvested and utilised within existing markets. Achieving the 2Mt target increase in wood production represents a 60% increase in wood production in England¹.

Green Infrastructure investment can provide new opportunities for agricultural diversification for food and non food crops, as well as providing the resource to generate renewable sources of energy. Rural areas and the agricultural industry undergoing structural change are provided with diversification opportunities to supply local markets for biofuels and biomass, which in turn has mitigation effects for climate change through cleaner energy generation and reduced fossil fuel use. Diversification of agricultural production can also be encouraged to meet local market demand – for example in relation to specialist ethnic products – and added value Regionally distinctive food and drink.

Example of Economic Value:

Jobs maintained and created in traditional rural economic sectors: agricultural production and processing, forestry.

£x investment in new market development and diversification opportunities = y new jobs created and maintained + increased industry GVA.

¹ A woodfuel strategy for England, Forestry Commission, (2007)

4.0 Valuing the economic benefits of Green Infrastructure investment

4.1 Introduction

The rationale and evidence provided in Chapter 3 and in Annex One illustrates the linkages between Green Infrastructure investment and economic benefits. This demonstrates that increased investment in both new and existing Green Infrastructure can have a positive impact upon the economic well-being of the Region. This chapter seeks to expand on this case by illustrating how decision makers can practically make the case for this new investment, alongside competing demands for investment in traditional economic development activities.

The key aim of this report is to explain through evidence how investment in Green Infrastructure is important for sustainable economic development. It needs to be integral in economic thinking, since a sustainable economy relies on more than investment in traditional areas associated with economic return (i.e. job creation/retention, employment support, commercial space, business support and training and skills development). Green Infrastructure itself contributes to these outputs, and enhances the value of investment more directly if it is included in the initial plans for an area and invested in as part of a more holistic economic development strategy.

The companion report to this, to be published by NENW, sets out in full a menu of tests which can be utilised by decision makers to attribute and measure the value of Green Infrastructure investments. This chapter summarises these tests and points the way towards a future framework which will enable investment to be made against a range of indicators, outputs and outcomes.

4.2 A menu approach towards valuation

The purpose of this menu approach to valuation is to show that investing in the Region's Green Infrastructure will produce a wide range of benefits, measurable in different ways and against different sets of indicators within differing evaluation frameworks. The key audiences will be those agencies and organisations involved in economic development and who have resources that can be invested in activities which have economic growth at their core.

However, equally, this report shows that achieving these economic benefits and outcomes can and does result from the activities of a wider set of organisations in public, private and voluntary sectors, for example the health services investing in healthy living initiatives or

private business investing in their corporate social responsibility agendas. As a result, the proposed menu of tests can equally be used as tool for organisations within and beyond the public sector who wish to see how their activities can be measured in terms of their contribution towards Green Infrastructure goals, social, economic and environmental.

The Key Tests are summarised below:

4.3 The Key Tests

4.3.1 Contributing to Gross Value Added (GVA).

The Treasury's Sub National Review 2007 points the way clearly towards measuring economic growth at the Regional level via a set of five outcome focused performance indicators:

- GVA per hour worked, as a measure of productivity.
- Employment rate.
- Skills attainment.
- Research and Development expenditure.
- Business start-up rates.

GVA can be defined as representing incomes generated by economic activity. This comprises:

- Compensation of employees (wages and salaries, national insurance contributions, pension contributions, redundancy payments etc).
- Gross operating surplus (self-employment income, gross trading profits of partnerships and corporations, gross trading surplus of public corporations, rental income etc).

The Region's Green Infrastructure supports a wide range of economic activities and employment which contributes towards GVA through land based industries and their associated support services, as well as natural tourism. When taken together, all investments in the Environmental Economy at a Regional level – for example, including all investment in conservation, agriculture, forestry, non food land based products – amount to approximately £2.6bn GVA (Environmental Economy Report for the North West, 2006).

4.3.2 Delivery against RES indicators.

The RES describes a set of key indicators against which progress in the Region can be measured. These range from job creation and employment rates through to carbon reduction measures and tourism and visitor spend. For each indicator, a relationship can

be made to Green Infrastructure intervention in terms of the impact it has upon each and the outputs that can be attributed to specific Green Infrastructure investments.

4.3.3 Delivery against core NWDA outputs.

A parallel set of output indicators relate to the NWDA's delivery of their Corporate Plan. These indicators are similar to those in the RES where they relate specifically to business and economic development. Again, it is a straightforward process to identify where Green Infrastructure can deliver core outputs, for example in relation to the remediation of brownfield land.

4.3.4 Delivering downstream economic outputs.

Green Infrastructure investment produces a wide range of benefits that can be termed as 'downstream'. These include the benefits that arise from what is referred to in this report as 'creating the setting', providing for a more attractive Region or localities for business to locate and invest in.

There are two key methodologies for relating to Green Infrastructure to downstream impacts: the first is a simple process of defining downstream outputs and attributing these to the initial investment via a logic model approach. The second involves the development of an economic multiplier. The two sets of downstream benefits that are sought to be measured in impact terms for any intervention can be termed as either indirect or induced effects, i.e:

- Indirect effects – downstream outputs related directly to the initial investment, for example jobs created in tourism businesses resulting from an environmental investment which improves the image of place, or increased economic activity resulting from reduced flooding in a locality as a result of sustainable drainage investment.
- Induced effects – the additional spend in an area resulting from additional economic activity in an area (directly or indirectly stimulated as a result of Green Infrastructure investment).

4.3.5 Reducing risk.

This report has shown how Green Infrastructure investment can reduce risks associated with climate change primarily, i.e. assisting the Region to adapt to changing weather patterns. However, furthermore, Green Infrastructure has benefits relating to healthier lifestyles and a cleaner environment. The risks that may be reduced via strategic Green Infrastructure investment are:

- Flooding – impact upon business.
- Flooding – impact upon homes.
- Poor health.
- Urban heat islands.
- Image related blight.
- Business competitiveness and security.
- Carbon tax/related pricing.

The test which may be developed in relation to reducing risk to the economic performance of the Region will potentially require subsequent analysis, for example in relation to attribution (the extent to which the Green Infrastructure investment is responsible for the claimed outcome) and comparative cost-benefit analysis (for example, comparing sustainable drainage scheme solutions to hard engineered solutions for flood management).

4.3.6 Delivering against Public Service Agreements (PSAs).

Government has produced a revised set of 30 new PSAs (2007)¹ designed to galvanise public service delivery and generate maximised outcomes through promoting 'joined up government' over the next three years. The PSAs relevant to Green Infrastructure and its economic benefits are:

- PSA7: Improve the economic performance of all Regions and reduce the gap in economic growth rates between Regions.
- PSA12: Improve the health and wellbeing of children and young people.
- PSA18: Promote better health and wellbeing for all.
- PSA21: Build more cohesive, empowered and active communities.
- PSA27: Lead the global effort to avoid dangerous climate change.
- PSA28: Secure a healthy natural environment for today and the future.

Each PSA has a Delivery Strategy attached to it, alongside a set of indicators for measuring progress. In the same way that Green Infrastructure can demonstrate progress against meeting Regional RES targets, so to can it be related to progress against PSA targets and demonstrate a relationship to the Delivery Strategy.

4.3.7 Contributing to headline Strategic Added Value (SAV).

The NWDA have defined three sets of SAV, based on national guidance. They are:

¹ http://www.hm-treasury.gov.uk/pbr_csr/psa/pbr_csr07_psaindex.cfm

- Strategic / Catalytic Activity.
- Increasing Co-ordination, Alignment, and Partnership.
- Improving Intelligence, Influencing, and Awareness Raising.

Green Infrastructure provides opportunities for the NWDA to demonstrate SAV against all three of these outcomes by providing leadership, developing partnerships, enabling research and through providing strategic investment.

4.3.8 Contributing to Natural Economy Strategic Added Value (NE-SAV).

In addition to the nationally agreed set of defined SAV activity which may be undertaken by a RDA, in 2006 the NWDA's Single Programme Advisory Group (SPAG) identified a series of socio economic outcomes related to the Natural Economy which developed further the notion of Strategic Added Value. Whilst there is some overlap between the two groupings - Headline and Natural Economy - we have produced the list of NE-SAV separately below as a further Key Test in order to fully demonstrate the additional value that Green Infrastructure investments can bring to economic renaissance. The four defined themes relating to NE-SAV are:

- Perception Changes.
- Lifestyle Changes.
- Downstream Economic Effects.
- Well-being and Security.

4.3.9 Valuing Ecosystem Services.

The Defra guide "An introductory guide to valuing ecosystem services" (2007) proposes a framework approach to estimating the Total Economic Value (TEV) of an intervention based on a series of potential value appraisals. The TEV calculation is comprised of use and non-use values and produces a value which is relative to gain in well-being, measured by the net sum of the willingness to pay or willingness to accept (i.e. the monetary measure of the value of obtaining or forgoing environmental gain or avoiding/allowing a loss). The Defra methodology is currently under construction but details of the approach proposed can be found on the Defra website at www.defra.gov.uk.

Further methodologies already constructed or under construction which seek to value non market goods include:

- Added Value Assessment

For example, that developed by the Forestry Commission to support the re-use of derelict under utilised and neglected sites in the North West for its Newlands programme of derelict site regeneration.

- CITYgreen model

CITYgreen is a GIS application based in the US which calculates £ benefits of ecosystems based on specific site conditions. The model creates easy-to-understand maps and reports and is used for land-use planning and policy making. CITYgreen allows the economic and environmental benefits to be calculated in relation to Green Infrastructure investment. The model analyses:

- ▶ Stormwater Runoff.
- ▶ Air Quality.
- ▶ Summer Energy Savings.
- ▶ Carbon Storage and Avoidance.
- ▶ Tree Growth.

- Economic Value Assessment

For example, a variation on the model proposed in the report to NWDA/RENEW entitled 'Economic value of urban design'¹ which incorporates consideration of many of the benefits proposed for Green Infrastructure in this report, for example:

- ▶ improvements in occupational rent and capital values;
- ▶ market attractiveness;
- ▶ whole life costs;
- ▶ user performance;
- ▶ economic performance of a local area; and
- ▶ image and external perception.

4.3.10 Creating return on investment (ROI).

Whilst much of the investment required to realise the economic benefits of Green Infrastructure is likely to come from the public sector, there is a key role to be played by the private sector too. At present this role is both under valued and not fully accounted for when considering the strategic interventions necessary to realise these benefits. The private sector have key roles to play in terms of:

¹ Economic value of urban design final report, AMION consulting and Taylor Young (May 2007)

- Land and asset management – for example, the considerable Green Infrastructure assets owned and managed by farmers, water companies, the National Trust and private estates.
- Investment in Green Infrastructure which may be realised through Corporate Social Responsibility.
- Investment in Green Infrastructure by developers as integral aspects of, for example, new housing and industrial growth.

For a given use of money in an enterprise, the ROI is how much profit or cost saving is realised as a result of that investment. An ROI calculation may be used to develop a business case for a given Green Infrastructure proposal, showing how the investment provides for greater profitability of a scheme – for example, a business park incorporating strong Green Infrastructure components resulting in higher rental returns.

5.0 Key conclusions

The key thrust of this report is to describe Green Infrastructure in terms of a set of eleven key economic benefits that result from intervention and investment and to justify these benefits through the collation of a comprehensive evidence base. The utility of this approach is to encourage new and on-going Green Infrastructure investment to be set within a strategic context – for example, a City Region/sub Region economic development strategy which incorporates Green Infrastructure investments into the strategic thinking of partners and stakeholders.

The eleven key benefits provide a framework within which to assess individual investments – for example the reclamation of a derelict site for an environmental end use – or with which to assess a wider programme of intervention. The evidence which supports the benefits will be of utility in providing examples, value ranges, case studies and, on occasion, exact values in relation to the benefits investments can bring.

Clear evidence has been presented in this report to show that Green Infrastructure provides tangible economic benefits for the Region, particularly in terms of the maintenance of the current resource and through strategic investment in new Green Infrastructure. Both conservation/maintenance and investment in new assets and functionality should pay particular heed to the following key requirements relating to the future economic prosperity of the Region:

- **First**, the need to secure the maximum economic benefits to the Region by planning, managing and enhancing the Region's Green Infrastructure, in order to enhance quality of place, create the best possible setting for both home-grown and inward investment, and to develop the image of the North West as a 'green' Region, attractive to tourists, entrepreneurs, investors and the skilled workforce necessary in today's knowledge economy. In undertaking this, a key target must be to address perceptions of the Region which are often associated with its industrial heritage and which, on occasion, fail to recognise the Region's unique environmental asset base.
- **Second**, the need to address the global issue of climate change at a local (Regional) level, using Green Infrastructure to provide a range of adaptation services to enable our urban and rural areas to remain habitable and economically viable as weather patterns change, alongside the opportunity presented for greater carbon capture and storage and the provision of the raw materials for renewable energy.

In the North West, a more pragmatic approach to Strategic Added Value has allowed for a progressive approach to be taken to Green Infrastructure investment to date, as demonstrated through, for example, the funding of the Newlands and Natural Economy Northwest programmes. The releasing of RDAs from the restrictions of the current Tasking Framework as signalled by the Treasury's Sub National Review offers huge potential for the North West to build upon the advantages it has created for itself through this progressive Green Infrastructure agenda – to undertake a programme of 'green activity' integrated with the economic renewal of the Region. However, this could be undermined if there is an exclusive focus on GVA per capita as the sole, or overriding objective for both planning and development activity.

However, it is important that when considering how to maximise the sustainable economic benefits of Green Infrastructure, attention is not wholly focused upon those agencies and structures whose task it is to deliver economic growth and development. Of significance too are those bodies tasked with developing and managing the natural environment itself. Here it must be a key objective to enable these organisations to recognise the importance of integrating economic (and social) objectives into project and programme development, in order for sustainable development to be fully realised.

Green Infrastructure provides a framework for this to take place, recognising as it does the interdependency between the natural world and that of human economic activity, thereby providing opportunity for those primarily concerned with the natural environment to realise the wider benefits that integration of economic outputs can bring without compromising their priority to protect and maintain biodiversity and the wider intrinsic benefits of the natural environment. Guidance for natural environment project managers with regard to realising these economic benefits is currently in preparation by NENW and will be published shortly.

This report, then, taken in conjunction with the wider body of work commissioned by Natural Economy Northwest, provides the rationale and evidence for:

- economic development activity to integrate Green Infrastructure in order to add value;
- natural environment activity to integrate economic objectives in order to add value; and
- the growth and maintenance of a strategic investment and planning programme for Green Infrastructure which develops the offer of the North West Region as a place to do business whilst simultaneously contributing to an improved quality of life for those who choose to live and work in the Region.

Annex One: The economic benefits of Green Infrastructure – evidence base.

THE KEY ECONOMIC BENEFITS OF GREEN INFRASTRUCTURE EVIDENCE BASE

Figure 1: Climate Change adaptation and mitigation

CLIMATE CHANGE ADAPTATION AND MITIGATION	
<p>Key benefits of investing in Green Infrastructure</p>	<p>Microclimate control for urban areas – shade in the summer reducing the need for air conditioning in buildings; reduced wind effects on homes and workplaces lowering heating costs.</p> <p>Evapotranspiring surfaces (i.e. vegetated and water) provide for urban cooling.</p> <p>Benefits for visitors and employees in cities.</p> <p>Increased capacity for absorption of carbon through greenspace cover.</p> <p>Increased oxygen production through greenspace cover.</p> <p>Reduced impacts of higher rainfall through flood mitigation resulting from canopy and greenspace cover.</p>
<p>Economic Value</p>	<p>Direct</p> <p>Reduction in energy costs for city businesses – heating costs and air conditioning in summer.</p> <p>Downstream</p> <p>Reduction in energy costs for domestic residences.</p> <p>Carbon capture and storage.</p> <p>Increased ecosystem services i.e. air quality.</p> <p>Increased numbers of visitors to city centres during summer.</p> <p>Risk management</p> <p>Reduced cost of flood events (see flood and water management section).</p>

CLIMATE CHANGE ADAPTATION AND MITIGATION

	<p>Reduced costs of potential carbon taxes to local government.</p> <p>Reduced costs to health services resulting from the impact of high temperatures (heatwaves)</p>
Potential investments and interventions	<p>Woodland planting and maintenance.</p> <p>New Biomass planting and production.</p> <p>Tree planting in urban areas.</p> <p>Urban greenspace.</p> <p>Tree planting on floodplains.</p> <p>Upland tree planting.</p> <p>Green roofs.</p> <p>Sustainable Drainage Systems (SUDS).</p>
Measures of success	<p>Amount and incidence of insurance claims relating to flood damage.</p> <p>Area of trees planted in urban and upland areas.</p> <p>Reduction in local CO2 and ozone levels in the atmosphere.</p>
Supporting evidence	<p>The net present value of carbon storage of woodlands has been estimated for different English Regions, this varies from £601 million in the North West to £2,684 million in the South East for broadleaved woodlands and for conifers £114 million in the East Midlands to £492 million in the South West, EFTEC, 2005, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).</p> <p>The capitalised value of forest and woodlands across Great Britain as a carbon sink was estimated at approximately £2.7 billion, (Social and Environmental benefits of forestry, Forestry Commission, 2004).</p>

CLIMATE CHANGE ADAPTATION AND MITIGATION

Urban heat islands can result in temperatures of up to 12°C warmer than in the countryside (Boundary Layer Climates, Oke 1987).

Greenspace and trees offer a way to cope with hot weather (through shading and evaporative cooling, (Climate Change: Adaptation by Design, Town and Country Planning Association, 2007).

Adding 10% green cover is projected to keep maximum surface temperatures in high density residential areas and town centres at or below the 1961-1990 current form case up until the 2080s (Gill et al, 2007).

Significant opportunities for urban designers, architects and developers to create spaces and buildings that increase a community's resilience to climate change, (Climate Change: Adaptation by Design, Town and Country Planning Association, 2007).

Significant urban warming over and above that expected for rural areas is anticipated as a consequence of climate change (Betts, R. and Best, M. Relative Impacts of Radiative Forcing, Landscape Effects and Local Heat Sources on Simulated Climate Change in Urban Areas, 2004).

An estimated 35,000 lives were lost during the European summer heatwave of 2003 (Larsen, 2003). England and Wales experienced a 22% increase in deaths of people over 75 – with a 59% increase in London (Environment Agency, Climate Change Adaptation on the Wear, 2006).

Hotter temperatures will lead to greater demand for greenspace, blue (water) infrastructure, open spaces and shading, (Climate Change: Adaptation by Design, Town and Country Planning Association, 2007).

Chicago Wilderness is a mosaic of urban forests and identified that greenspaces not only reduce UHI (Urban Heat Islands), they also help purify city air, reduce heating bills through windbreak trees, absorb storm water run off and lower noise pollution, (Climate Change: Adaptation by Design, Town and Country Planning Association, 2007).

Need to stop deforestation and extend the harvest cycle on timber to optimise the sequestration that is most powerful and most efficient with older trees. On a worldwide basis, 2 ½ trillion tons of the 10 trillion tons of CO2 emitted each year comes from burning trees. Better management of forests is one of the single most important strategies for solving the climate crisis, (NYU Law, Al Gore, 18/9/06).

Evaporative cooling effects from a matrix of green corridors, smaller open spaces, street trees, and green or living roofs and walls, can have a significant impact upon adapting and mitigating climate change

CLIMATE CHANGE ADAPTATION AND MITIGATION

	<p>temperatures, (Climate Change: Adaptation by Design, Town and Country Planning Association, 2007).</p> <p>USDA Forest Service estimates that a 50 year old tree saves \$75 a year in air conditioning, \$75 a year in storm-water and soil erosion control and \$50 a year in air pollution control (Urban Forestry News10, Autumn 2003).</p> <p>In a year, 100 mature trees remove 53 tons of carbon dioxide and 430 pounds of pollutants from the air, and catch 538,000 gallons of rainwater. They can save homeowners 20% on air conditioning costs and 2% on heating costs. (Virginia Outdoors Plan, Chapter IV. Green Infrastructure, 2007).</p>
Cross referenced to:	Flood alleviation and water management; Land and biodiversity; Economic growth and investment; Health and well being.

Figure 2: Flood alleviation and Water Management

FLOOD ALLEVIATION AND WATER MANAGEMENT	
Key benefits of investing in Green Infrastructure	<p>Absorption levels are higher where there is more 'soft surfacing'.</p> <p>Trees and other forms of green space, including private gardens, more effectively manage the flow of storm-water run off than concrete sewers and drainage ditches. This investment results in less catastrophic effects of major storm events upon homes and businesses.</p> <p>Enhanced land values and enhanced house prices (flood risk will depress both).</p> <p>Fewer disincentives to investment – improved perception of place for investors and lower insurance premiums.</p> <p>Green Infrastructure controls the risk of diffuse pollution.</p>
Economic Value	<p>Direct</p> <p>Area of trees planted and/or green space created result in savings in capital flood defence schemes.</p> <p>Downstream</p> <p>Increased values in land/property prices (linked to reduction in flood risk).</p> <p>Increased economic activity in areas affected previously by flooding.</p> <p>Cost reduction</p> <p>Reduced clean up costs after flood events.</p> <p>Lower hard capital infrastructure costs.</p> <p>Risk management</p>

FLOOD ALLEVIATION AND WATER MANAGEMENT

	<p>Reduced insurance premiums for homes and businesses.</p>
<p>Potential investments and interventions</p>	<p>Street tree planting and maintenance in urban areas.</p> <p>Tree planting and maintenance on floodplains.</p> <p>Upland tree planting and maintenance.</p> <p>Protection/maintenance of urban gardens and playing fields.</p> <p>Maintenance of upland peat bogs.</p> <p>Reducing moorland run off by closing moor-grips.</p> <p>Reducing overgrazing in uplands, allowing vegetation to recover, reducing erosion and run off.</p> <p>Sustainable Drainage Systems (SUDS).</p> <p>Storage ponds.</p> <p>Increased greenspace coverage in urban areas and protection of existing green space from development in urban and urban fringe areas.</p> <p>Restoration of wetlands slowing down water flows and creating reservoirs for flood water.</p>
<p>Measures of success</p>	<p>Area of trees planted in urban areas or upland areas</p> <p>Area of green space in urban areas.</p> <p>Amount and incidence of insurance claims relating to flood damage</p>

FLOOD ALLEVIATION AND WATER MANAGEMENT

	<p>House prices in flood areas (e.g. before and after flood alleviation measures)</p> <p>Environment Agency expenditure on SUDS against hard engineered flood defences.</p> <p>Business activity rates in previously flood affected / high risk locations.</p> <p>Reduced flooding and subsequent costs.</p> <p>Area of wetland restored and created.</p>
<p>Supporting evidence</p>	<p>Carlisle floods-£24.5m in claims from one insurer - Axa - alone (http://www.hm-treasury.gov.uk/media/7/1/Letter_from_Peter_Hubbard_to_Sir_Nicholas_Stern.pdf).</p> <p>By 2080 if we continue to discharge greenhouse gases then in the North West Region it is possible that winter rainfall could increase by 30% and summer rainfall decrease by 50%. Sea levels could rise by 67cm, threatening the 430km of low lying coastline and the 95,000 people living in the coastal floodplain (http://www.environment-agency.gov.uk/Regions/northwest/).</p> <p>Restoration of peat bogs on United Utilities estate in the North West via the Sustainable Catchment Management Programme (SCaMP) will save £2m per annum in water supply costs (Valuing the benefits of diversity, Economic and Funding SIG, 2007). http://www.unitedutilities.com/?OBH=4307.</p> <p>Approximately 212,500 properties in the North West are at risk of flooding. Environment Agency spends £40million per annum protecting people and property in the Region (http://www.environment-agency.gov.uk/Regions/northwest/)</p> <p>1 in 10 people in UK live at risk from flooding (www.environment-agency.gov.uk)</p> <p>According to the Environment Agency, 1.9 million properties (worth over £200 billion) and 1.4 million ha of agricultural land (worth about £7 billion) could be at risk over the next 50 years from either coastal or river-based flooding, The 2004 Foresight report on future flooding risk predicted that by 2080 this figure could increase to £27 billion, ('A land fit for the future', Rt Hon David Miliband, March</p>

FLOOD ALLEVIATION AND WATER MANAGEMENT

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	<p>2007).</p> <p>More intense rainfall events will mean drainage systems (roof drainage, sewer systems, carriageway drainage etc) are unable to cope, resulting in flash flood events, especially in urban areas, (Climate Change: Adaptation by Design, Town and Country Planning Association, 2007).</p> <p>Increased flooding of buildings and open spaces will lead to loss of life, injury, disease, mental stress, damage to buildings and their contents, contamination from sewage and access problems. Some properties may become uninsurable if they are in highly flood-prone areas, (Climate Change: Adaptation by Design, Town and Country Planning Association, 2007).</p> <p>The ASSCUE research project found that there is a need to increase rainwater storage in urban greenspace as well as increasing greenspace cover to cope with anticipated increased rainfall associated with climate change in the north of England (Gill et al, 2007).</p> <p>By 2080 the annual cost of flooding in the UK could be £22bn (Climate change, The Costs of Inaction, 2006).</p> <p>Government has spent £4bn on managing risk of flooding and coastal erosion since 1996 (Defra, 2007).</p> <p>The value of maintaining wetlands for their flood defence function has estimated at £1,279/ha/yr and storm defence function value has been estimated at £722/ha./yr, EFTEC, 2005 (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).</p> <p>Conserving Green Infrastructure can also reduce public costs for storm water management, flood control, and water treatment. The U.S. Fish & Wildlife Service estimates that the economic benefits generated by a single acre of wetland range from \$150,000 to \$200,000 (Developing America's Green Infrastructure, interview with Mark Benedict and Edward McMahon, 2006).</p>
<p>Cross referenced to:</p>	<p>Quality of Place; Economic growth and investment; Land and property values; Land and biodiversity; Climate change.</p>

Figure 3: Quality of Place

QUALITY OF PLACE	
Key benefits of investing in Green Infrastructure	<p>Improved access to greenspace for formal and informal recreation.</p> <p>Greater tourism and leisure expenditure.</p> <p>Retention/attraction of graduates and a skilled workforce.</p> <p>Reduction in anti social behaviour.</p> <p>Improved community cohesion.</p> <p>New opportunities for community ownership and involvement.</p> <p>Improved attractiveness of place for investment.</p> <p>Reduction in noise levels from road and industry.</p> <p>Improved visual amenity.</p>
Economic Value	<p>Direct</p> <p>Increased economic activity from investment leading to new employment opportunities.</p> <p>Downstream</p> <p>Increase in land and property values.</p> <p>Cost reduction</p> <p>Increased community ownership and management of greenspace reduces the cost to public services.</p>

QUALITY OF PLACE

	<p>Reduced cost to health services.</p> <p>Reduced cost to policing through greater community cohesion.</p>
<p>Potential investments and interventions</p>	<p>Street tree planting.</p> <p>Greenspace investment.</p> <p>Investment in parks, public realm and recreational facilities.</p> <p>Tree planting in strategic locations along road and rail arterial routes.</p> <p>Joining up of communities with greenspace and green arteries linking communities with services.</p> <p>Habitat creation, increasing opportunities for wildlife for local communities.</p> <p>Managing roadside/transport corridors for more ecological benefit.</p> <p>Protecting and enhancing the natural environment that reinforces character of place and local distinctiveness.</p>
<p>Measures of success</p>	<p>Quality of life surveys.</p> <p>Stress levels.</p> <p>Image/perception of an area.</p> <p>Amount of greenspace in urban areas.</p> <p>Inward investment levels.</p> <p>Area of trees planted.</p>

QUALITY OF PLACE

	<p>Area of habitat created.</p> <p>Length of verges better managed.</p> <p>Noise Levels.</p> <p>Social capital indicators, e.g. levels of community asset ownership and management.</p>
<p>Supporting evidence</p>	<p>83% of the NW Region is classified as greenspace, compared to 88% for England (GLUD 2005).</p> <p>17% of the Region is Green Belt but the Region has less than 7% tree cover (Environment Agency, 2007).</p> <p>Lack of parks and green space are frequently identified as the worst features about urban neighbourhoods (Parks and Green Spaces Study, 1999).</p> <p>Significant economic benefits will accrue from having a higher skilled workforce (Green Growth, the Economics of green cities, M.E. Kahn, 2006).</p> <p>Green Cities are “a magnet for the highly educated”. Green Cities attract skilled workers (Kahn, 2006)</p> <p>A belt of trees can reduce noise levels by as much as 6-8 decibels for every 30 metres width of woodland. Leonard RE and Parr SB, Trees as a sound barrier, Journal of Forestry, 1970).</p> <p>97% of respondents believe that parks and green spaces help to create a nicer place for them to live, (The Park Life report, GreenSpace, June 2007).</p>
<p>Cross referenced to:</p>	<p>Flood alleviation; Health & well being; Land & property values; Economic growth and investment; Tourism; Recreation and leisure.</p>

Figure 4: Health and Well-being

HEALTH AND WELL BEING	
Key benefits of investing in Green Infrastructure	<p>Improved public health, reduction in long term limiting illness and a more productive workforce.</p> <p>Studies show that even modest physical activities, such as walking, can reduce the risk of coronary heart disease, high blood pressure, obesity, diabetes and some types of cancer.</p> <p>Stress reduction through access to greenspace and green environment.</p> <p>Increased productivity and skills through higher attendance rates at work / training / education.</p> <p>Improved opportunities for walking and cycling as alternatives to motorised travel.</p> <p>Greenspace and trees absorb carbon dioxide and produce oxygen, improving local air quality.</p> <p>Greenspace and trees absorb pollution, by absorbing particulate and chemical pollutants, improving air quality.</p>
Economic Value	<p>Direct</p> <p>Reduction in limiting long term illness and incapacity benefits – cost to NHS and DWP - 16 million days of certified incapacity are attributable to obesity.</p> <p>Cost to NHS of treating illness related to e.g.: asthma, obesity, coronary heart disease.</p> <p>Downstream</p> <p>Benefit to employers of a more productive workforce.</p> <p>Cost reduction</p> <p>Cost to employers of days lost to sick leave.</p>

HEALTH AND WELL BEING

Potential investments and interventions

Investment in public realm and greenspace creation and improvements.

Provision of improved/new recreational facilities.

Woodland and other habitat creation and conservation.

Cycleway and footpath provision.

Networking of Green Infrastructure to allow for accessibility from residential to employment /service centres.

Improved quality of greenspace – improving ecosystems.

Measures of success

Number of days lost to industry through sickness.

Number of incapacity benefit claimants.

Obesity levels.

Number of deaths from asthma /respiratory related illness.

Mortality rates.

Participation in sporting activities.

Use rates of parks and other recreational facilities.

Satisfaction/well being levels (measured by Quality of Life Surveys).

Amount of green space in urban areas.

Area of trees planted.

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	<p>Number of journeys not taken by car.</p> <p>Km of cycle path provided.</p> <p>Condition of Public Rights Of Way (PROWs).</p> <p>Airborne Pollutant levels.</p> <p>Water quality.</p>
<p>Supporting evidence</p>	<p>20% of the population in the North West have a limiting long term illness, compared to 17.3% average for England (ONS, 2007).</p> <p>Stress levels reduce when a stressed person moves into a leafy environment (Trees Matter, NUFU, 2005).</p> <p>34,000 premature deaths in the UK are attributable to obesity ('The Urban Environment Royal Commission on Environmental Pollution, 2007).</p> <p>24,000 people die prematurely as a result of air pollution (UK Environmental Accounts, HM Government, 1998).</p> <p>The Department for Culture, Media and Sport indicates that a 10% increase in adult physical activity would benefit England by £500 million per year, saving 6000 lives, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK 2006).</p> <p>The majority of Britons will be obese by 2050 if weight gain in the population continues at the current rate (60% of men, 50% of women, 25% of children). (Tackling Obesities: Future choices, British Heart Foundation, 2007).</p> <p>The current cost of physical inactivity in England is estimated to be £8.2 billion. Obesity is likely to overtake smoking as the biggest killer in 10-15 years at present trends, (Social and Economic Benefits of</p>

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the Natural Environment: Review of Evidence, GHK Consulting, 2006).

People with very good access to attractive and large public open space were 50% more likely to have high levels of walking, defined as at least 6 walking sessions per week totalling 180 minutes, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).

The net increase in the benefits attributable to pollution absorption by woodland for deaths avoided is estimated to range between £199,367 and £11,373,707 yearly in Britain, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).

The net reduction in costs (or increase in benefits) attributable to this benefit of improved air quality by forests and woodland was estimated to be around £11 million per annum, (Social and Environmental benefits of forestry, Forestry Commission, 2004).

The public's activity in a park in Portsmouth has been estimated to save the local economy £4.4m each year in health costings, including £910,000 to the NHS. (Dr William Bird, 'Natural Fit'-RSPB, 2004).

A study of walking has shown that if just 1 in 100 inactive people took adequate exercise it could save the NHS in Scotland as much as £85m per year ('Nature is good for you!', Bird, W, 2003).

A permanent 1% reduction in the proportion of UK sedentary population considered obese estimated to save 1.44bn (causal link problem, between green space and increased activity - further research would be worthwhile), (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK, 2006).

A study in the West Midlands has suggested that doubling tree cover across the Region would reduce the concentration of fine PM10 particles by 25%, preventing 140 air pollution related premature deaths in the Region every year (Trees Matter!, National Urban Forestry Unit, 2005).

The cost of physical inactivity to the economy has been estimated at £8.2bn (Trees Matter!).

Hospital patients recover quicker with a tree view, stress levels reduce when a person moves into a leafy

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	<p>environment (Ulrich in Trees Matter!).</p> <p>A six fold increase in high quality public spaces in Copenhagen led to a 65% increase in bicycle use (Public Spaces, Public Life, Copenhagen, Gehl, J and Gemzoe, L 1998).</p> <p>The creation of better access to places for physical activity (combined with publicity) produced a 48% increase in the frequency of physical activity (American Journal of preventative medicine 22, no.4 2002).</p> <p>All types of green (infrastructure investment) seem to be equally effective in improving health (Sjerp de Vries et al. Nature and Health, 2001).</p> <p>A Forestry Commission study estimated that net pollution absorption by woodland resulted in the saving of 65 to 89 lives per year, (Making Woodland Count – its contribution to our quality of life, The Woodland Trust, 2004).</p>
Cross referenced to:	Quality of place; Tourism; Recreation and leisure; Climate change; Land and biodiversity.

Figure 5: Land and Property Values

LAND AND PROPERTY VALUES	
Key benefits of investing in Green Infrastructure	<p>Increased property and land values associated with access to high quality greenspace provision stimulates regeneration:</p> <ul style="list-style-type: none"> - Attraction of new investment stimulated by enhanced land and property prices/values. - High quality industrial and business zones. - Attraction of skilled workers to an area.
Economic Value	<p>Direct</p> <p>Higher value business attracted to an area, stimulating higher GVA.</p> <p>Increased investment in neighbourhoods.</p> <p>Downstream</p> <p>Increased land and property prices.</p> <p>Increased land values.</p> <p>Increased rental incomes.</p> <p>Risk management</p> <p>Reduced image related investment blight.</p>
Potential investments and interventions	<p>Greenspace provision /improvement / maintenance.</p> <p>Canal-side / waterway enhancement / maintenance.</p>

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	<p>Public realm improvements and maintenance (e.g. urban squares).</p> <p>Green business parks.</p> <p>Habitat creation – woodland, wetland, meadows – adding interest and distinctiveness.</p> <p>Better provision for wildlife by businesses – business park environments, corporate social responsibility.</p> <p>Better marketing of local values and distinctiveness.</p>
<p>Measures of success</p>	<p>Comparative house prices.</p> <p>Comparative land values.</p> <p>Comparative commercial rent levels.</p> <p>Changes in commercial activity – monitoring higher value added commercial activity rates.</p>
<p>Supporting evidence</p>	<p>The development of a community woodland on the former Bold Colliery site directly enhanced existing property values in the surrounding area by approximately £15 million. In addition, as a result of the development of the community woodland, new development to the value of £75 million has been realised, (Bold Colliery Community Woodland, District Valuer's Report on Property Values, 2005).</p> <p>CABE conducted an extensive study into the impact of park improvements on house prices, and found that following improvements houses near the park were, on average, 8% more expensive than comparable houses further away and the premium in Mowbray Park, Sunderland was 36% ('Does Money Grow on Trees', CABE, 2005).</p> <p>A 10 microgramme per cubic metre reduction in particulates correlates to a 10% increase in house prices (Chay and Greenstone, 'Does Air Quality Matter, evidence from the housing market, journal of political economy, no.2, pp 376-424).</p> <p>GLA Economics 2003, demonstrated that a 1% increase in green spaces (in London) was linked to a</p>

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0.3% to 1% increase in house prices, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).

“The surrounding environment is the single most important factor affecting the market value of a home” (National Association of Homebuilders, 1994).

Properties in Milton Keynes and Bedford were 18% higher in waterside than non waterside locations (Lambert, Smith, Hampton, 2002).

A CABI study of space estimated that properties directly overlooking a park had an average price premium of 5-7% relative to similar properties nearby, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).

A 1992 study by Garrod and Willis suggested that 20% broadleaved tree cover can enhance property values by 20%, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).

The willingness to pay of local residents in peri-urban settings for views of broad-leaved forests was estimated at £7,680 per household, or £4.2 billion across Great Britain, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).

According to a Savills study, homes directly next to or directly overlooking an open space can typically expect to see an uplift in value of +12% over properties in the same location with no park views. Even the presence of a park up to two streets away will result in an average +7% value uplift compared to streets with same type of property away from the influence of the open space, (Savills Residential Research, June 2006).

A view of a park can increase house prices by 8% in the Netherlands, and having a park nearby 6% (Luttik, J 2000 in ‘The value of trees, water and open spaces as reflected by house prices in the Netherlands’, Landscape and Urban Planning, Volume 48, p61-167).

Homes near the Monon Trail in Indiana command selling prices 11% higher than other homes in the area.

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	<p>(Central Indiana Centre for Urban Policy and the Environment).</p> <p>Several studies in north America have shown that average house prices are enhanced by between 5 and 18% by the presence of trees (Anderson LM and Cordell HK, Influence of trees on Residential property values in Athens, Georgia, 1988).</p> <p>In Salem, Oregon, land adjacent to a greenbelt was found to be worth about \$1,200 an acre more than land only 1,000 feet away, (Does Money Grow on Trees, CABE, 2005).</p>
Cross referenced to:	Flood alleviation and water management; Economic growth and investment; Land and biodiversity.

Figure 6: Economic growth and investment

ECONOMIC GROWTH AND INVESTMENT	
Key benefits of investing in Green Infrastructure	<p>Land values of commercial sites on former brownfield land with high landscape quality exceed those of commercial sites without landscape measures.</p> <p>The potential benefits of better landscaping of business parks for companies are:</p> <ul style="list-style-type: none"> - better acceptance of the park by neighbours. - a better quality of life for the employees and increased productivity. - the maintenance or increase of property value. <p>Benefits for the local population are:</p> <ul style="list-style-type: none"> - A better environment. - Improved access to green space. - Improvements to neighbourhood image. - Increase in property values.
Economic Value	<p>Direct</p> <p>Added value industry attracted to an area, creating additional employment and increasing income levels.</p> <p>Increased occupancy of industrial/business and commercial units.</p> <p>Downstream</p> <p>Increased property prices and rental values.</p>

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	<p>Higher skilled workers/graduates attracted or retained.</p> <p>Cost reduction</p> <p>Reduced land management costs.</p>
Potential investments and interventions	<p>Public realm improvements.</p> <p>Greenspace creation.</p> <p>High quality working environments – urban and rural, including access to the countryside.</p> <p>Green business parks.</p> <p>Non motorised routes from residential to commercial areas.</p> <p>Corporate Social Responsibility investments – improving the business environment.</p>
Measures of success	<p>Rental values of property.</p> <p>Number of inward investors, and value of this investment.</p> <p>Amount of greenspace in and around business parks and commercial centres.</p> <p>Amount of DUN land reused for greenspace, improving visual amenity and providing greenspace.</p>
Supporting evidence	<p>There are 2815 ha of previously developed land available across the North West Region (NLUD, 2007).</p> <p>The Portland Basin Green Business Park project undertaken by Groundwork working closely with local companies as well as a range of environmental and community groups, has established waste reduction schemes, set up new recycling initiatives, upgraded security and improved some 100 buildings. The end result included the safeguarding of 90 jobs, 900m² of new commercial floorspace, and 400 young people</p>

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	<p>benefiting from personal development projects. (Groundwork/CLES, 2007). http://www.groundwork.org.uk/upload/news/61_document1.pdf.</p> <p>Environmental improvements that increase the value of land will have an impact on property development viability and activity. (Creating the setting for investment, University of Sheffield, 2004).</p> <p>Commercial developments considered to possess higher design quality provide a range of economic, social and environmental benefits including higher rental values, lower maintenance costs, enhanced regeneration and increased public support for the development. (CABE, 2001).</p> <p>Riverside Park Industrial Estate, Middlesbrough, green development created a setting for stimulating business growth and investment. The redeveloped site attracted new, high profile occupants and saw occupancy grow from 40 to 78%, and leveraging over £1m of private investment (CLES/Groundwork, 2007).</p> <p>In 2002, the Green Spaces Taskforce emphasised the importance of parks and green space in influencing the quality of modern life, estimating to account for 14% of Britain's urban areas and to receive 2 billion visits per annum, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).</p> <p>82% of people believe that high quality green parks and spaces encourage people and businesses to locate in a town, and 97% feel that trees and green spaces can improve the appearance of a town, (The Park Life, GreenSpace, June 2007).</p> <p>Over 35% of companies relocating to SW England quoted environmental attractiveness as a key reason for their move, (The environment, economic growth and competitiveness, Landuse Consultants, 2006).</p> <p>Well planned improvements to public spaces within town centres can boost commercial trading by upto 40% (CABE, 2005)</p>
<p>Cross referenced to:</p>	<p>Quality of place; Flood alleviation and water management; Land management and biodiversity; Health.</p>

Figure 7: Labour productivity

LABOUR PRODUCTIVITY	
Key benefits of investing in Green Infrastructure	<p>Employees experience reduced stress as a result of greener working environments, as well as providing employees with places for relaxation and recreation.</p> <p>The potential benefits of better landscaping of business parks for companies include a better quality of life for the employees and increased productivity.</p>
Economic Value	<p>Direct</p> <p>Added value industry attracted to an area, creating additional employment and increasing income levels.</p> <p>Increased output and bottom line productivity.</p> <p>Downstream</p> <p>Increased property prices and rental values.</p> <p>Higher skilled workers/graduates attracted or retained.</p> <p>Cost reduction</p> <p>Reduced employer costs related to absenteeism.</p> <p>Reduced costs to health services resulting from healthier workforce.</p>
Potential investments and interventions	<p>Green business parks and commercial centres.</p> <p>Public realm improvements.</p> <p>Greenspace creation in towns and cities.</p> <p>High quality working environments – urban and rural, including access to the countryside.</p>

LABOUR PRODUCTIVITY

	<p>Non motorised routes from residential to commercial areas.</p> <p>Corporate Social Responsibility investments – improving the environment through business investments.</p>
Measures of success	<p>Productivity of business in areas subject to Green investments.</p> <p>Number of inward investors, and value of this investment.</p> <p>Amount of greenspace in and around business parks and commercial centres.</p> <p>Rates of sickness and absenteeism, including limiting long term illness.</p>
Supporting evidence	<p>Commercial developments considered to possess higher design quality provide a range of economic, social and environmental benefits including higher rental values, lower maintenance costs, enhanced regeneration and increased public support for the development. (CABE 2001).</p> <p>Riverside Park Industrial Estate, Middlesbrough, green development created a setting for stimulating business growth and investment. The redeveloped site attracted new, high profile occupants and saw occupancy grow from 40 to 78%, and leveraging over £1m of private investment (CLES/Groundwork, 2007).</p> <p>In 2002, the Green Spaces Taskforce emphasised the importance of parks and green space in influencing the quality of modern life, estimating to account for 14% of Britain's urban areas and to receive 2 billion visits per annum, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).</p> <p>More than 60% of staff indicated that their surroundings and external views had the greatest impact on how they felt at work (CABE, 2005).</p> <p>Small businesses choosing a new business location rank open space, parks and recreation as a number-one priority (CABE, 2005).</p> <p>Stress levels reduce when a stressed person moves into a leafy environment (Trees Matter! NUFU, 2005).</p>

LABOUR PRODUCTIVITY	
	The cost of physical inactivity to the economy has been estimated at £8.2bn (Trees Matter!).
Cross referenced to:	Quality of place; Flood alleviation and water management; Land and biodiversity; Health and well being; Economic growth and investment.

Figure 8: Tourism

TOURISM	
Key benefits of investing in Green Infrastructure	<p>Increased tourism activity related to the natural environment results in new / secured jobs.</p> <p>Increased attractiveness of urban centres for tourism brings new visitors and new / secured jobs.</p> <p>Enhanced quality of visitor experience brings 'return customers'.</p> <p>Added value activities for the farming and forestry sectors through diversification.</p>
Economic Value	<p>Direct</p> <p>Increased employment and GVA related to key sectors:-</p> <ul style="list-style-type: none"> - Natural tourism. - Urban tourism. <p>Downstream</p> <p>Greenspace maintenance and management.</p> <p>Cost reduction</p> <p>Increased 'countryside on the doorstep' reducing travel to honeypot locations.</p>
Potential investments and interventions	<p>Promotion and marketing of natural tourism.</p> <p>Development of new marketing opportunities related to farming and forestry.</p> <p>Promotion of added value activity in farming and forestry.</p>

TOURISM

	Business support and training initiatives.
Measures of success	<p>Jobs supported.</p> <p>Number of businesses.</p> <p>Visitor numbers.</p> <p>Business turnover.</p>
Supporting evidence	<p>Visitor economy is worth £10.9bn to the NW Region, supporting 200,000 FTE jobs (NWDA, 2007).</p> <p>Rural tourism is calculated to be worth £770 million per annum to the North West economy (NWDA, 2007).</p> <p>93,000 jobs and £2.2 billion GVA are generated by Scotland's natural heritage, (Role of the Natural Heritage in generating and supporting employment opportunities in Scotland, ERM, 2006).</p> <p>40% of employment in tourism depends on high quality environment (60-70% in rural areas), (Valuing our Environment, National Trust, 2001).</p> <p>Overall scale of the environment economy, including activities in urban areas, may number 1 million jobs, and typically accounts for between 3% - 6% of Regional GDP, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK, 2006).</p> <p>The total number of tourism visits to woodland in Great Britain in 1998 was around 114 million, (Forests' Role in Tourism: Phase 2, Forestry Commission, August 2003).</p> <p>Since 1995, The National Forest estimates that an extra 330,000 visitors have entered the area, spending £128 million annually, and that more than 500 new jobs have been created, (Revealing the Value of the Natural Environment in England, a report for Defra, GFA RACE & GHK, March 2004).</p>

TOURISM	
	Forestry activity is estimated to support 14,740 FTE jobs directly and 27,170 in total, and contribute £380 million to net output directly, and £1,000 million in total, (Revealing the Value of the Natural Environment in England, a report for Defra, GFA RACE & GHK, 2004).
Cross referenced to:	Climate change mitigation and alleviation; Creating the setting for investment; Land and property prices; Health and well being.

Figure 9: Recreation and Leisure

RECREATION AND LEISURE	
Key benefits of investing in Green Infrastructure	<p>Increased attractiveness of urban centres for retail and leisure activity brings new customers and new / secured jobs.</p> <p>Added value activities to farming and forestry sector through diversification.</p> <p>Opportunities to improve quality of life through improved access to high quality greenspace.</p>
Economic Value	<p>Direct</p> <p>Increased employment and GVA related to urban retail and leisure sector activity.</p> <p>Downstream</p> <p>Greenspace maintenance and management.</p> <p>Cost reduction</p> <p>Increased 'countryside on the doorstep' reducing travel to honeypot locations.</p>
Potential investments and interventions	<p>Development of new marketing opportunities related to farming and forestry.</p> <p>Promotion of added value activity in farming and forestry.</p> <p>New urban greenspace.</p> <p>Improved PROWs.</p> <p>Improved water features – lakes, rivers, canals – accessible and useable for recreation.</p>
Measures of success	<p>Jobs supported.</p> <p>Visitor numbers.</p>

RECREATION AND LEISURE

	<p>Quality of life surveys.</p> <p>Use of greenspace/PROWs.</p>
<p>Supporting evidence</p>	<p>The value of woodland recreation in England has been estimated at between £1.66 and £2.78 per visit, EFTEC, 2005, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).</p> <p>93,000 jobs and £2.2 billion GVA are generated by Scotland's natural heritage, (Role of the Natural Heritage in generating and supporting employment opportunities in Scotland, ERM, 2006).</p> <p>The total value of woodland recreation is estimated to be around £400 million per year for the UK, (Social and Environmental benefits of forestry, Forestry Commission, November 2004).</p> <p>It is estimated that some 33 million people make over 2.5 billion visits each year to urban green space in England, (Goode. D, Green Infrastructure, Report to the Royal Commission on Environmental Pollution, 2006).</p> <p>Good quality greenspace provides:</p> <ul style="list-style-type: none"> • places for quiet contemplation; • opportunities to improve health and personal fitness; • safe areas to meet, talk and play; • cultural links with an area's past; and • opportunities for community events, voluntary activities, educational resources. <p>(CABE, 2005)</p>
<p>Cross referenced to:</p>	<p>Climate change; Economic growth and investment; Land and property values; Health and well being.</p>

Figure 10: Land and Biodiversity

LAND AND BIODIVERSITY	
Key benefits of investing in Green Infrastructure	<p>Increased activity in conservation and land management results in new / secured jobs.</p> <p>Creating economic opportunity by developing a vibrant and sustainable biomass industry.</p> <p>Reducing carbon emissions and enhanced opportunities for carbon capture and storage.</p>
Economic Value	<p>Direct</p> <p>Employment and GVA related to key sectors:-</p> <ul style="list-style-type: none"> - Forestry. - Conservation and land management. - Greenspace maintenance and management. - Increased economic value of biomass and woodfuel sectors. - New income for farmers through diversification. <p>Downstream</p> <p>Increased economic value of natural tourism and niche markets.</p> <p>Increased opportunity for local procurement.</p> <p>Increased ecosystem services e.g.:</p> <ul style="list-style-type: none"> - soil quality.

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	<ul style="list-style-type: none"> - air quality. - water management. <p>Cost reduction</p> <ul style="list-style-type: none"> Combating climate change. Reductions in CO2 emissions.
<p>Potential investments and interventions</p>	<ul style="list-style-type: none"> Development of new marketing opportunities related to farming and forestry. Business support and training initiatives. Woodland planting and maintenance. New Biomass planting and production. New Biofuel production. New renewable energy opportunities – hydroelectric, combined heat and power.
<p>Measures of success</p>	<ul style="list-style-type: none"> Jobs supported. Number of businesses. Visitor numbers. Business turnover. Land in Stewardship schemes.

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	<p>The amount and proportion of biomass in overall renewable energy production.</p> <p>Number of new renewable energy schemes.</p>
<p>Supporting evidence</p>	<p>The social and environmental value of woodland and forest in GB has been estimated to be worth up to £1bn pa. Woodland has risen to 11.6% of the UK land area (2.8 m hectares). (Forestry Commission, 2007).</p> <p>Direct employment in the natural environment sector in the UK is estimated to total 18,000, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).</p> <p>Activities which are closely and positively connected with the management of the natural environment support 299,000 full time equivalent jobs in England and contribute £7.6 billion in GVA, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK Consulting, 2006).</p> <p>93,000 jobs and £2.2 billion GVA are generated by Scotland's natural heritage, (Role of the Natural Heritage in generating and supporting employment opportunities in Scotland, ERM, 2004).</p> <p>Direct employment in nature and landscape conservation in England is estimated to support some 8,600 FTE jobs and inclusion of wider activities to the management of the natural environment increases this total to 300,000, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK, 2006).</p> <p>Overall scale of the environment economy, including activities in urban areas, may number 1 million jobs, and typically accounts for between 3% - 6% of Regional GDP, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK, 2006).</p> <p>In England economic activities that are connected with the management of the natural environment – both directly and indirectly (including agriculture and food processing) – contribute £67.6 billion per annum in Gross Value Added to the economy, and support 2.68 million full time equivalent jobs, (The environment, economic growth and competitiveness, Landuse Consultants, January 2006).</p>

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	<p>Since 1995, The National Forest estimates that an extra 330,000 visitors have entered the area, spending £128 million annually, and that more than 500 new jobs have been created, (Revealing the Value of the Natural Environment in England, a report for Defra, GFA RACE & GHK, March 2004).</p> <p>Forestry activity is estimated to support 14,740 FTE jobs directly and 27,170 in total, and contribute £380 million to net output directly, and £1,000 million in total, (Revealing the Value of the Natural Environment in England, a report for Defra, GFA RACE & GHK, March 2004).</p> <p>At present, only around 40% of the annual increment in England's woodlands is harvested and utilised within existing markets. Achieving the 2Mt target increase in wood production represents a 60% increase in wood production in England. (A Woodfuel Strategy for England, Forestry Commission, 2007).</p>
Cross referenced to:	Tourism; Recreation and leisure; Climate change; Flood alleviation and water management; Quality of place; Economic growth and investment; Products from the land.

Figure 11: Products from the Land

PRODUCTS FROM THE LAND	
Key benefits of investing in Green Infrastructure	<p>Increased activity in farming and forestry results in new / secured jobs.</p> <p>Increased activity in conservation and land management results in new / secured jobs.</p> <p>Creating economic opportunity by developing a vibrant and sustainable biomass industry.</p> <p>New markets for agriculture for biofuels production.</p>
Economic Value	<p>Direct</p> <p>Employment and GVA related to key sectors:</p> <ul style="list-style-type: none"> - Agriculture and support services. - Forestry. - Increased economic value of biomass and woodfuel sectors. - New employment in production and processing of raw materials and in energy production. - New income for farmers through diversification. <p>Downstream</p> <p>Increased economic value of natural tourism and niche markets.</p> <p>Increased opportunity for local procurement.</p> <p>Cost reduction</p> <p>Combating climate change.</p>

PRODUCTS FROM THE LAND

	<p>Reductions in CO2 emissions.</p>
<p>Potential investments and interventions</p>	<p>Development of new marketing opportunities related to farming and forestry.</p> <p>Promotion of added value activity in farming and forestry.</p> <p>Business support and training initiatives.</p> <p>Woodland planting and maintenance.</p> <p>New Biomass planting and production.</p> <p>New Biofuel production.</p>
<p>Measures of success</p>	<p>Jobs supported.</p> <p>Number of businesses.</p> <p>Visitor numbers.</p> <p>Business turnover.</p> <p>Production of biofuels.</p> <p>Production of biomass.</p> <p>Output of locally branded food and drink.</p>
<p>Supporting evidence</p>	<p>Agriculture accounts for 2% of workforce and 2% of GDP nationwide. 40,000 are employed in agriculture in the North West Region and a further 2,800 in forestry (Forestry Commission, 2007).</p> <p>80% of the land in the NW is designated as agricultural, with 10,000 farm holdings involved in livestock. (Environment Agency, 2007).</p> <p>The social and environmental value of woodland and forest in GB has been estimated to be worth up to</p>

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	<p>£1bn pa. Woodland has risen to 11.6% of the UK land area (2.8m hectares). (Forestry Commission, 2007).</p> <p>Overall scale of the environment economy, including activities in urban areas, may number 1 million jobs, and typically accounts for between 3% - 6% of Regional GDP, (Social and Economic Benefits of the Natural Environment: Review of Evidence, GHK, 2006).</p> <p>In England economic activities that are connected with the management of the natural environment – both directly and indirectly (including agriculture and food processing) – contribute £67.6 billion per annum in Gross Value Added to the economy, and support 2.68 million full time equivalent jobs, (The environment, economic growth and competitiveness, Landuse Consultants, January 2006).</p> <p>Forestry activity is estimated to support 14,740 FTE jobs directly and 27,170 in total, and contribute £380 million to net output directly, and £1,000 million in total, (Revealing the Value of the Natural Environment in England, a report for Defra, GFA RACE & GHK, March 2004).</p> <p>Utilising an extra 2 Mt of wood would save 400,000 tonnes of carbon, equivalent to supplying 250,000 homes with energy. This would replace 3.6 million barrels of crude oil. (A Woodfuel Strategy for England, Forestry Commission, 2007).</p> <p>Energy from biomass currently supplies 83% of renewable energy, with the contribution from wood being 10%. If the 2Mt target is realised this would rise to 16% - a significant contribution to achieving renewable energy targets as set out in the Energy White Paper. (A Woodfuel Strategy for England, Forestry Commission, 2007).</p> <p>At present, only around 40% of the annual increment in England’s woodlands is harvested and utilised within existing markets. Achieving the 2Mt target increase in wood production represents a 60% increase in wood production in England. (A Woodfuel Strategy for England, Forestry Commission, 2007).</p> <p>Forestry provides a sustainable biomass supply. (A Woodfuel Strategy for England, Forestry Commission, 2007).</p>
<p>Cross referenced to:</p>	<p>Tourism; Recreation and leisure; Climate change; Flood alleviation and water management; Quality of place; Economic growth and investment; Land and biodiversity.</p>

Annex Two: The State of the Evidence Base

Summarising the state of the evidence base

The information provided in the tables in Annex One is a combination of evidence relating to:

- the knowledge base as it exists regarding the potential economic value of Green Infrastructure – direct, downstream, cost reduction and risk management; and
- the evidence that exists in relation to the value, importance and threats posed in relation to each particular benefit theme.

The literature reviews undertaken in the production of this Report have been comprehensive and have drawn upon a wide cross section of views and sources. This has enabled analysis to be undertaken and for the development of rationales for investment from the perspective of the economic benefits flowing from such investments.

Nonetheless, there have been a number of areas identified where there is a clear need for further research to be undertaken to further develop the arguments and to, in time, provide well tested methodologies for identifying the economic benefit which may flow from any given investment in Green Infrastructure. These areas, where further work is required, are summarised below:

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Benefit	Evidence available	Evidence certainty - High, medium, low	Evidence origin/provenance	Examples of opportunities for further research/evidence
Climate change adaptation and mitigation	Evaluative modelling	Medium	North West Region, UK, North America	Cost benefit analysis of investment and maintenance costs of greenspace in urban areas against reduction in 'heat island' costs to residents and business.
	Sector valuation studies	High		
	Health impact evaluations	High		
	Case studies	High		
	Predictive climate impacts modelling	Medium		

Benefit	Evidence available	Evidence certainty - High, medium, low	Evidence origin/provenance	Examples of opportunities for further research/evidence
Flood alleviation and water management	Risk assessments Case studies	Medium High	North American, UK	Relative costs and benefits of SUDS vs. hard engineering solutions.
Quality of place	Medical research Public opinion survey Case study Scientific measurement and monitoring	High Medium High High	North West Region, UK	Maintenance and management savings to landowners through community ownership and involvement in greenspace.
Health and well-being	Medical research Scientific measurement Modelling studies Cost benefit studies	High High Medium Medium	UK, Europe, North America	Impact of Healthy Walking projects on NHS services. Relative health levels in comparative areas with high and low accessibility to greenspace. Differentials across social groups. Appropriate methodologies and assessment tools to measure how environmental projects help increase physical activity levels and health. Cost effectiveness studies of environmental change

Benefit	Evidence available	Evidence certainty - High, medium, low	Evidence origin/provenance	Examples of opportunities for further research/evidence
				interventions.
Land and property values	Case study Impact assessment models Market research Value comparison studies	High Medium Medium High	North West Region, UK, Europe, North America	Quantification of the impact of variables upon property and land value uplift where greenspace investment has taken place.
Economic growth and investment	Opinion survey Market research Case studies	High High High	North West Region, UK, North America	Quantification of the impact of variables upon investment decisions where greenspace investment has taken place.
Labour productivity	Case studies Opinion surveys	Medium Medium	UK, USA	A wider evidence base relating to tangible improvements in business turnover/profitability related to green work environments.
Tourism	Market research Sector valuation surveys	High High	North West Region, UK	Quantification of the impact of greened cities upon visitor numbers and spend. Quantification of the economic value of natural tourism as a subset of the tourism industry in total.

Benefit	Evidence available	Evidence certainty - High, medium, low	Evidence origin/provenance	Examples of opportunities for further research/evidence
Recreation and leisure	Market research Sector valuation Case studies	Medium Medium Low	UK	More work on direct causal links between investment in recreation opportunities and benefits relating health (incidence of limiting illness/disease) and community cohesion and community safety.
Land and biodiversity	Sector valuation studies Sector activity statistics Added value assessments Cost benefit analysis	High High High Medium	North West Region, UK	Economic value of biodiversity as a subset of both natural tourism and in relation to quality of place.
Products from the Land.	Sector valuation studies Sector activity statistics	High High	North West Region, UK	Impact of diversification into biomass and biofuel production upon agricultural industry GVA and job creation.

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