



Natural Economy Northwest

The economic benefits of Green Infrastructure: Developing key tests for evaluating the benefits of Green Infrastructure

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behalf of Natural Economy Northwest



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1.0 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 is designed to stimulate debate amongst Regional stakeholders around the best methodologies which may be developed to value Green Infrastructure investment. This report provides a series of Key Tests for use by public, private and community sector stakeholders seeking to evidence the value of Green Infrastructure investments and interventions. It is one of a series of three companion reports considering (and entitled) "The Economic Benefits of Green Infrastructure"¹: this particular report builds upon the review of the evidence base undertaken by ECOTEC for NENW which illustrates the economic value that Green Infrastructure does have, and 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

¹ The Economic Benefits of Green Infrastructure: the public and business case for investing in Green Infrastructure and a review of the underpinning evidence, 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).

Defra's important work to try and ensure that the value of ecosystems is built into public decision-making.

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 and the NENW Green Infrastructure Steering Group.

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, 2008

2.0 Overview

2.1 Introduction

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 provides a menu of ten Key Tests which can be applied by different stakeholders in different circumstances seeking to quantify the economic value of Green Infrastructure investments, from programme through to project level, taking account of the range of potential interventions possible and the considerations, interests and appraisal techniques used by the different potential investors.

This report complements two companion reports: the first of which outlines the economic benefits of Green Infrastructure and summarises the evidence base that applies to eleven defined benefits². That report seeks to demonstrate that economic benefit can be linked directly to investment in the enhancement and management of Green Infrastructure and defines four types of economic benefit that flow from these investments:

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

The second companion report, produced by AMION Consulting for the NWDA, provides an assessment framework for utilisation by the NWDA in considering future Green Infrastructure investments in the Region³.

The eleven key economic benefits of Green Infrastructure identified in these reports are:

- Climate Change adaptation and mitigation.
- Flooding alleviation and Water Management.
- Quality of Place.
- Health and Well-being.
- Land and Property values.

² The Economic Benefits of Green Infrastructure: the public and business case for investing in Green Infrastructure and a review of the underpinning evidence, ECOTEC Research and Consulting for NENW (2008).

³ The Economic Benefits of Green Infrastructure: an assessment framework for the NWDA, AMION Consulting for the NWDA (2008).

- Economic growth and Investment
- Labour productivity.
- Tourism.
- Recreation and Leisure.
- Land and Biodiversity.
- Products from the land.

The reports are 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..."⁴

Green Infrastructure in its practical application is the creation, maintenance or enhancement 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 artificial administrative and political boundaries.

This report then is designed to draw the evidence of these benefits together into a framework which allows for these investments to be appraised via a menu of Key Tests, with a view to calculating their economic benefit on a case-by-case or programme level basis.

2.2 Measuring economic impact

There have been many efforts undertaken in the past that have sought to attribute clear economic (and wider societal) value to investments which can be termed as 'Green Infrastructure'. To date, few if any have been given sufficient attention by decision makers, largely due to the problematic issue relating to attributing economic value to non market goods and services provided by this type of investment. The government's own Green Book⁵ highlights the fact that:

⁴ North West Green Infrastructure Guide, North West Green Infrastructure Think Tank, 2007 - www.greeninfrastructurenw.co.uk

⁵ The Green Book: Appraisal and Evaluation in Central Government, HM Treasury (2003)

"...most appraisals will identify some costs and benefits for which there is no readily available market data. In these cases, a range of techniques can be applied to elicit values, even though they may in some cases be subjective. There will be some impacts, such as environmental, social and health impacts, which have no market price, but are still important enough to value separately..."

With reference to these "techniques", the Green Book makes reference to a series of tests which are currently being developed further by Defra in their own work investigating ecosystem services⁶ and include:

- Willingness to pay.
- Revealed preference/hedonic pricing.
- Stated preference.
- Willingness to accept.

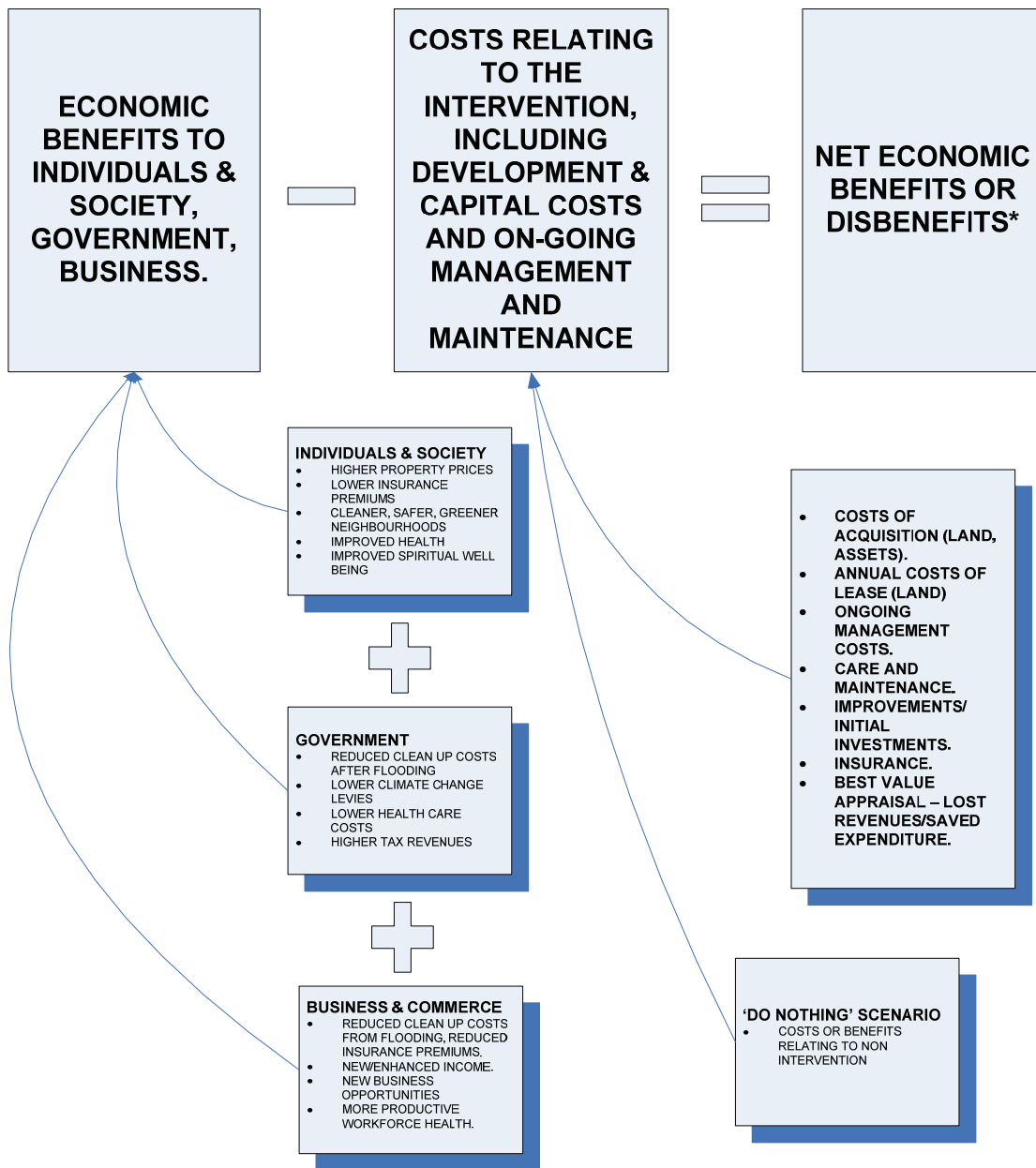
However, described in its simplest terms, the measurement of the economic and wider societal impact of Green Infrastructure investment can be expressed as being the financial benefits (including direct, indirect, cost saving and risk management benefits) accruing to business and society minus the costs relating to the investment. This is illustrated in Figure 2.1 overleaf and draws upon work undertaken in Wisconsin, USA⁷ in 2003.

This model, while seemingly straightforward, is in fact informed by a series of separate methodologies, ranging from a simple process of output counting – for example in relation to job creation – through to more complex and qualitative assessments, in particular ones which seek to attribute value to non market goods as mentioned above.

⁶ An introductory guide to valuing ecosystem services, Defra (2007)

⁷ Paint the town green: green infrastructure for tomorrow. A plan for open space reinvestment in Wisconsin's communities, Urban Open Space Foundation (2003).

Figure 2.1: Estimating economic value from Green Infrastructure investment



Source: Urban Open Space Foundation 2003/ECOTEC 2008

* includes direct and indirect benefits and disbenefits, cost savings and risk management.

2.3 Why develop a menu approach to valuation?

The research undertaken in the North West Region has been driven by the underlying objective of influencing and aligning public, private and voluntary sector activity and expenditure to optimise the economic benefits flowing from Green Infrastructure in growing the Regional economy and thus to provide more direct resources to it as an integrated part of development.

This objective has required the research to consider the wide range of investors contributing to economic development and growth, many of whom will be working towards overarching aims and objectives as outlined in the RES but who may also have individual organisational objectives which do not necessarily demonstrate direct connectivity with the RES. This is particularly true of the private sector but also for those organisations whose aims are not specifically oriented towards economic growth, yet whose activities and investments can be shown to have an impact through the utilisation of one or more of the Key Tests outlined here.

As a consequence, this report has developed a wide range of Key Tests which encompass the wide range of priorities, aims and objectives of those whose activities, directly or indirectly, impact upon the economic fortunes of the North West. It is hoped that this will allow stakeholders to 'pick and mix' those most appropriate to their investment plans and organisational aims and objectives.

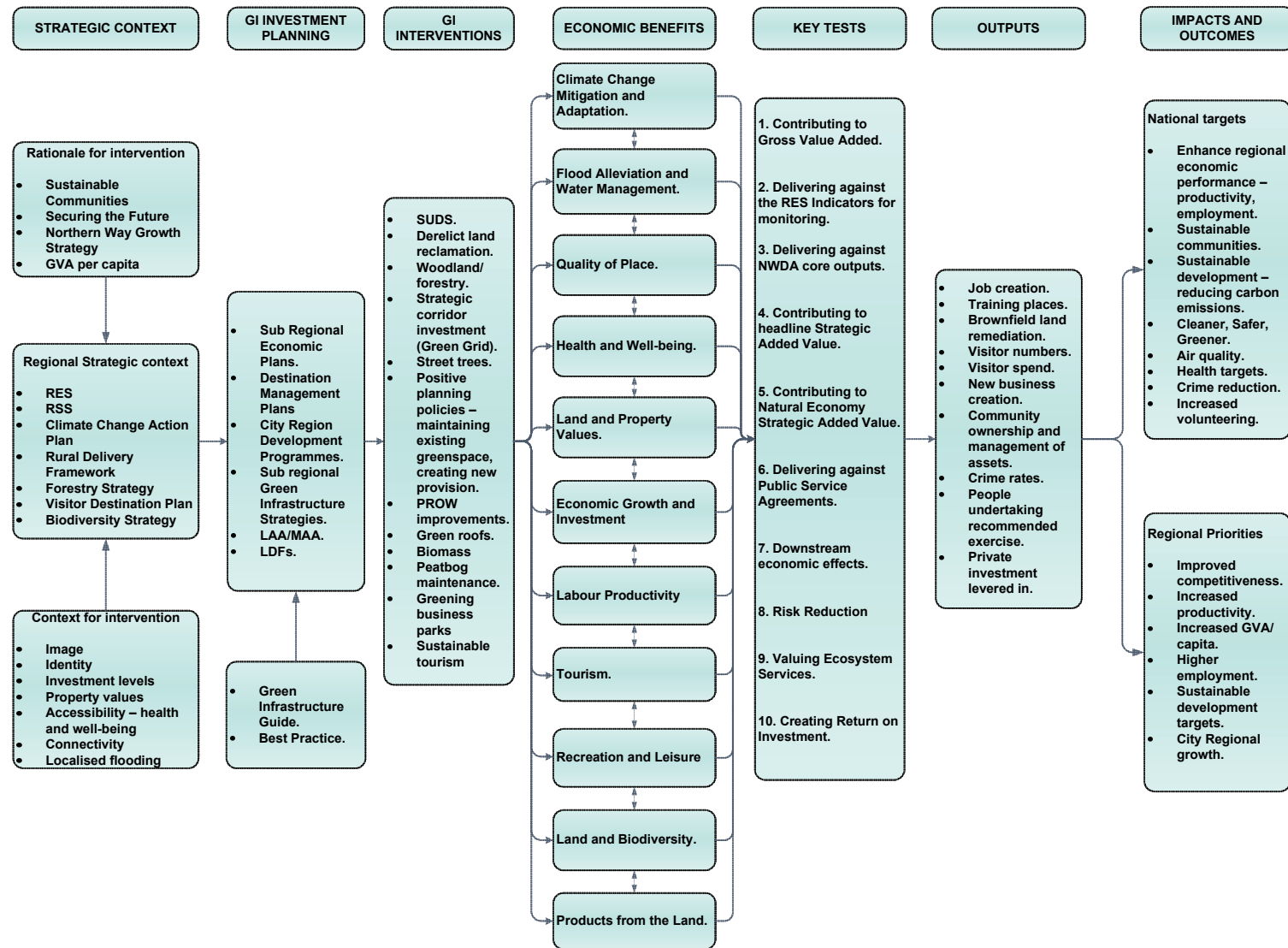
So, while it is argued in this report that there is no one overarching tool that can be used to calculate economic benefit in its totality for any individual or set of Green Infrastructure investment, there are a set of Key Tests which can provide a comprehensive and conclusive assessment of those benefits. These Key Tests can be used individually or, potentially, within the framework of a Multi Criteria Analysis, as illustrated in Figure 2.1 previously. Broadly, the Tests are ordered to flow out and down from GVA per capita as the anticipated key test for all Regional economic activity, through a set of further public sector tests, through to the private sector. The tests identified and described in this report are:

- Contributing to Gross Value Added (GVA).
- Delivery against RES indicators.
- Delivery against core NWDA outputs.
- Contributing to headline Strategic Added Value (SAV).
- Contributing to Natural Economy Strategic Added Value (NE-SAV).
- Delivering downstream economic outputs.
- Reducing risk.

- Delivering against Public Service Agreements (PSAs).
- Valuing Ecosystem Services.
- Creating return on investment (ROI).

Figure 2.2 overleaf illustrates the menu of Key Test within its wider contextual framework, showing a logic chain of progression from the rationale and context for investment through to national and Regional outcomes:

Figure 2.2: Green Infrastructure investment and the Key Tests



3.0 The Key Tests

The following set or menu of Key Tests are designed to be taken and used by partners in different circumstances, grouped or individually, according to what is required in terms of evidencing impact. They are primarily aimed at the public sector, although clearly Key Test 10 (Creating a Return on Investment) is aimed at drawing in the contribution of the private sector.

3.1 Key Test 1: Contributing to Gross Value Added (GVA)

The NWDA, like all RDAs, is developing its response to the Treasury's Sub National Review. In the draft Corporate Plan for the period 2008-2011⁸ the NWDA outline the five indicators against which progress in the Region will be measured during this period – Productivity, Employment, Skills, Innovation and Enterprise. In addition and overarching all of these, there is an assumption at the time of writing this report that the key measure will be GVA per head (capita).

GVA is essentially a measure of the output of the economy and can be defined simply as representing income generated by economic activity. It measures the contribution to the economy of each individual producer, industry or sector. GVA can be said to be comprised of:

- compensation of employees (wages and salaries, national insurance contributions, pension contributions, redundancy payments etc); plus
- 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, investments in Green Infrastructure at a Regional level include all investment in conservation, agriculture, forestry and non food land based products - and their associated outputs. The Environmental Economy Report for the North West (2006) quotes a figure of £2.6bn GVA - albeit in relation to a set of activities which, while broadly analogous to Green Infrastructure, are not as extensive (for example, in excluding land based products). Total GVA for the North West Region for 2006 was £111.2bn (National Statistics, 2008), which means that the environmental economy alone produced 2.3% of Regional GVA.

⁸ Draft Corporate Plan 2008-2011, NWDA (December 2007)

However, five key points should be noted when considering the contribution of Green Infrastructure to GVA:

- GVA is only concerned with the value of what is produced rather than that invested. So, the significant investments which are made in the Green Infrastructure of the Region, for example, from public sector agencies such as Natural England, the Environment Agency and the Forestry Commission, are not accounted for under GVA.
- GVA is a very limited measure of economic well-being. Despite Treasury Green Book assertions about the value of non market transactions, these are difficult if not impossible presently to incorporate into basic GVA calculations.
- Direct effects resulting from Green Infrastructure, for example in relation to the sale of forestry products or employment in conservation and land management, are readily dealt with within GVA assessments, however they are likely to be minor at a Regional level compared to 'mainstream' economic activity.
- GVA cannot attribute the 'downstream' economic outcomes related to Green Infrastructure investments, even where outputs and outcomes are affected by that investment.
- Finally, employment in Green Infrastructure related activity is often associated with low wages (for example, farming and tourism), which can have the adverse affect of driving down GVA per capita.

The view of this report is that whilst GVA per capita should be a legitimate test that is applied to Green Infrastructure activity at a Regional or sub Regional scale, it is currently too crude to properly account for the impact made and may only develop as a relevant test if the full range of non market goods and services produced are accounted for, utilising the approaches under development by Defra presently (see 3.9), alongside a more proper and full accreditation of the value that Green Infrastructure provides to the Regional economy through creating the setting for investment, contributing to the positive image of the Region, addressing climate change etc. In other words, taking full account of the eleven key economic benefits referred to earlier and the subject of the companion report from NENW.

3.2 Key Test 2: Delivering against RES Indicators for Monitoring

The RES⁹ describes a set of Indicators for Monitoring 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

⁹ Northwest Regional Economic Strategy 2006, NWDA (2006)

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.

As the RES is the key strategy for the Region in delivering economic improvement, this test should be applied by every organisation developing a Green Infrastructure project or programme in the North West.

Table 3.1: Delivering against RES Indicators

Indicator (grouped)	How does Green Infrastructure deliver against key indicators?	Outputs provided by intervention?
Employment		
Full time/part time jobs created. Male/female jobs created. Employment rates. Employment rates for disadvantaged groups.	Improving the tourism, recreation and leisure offer. Creating the setting for inward investment. Increased employment in land management and biodiversity. Providing opportunities for Land Based Industry.	?
Health and well-being		
Incapacity benefit claimants as a % of working age population. Sickness and absence from work (hours lost).	Improving fitness levels through access to greenspace. Reducing stress levels. Improving air quality.	?
Business activity		
VAT registrations and deregistrations. Stock of VAT registered companies. Foreign Direct Investment. Perceptions of the Region as a place to do business.	Creating the setting for investment. Improving the tourism, recreation and leisure offer. Improving Land Management and Biodiversity. Providing opportunities for Land Based Industry.	?

Indicator (grouped)	How does Green Infrastructure deliver against key indicators?	Outputs provided by intervention?
Energy and climate change		
Energy consumption. CO2 emissions. % energy use from renewables.	Adapting to and mitigating the effects of climate change through: - Flood alleviation: new and maintained greenspace, SUDS, greening of urban landscapes. - Providing opportunities for agriculture: opportunities for biofuel and biomass production and resources for renewable energy. - Carbon capture and storage.	?
Brownfield land		
(Reuse of) Previously developed land.	Flood alleviation and water management. Enhancing quality of place. Creating the setting for inward investment. Improving the tourism, recreation and leisure offer. Carbon capture and storage.	?
Quality of life		
Crime rates. Perception of the Northwest as a place to live.	Enhancing quality of place. Flood alleviation and water management.	?
Visitor economy		
International and domestic visitors. Tourism expenditure.	Improving the tourism, recreation and leisure offer. Enhancing quality of place.	?

3.3 Key Test 3: Delivering NWDA core outputs

The NWDA's Corporate Plan¹⁰ includes a parallel set of output indicators to those set out in the RES. As with Key Test 1, it is a straightforward process to identify where Green Infrastructure can deliver core outputs, for example in relation to the remediation of brownfield land. These are illustrated in table 3.2.

This Key Test is primarily aimed at allowing the NWDA to assess its own performance but clearly is a useful Test that can be applied by organisations seeking the support of the NWDA. Only those Output Indicators which are relevant to Green Infrastructure are shown.

Table 3.2: Delivering the NWDA Corporate Plan 2005-2008

Output Indicator	How does Green Infrastructure contribute to producing core outputs?	Outputs provided by intervention?
1. Jobs created and safeguarded.	Green Infrastructure provides a growing market place for new economic activity, from growing biofuels through to natural tourism and the visitor economy.	?
3. Businesses created.	The specific economic benefits that Green Infrastructure provides in relation to NWDA output indicators are in relation to: - Improving the tourism, recreation and leisure offer, particularly in relation to natural tourism.	
4. Businesses assisted.	- Increasing employment through land management and biodiversity.	
5. Investment levered (£).	- Providing opportunities for Land Based Industry, such as biofuel and biomass production. - Creating the setting for investment, attracting new higher value business.	
5a % of private investment levered.	- Flood alleviation and water management, averting blight and dereliction and encouraging new investment. - Increasing land and property values, attracting higher value business and investment.	
5b Brownfield remediated (Ha).	- Enhancing quality of place, providing a better image of the Region and attracting and retaining investors and skilled workers.	

¹⁰ Corporate Plan 2005 - 2008, NWDA (2005)

3.4 Key Test 4: Contributing to Headline SAV

Strategic Added Value (SAV) can be defined as the impact that an RDA or partner activity has on the Region beyond that which is immediately measurable through outputs. This can include changes directly or indirectly caused as a consequence of non delivery programme activities, which create a resultant change in the behaviour of industry, communities or partners.

Alongside the tasking framework, the Department for Business Enterprise & Regulatory Reform (BERR - formerly the DTi) stipulates that the RDA's role in influencing or acting as an agent for change should be captured as a performance measure. SAV on the macro level measures the impact that the RDA's interventions have had on the Regional economy, but, at a micro level, it measures value for money (of projects and activities) and influencing effects.

The headline measures of SAV adopted and utilised by the NWDA are outlined in table 3.3 below, alongside its relevance to Green Infrastructure investments and how SAV can be measured:

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

- 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, as illustrated in table 3.3 below:

Table 3.3: Delivering Strategic Added Value

Strategic Added Value	Types of SAV	How does Green Infrastructure contribute to SAV?	Possible Evaluation Measures	Project outcomes?
Strategic / Catalytic Activity Increased profile of the Region, leading to increased confidence and investment in activities that have	Leverage.	Enhancing quality of place.	Area based evaluation.	?
	Increased Regional profile.	Increasing land and property values.	Impact assessment/ stakeholder feedback.	
	Investment/ buy in from other partners.	Flood alleviation and water management.	Impact assessment/ stakeholder feedback/ customer	
	Future projects /	Adapting to and		

Strategic Added Value	Types of SAV	How does Green Infrastructure contribute to SAV?	Possible Evaluation Measures	Project outcomes?
<p>a ripple or multiplier effect on the economy in support of targeted strategic objectives.</p>	<p>investment arising from raised profile.</p> <p>Future projects/ investment arising from increased confidence.</p> <p>Profile raising; investment arising from increased confidence.</p> <p>Stronger profile leading to increased awareness of the Region.</p>	<p>mitigating the effects of climate change.</p> <p>Creating the setting for inward investment.</p>	<p>survey.</p> <p>Media review/ impact assessment/ stakeholder feedback.</p> <p>Project monitoring against key criteria – leverage, new partners.</p>	
<p>Increasing Co-ordination, Alignment, and Partnership</p> <p>Create awareness and interest for Regional partners and stakeholders to either work together where they previously may not have done or to work together in a more effective way that builds capacity.</p>	<p>Joined up approach maximising resources.</p> <p>Generates networks and learning; builds capacity.</p> <p>Better liaison engagement with Higher Education.</p>	<p>Adapting to and mitigating the effects of climate change.</p> <p>Flood alleviation and water management.</p> <p>Improving health and well being.</p> <p>Increasing land and property values.</p> <p>Enhancing quality of place.</p>	<p>Project monitoring against key criteria:</p> <ul style="list-style-type: none"> - Leverage from all sources. - Involving the private and 3rd sectors. - New networks, partnerships and alliances. 	<p>?</p>
<p>Improving Intelligence, Influencing, and Awareness Raising</p> <p>Provide an evidence base or lead to increased knowledge and awareness and stimulating action.</p>	<p>Improved knowledge in particular areas.</p> <p>Improving awareness of particular areas.</p>	<p>Flood alleviation and water management.</p> <p>Adapting to and mitigating the effects of climate change.</p> <p>Improving health and well being.</p> <p>Enhancing quality of place.</p>	<p>Number of community meeting/events held and numbers attended.</p> <p>Action research.</p> <p>Websites /dissemination events.</p>	<p>?</p>

3.5 Key Test 5: Contributing to Natural Economy 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.

Again, as an internal measure primarily, this key Test is designed for the NWDA to consider in relation to its investment strategies but will be useful for other project partners to consider in developing Green Infrastructure interventions. Table 3.4 illustrates the Key Test as described:

Table 3.4: Delivering Natural Economy Strategic Added Value

SAV for Natural Economy investments	How does Green Infrastructure contribute to SAV?	Possible evaluation measures	Project outcomes?
Perception Changes	Increasing land and property values. Enhancing quality of place. Flood alleviation and water management. Creating the setting for inward investment. Improving the tourism, recreation and leisure offer.	Visitor surveys/inward investor surveys. Stakeholder feedback/customer survey. Media review. Key business surveys.	?
Lifestyle Changes	Improving the tourism, recreation and leisure offer.	Quality of life surveys. NHS data and	

SAV for Natural Economy investments	How does Green Infrastructure contribute to SAV?	Possible evaluation measures	Project outcomes?
	<p>Improving health and well being.</p> <p>Adapting to and mitigating climate change.</p> <p>Flood alleviation and water management.</p> <p>Enhancing quality of place.</p>	<p>surveys.</p> <p>Surveys of recreational habits and greenspace use.</p>	<p>?</p>
Downstream Economic Effects	<p>Increasing land and property values.</p> <p>Increasing the opportunities for food and non food production.</p> <p>Flood alleviation and water management.</p> <p>Increased employment in land management and biodiversity.</p> <p>Creating the setting for investment.</p> <p>Improving the tourism, recreation and leisure offer.</p>	<p>Economic Impact Assessments.</p> <p>Inward investment monitoring.</p> <p>University graduate destination data.</p> <p>Customer surveys.</p> <p>Tourism operator surveys.</p> <p>Visitor numbers to NPs/AONBs.</p> <p>NHS expenditure on associated illness.</p>	<p>?</p>
Well-being and Security	<p>Improving health and well being.</p> <p>Adapting to and mitigating the effects of climate change.</p> <p>Flood alleviation and water management.</p> <p>Enhancing quality of place.</p> <p>Increasing land and property values.</p>	<p>NHS data.</p> <p>Community surveys.</p> <p>Numbers of community groups and activists.</p> <p>Police data on anti social behaviour.</p> <p>PBRS data on relationship between deprived wards and greenspace quantity.</p>	<p>?</p>

Source: NWDA SPAG Apr 2006

3.6 Key Test 6: Delivering against Public Service Agreements

Government has produced a revised set of 30 new PSAs (2007)¹¹ 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 too can it be related to progress against PSA targets and demonstrate a relationship to the Delivery Strategy.

The utility of this Key Test is primarily in its application by sub Regional and Regional partnerships seeking to illustrate the wider contribution that a set of Green Infrastructure activities will make towards government policy objectives. Table 3.5 illustrates:

Table 3.5: Delivering PSAs

PSA	Measurement (indicators)	How does Green Infrastructure contribute?	Outputs /outcomes?
PSA7: Improve the economic performance of all Regions and reduce the gap in economic growth rates between Regions	<p>Regional GVA per head growth rates.</p> <p>Regional GDP per head levels indexed to EU15 average.</p> <p>Regional productivity as measured by GVA per hour worked indices.</p> <p>Regional employment rates.</p>	<p>Increasing land and property values.</p> <p>Increasing the opportunities for products from the land.</p> <p>Flood alleviation and water management.</p> <p>Adapting to and mitigating the effects of climate change.</p>	?

¹¹ http://www.hm-treasury.gov.uk/pbr_csr/psa/pbr_csr07_psaindex.cfm

PSA	Measurement (indicators)	How does Green Infrastructure contribute?	Outputs /outcomes?
		<p>Improving health and well being.</p> <p>Increased employment in land management and biodiversity.</p> <p>Creating the setting for inward investment.</p> <p>Improving the tourism, recreation and leisure offer.</p> <p>Enhancing quality of place.</p>	
➤Delivery Strategy.	<p>CLG will develop a framework for regeneration, providing a clearer link between neighbourhood renewal and wider regeneration and economic interventions.</p> <p>Defra will work with Regions to explore and value its own natural advantages, including market opportunities for Regional environmental goods and services....maximising economic benefits from conserved areas of special environmental interest.</p>		
PSA12: Improve the health and wellbeing of children and young people	Levels of childhood obesity.	<p>Adapting to and mitigating the effects of climate change.</p> <p>Improving health and well being.</p> <p>Increasing the opportunities for products from the land.</p> <p>Improving the tourism, recreation and leisure offer.</p>	?
➤Delivery Strategy.	Schools to encourage healthy eating, promote healthy and sustainable transport through initiatives such as bikeability and walking bus.		
PSA18. Promote better health and wellbeing for all	<p>All age all cause mortality (AAACM) rate.</p> <p>Difference in AAACM between England average and spearhead areas¹².</p>	<p>Adapting to and mitigating the effects of climate change.</p> <p>Improving health and well being.</p> <p>Improving the tourism, recreation and leisure offer.</p> <p>Enhancing quality of place.</p>	?

¹² The 20% of areas with the worst health and deprivation indicators

PSA	Measurement (indicators)	How does Green Infrastructure contribute?	Outputs /outcomes?
➤Delivery Strategy	DoH furthering work on risk management across the range of cardio vascular diseases. CLG actions through the National Strategy for Neighbourhood Renewal (NSNR).		
PSA21. Build more cohesive, empowered and active communities	<p>The % of people who have meaningful interactions with people from different backgrounds.</p> <p>The % of people who feel that they belong to their neighbourhood.</p> <p>The % of people who feel they can influence decisions in their locality.</p> <p>A thriving 3rd sector.</p> <p>The % of people who participate in culture or sport.</p>	Enhancing quality of place.	?
➤Delivery Strategy	<p>CLG role in housing development design to promote cohesion and tenant and neighbourhood management of assets</p> <p>Office of the Third Sector to invest in 'v' the youth volunteering charity and support new volunteering for all programme.</p> <p>DCMS investing in sports opportunities and infrastructure.</p> <p>Defra promotion of environmental sustainability best practice resulting from Climate Challenge Fund, Environmental Action Fund and Every Action Counts.</p>		
PSA27. Lead the global effort to avoid dangerous climate change	<p>Global CO2 emissions to 2050.</p> <p>Proportion of areas with sustainable abstraction of water.</p> <p>Total UK greenhouse gas and CO2 emissions.</p> <p>Greenhouse gas and CO2 intensity and the UK economy.</p>	<p>Adapting to and mitigating the effects of climate change.</p> <p>Flood alleviation and water management.</p>	?
➤Delivery Strategy	Defra lead on domestic adaptation measures.		

PSA	Measurement (indicators)	How does Green Infrastructure contribute?	Outputs /outcomes?
	<p>BERR key role in mitigation measures.</p> <p>CLG role regarding spatial planning, location/design of new development</p>		
PSA28. Secure a healthy natural environment for today and the future	<p>Water quality as measured by parameters assessed by Environment Agency river water quality monitoring programmes.</p> <p>Biodiversity as indicated by changes in wild breeding bird populations in England as a proxy for the health of wider biodiversity.</p> <p>Air quality – meeting the Air Quality Strategy objectives for eight air pollutants.</p> <p>Land management – the contribution of agricultural land management to the natural environment as measured by the positive and negative impacts of farming.</p>	<p>Improving health and well being.</p> <p>Flood alleviation and water management.</p> <p>Adapting to and mitigating the effects of climate change.</p> <p>Increasing the opportunities for products from the land.</p> <p>Improving the tourism, recreation and leisure offer.</p>	?
➤ Delivery Strategy	<p>Defra have the key role in taking forward UK Air Quality Strategy, development of the new Water Strategy and making Space for Water flood and erosion strategy. Site and biodiversity protection/enhancement under the England Biodiversity Strategy.</p> <p>SFFS polices driven forward by Defra, including stewardship, environmental protection regulation, Whole Farm Approach.</p> <p>Defra development of valuing ecosystems approach.</p> <p>CLG work closely with Defra on implementation of Growth Points and lead on delivery of urban parks and green space – and develop a green space action plan.</p>		

3.7 Key Test 7: Downstream economic effects

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 for investment', 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).

The downstream effects of Green Infrastructure investment identified are illustrated below in table 3.6 and are applicable to any project or activity where clear and specific parameters are known, for example location, scale of proposed investment, type of intervention:

Table 3.6: Delivering downstream economic effects

Benefit arising from Green Infrastructure	Downstream effects	Output value – based on researched/case study evidence.
Climate change adaptation and mitigation	Reduction in energy costs for business.	?
	Carbon levy reduction.	?
Flood alleviation and water management	Increased land and property values.	?
	Increased economic activity.	?
Enhanced Quality of place	Increased land and property values.	?
Improved Health and well being	More productive workforce.	?
Increased Land and property values	Higher rateable values of business.	?

Creating the setting for inward investment	Increased land and property values.	?
	Higher skilled workers attracted and retained.	?
	New higher value business attracted and retained.	?
	Induced spend from new employment.	?
Enhanced Tourism, recreation and leisure	Employment in conservation, maintenance and management.	?
	Additional tourist and leisure spend.	?
Improved Land management and biodiversity	Increased value of natural tourism and niche markets.	?
Opportunities for Land Based Industry	New business creation and diversification.	?

For the purposes of this Key Test it is sufficient to undertake analysis that puts values to the downstream effects identified above. However, it may be useful in due course to develop this further in the form of an economic multiplier which can be used alongside the direct effects of the initial investment to produce a comparative assessment of impact as expressed below:

$$\text{Economic multiplier} = \frac{(\text{Direct} + \text{Indirect} + \text{Induced Effects})}{\text{Direct Effects}}$$

3.8 Key Test 8: Risk Reduction

Green Infrastructure investments can produce positive economic outcomes which are, in essence, concerned with reducing and/or managing risk in the Regional economy, in particular those which are concerned with the outcomes of changing climate. This is also at times referred to as 'economic security'. However, Green Infrastructure also has benefits relating to healthier lifestyles and a cleaner environment. The risks that may be reduced via strategic Green Infrastructure investment can be defined as:

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

The Key Test which can 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).

The Risk Reduction Key Test will be of primary utility to those involved in the forward planning of the Region's economic infrastructure and is illustrated in table 3.7 below:

Table 3.7: Risk reduction

Area of risk	How does Green Infrastructure contribute to risk reduction and management?	Projected Outcomes of the intervention	Costs/values associated with risk reduction?
Flooding – impact upon business	Flood alleviation and water management. Adapting to and mitigating the effects of climate change.	Number of business premises protected. Transport infrastructure maintained. Agricultural production protected. Reduced insurance premiums. Reduced clean up costs.	?
Flooding – impact upon homes and	Flood alleviation and water management. Adapting to and mitigating the effects of	Homes and property protected.	

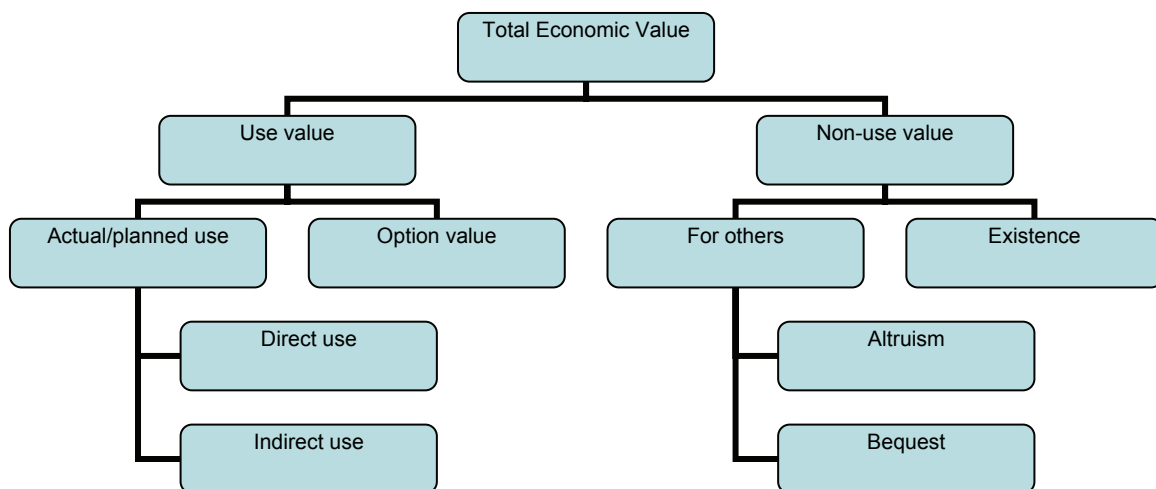
Area of risk	How does Green Infrastructure contribute to risk reduction and management?	Projected Outcomes of the intervention	Costs/values associated with risk reduction?
communities	climate change.	Reduced insurance premiums. Reduced clean up costs.	?
Poor health	Adapting to and mitigating the effects of climate change. Improving health and well being.	Improved air quality. Improved opportunities for outdoor sport and recreation.	?
Urban heat islands	Adapting and mitigating the effects of climate change.	Improved air conditioning for urban centres - reduced costs to business. Urban 'liveability'.	?
Image related blight	Flood alleviation and water management. Adapting to and mitigating the effects of climate change. Creating the setting for investment. Enhancing quality of place.	Brownfield and derelict land reused for new greenspace. Reduced noise levels. Improved air quality. Greener cities – more economic activity.	?
Business competitiveness and security	Flood alleviation and water management. Adapting to and mitigating the effects of climate change. Creating the setting for investment. Enhancing quality of place.	New investment and entrepreneurs attracted. Skilled workforce attracted and retained. Higher quality business	?

Area of risk	How does Green Infrastructure contribute to risk reduction and management?	Projected Outcomes of the intervention	Costs/values associated with risk reduction?
		environments attracting higher value industry.	
Carbon tax/related pricing	Adapting to and mitigating the effects of climate change.	New opportunities for carbon sequestration. New opportunities for low carbon energy production.	?

3.9 Key Test 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 and is summarised in figure 3.1 below:

Figure 3.1: Defra Total Economic Value Framework



The utility of the Defra work will be realised in due course and will, if accepted, be of utility in application across a range of the Key Test proposed in this report, including those applying to GVA, Downstream Effects and Delivering PSAs.

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.

NENW has funded a feasibility study by the Universities of Salford and Manchester into the application of CITYgreen. This indicated that it is feasible but expensive to customise this to UK circumstances. A small working group is currently talking to Defra about how to take this forward nationally.

- **Economic Value Assessment**

For example, variations on the model proposed in the report to NWDA/RENEW entitled 'Economic value of urban design'¹³ 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.

¹³ Economic value of urban design final report, AMION consulting and Taylor Young (May 2007)

- ▶ Image and external perception.

Further work is currently being undertaken by AMION Consulting and the NWDA which builds upon this report and considers the economic effects of Regional Parks and methodologies in relation to Green Infrastructure valuation. The results of this research will again be of utility in driving forward the debate and all these methodologies may provide valuable means of implementation for the Key Tests described in this report.

3.10 Key Test 10: Creating Return on Investment

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:

- 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.

A private enterprise is able to assess the potential value of any investment by the utilisation of a simple model used to calculate Return on Investment (ROI), providing an immediate predicted value based upon the inputs (investment) and outputs (profits). So, 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.

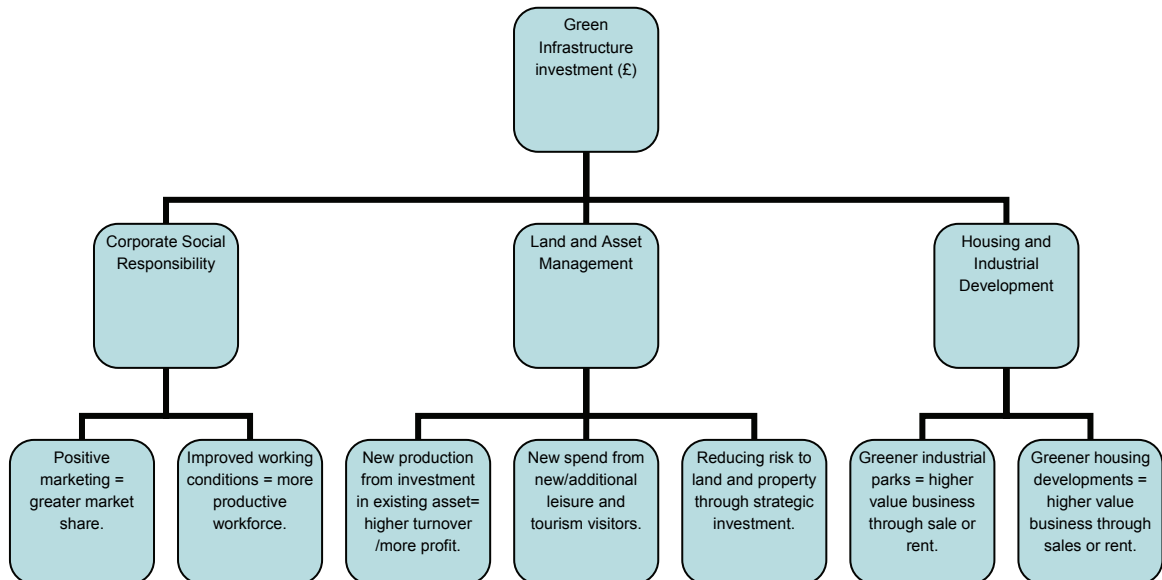
In mathematical terms, calculating ROI can be simply expressed as:

$$\text{ROI} = \frac{V_f - V_i}{V_i}$$

(Where V_i is the initial investment value and V_f is the final investment value)

Figure 3.2 below illustrates how ROI for a Green Infrastructure investment can be considered by a private business or investor in their business planning process:

Figure 3.2: Return on Investment



3.11 In summary

The Key Tests presented here are clearly ones which require further development and evolution, both in terms of practical guidance for their application and in relation to where and how they might be best applied.

However, at this stage and for the purposes of this document, they are presented as a set for discussion, debate and to provide a comprehensive menu to select from according to circumstances. The work of Defra will be vital in informing the test on ecosystem services in due course and further guidance too is required (from the NWDA) to enable a full assessment to be made against the GVA per capita test.

4.0 Recommendations

This report and its companion, "The Economic Benefits of Green Infrastructure: the public and business case for investing in Green Infrastructure and a review of the underpinning evidence"(NENW, 2008) have set out a rationale for investment in Green Infrastructure, accompanied by a set of evidence in relation to economic value and a set of Key Tests which may be adopted by partners and stakeholders in the Region as a means of justifying investment, be that from private or public sources.

It is hoped that in undertaking this work, a framework has been set out which will be significantly added to by Defra's currently on-going work on valuing ecosystem services. It is the hope that this work will allow the key gap to be filled in relation to Treasury Green Book advice on valuing non market goods and that this will go some way to persuading public investors in particular that Green Infrastructure does produce a much higher value of economic outputs than can currently be attributed through standard mechanisms.

Looking to the future too, it is a key recommendation of this report that if GVA per capita is adopted as the single measure of a Region's economic performance, then Green Infrastructure investors must be able to bring into this equation the full value of the outcomes of their investment through attributing value to market and non market goods, and that the critical role of Green Infrastructure in relation to the eleven key economic benefits identified in this work is properly factored into this and other calculations relating to Value Added. The implementation of the government's Sub National Review through the development of the Single Regional Strategy provides an opportunity to take the economic benefits of Green Infrastructure more fully into account, not only in strategy development but also in economic plans and project level evaluation.

However, with respect to this report and the immediate future, it is recommended that the Key Tests outlined here are developed further within this menu approach, whereby investors are able to select Tests most applicable to their circumstances and utilise this in the most productive way to demonstrate the value of the proposed investment. We anticipate this approach will, if properly monitored, enable an increasingly utilitarian approach to valuing Green Infrastructure to be adopted across the Region, recognising the wide variety of assets and types of investment which comprise our Region's Green Infrastructure, from the Regionally significant strategic assets and investments through to the very local, neighbourhood scale.

It is our conclusion that there is not a 'one size fits all' approach to Green Infrastructure in terms of valuation but that there is a framework within which all values can be incorporated and that cumulatively, these provide a huge benefit to the Region, summarised here in

terms of the eleven economic benefits, and underpinned by the full range of services that ecosystems provide to human activity. For the North West to meet its aspirations for growth and sustainability, it is vital that the real benefits of its Green Infrastructure assets are more properly accounted for and, where there is the opportunity to do so, new investment – public and private – is enabled, encouraged and realised.