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Natural Economy Northwest

A Guide to Planning Green Infrastructure at the Sub-Regional level

Draft

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1.0 Introduction

The term 'infrastructure' is a generally accepted definition used to describe the basic physical and organisational structures that are needed for the operation and organisation of society. The term is, for example, often applied to buildings, roads, utilities and the like. By way of contrast, our environmental assets and systems are frequently viewed in a more fragmented way – often as individual, possibly isolated, elements of green space within the larger landscape. However, it is becoming more obvious that such a view does not provide a sound basis for fully understanding the vital contribution that the environment makes to society as a whole – particularly with regard to the need to operate within the limits of sustainable development. To rectify this problem the use of the term green infrastructure is being increasingly adopted. This views green infrastructure as a mosaic of green spaces, blue spaces and urban trees that are distributed within and around other forms of physical 'grey' infrastructure. The green infrastructure can then be viewed as a large complex system that functions on many levels and delivers a wide range of critical social and economic benefits in addition to the more obvious environmental ones. Such an approach allows green infrastructure to be analysed, evaluated, planned, enhanced and created in an integrated manner.

Within certain common parameters of understanding there are many definitions of green infrastructure but one that is commonly used in the North West, and which now appears in the North West of England Plan – Regional Spatial Strategy to 2021 (GONW, 2008), is as follows:

“Green Infrastructure is the Region’s life support system – the network of natural environmental components and green and blue spaces that lies within and between the Northwest’s cities, towns and villages and which provides multiple social, economic and environmental benefits”

The North West region has made a valuable contribution to the rapidly developing concept of green infrastructure and a guide published by the North West Green Infrastructure Think Tank (GriTT) is available for downloading on the Green Infrastructure North West website: (<http://www.greeninfrastructurenw.co.uk/resources/GIguide.pdf>).

This guide to planning green infrastructure at the sub-regional scale has been commissioned by the Natural Economy Northwest (NENW) programme as a supplement to the NW Green Infrastructure Guide

1.1 Why is green infrastructure planning important?

Like all forms of infrastructure, green infrastructure must be properly planned and coordinated if it is to function efficiently and deliver optimal benefits to society. This can happen at a range of levels from the macro to the micro. At the national level, a growing awareness of the need to plan for the growing effects of climate change is driving the development of Government policy and this is finding an expression in recent publications by DEFRA (DEFRA, 2007 a,b,c) relating to water management issues, biodiversity duties and so on. These national policies and drivers now invariably place duties on sub-regional and local bodies. In many cases such duties can be most effectively satisfied by recognising the role that green infrastructure can play and by fully integrating it in policies plans and strategies. The Natural Economy Northwest (NENW) report *'Developing an outline strategy for linking grey and green infrastructure'* (NENW, 2008) provides a detailed overview of policy influences on the development and delivery of both grey and green infrastructure.

So, at the sub-regional level there is a clear need to fully integrate green infrastructure with sub-regional action plans (SRAPs) and other regional and sub-regional policies and strategies. Economic and social planning at the sub-regional level will almost certainly require the support of green infrastructure in some form or other. For example, the housing growth points and growth point partnership areas distributed throughout the five sub-regions will, under guidance from the Government (CLG, 2008), be obliged to

provide a statement on the delivery of green infrastructure to support new development. Similarly green infrastructure is often a key component in the delivery of a tourism and rural industry and most sub-regional economic partnerships now understand that attracting and retaining businesses is contingent on creating a setting for investment. Such aims are highly dependant on the presence of high quality, well-maintained green infrastructure.

1.2 Purpose & scope of this Guide

The region has already commenced planning green infrastructure at a sub-regional scale with development now at various stages in Lancashire, Greater Manchester, Merseyside and Cheshire. These early initiatives have produced valuable insights and lessons that could usefully inform the future development of sub-regional planning. A review of the early sub-regional green infrastructure planning has been incorporated into this guidance document.

One particular way of considering green infrastructure is as a large, complex system that is subject to feedback. This means that while each cause and effect is theoretically deterministic and therefore predictable, the size of the complexity makes it practically impossible to predict in detail what is going to happen. Although this sometimes makes it difficult to fully understand and plan green infrastructure, provided that enough is understood it is still possible to realise the benefits - and occasionally unexpected consequences can be beneficial also.

The current version of the North West Green Infrastructure Guide (NW GI Guide) is a first iteration and it has always been understood that the rapid rate of developing ideas, methodologies and so on would require the resource to be updated and added to from time to time. This Guide to Sub-regional Planning of Green Infrastructure is therefore intended to sit alongside the NW GI Guide and to build on and extend the current guidance.

Other than for a brief overview of green infrastructure that provides contextual information for those who do not require an in-depth knowledge, this guide does not aim to replicate the details to be found in the NW GI Guide since that document already provides an in-depth description of green infrastructure, its component parts, how it works, how it can be spatially represented and the steps required in sound green infrastructure planning. Similarly, the way in which green infrastructure delivers an array of economic benefits, the relationship between green infrastructure and grey infrastructure and the role that green infrastructure can play in supporting the region's Climate Change Action Programme are covered in recent reports that are referenced in the main body of this Guide.

1.3 Dealing with a developing methodology

Green infrastructure is a relatively new and rapidly developing idea. Much innovative development is taking place simultaneously on issues ranging from mapping to evaluation. Sub-regional planning forms but one strand of this current work.

The highly interactive nature of all this work means that the process of planning green infrastructure at a sub-regional level is developing against a background of increasing knowledge and expertise. This necessarily results in a process of constant upgrading, re-evaluation and modification and for this reason the guide is being developed over an extended period of time and will be made available as a series of 'work in progress' type versions. Work on the first round of sub-regional planning will extend well into 2010 and will no doubt add to, and modify some of the existing ideas and methods developed so far.

This version of the guide should therefore be viewed as reflecting development to date rather than as a final definitive statement relating to the planning of green infrastructure.

The NENW programme will be completed by the end of 2010. After that date the task of collecting and collating further information and publishing future drafts of this sub-regional guidance will be undertaken by the Northwest Green Infrastructure Unit. Further details can be found at: <http://www.ginw.org.uk/html/index.php>

2.0 An overview of Green Infrastructure

The NW GI Guide provides a detailed explanation of what green infrastructure is, how it works, and how it could be planned. However, for the benefit of those readers who do not feel it necessary to acquire such a detailed understanding, the following section provides a brief overview of a number of key generic issues relating to green infrastructure.

2.1 A holistic approach:

An inclusive and integrated view of green infrastructure – such as the one recommended in the NW GI Guide would include the following:

Urban & rural: Green infrastructure is not just a rural issue. It extends throughout both rural and urban locations. Clearly, green spaces in urban areas have the potential to benefit the greater proportion of the population, since most people live and work in and around towns.

Existing & new: Sub-regions will have a substantial amount of existing green infrastructure, which should be recognised, protected and enhanced. There is also scope for adding to this through the planning of new green infrastructure in order to improve connectivity and achieve greater integration of greenspace with new development.

Public & private: Land in both public and private ownership should be considered, since public access to the land is not essential in order to deliver all aspects of potential public benefit.

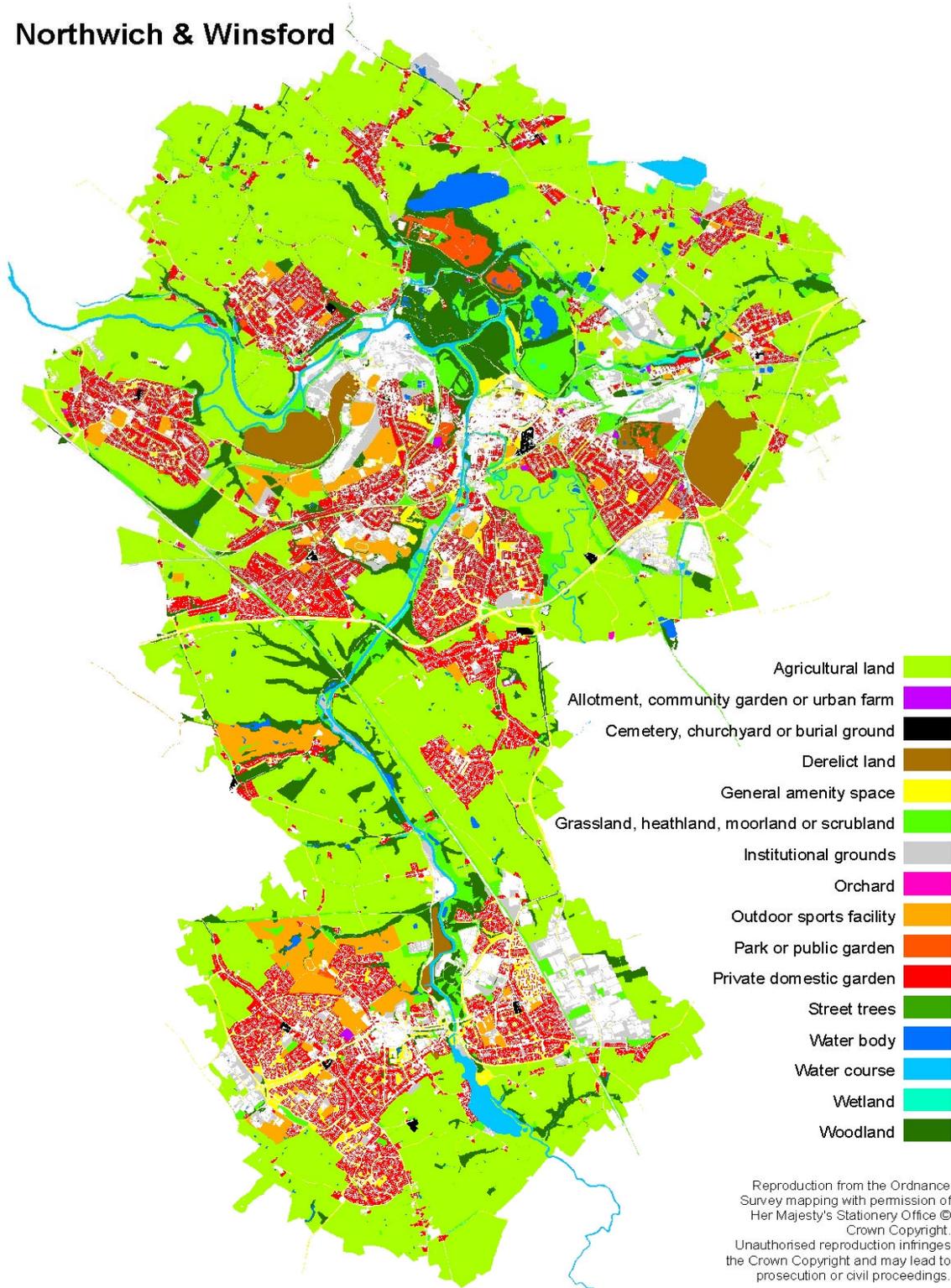
Permanent & temporary: Land use is dynamic and green infrastructure does not have to be permanent in order to deliver benefits. Changes to the urban form, for example, the kind of physical restructuring afforded by the Housing Market Renewal Pathfinder areas, throws up opportunities for temporary greening which can make a valuable contribution.

Connectivity: The way in which green infrastructure can be viewed as a mosaic of physically linked spaces operating as a large, complex system is illustrated by diagram 1. The map, included at diagram 1 (courtesy of the Weaver Valley Regional Park), indicates the different types of green infrastructure to be found within the administrative boundaries of Northwich and Winsford. All the areas coloured represent a form of green infrastructure - including the bright scarlet that is used to denote domestic gardens. Only the areas left uncoloured are not green infrastructure. These represent grey infrastructure – buildings, roads and the like. This diagram serves to demonstrate the extensive distribution of the green infrastructure and the way in which it performs as a green matrix, wrapping around grey infrastructure and providing a range of support functions. It is the resulting connectedness that brings considerable added value, particularly in terms of water management, air quality, ecological and recreational benefits.

It is very important to note that, at the systems level, green infrastructure and its attendant functions and benefits does not respect administrative boundaries. For example, surface water, having entered Greater Manchester from the adjacent sub-region sitting to the northeast, then proceeds to flow through two further sub-regions to the west and the air-borne pollution is carried to adjacent sub-regions to the east. Viewed in this way, it is important that sub-regional green infrastructure planning looks

Diagram 1

Northwich & Winsford



beyond its own administrative boundaries and this in turn will have an influence on how data is collected, represented on maps and generally interpreted and understood.

2.2 Differing scales

Green infrastructure is able to function at different scales and it is important to develop approaches and policies that work from the macro to the micro level. The Public Service Agreements reviewed and updated in 2007 in the Government's Comprehensive Spending Review (CSR07) requires government departments to work together to deliver a range of targets. The North West Regional Spatial Strategy (RSS) now contains policies relating to green infrastructure that form part of all Local Development Frameworks. This tendency for joining up efforts between organisations and at all scales reinforces the need for sub-regional green infrastructure planning to interlock with adjacent sub-regions and for there to be a consistency between plans at the different levels. This provides a good opportunity for sub-regional green infrastructure planning to establish a framework within which lower spatial levels of planning, at district and city region, for example, can be carried out.

Sub-regional: At a sub-regional or county scale, large areas of green infrastructure, such as green belt, river valleys, community woodlands, the Forest of Bowland and the Ribble Estuary in Lancashire, may appear to be the most important elements.

City and District: At a city level, the role of urban parks, woodlands, canal and rail corridors and even street trees may be more obvious, but these will not be so evident when considering green infrastructure at a sub-regional level. At a District level the need for a detailed understanding of green infrastructure is reinforced by a series of duties imposed by central and regional policies. These include biodiversity duties, the requirement to produce flood risk assessments, the need for green space audits as set out in the Government's Planning, Policy Guidance 17 and the statutory role of the Regional Spatial Strategy that now, under policies EM1 and EM3, firmly embeds green infrastructure in Local Development Frameworks.

Neighbourhood: At a local, neighbourhood level, individual gardens and street trees give the green infrastructure a much finer grain. This level of detail is not discernable when viewing the county or sub-region as a whole, but in many ways this is the scale at which green infrastructure has the greatest impact on the lives of local people.

2.3 Size as an influence on sub-regional planning

The actual size of a sub-region will have an effect on how green infrastructure is mapped and understood. The mapping in diagram 1 covers an area of 70 square kilometres so it is easy to see that mapping larger areas at this level of detail has attendant issues relating to both the resource required and whether, when plotted, the detail is lost to a point where interpretation and understanding is also lost. One problem is that sub-regions vary considerably in size as the following table shows:

Sub Region	Area (km ²)
Cheshire	2253
Cumbria	6786
Greater Manchester	1270
Lancashire	3059
Merseyside	721

The issue that this variation throws up with regard to mapping as recommended in the NW GI Guide is discussed in sections 4 & 5. However, what this variation serves to emphasise is that any client group commissioning a sub-regional green infrastructure planning exercise, either in part or a whole study, must think carefully about what the objectives of the work will be when considered against the constraints of time and funding resources.

2.4 Multifunctionality

Green infrastructure is multifunctional and has the potential to deliver a wide range of benefits to people who live within, work within or might wish to visit a sub-region. Although the physical appearance of the landscape and its potential as recreational space may seem the most obvious attributes, there are many other functions to consider.

Many of those functions that seem to be primarily environmental or social will have significant economic consequences. An example of this is the role that urban greenspace can play in reducing the rate of storm water run-off and reducing local flood risk.

As the NW GI guide makes clear, some of these functions are more easily understood at the broad strategic level and some are more relevant at a local level. The key point is that individual functions often co-exist and therefore deliver multiple benefits.

A recent report, carried out for the Natural Economy Northwest (NENW) programme by consultants Ecotec¹ has helped to confirm that green infrastructure can deliver economic benefits to society in a number of ways. These are shown in Table 1:

Table 1 – The economic benefits of Green Infrastructure

Benefit	Description
Climate change adaptation and mitigation	Green infrastructure provides natural air conditioning for urban areas reducing the need for power consumption for heating and cooling alongside its contributions towards greenhouse gas absorption and longer term benefits in managing the impact of climate change
Flood alleviation and water management	Increasing and maintaining the canopy cover together with providing an absorbent ground cover reduces and helps to control run-off. Green infrastructure increases water storage capacity resulting in less dramatic flood events
Quality of place	Green infrastructure provides for an improved living environment. This provides opportunities for recreation, empowerment through community action and ownership and improved visual amenity
Health and well-being	Green infrastructure provides multiple health benefits through improved air quality, reduced stress levels, increased opportunities for informal and formal physical activity and recreation. All these contribute to the reduction of limiting long term illness and cost to the health services, reducing days lost through illness and improving productivity.
Land and property values	Developing green infrastructure 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 green space directly impacts positively upon house prices.
Economic growth and investment	The creation and development of green spaces and landscaping can encourage and attract high value industry and workers to a locality or region. This can provide many benefits to urban areas in terms of improvements in quality of life. An improved green environment can increase opportunities for

¹ Ecotec. (2008) 'The economic benefits of the natural environment'

Benefit	Description
	adding GVA to local economies.
Labour productivity	High quality accessible green infrastructure can provide opportunities to develop a more productive workforce for employers through improved health, stress alleviation and enhancing motivation/attracting and retaining motivated people.
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 the maintenance of key environmental assets, the creation of new assets and greening city centres, attracting new visitors and in turn supporting urban retail and tourism sectors.
Recreation and leisure	Green infrastructure generates the provision of new leisure and recreation opportunities, stimulating investment in rights of way and publicly accessible green space and woodlands. Community involvement in neighbourhood projects, including ownership/management of green infrastructure assets, can encourage cohesion and develop a renewed sense of local identity.
Land and biodiversity	Green infrastructure plays a strong role in supporting direct and indirect employment in agriculture, forestry, land management and conservation industries. The potential to create green spaces within built up areas reconnects urban communities with the land and improves opportunities for local food marketing.
Products from the land	The vast majority of green infrastructure takes the form of land in production located in the countryside. This includes land for agricultural, and horticultural uses and managed woodlands and moorland. Increased benefits may be realised through investment targeted at diversification activities and creating added value from land based products including renewable energy resources.

While the above benefits are expressed in terms of their economic outputs and outcomes, the same array can in fact be used to categorise social and environmental benefits also. This array therefore provides a useful checklist for all the benefits arising from green infrastructure.

However, not all green infrastructure delivers all the above benefits at the same time. Some agricultural land will, for example, function as a means of providing food products but will not provide access for leisure and recreation. Nor will such land necessarily function well in terms of supporting a wide biodiversity but it might provide flood alleviation depending on its topography and soil type. This notion of a distribution of functions over a range of different types of green infrastructure is central to the NW GI Guide's suggested methodology for mapping and interpreting green infrastructure as an integrated complex system.

3.0 The benefits of green infrastructure planning at a sub-regional level

The overarching contribution that green infrastructure planning can make as a mechanism to support the delivery of other sub-regional plans and strategies has already been briefly mentioned in the Introduction to this Guide. However, there are further detailed reasons that reinforce the need for a coherent approach to green infrastructure planning at a sub-regional level. These are explored in more detail below:

3.1 Creating an evidence base to support future funding and development

In any modern day society there are always likely to be competing demands for scarce resources such as time and money. Most green infrastructure is associated with what economists describe as 'public goods'. This simply reflects the fact that there is no method for buying a unit of clean air or an improved feeling of well-being through directly experiencing nature. Often this means that funding for green infrastructure must be allocated by the use of some form of proxy that is accepted as representing value. The problem is that other forms of 'public goods' such as public health, education, and economic development are also competing for the same scarce resources. All this means that green infrastructure planning needs to adopt as robust a methodology as is possible in order to provide a convincing case for the allocation of funds.

When considering the private sector the tension between supply and demand is usually reconciled through the market mechanism of price or return on investment. The question is, therefore, what mechanisms would persuade a developer of an office complex to use a green roof, recycle waste water and plant trees to provide summer shading? One answer might simply be that the developer wishes to see a project with good environmental credentials. It has been established that much green infrastructure offers economic benefits in its own right and a development company that is keen to prove that it is responding to concerns over climate change and sustainable development might well be motivated to respond accordingly - providing there was little or no reduction in net margin. The reality is however, that Local Development Frameworks (LDFs) will provide the major influence and control on this aspect of development. Again, a robust plan for green infrastructure at a sub-regional level should ensure that LDFs would provide the necessary evidence base to encourage a better alignment of private development and the creation of green infrastructure.

The NW GI guide suggests a methodology that would certainly provide a robust evidence base. The problem is that it is currently resource intensive and therefore costly. This issue is examined in more detail in section 4. It is important that a client group commissioning sub-regional green infrastructure planning is aware of the issues in order to make an informed decision regarding the degree of detail in the intended evidence base.

3.2 Compliance and support of national and regional policies

There is a growing pressure from the Government for socio-economic development to be pursued without damaging the environment. This offers the opportunity to plan green infrastructure at a sub-regional level in such a way that it provides those organisations and agencies – particularly the ones responsible for the delivery of grey infrastructure, with the means of complying with government policy.

Policies are hierarchical and range from national to local and the Government expects there to be conformity within all policies. It is reasonable, therefore, to expect

organisations delivering all forms of infrastructure to have had regard to relevant policies. This is particularly true when such organisations are in receipt of public funding. The main policy areas that offer opportunities for securing a better alignment of economic, social and environmental targets through the use of green infrastructure are examined below. Further information can be found in the NENW Report *'Developing an outline strategy for linking grey and green infrastructure'* (NENW, 2008 a)

3.2.1 Delivering Public Service Agreement targets

The Government's Comprehensive Spending Review 2007 (CSR07) continued the use of Public Service Agreements (PSAs) as a method of driving up standards of public service delivery. Some 30 new and revised PSAs have been published, many of which have an influence on the interface between grey and green infrastructure.

Just one example is PSA 27 that deals with climate change and provides some direction in this respect. Paragraph 3.37 states:

"At the regional level, Government Offices (GOs), Regional Development Agencies (RDAs) and Regional Assemblies will ensure that climate change and sustainable development are considered and integrated into regional policies, strategies and programmes. The outcome of the Review of Sub National Economic Development and Regeneration, which proposes a single integrated strategy and changes to regional governance, will impact during the course of the CSR period and will need to be taken into account in the delivery of climate change and energy outcomes at regional and local level." (HMG, 2007a)

A further example can be identified in the form of Public Service Agreement 28 – *'Secure a healthy environment for today and the future'*, (HM Government, 2007) In this PSA, the need to consider green and grey infrastructure together is very pronounced as can be seen in the following extract:

"The health of the natural environment is under threat. Although there have been some real improvements in the state of the natural environment, many aspects of it are still suffering substantial degradation. The pressures of economic growth and development, including transport and new housing, along with the challenges presented by climate change, are threatening the health of natural ecosystems upon which people depend." (HMG, 2007b)

3.2.2 Complying with flooding and water management policy

The flooding of 2007 led to an accelerated pressure on organisations to develop strategic plans and actions to mitigate future flooding. These were set out in *'Future Water'* (DEFRA, 2008). The Government has a clear agenda for water management that is set out in this strategy. Closely linked to the strategy is a programme called *'Making Space for Water'* under which the Environment Agency is identified as the body responsible for taking a strategic overview of inland flooding. This recent urgent focus on water management is already highlighting the role that green infrastructure can play in supporting a range of solutions.

In the foreword of *'Future Water'* Hilary Benn, Secretary of State for Environment, Food and Rural Affairs sums up the situation well:

"The problem we face is this; because of our need to adapt to climate change, our water intensive lifestyle and other pressures such as changing land use, we need to find ways of using water much more efficiently and sustainably if we are to continue to enjoy high standards and constant supply." (DEFRA, 2008)

The report sets out a range of actions, many of which will have a positive reinforcing effect on the green/grey infrastructure interface. The most relevant of these are:

- Developers and owners or managers of land and property will be required to consider creating local rainwater storage for both commercial sites and houses.
- The Government will change householders' permitted development rights to allow them to pave over their front garden without planning permission only if the surface is porous, such as by using permeable paving or gravel. The Government will introduce legislation with the effect of requiring planning permission for impermeable surfaces in front gardens in 2008.
- The Government will consult on options for resolving the barriers to the take up of sustainable drainage systems (SUDS), including options for ownership and adoption of these systems across the main agencies involved in urban and land drainage.
- In spring 2008 the Government is to publish a Practice Guide Companion to Planning Policy Statement on development and flood risk (PPS 25), to help planning authorities implement the new planning policy.
- The Government is to publish further guidance on the role of land use management in controlling flood risk.
- The Government will consider whether funding for surface water drainage should be changed to better reflect the polluter pays principle.

To the impetus from the Government's views that are articulated above, must be added other significant initiatives being pursued at a regional level. These include United Utilities' Sustainable Catchment Management Programme (ScaMP) and the EA's work in progress on Catchment Flood Management Plans. When viewed as a collection of proposed imminent actions it becomes clear that flood risk and water management will offer many challenges and opportunities for green infrastructure planning over the next few years.

3.2.3 Complying with regional policies

Sub regional planning of green infrastructure needs to comply with all the regional policies but of particular relevance are the Regional Spatial Strategy (RSS) and the Regional Economic Strategy (RES).

Regional Spatial Planning

North West of England Plan – Regional Spatial Strategy to 2021 (GONW, 2008), was formally adopted on the 30 September 2008. It will have a significant impact on spatial planning at all levels. Of particular relevance to green infrastructure planning at the sub-regional level is policy EM3. A summary is included in Box 1.

Regional Economic Strategy

The RES sets out a range of actions that, whilst largely based on economic development and the delivery of grey infrastructure, nevertheless offer opportunities to align green infrastructure development so as to help in mitigating any negative social and environmental impacts that the economic development might have. These opportunities have been identified in two reports published by NENW². Of particular relevance is the RES action 113 that calls for the development of the region's natural environment through better alignment of environmental activities and economic gain.

² 'Developing an outline strategy for linking grey and green infrastructure (NENW, 2008) and 'A strategic plan for developing and funding natural economy projects' (NENW 2007)

Box 1

Policy EM3 – Green Infrastructure

EM3: Green Infrastructure

Plans, strategies, proposals and schemes should aim to deliver wider spatial outcomes that incorporate environmental and socio-economic benefits by:

- Conserving and managing existing green infrastructure;
- Creating new green infrastructure;
- Enhancing its functionality, quality and connectivity.

Local authorities should work with partners to:

- Identify partnerships at an appropriate scale to take forward green infrastructure planning, in the context of relevant environmental and socio-economic objectives. Green infrastructure should include the identification, development and management of new areas of open space, not just more intensive use of existing areas of open space;
- Ensure that a key aim of green infrastructure is the maintenance and improvement of biodiversity;
- Protect the integrity of sites of international importance;
- Use existing strategies and frameworks to develop consensus on green infrastructure priorities and associated data needs;
- Consider how to improve access to and usage of open spaces by disadvantaged groups and communities;
- Set out the significant green infrastructure needs across the spectrum of economic, environmental and social objectives;
- Identify and secure opportunities for delivery and put in place implementation plans;
- Integrate proposals to improve green infrastructure in the delivery of new developments, particularly through area based regeneration initiatives and major proposals and schemes;
- Maximize the role of green infrastructure in mitigating and adapting to climate change;
- Provide new areas of appropriate greenspace where development would otherwise cause unacceptable recreational pressure on sites of international ecological importance, for example where new housing is proposed close to such sites.

Local Delivery of Green Infrastructure Plans should seek first to make use of existing delivery mechanisms supplemented by bespoke delivery mechanisms where necessary.

A Green Infrastructure Guide for the North West has been produced which provides more detailed guidance and will assist the way this policy is put into practice.

The Secretary of State's proposed changes to the draft Regional Spatial Strategy, 'The Northwest Plan'. 2008, p136

3.2.4 Green infrastructure and housing policy

The region is currently reviewing the regional housing policy. A discussion paper published in April 2008 includes the aims of improving the quality of life for people in the North West and improving the quality and sustainability of the housing stock. It is also committed to supporting the Regional Spatial Strategy. The need for housing to comply with sustainable development, water management, and fulfil biodiversity duties will generate a need that can readily be satisfied by green infrastructure. At a sub-regional level these opportunities need to be identified as offering a means of complying with such duties.

All sub-regions are involved in the development of housing growth points and growth point partnership areas. In order to comply with Communities and Local Government (CLG) guidance each partnership is required to prepare a programme of development in order to confirm indicative allocations from the Growth Fund. CLG has provided guidance (CLG, 2008a) that sets out the content of the programmes of development. This guidance will impact directly on the need to plan green infrastructure within growth points by requiring the following elements:

- A statement on design and environmental aspirations.
- A statement on the delivery of green infrastructure to support new development.
- An assessment of the impact on existing, or the need for new major water related infrastructure.

The guidance explicitly references green infrastructure as a key component for sustainable growth and for improved environmental outcomes and it encourages the inclusion of green infrastructure providers in partnerships.

3.2.5 Complying with the biodiversity duties of public bodies

The Government's stated intention is to make biodiversity an integral part of policy and decision-making. Public and local authorities now have a key part to play in conserving biodiversity through their role in developing and influencing local policies and strategies, planning and development control and in managing their estates. They have a duty under the Natural Environment and Rural Communities Act (2006) to have regard to the conservation of biodiversity in exercising their functions. DEFRA has published two sets of guidance³ on the subject - one for local authorities and one for public authorities.

3.3 Providing a process for delivering sustainable development

Green infrastructure, when aligned with and delivered alongside other forms of infrastructure, has a transformational capability that helps to deliver the guiding principles of the Government's current UK sustainable development strategy⁴. The strategy sets out four shared priorities:

- Sustainable consumption and production
- Climate change and energy
- Natural resource protection and environmental enhancement
- Sustainable communities

All of these are clearly highly relevant to green infrastructure planning because they confirm the need to embed green infrastructure in all forms of physical infrastructure development. Sub-regional green infrastructure planning therefore needs to consciously address these priorities.

Of particular prominence are the issues relating to climate change.

3.3.1 Supporting climate change adaptation and mitigation

In the introduction to the draft Climate Change Bill, the Government expressed the view that:

"The UK Government is committed to addressing both the causes and consequences of climate change and to that end is bringing forward proposals for a Climate Change Bill. The Bill will introduce a clear, credible, long-term framework for the UK to achieve its goals of reducing carbon dioxide emissions and ensure steps are taken towards adapting to the impacts of climate change". (DEFRA 2007e)

Under action 4.3 of the North West Climate Change Action Plan (NW CCAP), Community Forests North West is carrying out scoping studies to assess future regional risks, opportunities and priorities for the potential for green infrastructure, including regional parks, to adapt and mitigate for climate change impacts and commence implementation of findings. An initial study⁵ has been published that seeks to identify where climate change mitigation and adaptation functions of existing and potential green infrastructure are critical for the short-term sustainable economic development of the region. The work of CFNW is

³ Guidance for Public Authorities on implementing the biodiversity duty (DEFRA, (2007a & b)

⁴ Securing the future: delivering UK sustainable development strategy (DEFRA, 2005)

⁵ 'Critical Climate Change functions of Green Infrastructure for sustainable economic development in the Northwest' (CFNW, 2008)

particularly useful in showing how spatial mapping and geographical information systems (GIS) techniques can be used in sub-regional planning of green infrastructure – particularly in helping to assemble an evidence base.

Adaptation to climate change effects in urban areas is a critical component of delivering sustainable development and sustainable communities. The University of Manchester Centre for Urban Regional Ecology (CURE) has published research carried out under the Adaptation Strategies for Climate Change in Urban Environments (ASCCUE) Project. This work established that green infrastructure is able to play a vital cooling function as city temperatures increase. Using CURE's approach it would be possible to demonstrate how the sub-regional green infrastructure planning would be able to contribute to the region's Climate Change Action Plan.

3.4 Delivering better value through building partnerships

In the past environmental projects have suffered from a fragmented approach to both development and funding and because such work has often been marginalised by the need to concentrate on economic and social development and the outputs demanded by the sponsoring funding organisations.

One of the main benefits of carrying out planning at a sub-regional level is the opportunity to aggregate the environmental work into a coherent critical mass that can justifiably demand a proper response in terms of funding and the allocation of resources.

However, planning at a sub-regional scale also presents a great opportunity to create a better alignment of grey and green infrastructure. This should mean that some green infrastructure delivery could be accommodated within other budgets. For example, some grey infrastructure solutions could be less heavily engineered leading to better sustainable development, cheaper projects and a greater number of outputs and outcomes.

This approach does require the careful assembly of suitable partnerships that reflects a wide stakeholder interest. It should include social and economic agencies and organisations as well as the private sector.

At a sub-regional level green infrastructure planning should be within the interest areas of many organisations and agencies including:

- Town planners
- Economic planners
- Strategic Health Authorities
- Regional Parks
- Job Centre Plus
- Learning and Skills Council
- Local Authorities, LAA & MAA bodies
- Tourist Boards
- Utilities – especially United Utilities
- Private sector developers
- The DEFRA sponsored agencies - Environment Agency, Natural England and the Forestry Commission
- The non-governmental sector bodies and agencies

Local Area Agreements & Multiple Area Agreements

Because a Local Area Agreement (LAA) is based on a local Sustainable Community Strategy, it must conform to the requirements of Planning Policy Statement 12 *'The*

importance of spatial planning in creating strong safe and prosperous communities' (CLG, 2008b). PPS 12 requires that, what it terms the 'core strategy' should be supported by evidence of what physical, social and green infrastructure is needed to enable the amount of development proposed for the area, taking account of its type and distribution. This evidence should cover who will provide the infrastructure and when it will be provided. The core strategy should draw on and in parallel influence any strategies and investment plans of the local authority and other organisations.

The guidance issued by CLG identifies a framework comprising of four strands:

- Children and Young People
- Safer Stronger Communities
- Healthier Communities and Older People
- Economic Development

Of these it is the Safer Stronger Communities strand that correlates most readily with the issues of grey and green infrastructure. Under this strand LAAs will be required to deliver:

- Cleaner, greener and safer public spaces
- Reduce waste to landfill and increase recycling
- Tackle climate change Increased access to the countryside
- Improve quality of life in deprived areas, and liveability
- Improve the quality of public space and the quality of the local environment

3.5 Developing a critical mass through strategic planning

The ability of green infrastructure to function at different scales had been mentioned earlier. Scale clearly has an impact on the way green infrastructure can be identified, planned and resourced. Street trees and urban gardens are obvious examples of typologies that can only be 'read' at a local scale and the benefits that are associated with these particular typologies could probably not be secured by planning at a sub-regional scale. The converse is, however, true for many of the other identified benefits such as:

- Climate change adaptation and mitigation,
- Flood alleviation,
- Health and well being
- Economic growth and investment
- Labour productivity
- Tourism
- Recreation and leisure
- Products from the land

These benefits are associated with typologies that might be distributed over several local authorities. Each authority will prioritise planning and interventions against its own criteria – and these will not necessarily be the same as its neighbours. It is only at the sub-regional level that a critical mass can be assembled that resolves the danger of such fragmentation.

Viewed at a local level the organisations involved in the utilisation of a particular element of green infrastructure – say an urban park, will tend to concentrate on delivering benefits closely associated with their particular objectives and locality. This will tend to limit the benefits they can deliver. Grouping and considering such assets at a sub-regional level provides a strategic overview that facilitates a multi-agency approach that secures multiple benefits.

4.0 The process of green infrastructure planning at a sub-regional level

The NW GI Guide offers eight principles of green infrastructure planning, design and implementation:

1. Identify and protect green infrastructure before development
2. Engage diverse people and organisations from a range of sectors
3. Linkage is key, connecting green infrastructure components with each other and with people
4. Design green infrastructure systems that function at different scales and across boundaries
5. Green Infrastructure activity must be grounded in good science and planning practice
6. Fund green infrastructure up-front as a primary public investment
7. Emphasise green infrastructure benefits are afforded to all; to nature and people
8. Green infrastructure should be the framework for conservation.

These principles are embodied in an approach to green infrastructure planning that is set out in a series of five steps:

1. Partnerships and priorities
2. Data audit and green infrastructure resource mapping
3. Functional assessment
4. Needs assessment
5. Intervention plan

The aim at the end of the full process is to have a plan that provides a comprehensive, interactive and highly flexible evidence base for a range of purposes. These are:

- A framework for the sustainable land management of the study area.
- A tool for predicting the implications of change on the natural environment.
- An accurate picture of the green infrastructure of the study area – essential in making planning decisions and informing developments and strategies.
- A tool for delivering the natural environmental contribution to identified priorities in the fields of health, economy, quality of life and so on.
- A structured plan for delivering environmental change.
- Attracting funding by demonstrating researched needs and outcomes.
- Attracting inward investment

In reality, the five steps should be considered as a guide to a process that will probably need to follow an iterative approach as feedback from the study influences priorities or even throws up constraints imposed by the limits of the available funding.

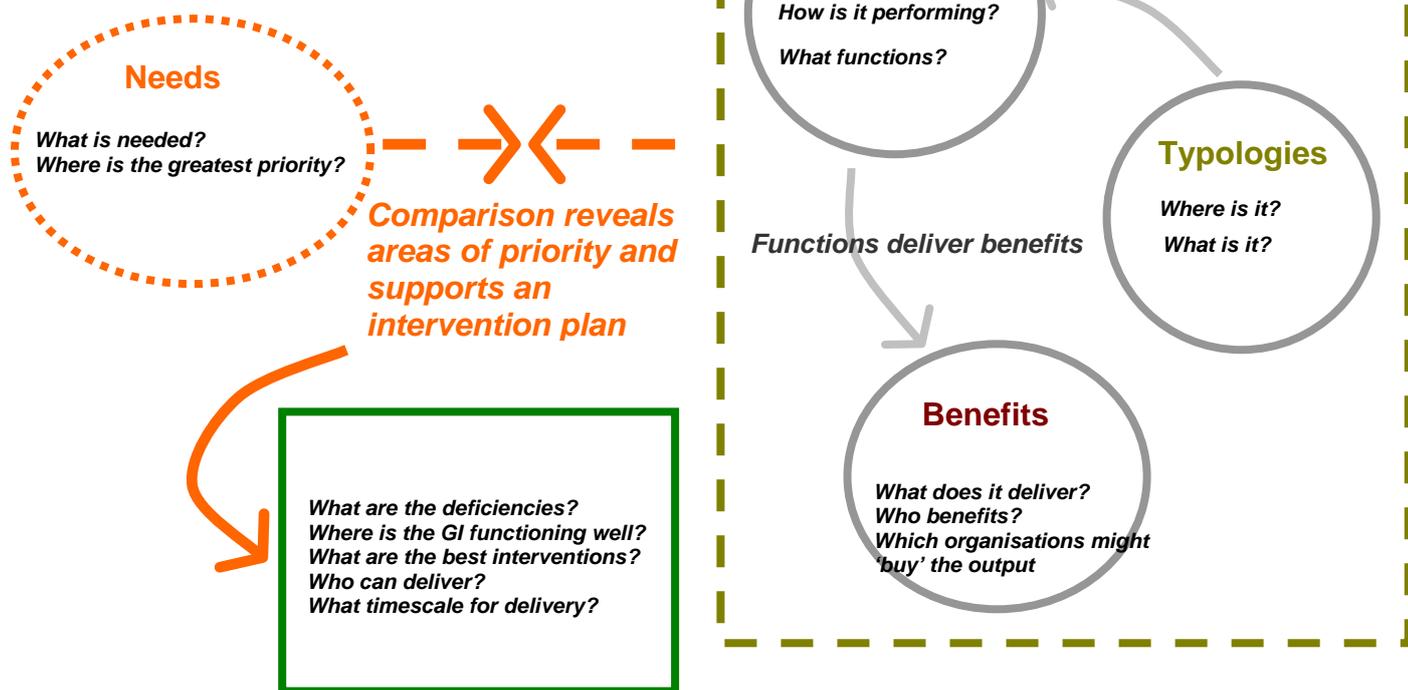
The funding required for a sub-regional green infrastructure study will vary relative to its size and characteristics. The sub-regions range from 700 km² to 7000 km² and their surface cover varies from large areas of open countryside to dense urban areas.

The five steps are not absolutely sequential. The understanding of where the green infrastructure resource sits (step 2) and how it functions (step 3) are not prerequisites for an understanding of need (step 4). In fact the needs assessment would, in some circumstances, be a very useful early step because it could then be used to prioritise the objectives for the sub-regional green infrastructure plan. Diagram 4 indicates the relationship between the steps.

Diagram 4 – The relationship of typology and function to need

Needs can be determined and represented in spatial distributions of:

- Economic need
- Social need
- Environmental need



Needs can be mapped against administrative boundaries

This group requires the GI asset to be spatially mapped in terms of typologies

The right hand side of the diagram represents steps 2 and 3. This is the work required to describe the physical nature and distribution of the green infrastructure asset. The process here involves mapping the green infrastructure in some satisfactory manner together with determining how well it is performing. Comparing the location and functionality of the green infrastructure with an assessment of the need can then form the basis for determining the interventions that will address any deficiencies in either the quantity or performance of the resource.

The five-step approach is designed to provide a sound, objective evidence base that can support the determination of a rational set of actions and activities. As recognised in the principles cited at the start of this section the better the science that is applied to the process the greater should be the degree of objectivity and this should lead to demonstrable outcomes and benefits. However, it must be understood that green infrastructure is a concept that is rapidly developing on many fronts simultaneously. The approach to sub-regional planning is, for example, developing alongside the technologies for GIS mapping and evaluation that are the very tools required to avoid excessive subjectivity.

These issues should not be a reason for impeding the sub-regional planning of green infrastructure. It is important to proceed with sub-regional planning even in the face of a continued process involving the improvement of mapping and evaluation methodologies – otherwise vital time will be lost and the development of green infrastructure will be held back. It is likely, therefore, that sub-regional planning will need to be a process that works towards a

final objective goal through a succession of iterations that might span several years and this should be recognised when planning the process. These issues are discussed further in section 5.

4.1 Partnerships

Green infrastructure planning is a process that is developing from the bottom up. This means that the stimulus for planning green infrastructure at the sub-regional is likely to spring from a wide variety of sources and this will be naturally reflected in the group that comes together to initiate the process. However, the commencing partnership will not necessarily be the same as the final partnership that is built to drive the plan forward in the longer term. Indeed, as the five-step process develops it is to be expected that the group of potential interested parties will widen to reflect the multifunctional nature of the outputs and the concomitant multiplicity of benefits. Section 3.4 sets out a range of bodies that should be reflected in the constitution of the final sub-regional partnership.

4.2 Green infrastructure resource mapping and functionality assessment

The NW GI guide provides an in-depth explanation of all the 5 steps and so need not be repeated other than to briefly explain that the form of the green infrastructure resource can be broken down into an array of typologies (woodland, agricultural land, water courses and so on). Each of these typologies has associated functions – that is an activity that is natural to that particular type of green infrastructure. Functions include, for example, the capacity to provide evaporative cooling, operating as a corridor for wildlife, providing a store for water and storing carbon. Each typology will return an associated array of functions so that some areas can be seen as highly functional and others less so. The functions inherent in the typologies are considered to produce one or more of the benefits outlined earlier in section 2.4. Using geographical information system software (GIS) in combination with Ordnance Survey MasterMap topography, it is possible to identify the spatial distribution of the functions and, if necessary, the associated benefits. Other features such as street trees and green ways can be derived from a variety of other sources. A typical map of the typology and multifunctionality of Frodsham in the Weaver Valley area of Cheshire is shown in diagrams 2 & 3 on page 20. By comparing the two maps it is possible to identify the actual areas (shown in deep purple) of green infrastructure that need to be protected, maintained and enhanced, in contrast to the areas where functionality is low (light orange) that might represent good targets for creating new green infrastructure assets.

The analysis offered by this methodology is of course based on the selection of suitable datasets to represent, as accurately as possible, the inherent nature of the typologies or functions being considered. The methodology therefore provides an inferred rather than an absolute picture of reality. Properly constructed and transparently used it offers a good tool for green infrastructure planning. More importantly it provides an evidence base on which to support the case for future funding and development.

This example serves to make the point that some means of understanding the location and functionality of the green infrastructure is critical for objectively determining the best interventions.

The cost of mapping and GIS analysis at a sub-regional level

As discussed above, the picture becomes complicated at the sub-regional level where developing a plan with all 5 steps could be curtailed by the limit of available funding.

Diagram 2 – Frodsham green infrastructure typologies

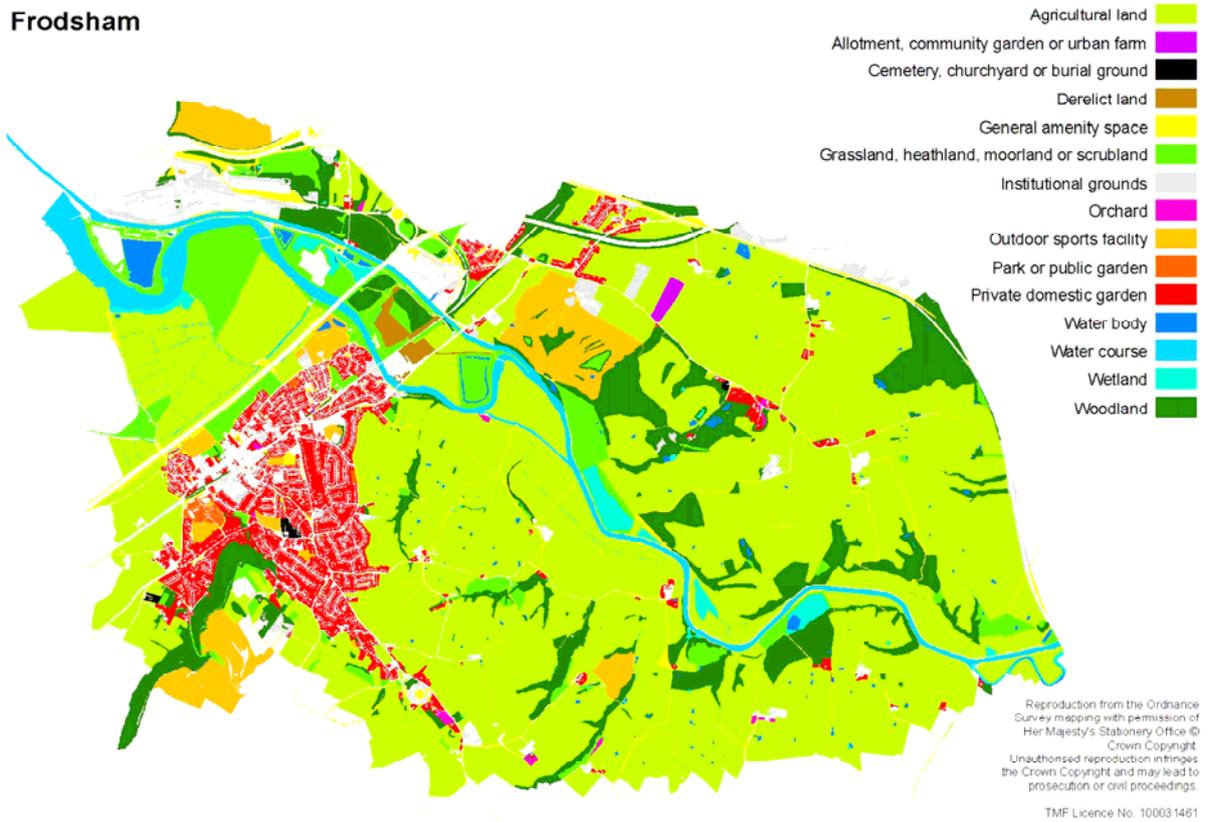


Diagram 3 – Frodsham cumulative multifunctionality



Community Forests North West are actively using and developing the methodology of the NW GI guide. From this and other work it is possible to calculate that the cost of carrying out the full range of mapping and analysis using the five-step approach is likely to be in the region of £35–45 per km² for urban areas. The cost of mapping predominantly rural areas is less resource intensive and cheaper. This is because the cost is directly proportional to the number of polygons⁶ of green infrastructure typologies that need to be processed. The density of polygons in an urban area tends to be greater than in rural areas where larger units of land occur.

The fact that many of the needs for green infrastructure are linked to the distribution of population offers the opportunity to use this as a filter that would help to determine where full typology mapping would have a positive cost-benefit. It is also generally the case that agricultural areas do not return high rates of multifunctionality and so some form of coarser grain mapping in rural areas would not necessarily reduce the integrity of the resulting evidence base.

4.3 Methods for determining need

There are probably several ways to determine the need for some form of green infrastructure intervention. However, for the purpose of planning green infrastructure at a sub-regional level, the following two main areas will be probably be sufficient to support a comprehensive plan:

- How is the need to deliver green infrastructure driven by national, regional and sub-regional policies and strategies?
- What are the social, economic and environmental deficits that exist within the region that would be ameliorated by the existence of green infrastructure

Using policies, frameworks and duties as analogies of need

The NENW report 'A strategic plan for developing and funding green infrastructure' (NENW, 2007) argued that, in a region that has seen the iteration of at least two versions of Regional Economic and Spatial Strategies, it is reasonable to conclude that regional policies and strategies can be assumed to represent a good approximation to identified need. Logic dictates that the same reasoning can be applied to national policies and strategies and that an examination of any policy spectrum that is reasonably current could therefore be used for the determination a set of required actions that are implicitly based on identified need.

Sections 3.2 and 3.3 touch on some of the main elements of policy and strategy that can be considered as reflecting particular types of need:

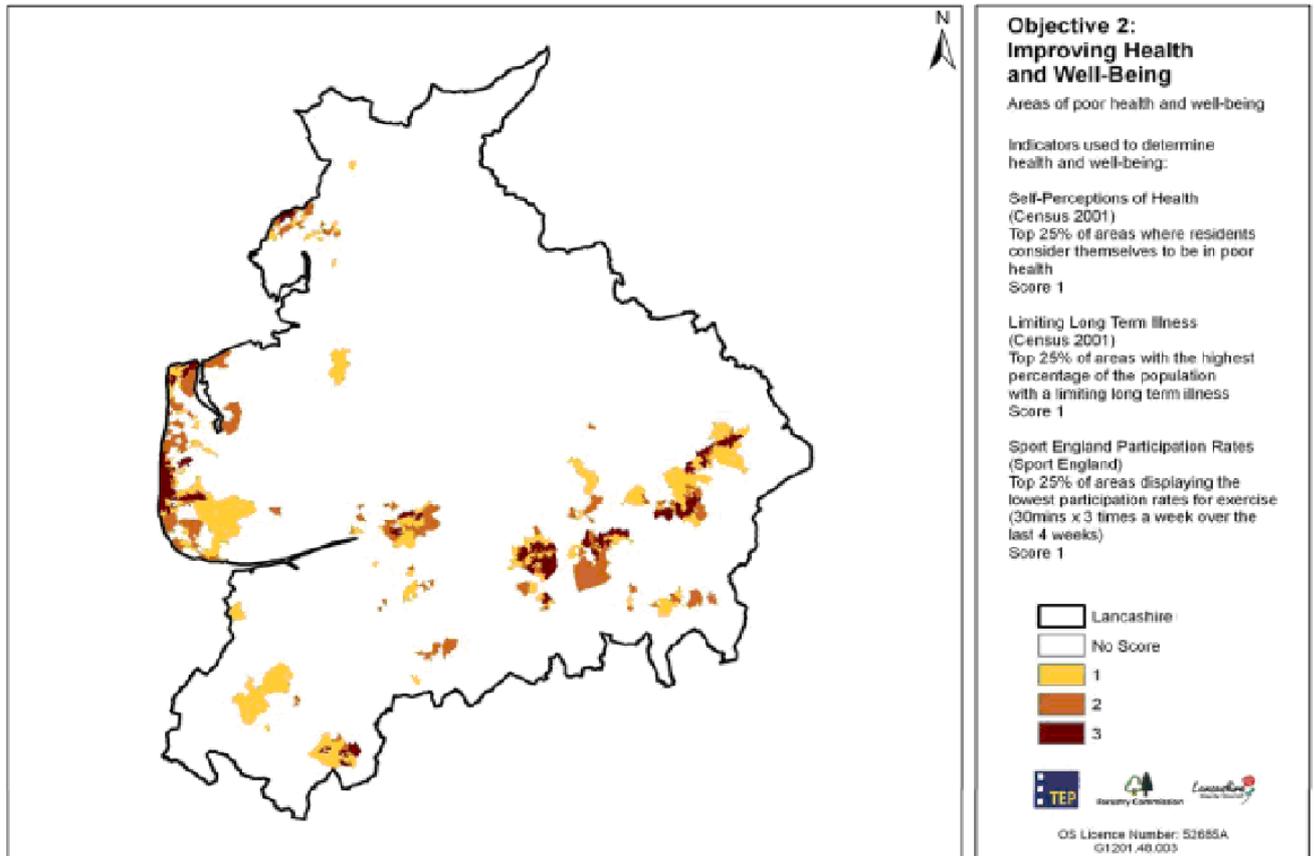
Determining the locality of need through mapping social, economic and environmental deficits

Diagram 4 on page 18 suggests that that the needs of a study area can be determined by reference to datasets that provide suitable proxies for need. The green infrastructure planning for the Lancashire Economic Partnership has already employed this methodology for assessing the need of a range of strategic objectives. As an example the need to improve health and well-being has been assessed by combining data from the following sources:

⁶ Polygons are simply shapes present on OS MasterMap and are the means by which data can be attached to an object on a map as part of the GIS mapping and interpretation

- Self-perceptions of health (Census 2001). The top 25% of areas where residents consider themselves to be in poor health.
- Limiting long-term illness (Census 2001). The top 25% of areas with the highest percentage of the population with a limiting long-term illness.
- Sports England participation rates (Sport England) The top 25% of areas displaying the lowest participation rates for exercise (30 mins. x 3 times a week over the last 4 weeks)

Diagram 5 – Assessing the need for improving health and well being in Lancashire



The study allocated each of these variables a score of 1 and before combining them in a GIS map showing the spatial distribution of these data. The result is shown in diagram 5.

This particular diagram is an example of the PBRS methodology developed by the Forestry Commission. A more detailed explanation of this methodology is to be found on the PBRS website:

<http://www.pbrs.org.uk/>

Of course diagram 5 indicates only where there is a need and where the location of that need might be greatest. It is not able to demonstrate whether the need is currently being fulfilled by existing green infrastructure. Nor does it help in ascertaining whether there is a deficiency that needs some form of action. To perform this step the methodology needs to have some means of knowing where the actual green infrastructure resource sits and how well it is functioning. In other words diagram 5 represents only the left hand side of the chart shown in diagram 4.

4.4 Determining the nature of actions and interventions in a green infrastructure plan

It is vital that green infrastructure planning leads to physical actions on the ground. In order to attract wide support, funding and delivery the interventions need to be founded on as robust an evidence base as can be provided. The degree of robustness is currently affected by the satisfactory resolution of several conflicting parameters. These are:

- The cost of detailed mapping of typologies and functionality
- The resource of time and money that is available to allocate to the planning process.
- The current state of development of mapping technologies, and the absence of an adopted protocol.

The resolution of these matters must be an early consideration in the development of a sub-regional green infrastructure planning initiative. Some options are explored in the following section

5.0 Determining objectives and outputs from sub-regional green infrastructure planning

The planning of green infrastructure carried out so far indicates that each sub-region is likely to have its own commencing needs and priorities with regard to the planning and development of the process. However, notwithstanding the initial starting point the overall aim should be to end up with a plan that delivers the same primary objectives in each sub-region – albeit over differing timescales.

As stated in section 4, scarcity of funding, time constraints and ongoing technical development will be major influences on deciding the precise nature of any sub-regional plan. The most effective way of dealing with such constraints would be to pursue an option that allows the process to be built in a series of stages. This approach has already been explored in the Greater Manchester sub-region.

Table 2 is based on a similar table in the study *'Towards a Green Infrastructure Framework for Greater Manchester'* (TEP, 2008) but it has been modified to make it more generic to sub-regional green infrastructure planning. It offers a range of four options for planning green infrastructure at a sub-regional scale from the production of a guide to the production of a detailed plan.

These options represent levels of increasing detail that could be developed in stages since the move from step to step simply adds further information from the previous stage. The advantage of this approach is that, since the complexity and therefore the cost increases stage by stage, the budget required for the first stages is correspondingly low.

Planning the work in these stages also provides time for the development of partnerships and allows for the responses and support of participating organisations to be built in to the process. Most importantly, it provides a means of sharing out the task of mapping at a detailed scale always assuming that a satisfactory protocol has been agreed upon at the Framework stage.

The stages suggested in Table 2 are as follows:

Concept statement

A high-level envisioning document that involves no analytical mapping but does provide some form of primer in order to lay the foundations for further coordinated effort.

Framework

A study that assesses need but does not attempt to map the actual asset base – at least not in the level of detail recommended by the NW GI Guide. The main purpose of this study is that it would provide the context within which green infrastructure planning would take place – possibly at the district level. A Framework would provide an evidence of need but it could not produce an intervention plan based on typological mapping and it would not be able to establish an evidence base at the sub-regional scale in the format discussed in 4.2 above. There would be a danger that the detailed mapping at a district level would vary in quality or may not be carried out. This would make it difficult to aggregate the data into a form that would allow cross-boundary coordination of green infrastructure. Setting out a protocol for typological mapping and the mapping of functionality at a district level would be one way of avoiding this type of problem.

Strategy

A study that would deliver all the steps envisaged in the NW GI Guide including an intervention plan supported by a comprehensive evidence base.

Detailed plan

A detailed plan takes a strategy one stage further by providing a detailed business plan.

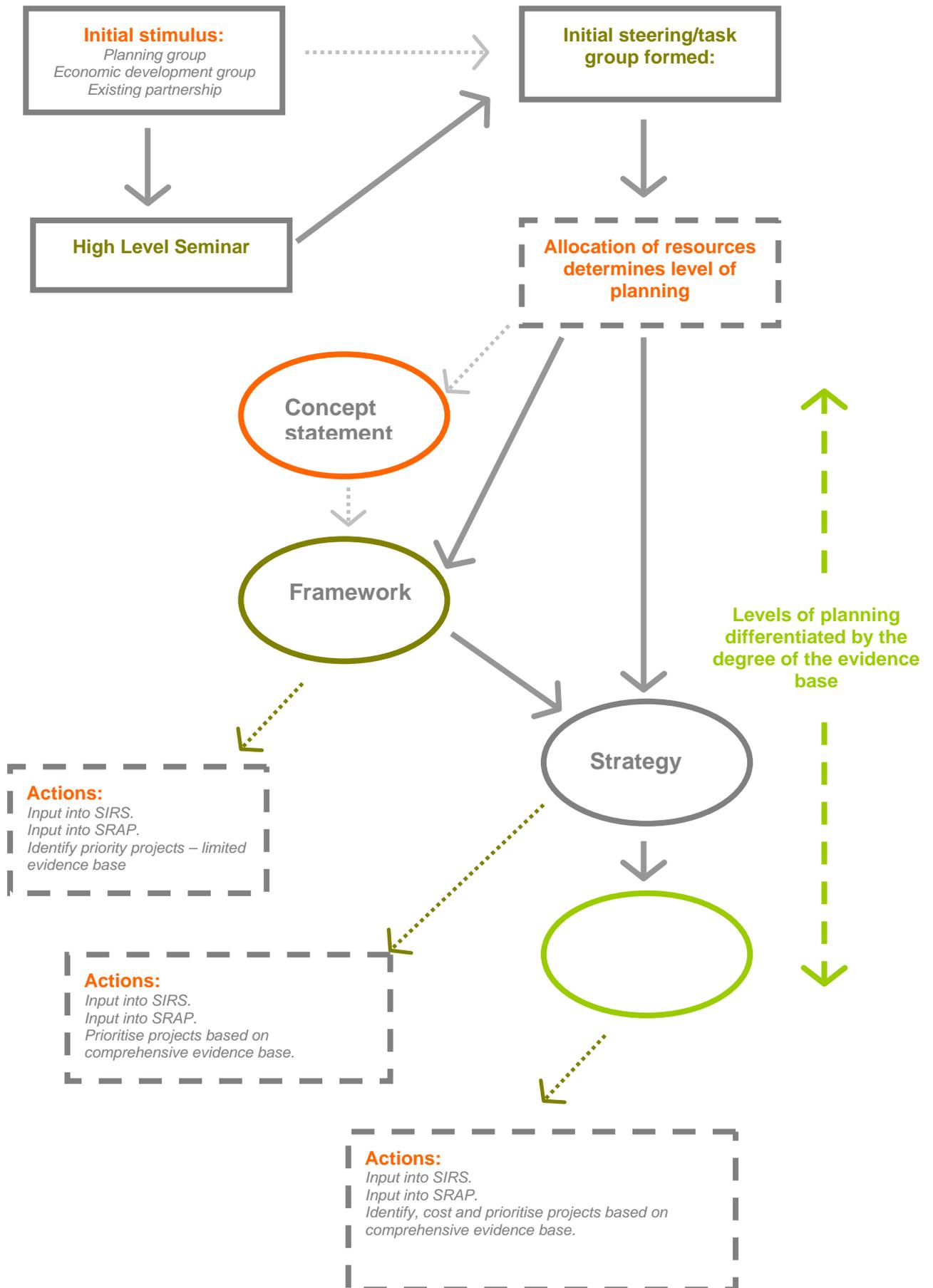
The five steps of green infrastructure planning and the resulting outcomes can be fully realised at the district level and are particularly relevant to those involved in producing Local Development Frameworks and planning for Growth Points. At the local level a green infrastructure plan that covers all steps would represent an excellent tool for spatial planning.

Table 2 – The levels of green infrastructure planning

Component	Stages of green infrastructure planning:			
	Concept statement	Framework	Strategy	Detailed plan
Vision for GI in sub-region stated	✓	✓	✓	✓
GI objectives for sub-region stated	✓	✓	✓	✓
GI Case studies included	✓	✓	✓	✓
GI partnership with shared endorsement of GI in existence		✓	✓	✓
Coordinator / champion identified		✓	✓	✓
Primer for advocacy included	✓	✓	✓	✓
Needs Assessment prepared		✓	✓	✓
Preliminary audit of GI assets prepared		✓		
Mapping of GI in priority investment areas		✓	✓	✓
Full typology mapping carried out			✓	✓
Functionality mapping carried out			✓	✓
GI covered by supplementary planning guidance			✓	✓
Action plan based on need, priorities, and policies and identified sub-regionally strategic projects.		✓		
Protocol for mapping typologies and functionality prepared		✓		
Protocol for mapping typologies and functionality followed			✓	✓
Intervention plan based on detailed typologies prepared			✓	✓
Business plan prepared				✓
Monitoring + evaluation plan prepared		✓	✓	✓

Diagram 7 shows the relationship between the different levels of planning and demonstrates how a very detailed plan could be built up over a period of time. The mapping of typologies and functions becomes more robust at the strategic and detailed stages providing a better means of assessing the location of interventions based on the comparison of existing functionality and need.

Diagram 7 – chart showing levels and relationships of green infrastructure planning



The levels indicated in Table 2 and diagram 7 should not be seen as forming constraining rigid boundaries but rather as indicative markers that in reality represent a spectrum of levels that can be allowed to blend and merge to accommodate the requirements of the partnership in any individual sub-region.

Any sub-regional plan for green infrastructure will need to make sense to a wide audience. It should seek to emphasise that delivering optimum solutions is not just about increasing spending on green infrastructure but more about achieving an increase in outputs through a better alignment of funding. Those bodies delivering grey infrastructure such as schools, hospitals, transport systems and the like will all need to be drawn into the process of sub-regional planning of green infrastructure so that they can meet the obligations increasingly demanded by the range of policy requirements outlined in section 3.

Better alignment of plans does not merely impact on capital initiatives. Revenue spend can also be harnessed to produce better management of green infrastructure. The NENW Investment Forum is, for example, working up a proposal that would align socio-economic funding such as jobseekers allowance and incapacity benefits in a way that supports the management of green infrastructure.

Sometimes bodies such as Tourist Boards appear to struggle with the concept of green infrastructure. However, it remains a fact that the successful exploitation of a natural resource such as parts of the Lake District is, in the long term, only viable if the resource itself is protected. Economic activities in parts of Cumbria are, for example, doing damage to the fells and water bodies that, if left unmanaged will destroy the carrying capacity of the green infrastructure.

Some of the target group of organisations that need to be brought into the strategic planning of green infrastructure may have responsibilities for policy and marketing. These bodies also have a part to play in setting a framework of compliance that helps to fully realise the economic and social benefits of green infrastructure.

6.0 Signposting to further mapping aids

Mapping, whilst not the single most critical component of green infrastructure planning, is nevertheless a very potent tool. The northwest region has been responsible for the development of methodologies that are highly useful aids to the planning of green infrastructure at all scales. The mapping mentioned in section 2 was developed by the team at the Mersey Forest and the protocol for carrying out mapping typologies and functionality can be sourced at:

http://www.ginw.org.uk/resources/A_Green_Infrastructure_Mapping_Method.pdf

7.0 A Glossary of terms

Benefit	An advantage or profit gained from something.
Framework	An essential supporting or underlying structure
Function	An activity that is natural to the purpose of a person or thing.
Infrastructure	The basic, physical and organisational structures (e.g. buildings, roads, power supplies) needed for the operation of society or an enterprise.
Plan	A detailed proposal for doing or achieving something
Strategy	A plan designed to achieve a particular long-term aim.

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