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# Design, implementation and cost elements of Green Infrastructure projects



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## I Executive summary

Green infrastructure has been identified as a valuable tool for addressing needs for ecological preservation and environmental protection as well as societal needs in a complementary fashion. By maintaining healthy ecosystems, reconnecting fragmented natural areas and restoring damaged habitats, green infrastructure offers an economically viable and sustainable infrastructure that provides goods and services and by which multiple objectives can be addressed.

The planned European Green Infrastructure Strategy aims to create the framework for progress in this area and, more specifically, support Target 2 of the EU biodiversity strategy to 2020. This target, which states that “By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems”, aims to address the increasingly fragmented nature of European habitats as a result of human-induced land cover change and land use intensification while also providing recreational, economic and health benefits to society. Successful implementation, however, asks for the integration of green infrastructure considerations into other policies and sectors within Europe. While biodiversity conservation and protection is central to the strategy, recognising and highlighting the wider benefits of green infrastructure to society and the economy through the delivery of ecosystem goods and services will also be of vital importance.

### Project approach

Given the current gaps in knowledge regarding the types and extent of green infrastructure projects and initiatives in the EU as well as the associated costs and benefits, this project aimed to provide an overview of such European initiatives and develop a clear and applicable concept of green infrastructure for future policy-making as well as to examine aspects of the design and implementation of green infrastructure projects, and to assess their costs and benefits. Currently, a variety of interpretations of Green Infrastructure exist throughout the literature and emphasise green infrastructure components, features and characteristics as well as the functions and services provided to differing degrees. Taking these understandings into account and incorporating this project’s findings, the following definition has been produced for wider application:

**Green infrastructure** is the network of natural and semi-natural areas, features and green spaces in rural and urban, and terrestrial, freshwater, coastal and marine areas, which together enhance ecosystem health and resilience, contribute to biodiversity conservation and benefit human populations through the maintenance and enhancement of ecosystem services. Green infrastructure can be strengthened through strategic and co-ordinated initiatives that focus on maintaining, restoring, improving and connecting existing areas and features as well as creating new areas and features.

Utilising the above definition, a three-fold approach was applied to gather data for the analysis of European green infrastructure projects and pertinent policy, including a database of 127 projects or larger scale initiatives that contained approaches relevant for Green Infrastructure or that could be regarded as green infrastructure, six in-depth case studies and an expert workshop in Brussels. While only 20% of the database projects identify themselves explicitly as 'green infrastructures', the typology developed as part of this project served to facilitate their identification and to populate the database. Within this typology, the identification of key parameters served rather to facilitate an increased understanding of differences in focus, emphasis, and characteristics between initiatives than to identify distinct types of categories of green infrastructure projects. The aspects explored for each initiative included: main objectives, scale of operation, types of green infrastructure components covered, activities or measures carried out and the different sectors, settings and habitats involved and affected.

### **Initiation, design and implementation of green infrastructure projects**

Subsequent analysis of the information collected for these projects produced interesting results about the incredible diversity of green infrastructure projects in terms of their initiation, design and targeted objectives, processes established for implementation and actions involved. Regarding the initiation of green infrastructure projects, for example, several key drivers emerged as motivating factors. The **main drivers**, which were found to both work independently as well as in combination with one another, can be broken down as follows:

- policy and spatial planning requirements,
- strategies and action plans, and
- local/regional needs and stakeholder interests and motivations.

A large degree of diversity also appears in the distribution of green infrastructure initiatives across spatial scales (with the majority being local/regional) and Member States (predominantly in the EU-15). A breadth of objectives, sectors, elements and activities were addressed within and amongst the projects, with most of them addressing several aspects simultaneously in a complementary fashion. The **most frequently targeted objectives** within the explored projects were, in decreasing order,

- biodiversity conservation;
- human health/well-being;
- sustainable land management;
- water management; and
- climate change mitigation and adaptation,

which emphasizes the multi-functionality of green infrastructure in benefiting both people and nature. Addressing these multiple objectives and embodying a cross-sectoral nature also positions the projects as useful contributors to different EU and nationally driven policies and actions, including those in the fields of agriculture and rural development, forestry, biodiversity and nature, water, climate change, green growth, transport and energy, health and spatial planning.

## Barriers and enabling factors

The study has also identified a number of factors, which have served either an impeding or an enabling role in ensuring successful project implementation. While no universal formula can be developed which applies to all green infrastructure projects, a number of **common barriers** were identified. One major barrier was the differing priorities and points of view amongst stakeholders and the resultant competing interests and agendas. Such disparities affect both project development in a general sense (e.g. distribution of funds; degree of political support) as well as the specifics of project design, such as the selection of objectives to be addressed and activities to be carried out and the degree of support from local communities for the project. Often, economic capacity barriers such as insufficient funding, lack of stability in financial flows and a lack of political will, interest and continuing support were also experienced. Additional capacity barriers frequently emerged in the form of limited knowledge and lacking scientific and technical skills required for the various project phases. Historical considerations such as landownership patterns under previous political parties and an overarching lack of synergies between different green infrastructure-relevant sectors comprised common contextual barriers. Finally, regulatory (including administrative requirements and differing definitions of green infrastructure across spatial scales), structural (e.g. mixed land ownership titles and cross-border considerations) and technical barriers were encountered.

While a range of barriers were experienced, numerous enabling factors were also identified which could help to ensure a successful project implementation and overcome such inhibiting factors. The main **enabling factors** were found to be:

- acquiring sufficient knowledge and evidence,
- adopting a cross-sectoral approach and involving appropriate experts accordingly,
- ensuring sufficient financing, including accounting for monitoring and maintenance activities,
- embracing partnerships,
- building on and being comprehensive with established policy frameworks, spatial planning initiatives and wider strategies for land management, and finally
- raising public and political awareness and support while also facilitating stakeholder involvement.

## Costs of green infrastructure projects

The analysis of case studies and literature also reveals several interesting findings regarding the costs associated with green infrastructure projects. The one-off costs of identifying, mapping, planning, creating/establishing and restoring green infrastructure were found to represent a large proportion of the total costs of green infrastructure initiatives (for the six projects reviewed in-depth, one-off costs were between €0.6 million and €58 million). The relatively low costs of ongoing maintenance are also important, but are often not captured in the budgets of the initiatives themselves. For the six case studies, such recurrent annual costs only equated to 6% of the one-off expenditures. Information on opportunity costs is often missing, suggesting that opportunity costs may not be reflected on the costs estimates of such projects or that they are not necessarily attributable to the projects themselves as

they often arise as a result of wider policies to protect green infrastructure (e.g. protected areas policies).

In terms of costs per hectare for different green infrastructure projects, figures ranged from €250 to almost €1 million per hectare due to a range of considerations. The study revealed that the restoration of urban parks and green spaces tend to have very high costs per hectare, especially where this involves work on buildings and gardens, while targeted species conservation work focusing on specific sites (e.g. site restoration for butterflies) tends to have relatively high costs per hectare. Furthermore, labour intensive restoration work (e.g. involving tree and scrub removal) tends to have higher per hectare costs than more extensive conservation action (e.g. reintroduction of grazing). The estimated per hectare costs are often inflated where projects involve wider activities in addition to land management (e.g. awareness raising).

### **Benefits of green infrastructure projects**

While the costs of establishing and maintaining green infrastructure are known for most projects, the benefits are much more difficult to value. Benefits are often assessed in purely qualitative terms, or quantified only in terms of the extent of green infrastructure protected or maintained. There is much less quantitative evidence of the ecosystem services delivered by green infrastructure, and of the value of these services. While this lack of evidence makes it difficult to speculate on the value of services that may have been delivered by most of the projects, even partial assessments of the value of the benefits of green infrastructure indicate that they can significantly exceed the costs. Improving the understanding of ecosystem services and their value through further work and improved guidance and/or tools for valuation at project level is therefore necessary.

Despite this lack of information, it can be said that green infrastructure projects have the advantage of delivering multiple benefits as compared to investments in "grey infrastructure", which often only meet a single objective, e.g. flood control or water treatment. Taking account of the wider benefits accrued not only to people, but also nature and ecosystems, often enhances the balance between the estimated benefits and costs of green infrastructure investments. In this context, it is also necessary to recognise that while a large proportion of green infrastructure costs are one-off costs which are incurred up-front, benefits (through enhanced ecosystem service delivery) may be expected to accrue long into the future. This indicates the need to take account of the present value of future flows of costs and benefits in appraising green infrastructure projects and in evaluating such investments as compared to those in grey infrastructure. That being said, within the majority of the projects explored, green infrastructure was not seen as a substitute for grey infrastructure, but instead played a distinctive role in providing essential services that were lost as a result of built development.

### **Recommendations for policy action**

Based on the results of this research project, a set of recommendations for policy actions at the EU as well as the national and local/regional levels has been prepared to inform developments on the upcoming EU green infrastructure strategy and strengthen the implementation of green infrastructure initiatives throughout Europe. In general, policy makers at all spatial levels are asked to:

- i) **explore and use opportunities for cross-sectoral integration** of green infrastructure in the relevant policies;
- ii) **increase awareness** of green infrastructure, promote capacity building and facilitate stakeholder involvement/consultation in policy processes; create platforms for exchanges of knowledge and best practices and
- iii) **highlight the benefits received by various sectors and stakeholders**, creating an enabling environment to encourage public and private investments in green infrastructure and discuss the cost effectiveness of green vs. grey infrastructure. Further specific recommendations for policy action at the EU as well as the national and local/regional levels are presented briefly below.

At the **EU-level**, the following recommendations have been developed:

#### **Create a legislative framework**

- Develop an EU strategy on green infrastructure including a common vision and strategic goals for the future direction of green infrastructure and establish a workable definition of green infrastructure and typology of green infrastructure initiatives, which allows for flexibility in its application across the MS
- Set clear targets for protecting, maintain and creating green infrastructure (measurable in quantitative and qualitative terms)
- Increase policy coherence at EU level (by integrating green infrastructure into all relevant policies as one objective, highlighting the link and potential benefits received)
- Integrate green infrastructure as a cross-cutting issue into binding spatial planning policies such as the Strategic Environment Assessment, the Environmental Impact Assessment and the Environmental Liability Directive

#### **Increase awareness and facilitate knowledge transfer across the EU Member States**

- Run campaigns targeted at specific stakeholders and sectors to increase understanding and acceptance for green infrastructure initiatives
- Highlight best-practice examples and demonstration projects being implemented in the EU Member States and encourage the exchange of relevant know-how and experiences (e.g. through a platform)
- Support the development of tools for measuring benefits and costs in a standardised way and disseminate these tools

#### **Maximise efficiency of EU funding**

- Better target available funds in terms of objectives, beneficiaries and benefits (to maximise their support of green infrastructure)
- Identify the financial needs for green infrastructure at EU level
- Outline benefits delivered by green infrastructure and the different groups that receive them
- Increase support of public private partnerships (PPPs) and other forms of innovative financing (informing relevant parties about these possibilities)
- Promote development of PES schemes (both public and private) in order to reward provision and maintenance of green infrastructure

Similarly, recommendations for policy action at a **national and local/regional** level have been established, as follows:

**Create an overarching and supporting framework at a national level by**

- Developing national strategies for green infrastructure;
- Adjusting spatial planning legislation and instruments;
- Integrating green infrastructure (including its creation, protection and maintenance) in all relevant policies (biodiversity, agriculture, forestry, water protection, tourism, health etc.)
- Establishing targets for the maintenance and creation of green infrastructure

**Provide financing and explore potential financing instruments**

- Explore available financing sources at EU level and encourage a broader sector-involvement (which goes beyond nature protection)
- Focus on long-term objectives for green infrastructure
- Ensure funding to stimulate pilot projects (e.g. adopting an integrated approach, developing innovative approaches), cover administrative costs of projects and maintenance costs
- Establish adequate funding conditions (e.g. pre-financing, flexible management of money)
- Encourage PPPs (e.g. green partnerships)

**Promote networking, monitoring and research**

- Support the creation of national green networks
- Encourage exchange of best practice in and outside the country/region
- Map existing green infrastructure features at national level
- Conduct screening of current projects/initiatives that fall under the green infrastructure umbrella
- Commission research projects to support the development of tools/methods to measure green infrastructure benefits and project-related cost and benefit analyses

## 2 Introduction

### 2.1 Scope and objectives of the study

This project aimed to support the development of an EU-wide strategy for green infrastructure as part of the EU's post-2010 biodiversity policy (COM(2011) 244 final).<sup>1</sup> The increasingly fragmented nature of European habitats as a result of human-induced land cover change and land use intensification necessitates the integration of biodiversity and habitat considerations into other policies and sectors to strengthen ecological coherence within Europe. This development contributes also to the fact that nearly 30 % of the EU territory is moderately to very highly fragmented. Although the Natura 2000 Network now covers 18% of EU territory<sup>2</sup> and explicitly recognizes the importance of ecological coherence<sup>3</sup>, designated sites can currently be categorized more as a collection of isolated areas than as a cohesive network. The planned European green infrastructure strategy thus aims to address this issue by reconnecting fragmented natural areas, maintaining healthy ecosystems and restoring damaged habitats.<sup>4</sup> While biodiversity conservation is central to the strategy, recognising and highlighting the wider benefits of green infrastructure to society and the economy through the delivery of ecosystem services will also be of vital importance. In this context, green infrastructure can promote quality of life and human well-being, for example, by establishing recreational areas, help to better adapt to climate change through natural flood management and soil protection or enhance water purification and regulation by wetland restoration. Specifically target 2 of the EU biodiversity strategy to 2020 states that: "By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems."

Accordingly, this project aimed to achieve an overview of current projects and initiatives on green infrastructure in the EU, assisting in the development of a clear and applicable concept of green infrastructure for future policy-making. The project will significantly contribute to the future EU biodiversity policy by improving the understanding of green infrastructure and its benefits, which contribute to biodiversity conservation and benefit human populations and showing implementable measures to enhance the building of green infrastructure throughout Europe. More specifically, the objectives of the study are:

- to identify green infrastructure projects and bring them in a comprehensive framework by constructing a working definition and a typology for the projects, eventually aiming for an operationalisation of the Green Infrastructure concept;
- to analyse green infrastructure projects carried out under EU funds or as national initiatives and investments and to provide estimates of their cost and benefits, and of their potential to respond to multiple objectives (biodiversity management and

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<sup>1</sup> Communication from the Commission to the European Parliament, the Council, The Economic and Social Committee of the Regions (2011): Our life insurance, our natural capital: an EU biodiversity strategy to 2020

<sup>2</sup> European Commission (2010): Green Infrastructure factsheet.

<sup>3</sup> European Commission: Article 10 of the Habitat's Directive (92/43/EEC) and Article 3 of the Bird's Directive (79/409/EEC)

<sup>4</sup> European Commission (2010): LIFE building up Europe's green infrastructure – Addressing connectivity and enhancing ecosystem functions. Luxembourg.

enhancement, increasing resilience to climate change, protection against natural disasters, etc.); and

- to analyse the potential of EU policy and available funding instruments to promote green infrastructure projects and provide for the capacities and planning needed to develop them further.

## 2.2 Evidence base

The project adopted a three-fold approach to gather data for the analysis of green infrastructure projects and pertinent policy, entailing a database of green infrastructure projects and initiatives in Europe, six in-depth case studies and an expert workshop in Brussels. The different components of the project's evidence base are described in more detail below.

### Project database

The early stages of the work included the development of a MS Excel database of green infrastructure projects across the EU. This database contains basic information on a large number of GI projects in different Member States and regions and characterises these projects according to a green infrastructure typology (see section 3.2). In total, details of 127 projects have been entered in the database.

The database has been adapted throughout the data collection process, taking account of and incorporating new parameters as appropriate. The projects in the database are described in terms of the following parameters:

- **Name of the project or initiative**
- **Member state**
- **Sectors involved** (agriculture, forestry, water, etc.)
- **Geographic scale** (local/regional, national, transnational, EU)
- **Strategy or policy involved** (e.g. Natura 2000 (Birds and Habitats Directives), Water Framework Directive, regional/national/local development plans and planning regulations, national and regional adaptation strategies)
- **Setting** (rural, urban, combined)
- **State of implementation** (i.e. proposed, planned, implemented (year of implementation and if ongoing or not), evaluated.)
- **Ecosystem/ habitat covered**
- **Actions/measures involved** (e.g. mapping, planning, restoration)
- **GI elements involved** (e.g. protected areas, restoration zones, connectivity features)
- **Objectives**
- **Stakeholders involved & beneficiaries of the project** (e.g. local community, local business, user groups, local authority, investors and developers)
- **Funding sources used to implement the project** (e.g. EU sources such as LIFE+, ERDF, Cohesion; public funding from national/regional/local government funds; private funding)
- **Costs**
- **Benefits**
- **Project description and references/website**

A more detailed breakdown of the current parameters, including sub-categories and/or examples, can be found in Table 1 in the section 3.2. These parameters served to facilitate the identification of European green infrastructure projects relevant to this study.

Given the variable usage of the term 'green infrastructure', projects were identified that either labelled themselves with this term or described themselves differently, but still fell within the defined parameters. The objectives of the initiatives served as a useful starting point in the search. However, the large number of cases qualifying at least in part as being associated with green infrastructure (e.g. parks, nature reserves or farms) necessitated a more restricted focus before projects could be entered into the database. Thus, the search focused on projects of EU relevance that not only exhibit the aforementioned GI elements, but that also act as part of a larger coordinated strategic approach rather than as an isolated endeavor.

Several approaches and sources were employed. A general web search efficiently provided an overview of existing projects and served as a starting ground for further research, utilizing such terms as: *green infrastructure, ecosystem connectivity, wildlife corridors, ecological network, regional climate adaptation, ecosystem services, habitat restoration, green urban area, ecosystem-based approach, sustainable resource management*, etc. Additionally, presentations and proceedings from green infrastructure-related events and conferences were also consulted. In addition, databases on projects financed by the Cohesion Fund, LEADER or the INTERREG programme and by LIFE+ were consulted. The project search was also complemented where possible by the database being compiled as part of the parallel study on the "Assessment of the potential of ecosystem-based approaches to climate change adaptation and mitigation in Europe" as well as from the project UNEP-WCMC-project "Ecosystem-based Adaptation and Mitigation: good practice examples and lessons learnt in Europe".<sup>5</sup>

Finally, scientific and grey literature as well as reports from research projects<sup>6</sup> were reviewed and projects being developed as part of national strategies were identified and included in the project database.

### In-depth case studies

The six in-depth case studies of green infrastructure projects across the EU (see Table 1) represent an important element of the evidence base. These case studies allow for a more detailed assessment of the design and implementation of the respective projects, their costs and benefits, and the lessons learned. Reflecting the research questions of the project (see 2.3) the following topics (accompanied by a set of questions) have been defined to develop and structure the case study guidance document:

- **1. Introduction and project overview**
- **2. Green infrastructure, implementation facilitation and barriers**
  - Understanding of green infrastructure

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<sup>5</sup> Doswald N and Osti M. (2011). Ecosystem-based Adaptation and Mitigation: Good Practice Examples and Lessons Learnt in Europe. BfN Skripten.

<sup>6</sup> Kazmierczak and Carter (2010): Adaptation to climate change using green and blue infrastructure: A database of case studies, EU Adaptation Clearinghouse, 'Green Infrastructure Implementation' EC conference (November 2010), EEB (2008) Building Green Infrastructure in Europe. Special Report, Benefits of GI Knowledge Portal, Green infrastructure session of the EC at Green Week (June 2010), Sylwester, A (2010): LIFE building up Europe's green infrastructure and NAO "Enhancing Urban Green Space" 2006

- Implementation facilitation and set-up
- Barriers
- **3. Funding and costs**
- **4. Benefits**
  - Green infrastructure provision
  - Ecosystem services
  - Socio-economic benefits and impacts
- **5. Awareness**
- **6. Monitoring**
- **7. Lessons learned and additional comments**

As well as examining available documents and data, each case study involved a visit to the Member State/region concerned, to enable project managers and stakeholders to be interviewed. The criteria on how the case studies were selected are presented in section 3.4). A more detailed case study description can be found in Annex A.

**Table 1: Description of six in-depth case studies**

	<b>Name and country</b>	<b>Short description</b>
<b>1</b>	<b>Väinameri project</b> (Estonia)	The project (planned and implemented from 1997-2004) aimed to restore and conserve semi-natural coastal ecosystems through a set of interrelated activities that support rural economic development for local people and increase the attractiveness of the area. The project was originally part of a Helsinki Commission (HELCOM) effort to develop an Integrated Coastal Zone Management (ICZM) plan for the Southeast Baltic Region, thus encompassing a semi-enclosed area in Estonia covering ca. 2,000 km <sup>2</sup> . Activities were focused on restoring the semi-natural coastal grasslands through a combination of cattle farming (mowing, grazing and clearing activities), sustainable extraction for handicraft production and ecotourism, as well as ecological education and awareness-building efforts.
<b>2</b>	<b>Tiengemetten</b> (Netherlands)	In response to flooding damages and as part of the development of the National Ecological Network, the project aimed to restore a 660ha large freshwater tidal landscape on the island of Tiengemetten in which nature, recreation and the island's cultural history could co-exist. Part of the island was restored to its original state, traditional farmland, while dikes were removed in other areas to create the tidal landscape. The project was highly successful and saw the construction of a new visitor's centre, the completion of the opening of the dams, efficient flooding of the island, and the social acceptance of the transformation of 700ha farmland into tidal ecosystems.
<b>3</b>	<b>Alpine Carpathian Corridor</b> (Austria, Slovakia)	The project aimed to construct and preserve a coherent 120 km corridor from the Alps to the Carpathians in response to the increasing fragmentation caused by agriculture intensification, the rapid expansion of built-up areas and expanding transport infrastructure. The main objectives are to safeguard these habitats and enable the migration and genetic exchange between wild animal populations. From 2009-2012, implementation measures are planned within the framework this cross-border and cross-sectoral project (AT and SK), such as improving the traffic network by building 'green bridges' over highways at key points/bottlenecks as well the creation of suitable habitat patches or stepping stones within the corridor. Public awareness campaigns and environmental education for schools within the region are also part of the project.

4	<b>Transformation of the banks of the Rhone</b> (France)	Historical flooding of the Rhone River in France resulted the building of bridges, and construction of dams as flood control mechanisms, enabling the urbanisation of the banks. In the 1960s, the banks became a car park and the link between inhabitants of Lyon and the river was broken. A transformation project began in 2001, covering 10 ha over 5 km on the left river bank. The goal was to restore the banks with grass, plants and trees (creating new habitats for e.g. beavers), support sustainable land use activities (e.g. recreation) and connect the two green urban parks (linking the river and the streets above the banks).The project was launched in 2001, by the newly elected Mayor of the city and President of the Urban Community, Gérard Collomb, and financed through a budget of €42,886,000 from Greater Lyon, the city of Lyon and the Rhone-Alpes region.
5	<b>Gallecs</b> (Spain)	The objective of the project was to protect the region 'Gallecs' from urban and industrial pressures and subsequent environmental degradation. The aim was to strengthen the area's function as a "biological interface", i.e. a buffer zone between the urban fringe and the countryside beyond. Improved environmental conditions were to result in a higher quality of life for the inhabitants of the areas on the outskirts of Barcelona. An integrated approach was developed with a view to achieving sustainable land-use in the area. The strategic plan comprised a series of actions to control and manage urban sprawl, as well as to mitigate its detrimental impact on the environment. Activities included initiatives in the following areas: the restoration of natural habitats, sustainable agricultural and forest management, the use of renewable energy, and environmental education.
6	<b>National Forest</b> (UK)	The National Forest idea was conceived in the Government policy document 'Forestry in the Countryside' published in 1987 and, accordingly, receives significant annual funding directly from the government. The concept was to create a vast, new forest for the nation in lowland Britain that demonstrated the principles of multi-purpose forestry. This blends commercial forestry with a range of additional objectives and benefits including economic regeneration, landscape and ecological enhancement, rural diversification and community engagement, and creation of a new recreational and tourism resource. The Forest area spans 518 km <sup>2</sup> , representing an increase from 6% to nearly 19% since 1990.

## Expert workshop

*How can green infrastructure and its contribution to the provision of a wide range of ecosystem services be strengthened at different spatial scales?* The expert workshop on "Green infrastructure policies and projects" aimed to answer this question and to discuss lessons learned from the projects "Design, implementation and cost elements of Green Infrastructure projects" and "Green Infrastructure efficiency and implementation" as well as recommendations for future policy making. The workshop took place in Brussels on 7 September 2011 and was organised by Ecologic Institute with support from GHK and Institute for European Environmental Policy (IEEP).<sup>7</sup>

A world café discussion facilitated the sharing of experiences with and knowledge about GI from practitioners, scientists and NGOs as well as EU, national and regional administrative body representatives. Six main themes were explored in their respective working groups, namely:

1. Design and implementation of green infrastructure initiatives in Europe today

<sup>7</sup> <http://ecologic.eu/4286>

2. Integrating green infrastructure in spatial planning, policy and strategy development at regional/national levels
3. Costs and benefits of green infrastructure
4. Financing green infrastructure projects and initiatives
5. Policy tools, instruments and the EU framework
6. Identifying indicators and measuring the efficiency of green infrastructure

The results of these discussions feed directly into the analysis and recommendations provided in this report.

## 2.3 Analytical framework

In order to develop and operationalise the green infrastructure concept, the project team strove to create a clear working definition and typology of green infrastructure projects which could be understood by planners, implementers, policy makers and other relevant stakeholders. The definition aims to delineate the wide scope of green infrastructure projects as well as their benefits (see 3.1) and can be illustrated by the typology of green infrastructure projects. This typology seeks to capture the different types of projects that exist and highlight their distinguishing attributes. Ultimately, the typology guided the development of the project inventory as well as the selection of case studies and their subsequent analyses (see Figure 1).

Following the objectives of the project<sup>8</sup> different research questions were defined, which set the basis for the development of the project database, the case study guidance document and the expert workshop. These research questions embrace a wide variety of issues addressing the planning, set-up, implementation and evaluation of green infrastructure projects at local/regional level including inter alia the use of different financing instruments, type and role of stakeholders involved, resulting costs and benefits and the link and influence of wider policies, strategies and programmes at national and EU-level.

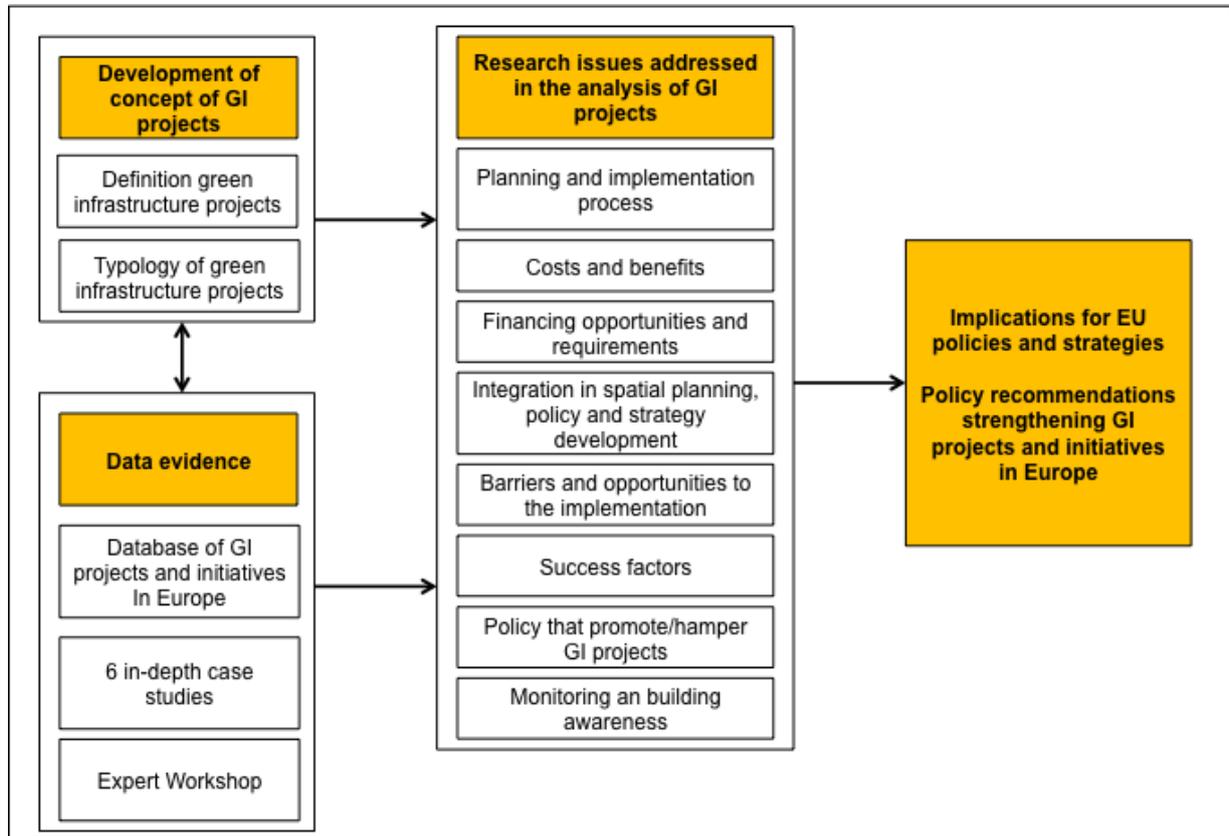
The project adopted a bottom-up approach drawing on in-depth case study results and the project database, which will complement the top-down EU policy approach, chosen for the research project “Green Infrastructure efficiency and implementation”.

The results reveal the implications for EU as well as national and regional policies and strategies and feed directly into the development of policy recommendations in order to strengthen and promote green infrastructure project and initiatives and thus contribute to the implementation of the planned EU Green Infrastructure strategy and the EU 2020 Biodiversity Policy. The recommendations emphasise more general considerations, such as the opportunities for cross-sectoral integration of green infrastructure in EU/national and regional policies, including outlining the possible benefits received by different sectors and stakeholders. Further recommendations focus on particular actions to be taken at an EU-

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<sup>8</sup> i) to identify green infrastructure projects and bring them in a comprehensive order by constructing a working definition and a typology for the projects, eventually aiming for a operationalisation of the Green Infrastructure concept; ii) to analyse green infrastructure projects carried out under EU funds or as national initiatives and investments and to provide estimates of their cost and benefits, and of their potential to respond to multiple objectives (biodiversity management and enhancement, increasing resilience to climate change, protection against natural disasters, etc.); and iii) to analyse the potential of EU policy and available funding instruments to promote green infrastructure projects and provide for the capacities and planning needed to develop them further.

level and respectively at the regional and national levels, such as creating a legislative framework, implementing and promoting the green infrastructure concept and establishing and promoting financing and administrative conditions which enable and encourage a wider uptake of green infrastructure initiatives and projects in a coordinated manner.



**Figure I: Analytical framework of the project**

## 3 Definition and typology of green infrastructure

### 3.1 Definition of green infrastructure

There is no single, universally accepted definition of Green Infrastructure. It is a relatively recent and increasingly widely used term, whose meaning and definition can vary according to context. One of the key objectives of this study was to arrive at an overall definition, which applies, to the wide range of green infrastructure initiatives across the EU. With reference to the available literature, and in consultation with parallel projects being undertaken for the Commission, the following definition was agreed:

**Green infrastructure** is the network of natural and semi-natural areas, features and green spaces in rural and urban, and terrestrial, freshwater, coastal and marine areas, which together enhance ecosystem health and resilience, contribute to biodiversity conservation and benefit human populations through the maintenance and enhancement of ecosystem services. Green infrastructure can be strengthened through strategic and co-ordinated initiatives that focus on maintaining, restoring, improving and connecting existing areas and features as well as creating new areas and features.

Different studies and reports present a variety of definitions of green infrastructure. These definitions are broadly consistent and overlapping, but may differ in their emphasis on the various components, features and characteristics of green infrastructure and the functions and services that it provides<sup>9</sup>.

Some definitions, for example, stress the importance of biodiversity conservation, through the role of green infrastructure in connecting ecological networks and contributing to landscape scale conservation.<sup>10</sup> Others focus on the functionality of green infrastructure and stress its importance in providing ecosystem services, often comparing its role to man-made infrastructure such as engineered drainage systems and flood defences<sup>11</sup>. In other contexts, the emphasis is on the benefits of green infrastructure to communities and the role it plays in enhancing the built environment and providing a resource for recreation, supporting human health and improving quality of life<sup>12</sup>. Other definitions focus more on the role of green infrastructure as a management tool, providing a strategic approach to land use planning and conservation<sup>13</sup>.

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<sup>9</sup> Sylwester (2009). *Green Infrastructure: supporting connectivity, maintaining sustainability* presents a longer discussion of the origins and various definitions of green infrastructure.

<sup>10</sup> European Commission (2010) LIFE building up Europe's green infrastructure - Addressing connectivity and enhancing ecosystem functions. Luxembourg.

<sup>11</sup> US Environmental Protection Agency (2008) Green Infrastructure Action Strategy. [http://www.epa.gov/npdes/pubs/gi\\_action\\_strategy.pdf](http://www.epa.gov/npdes/pubs/gi_action_strategy.pdf)

<sup>12</sup> England's Community Forests (undated) The Green Infrastructure of Sustainable Communities – Making the Difference. [http://www.communityforest.org.uk/resources/ECF\\_GI\\_Report.pdf](http://www.communityforest.org.uk/resources/ECF_GI_Report.pdf); <http://www.greeninfrastructurenw.co.uk/resources/GIguide.pdf>

<sup>13</sup> Benedict and McMahon (2006) Green Infrastructure: Linking Landscapes and Communities. <http://www.conservationfund.org/node/483>

Further subtle distinctions can be identified between definitions of green infrastructure at the local, regional, national and EU scales. EU level definitions tend to stress the role of green infrastructure in delivering ecosystem services and meeting EU environmental objectives such as adapting to and mitigating climate change and conserving biodiversity. At the local or regional scale, the social impacts of green infrastructure and the benefits it provides to local communities are often stressed, as well as its role in delivering particular ecosystem services.

While a wide range of features – such as trees, hedges, woodlands, green roofs, parks, semi-natural habitats, fields, wetlands and coastal areas - can in theory be components of green infrastructure, definitions of green infrastructure tend to emphasise certain characteristics, which include:

- **Critical mass** – To be defined as such, the components of green infrastructure normally have some degree of scale, critical mass and/or connectivity. Thus while an individual tree may be a component of green infrastructure, it is not normally recognised as such unless it forms part of a larger habitat, green area, corridor or network that serves a wider function.
- **Benefits to people** – Definitions of green infrastructure tend to stress the benefits and services that green spaces, semi-natural areas and features provide to people, i.e. their contribution to the delivery of ecosystem services;
- **Multi-functionality** – Green infrastructure is normally recognised as serving a variety of functions for both people and nature, and not just meeting single objectives such as nature conservation or public recreation.
- **Substitutability with grey infrastructure** – The term “infrastructure” implies that green infrastructure is a capital asset that requires investment and maintenance in order to deliver services to society. It has the potential to replace some of the functions that would otherwise be served by man-made or “grey infrastructure”, such as flood defences, water treatment and pollution control plant, and recreational infrastructure.
- **Co-ordinated interventions** – Green infrastructure is often defined by human interventions which aim to identify map, protect, restore, enhance or maintain it. In this sense green infrastructure may only be defined as such when it is included as part of a green infrastructure initiative or project.

While the term green infrastructure has been in place since at least the 1990s, its use has increased gradually over this period, and it has only recently become widely adopted in Europe. As a result, many green infrastructure initiatives have been established that did not – at least initially – refer to themselves as such. Green infrastructure projects frequently therefore use other terms or labels to describe themselves.

This is demonstrated by the green infrastructure projects in the database compiled for this study. Only a minority (fewer than 20%) of these refer to themselves explicitly as “green infrastructure” projects in their title or statement of main objectives. A wide variety of other labels are used, such as green spaces, green areas, open spaces, green systems, green networks, biological interfaces, biotope areas, biotope networks, corridors, ecological hubs, ecological networks, habitat networks, living spaces and green belts. Many projects also define themselves according to their objectives (e.g. species conservation, habitat

restoration, area regeneration, community development, climate adaptation), location and/or the habitat and landscape features they are seeking to protect or enhance (e.g. heathlands, woodlands, bogs, parks).

Similarly, none of the six case study projects was originally termed a “green infrastructure” project, though in all six cases interviewees agreed that their project could be defined as such (see Box 1 below).

### Box 1: Definitions of green infrastructure within the case studies

- **Alpine Carpathian Corridor** – as an ecological connectivity project, the initiative contributes significantly to green infrastructure;
- **Gallecs** – the project should certainly be defined as a GI project – it creates a connected green corridor between the city of Barcelona and the surrounding countryside, meeting multiple environmental objectives and delivering a range of ecosystem services;
- **Transformation of the banks of the Rhone (Lyon)** – the project has contributed to green infrastructure through the restoration and enhancement of green spaces in the urban area, for the benefit of people and the environment
- **National Forest** – the project was not initially termed a GI project. However, while still not universally understood, green infrastructure has become an increasingly used term during the history of the National Forest, and this has been reflected in the initiative’s activities, including the appointment of a Green Infrastructure and Planning Officer.
- **10Gemeten** – as a coastal restoration project which has formed an integral part of the EHS and Delta Natuur ecological networks, the project is clearly a GI initiative, but was not initially defined as such.
- **Väinameri** – consultees stressed the broad definition of green infrastructure, which can be taken to include a wide range of initiatives, including the Väinameri project.

In defining green infrastructure projects, it is also helpful to distinguish between those that take a holistic approach to green infrastructure within a particular area (e.g. including overall approaches to identification, planning, protection and provision of green infrastructure) and those that deliver specific aspects of a green infrastructure plan (e.g. targeting the provision of particular green infrastructure elements). The more holistic and co-ordinated approaches are more likely to identify themselves as green infrastructure initiatives.

## 3.2 Typology of green infrastructure projects

The wide range of different components, features, characteristics, functions and services of green infrastructure have led to a wide variety of different types of green infrastructure initiatives. Defining a typology of green infrastructure projects helps us to understand, describe and categorise the various different initiatives that are being taken across the EU.

For example, green infrastructure projects can be defined and categorised according to their main objectives, the scale at which they operate, the types of green infrastructure components they cover, the type of activities they involve, and/or the different sectors that they involve and affect.

Table 2 presents such a typology of green infrastructure initiatives, identifying key parameters that can be used to group or segment green infrastructure projects. This typology was used in the database of green infrastructure projects compiled for this study while recognizing that an overarching green infrastructure approach can support multiple objectives which can act in a complementary fashion.

**Table 2: Typology parameters, sub-categories and definitions**

Parameter	Sub-categories/definitions/examples	
<b>Objectives</b>	Water quality and supply	Includes actions on water purification and regulation such as improvement of riparian vegetation, wetland restoration
	Climate change adaptation and mitigation	Enhancing ecosystem resilience and functioning, help society to adapt to climate change <sup>14</sup> (e.g. natural flood management, coastal protection, green roofs)
	Biodiversity conservation	Combating biodiversity loss by protecting and improving areas of high conservation value, restoring new areas of habitat where possible and improving connectivity between existing natural areas through increasing the permeability of the wider landscape and the protection of spatial connectivity features
	Soil protection	e.g. afforestation, sustainable agriculture, land management
	Human health/quality of life/well-being	e.g. establishing recreational areas, installing green roofs to improve local climate and air quality, creating jobs and promoting rural and regional development
	Sustainable management	Taking actions specifically aiming to improve the ecological quality and permeability of landscapes, therein addressing multiple ecosystem services and functions and adopting a long-term perspective
<b>Actions/ measures involved</b>	Identification/ mapping/ spatial planning	Assess existing green infrastructure features/ elements and its functionality in order to identify how it needs to be improved (e.g. where restoration or development is needed) and where there is a need to enhance connectivity
	Legal designation of green infrastructure areas/features	e.g. protection under the Natura 2000 network, national parks, nature reserves, etc.
	Maintenance/protection	Maintaining protected areas, corridors and stepping stones; taking actions specifically aiming to benefit a particular habitat or species (e.g. conservation of a breeding ground area for migrating birds)
	Restoration	Improving the health of or converting an area/ecosystem back to its natural state (e.g. bog and mire, wetland, fish stock, forest, peat bogs)
	Creating new green infrastructure components	Creation of connectivity features, green roofs, new green (urban) areas (e.g. parks), sustainable use areas, habitats (national forest area, etc.)
	Research/analysis	Aiming to increase the knowledge of a certain species, or of specific habitat/ecosystem functions or features; testing/ developing appropriate management practices (e.g. impact of cover crops on soil erosion)
	Increasing public awareness	Public awareness campaign, production of guidance documents, involvement of local stakeholders and

<sup>14</sup> [www.ginw.co.uk/climatechange](http://www.ginw.co.uk/climatechange)

		populations
<b>Green infrastructure elements</b>	Protected areas	Large areas of healthy and functioning ecosystems with minimal intervention required (e.g. national parks, forest reserves, IUCN categories I and II); smaller areas that require management intervention (e.g. Natura 2000, IUCN category IV).
	Restoration zones	Reforestation zones, increased foraging areas, new areas of habitat for ecosystem services (e.g. peat bogs); conversion of a habitat back into its original form via management actions
	Sustainable use areas	Areas for improved ecological quality and permeability of landscape; sustainable economic land uses and related restrictions (e.g. relevant to tourism activities) that help maintain or restore healthy ecosystems (e.g. IUCN categories V and VI, biosphere reserves)
	Green urban features	e.g. parks, gardens, grassy verges, green walls, green roofs
	Natural connectivity features	Ecological corridors (hedgerows, wildlife strips) stepping stones, riparian river vegetation, etc.
	Artificial connectivity features	Features designed specifically to assist species movement (e.g. green bridges, eco-ducts, wildlife passages, etc.), which can result from compensation measures to recreate a physical connection which has been lost or compromised as a result of grey infrastructure construction (e.g. a motorway)
	Multifunctional zones	Balance between various uses such as access, recreation and biodiversity; promote enhanced public access to the landscape particularly adjacent to existing and planned settlements <sup>15</sup>
<b>Ecosystem/habitat covered</b>	e.g. Arable land, coast, forest, grassland, river, wetland; if the project focuses on a specific species, the name of the species is listed as well as the relevant habitats	
<b>Sectors affected</b>	Agriculture, built environment, energy, fisheries, forestry, health, tourism, transport, urban & regional planning, water, cross-sectoral, nature protection	
<b>Setting</b>	Rural, urban, peri-urban, combined (containing elements of both rural and urban landscapes)	
<b>Geographic scale</b>	Local/regional, national, transnational <sup>16</sup> , EU	

### 3.3 Spectrum of green infrastructure projects

Looking at the 127 projects in the database to which the typology has been applied, it becomes clear that European green infrastructure projects are extremely diverse in nature and exist across all spatial scales. Database projects represented approximately 70% local/regional, 20% national and 10% transnational cases. While the majority of projects have been implemented within the EU-15 Member States, around 16% of the projects took place in the EU-12 MS; all 27 MS were covered by at least one green infrastructure project. Furthermore, projects were split between rural, urban or combined rural-urban areas, with the majority taking place in rural areas or urban fringe locations (combining elements of both rural and urban landscapes).

<sup>15</sup> Cambridgeshire Horizons (ND). Quality of life programme: Green infrastructure strategy.

<sup>16</sup> Transnational and EU focused projects may also involve non-EU countries

Further analysis highlights the range of objectives, sectors, elements and activities addressed across the projects. The distributions across each aspect are illustrated below (see Figures 2-5), reflecting the frequency with which each category was addressed by the database projects. Interesting to note is that the majority of projects do not have a single objective or address only one sector, element or activity, but rather incorporate many of each of these aspects in a complementary fashion. Using the typology is therefore helpful for understanding differences in focus, emphasis and characteristics between initiatives rather than to identify distinct types or categories of green infrastructure projects.

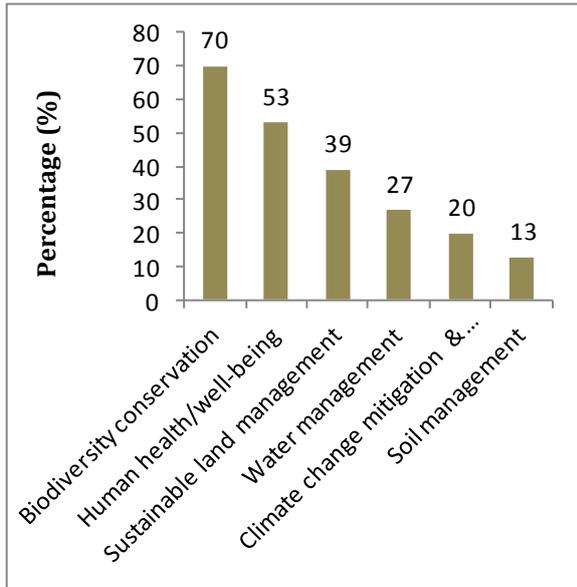


Figure 2: Frequency of objectives targeted

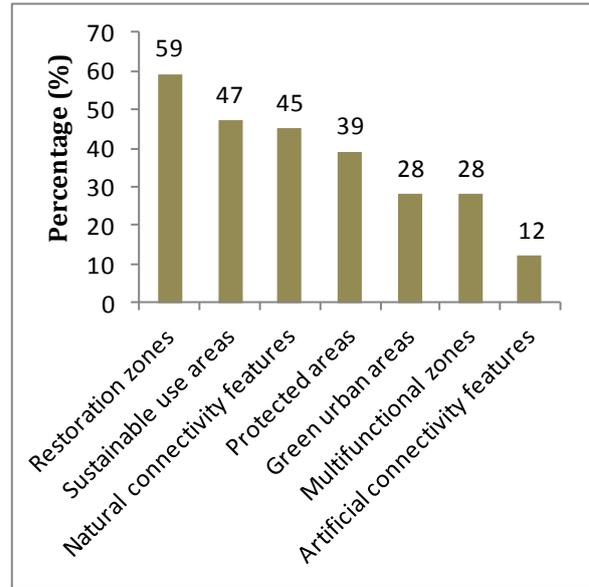


Figure 3: Frequency of elements addressed

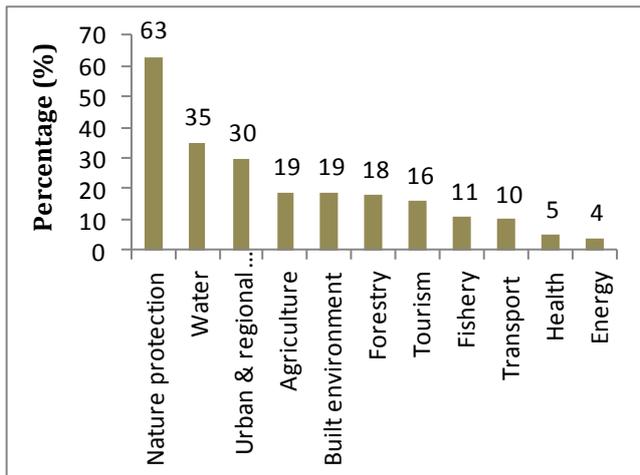


Figure 4: Frequency of sectors addressed

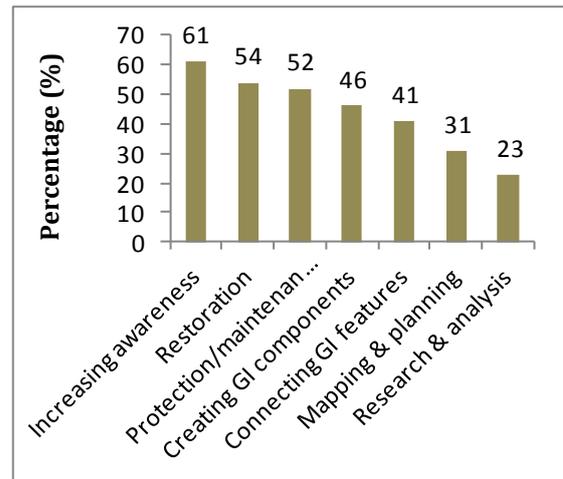


Figure 5: Frequency of activities

Beyond the overarching distributions outlined above, the database also revealed some trends regarding the sectors addressed. As most projects were cross-sectoral in nature, it follows that certain sectors were commonly found in connection with others. Almost all of the projects addressing the health sector, for example, also related to urban and regional planning, e.g. the Stuttgart green aeration corridor study<sup>17</sup> and the in-depth case study “Transformation of the banks of the Rhone: from a car park to public parks”. These and further examples from the database representing the different sectors are outlined in Table 3.

**Table 3: Examples of green infrastructure projects, distinguished by sector<sup>18</sup>**

Sector(s) addressed	Project/Initiative	Duration	Scale	Short description
<b>Nature protection; fishery; tourism</b> (built environment)	Setting up the first coastal nature reserve in Malta ( <i>Dwejra, Malta</i> )	2004-2007	Local/regional	The project sought to establish a coastal nature reserve at Dwejra (Malta’s first such protected area). Activities included stakeholder consultations, dissemination, developing an environmental management plan and conducting capacity building exercises as well as restoration and conservation activities.
<b>Water</b>	The Netherlands Live with Water ( <i>Netherlands</i> )	2003 - ongoing	National	One of three major communication campaigns related to raising awareness of the risk of flooding in the Netherlands and the natural solutions that can be employed to address this risk, such as integrated coastal management. The durability aspect of solutions is emphasized, looking for example at green vs the historically used grey infrastructure ideas.
<b>Agriculture; nature protection</b>	Sustainable Doñana ( <i>Doñana National Park, Spain</i> )	2001-2004	Local/regional	The project aimed to (1) strengthen the active participation of farmers in adopting environmentally friendly agronomic techniques; (2) improve the sustainability of woodland farms through efficient management of land/water resources; (3) reduce water contamination from pollutants coming from agricultural soils; and (4) increase civil participation in the conservation of important sites/Natura 2000.
<b>Forestry</b>	The Mersey Forest ( <i>UK</i> )	2003-ongoing	Local/regional	The aim is to create 8,000 hectares of new community woodlands and associated environmental, economic and social benefits through sustainable landscape improvements to The Mersey Forest area. Interventions include new tree planting, land reclamation, bringing woodland into management, creating access to green space and recreational facilities, managing and improving habitats, engaging local communities and business support activity for forestry businesses.

<sup>17</sup> See Kazmierczak, A. and Carter, J. (2010): Adaptation to climate change using green and blue infrastructure. A database of case studies.

<sup>18</sup> Secondary sectors are placed in brackets

<b>Fishery</b>	Baltic Marine Protected Areas ( <i>Estonia, Latvia and Lithuania</i> )	2005 - 2009	Trans-national	The project objective was to secure the protection and sustainable use of marine biodiversity in the Eastern Baltic Sea. The project completed the Natura 2000 sites in the marine territories of Estonia, Latvia and Lithuania and assessed/reduced the impact of fishery by-catch on target bird and mammal species. The project also addressed other threats such as construction developments, economic or recreational activities and pollution.
<b>Tourism</b>	Vosges-Pfälzerwald Cross-Border Biosphere Reserve ( <i>France, Germany, Italy</i> )	1993-2007	Trans-national	The initiative improved the links between two territories that share a natural area, but are separated by regional and national boundaries. Signage was improved and cross-border tours were established.
<b>Urban and regional planning</b>	Development of open space standards ( <i>Slovakia</i> )	2009-ongoing	National	The Ministry for Construction and Regional Development commissioned a group of experts in 2009 to update the set of national standards for land use planning. The standards include guidance for planning of open spaces and green areas and describe not only the aspects relating to the quantity of open space in towns or in a green development, but also include aspects relating to the quality and character of open spaces.
<b>Transport</b> (forestry; water; regional planning)	Bulgaria de-fragmentation ( <i>Bulgaria</i> )	2008 (1-year-study)	National	Research project to analyze species migration needs and bottlenecks in Bulgaria as well as associated costs, which should lead up to the Development of a National Policy Plan for Habitat De-fragmentation across Transport Corridors in the Republic of Bulgaria.
<b>Health; urban and regional planning</b>	Combating heat island and poor air quality with green aeration corridors ( <i>Stuttgart, Germany</i> )	2008	Local/regional	This project aimed to facilitate air exchange in the city and enhance cool air flow from the hills towards the urban areas on the valley floor by enhancing open spaces and providing vegetation. Development regulations and promotion of green roofs and green facades were used to this end. Ultimately, air flow was improved, protected areas were created and citizen health improved.
<b>Built environment</b> (energy; health)	Block 103 ( <i>Berlin, Germany</i> )	1987-1991	Local/regional	A framework of pilot projects in energy generation, water and refuse recycling, the use of environmentally sensitive building materials – and greening. Nearly 40 per cent of Block 103's roofs have now been planted, bringing a variety of benefits, including a beneficial increase in humidity and improved insulation.

Another interesting trend was that all of the projects in the transport sector were connected with the nature protection sector, and the majority were also listed in combination with regional planning. Within the context of green infrastructure, these relationships often stem

from the notion of trying to mitigate or compensate environmental damages caused by grey transport infrastructure (including motorways, roads, car parks, railways, ports/freight terminals, canals, airports, dams) and the need to integrate such developments in regional plans. This is demonstrated in the Alpine Carpathian Corridor in-depth case study, which involved conducting scoping studies on the state of regional fragmentation caused by transport infrastructure and the feasibility of constructing green bridges to improve the region's functional connectivity for wildlife.

Finally, nature protection projects were most commonly linked with the water sector, such as the restoration of the Danube river banks in Austria to deliver improved ecosystem services and prevent further erosion. The in-depth Tiengemeten case study also exhibited this relationship, aiming to restore a large area to its natural freshwater tidal landscape character and thereby additionally support threatened species reliant on such ecosystems.

### 3.4 Application of typology - Selecting case studies

The typology and its descriptive parameters were used to select the case studies, which seek to represent the wide spectrum of green infrastructure projects. Accordingly, the matrix below illustrates both the diversity of green infrastructure projects and the representativeness of the selected case studies. The fisheries sector was the only one not addressed in the selected case studies due to the limited number of examples available in the database and the need to also select projects representing the range of objectives and elements. Similarly, no projects taking place on a national scale were selected also because of the variety of other criteria that were employed in case study selection.

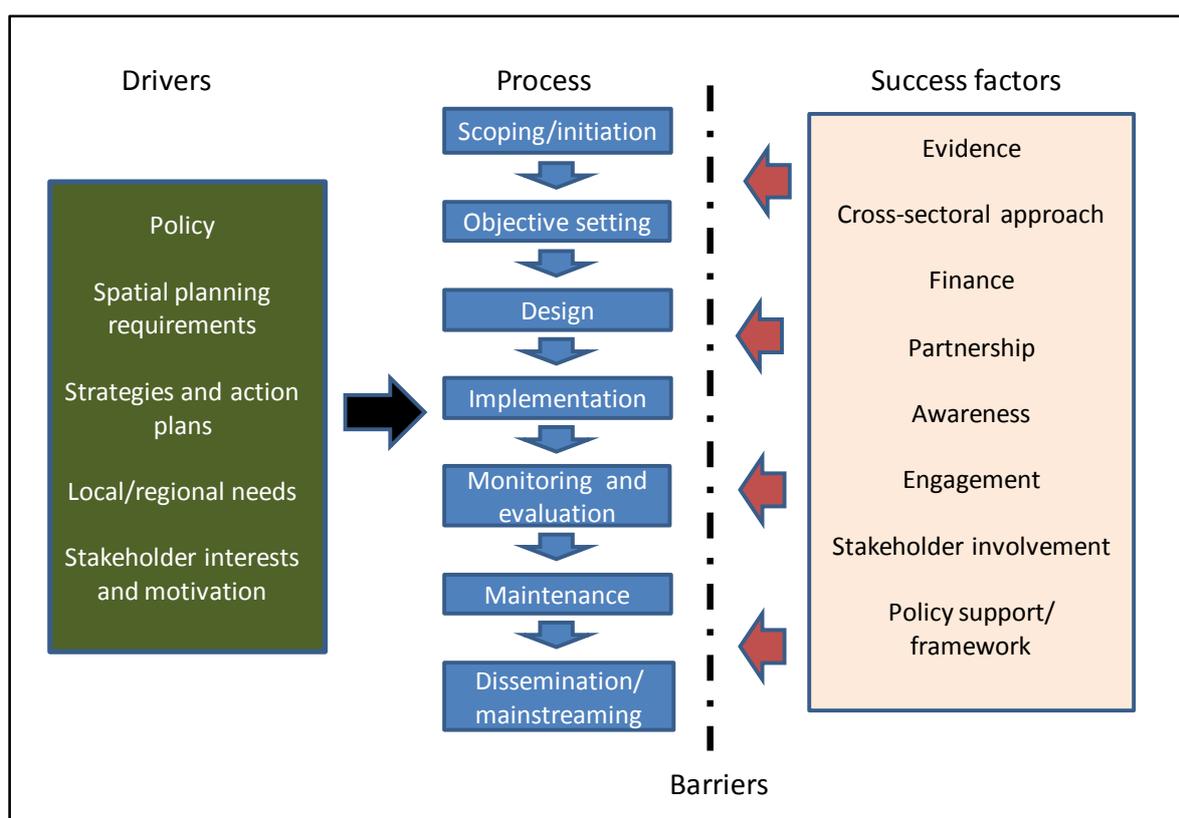
**Table 4: Selection matrix for in-depth case studies**

Selection criteria		In-depth Case Studies					
		Väinameri	Tiengemeten	Alpine Carpathian Corridor	Transformation of the banks of the Rhone (Lyon)	Gallecs	National Forest
MS	Old MS (EU-15)		NL	AT	FR	ES	UK
	New MS (EU-12)	EE		SK			
Scale	Local/regional						
	National						
	Transnational						
Sector	Agriculture						
	Built environment						
	Energy						
	Fishery						
	Forestry						
	Health						
	Tourism						
	Transport						
	Urban/regional planning						
	Water						
	Nature protection						
Obj	Water quality/supply						

	Climate change A&M						
	Biodiversity conservation						
	Soil protection						
	Human health/well-being						
	Sustainable management						
<b>Green infrastructure elements</b>	Protected areas						
	Restoration zones						
	Sustainable use areas						
	Green urban features						
	Natural connectivity						
	Artificial connectivity						
	Multifunctional zone						
<b>Funding</b>	EU (e.g. LIFE+)		LIFE+	ERDF		LIFE+	
	Public						
	Private						
	Project duration	1997-2004	2003-2007	2002-2012	1991-ongoing	2001-ongoing	1990-ongoing
		Väinameri	Tiengemeten	Alpine Carpathian Corridor	Transformation of the banks of the Rhone (Lyon)	Gallecs	National Forest

## 4 Initiation, design and implementation of green infrastructure projects

This section analyses inter alia the drivers for initiating green infrastructure projects, the ways in which green infrastructure projects have been designed and implemented and the barriers and enabling factors in relation to the design and implementation of projects. The relationships between these factors, as evidenced by the project database, in-depth case studies, relevant literature and findings from the green infrastructure expert workshop are represented in the graphic below (see Figure 6).



**Figure 6: Elements of green infrastructure project design and implementation**

As becomes evident in the above figure and will be discussed in more detail throughout this chapter, there are a diversity of factors responsible for inspiring green infrastructure action which can work either independently or in combination with one another (see 4.1). The same holds true for the enablers (see section 4.3.2) and the barriers, barriers that they seek to address, which represent weaknesses or failures in achieving the project objectives. Finally, as illustrated, several phases comprise a green infrastructure project; it should be noted, however, that not all projects integrate each of these stages or necessarily follow the given order.

## 4.1 Drivers of green infrastructure projects

There can be several reasons underlying the motivation to initiate a green infrastructure project, including policy and strategic drivers at the EU, national and/or local/regional levels, clearly identified local and regional needs and/or the interests of private and social actors or motivated communities. The following section explores these reasons in more detail, based on the outcomes of the database and case study analysis as well as the expert workshop, in order to detect patterns and reveal the influence of such drivers on the establishment of green infrastructure projects and initiatives. Examples of green infrastructure initiation in practice are taken from the six in-depth case studies, illustrating not only the diversity of drivers for initiating such projects, but also the variations possible regarding the approach to initiation. In addition, results from the project database have been taken into account.

### Local/regional, national and EU policies and strategies

Green infrastructure projects do not emerge on their own, but are usually embedded in specific policy frameworks which provide *inter alia* for fundamental target setting, basic guidelines for design and implementation of such projects and, sometimes, also for funding schemes for implementation. Such frameworks can exist at various levels, including EU, national and regional/local, and can range from being legally binding to evoking voluntary action. Therefore, a green infrastructure project can be the result of legislative requirements for land use or simply part of a general strategy for biodiversity protection or climate adaptation in a particular region. The assessment of a total of 127 green infrastructure projects from across the EU showed that about 50% of the projects are embedded in a regulation and planning framework and are based on specific strategies and plans.

**EU policies:** The most common policy that projects refer to is the Natura 2000 network under the Habitats and Birds Directives. The Habitats Directive does not refer to green infrastructure directly, but requires the Member States to contribute under Article 3(1) to forming ‘a coherent ecological network’, referred to as the Natura 2000 network, which forms the cornerstone of nature legislation in the EU. The term ‘coherence’ is of key importance as it indicates that Natura 2000 sites may not be seen as isolated ecological hot spots that can survive on their own, but as elements of a broader network with numerous functional links amongst sites, proving consistent with the green infrastructure concept. Projects presenting the Habitats Directive and the Natura 2000 network as the reference framework are mostly government driven initiatives that seek to implement the EU legislation on national level. Such projects often design a network of protected areas and other landscape structures to ensure the connectivity of habitats on landscape level.

The **Cohesion Policy and its European Regional Development Fund (ERDF)** are also an important piece of legislation inspiring green infrastructure projects, having relevance for around 10% of the database projects (predominantly with regard to financing). Under this policy, projects aiming to allow species to move and adjust as well as restore ecosystem services are supported. Many Operational Programmes provide co-financing for managing Natura 2000 and implementing measures that support ecological coherence and connectivity in the context of regional development. However, it should be noted that funding may help to drive implementation of green infrastructure projects, but it is more of an enabler as it allows the initiatives to happen rather than being the original motivation. This also applies to the LIFE+ programme, which does not specifically address the development of EU green infrastructure, but contributes to co-financing Natura 2000 implementation and supports

green infrastructure features/elements within the areas of nature and biodiversity and environmental policy and governance (see also section 4.2.4).

A clear potential to integrate and boost green infrastructure projects throughout the EU is offered by **spatial planning policies** which, at the EU level, are comprised *inter alia* of the **Strategic Environment Assessment (SEA), Environmental Impact Assessment (EIA) and Environmental Liability Directive (ELD)**.<sup>19</sup> The SEA and EIA are considered as the most important legal instruments of horizontal European environmental policy. This policy encompasses environmental legislation on issues that cut across other environmental legislation and the environmental media such as water, biodiversity, soil, climate, air and landscape. Due to this broad focus, green infrastructure can be addressed in a holistic manner. The shared aim of both directives is to ensure that projects, policies, plans and programmes are unlikely to have significant effects on the environment. Prior to approval or authorisation, all of the above are subject to an environmental assessment. In addition, the ELD establishes a framework based on the "polluter pays" principle, under which the polluter is responsible for paying when causing environmental damage; this principle is already outlined in the treaty establishing the European Community. As the ELD deals with "pure ecological damages", it is based on the powers and duties of public authorities as opposed to a civil liability system, which is more appropriate for "traditional damage" (damage to property, economic loss and personal injury).<sup>20</sup>

By screening the wider EU policy context, it becomes clear that many objectives set out in green infrastructure projects are shared by EU policies and strategies (see Table 5), even if most of the projects analysed do not refer explicitly to these policies. However, these findings offer an opportunity to integrate and support green infrastructure initiatives at a wider policy scale, which is explored in more detail in section 6 (Table 30). This overview highlights the fact that a wide range of policy sectors including agriculture, water, climate, forestry, fisheries and energy offer opportunities to support green infrastructure and its requirements. However, it should be noted that the table only includes policies/strategies that have a potential to support green infrastructure, but does not list those policies which might endanger the maintenance and protection of green infrastructure or hamper its development. Such policies include, for example, the Trans-European Transport Network (TEN-T) or the Cohesion Policy, which are likely to provide financing through the structural funds, but which can lead to increased fragmentation; necessary compensation measures (e.g. green bridges) for reconnecting fragmented habitats might be paid from much smaller conservation budgets.

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<sup>19</sup> Further "spatial planning policies" comprise the European Spatial development Perspective, the EPSON 2013 Programme, Territorial Agenda of the EU 2020 and the EC 2006 Thematic Strategy on the Urban Environment (see Table 30)

<sup>20</sup> <http://ec.europa.eu/environment/legal/liability/index.htm>

**Table 5: Objectives, definitions/examples and relevant EU policies/strategies (non-exhaustive list)**

Objective	Definition/examples	Relevant EU policy/ strategy
<b>Water quality and supply</b>	Includes actions on water purification and regulation such as improvement of riparian vegetation, wetland restoration and floodplain restoration	<ul style="list-style-type: none"> <li>• Water Framework Directive</li> <li>• Floods Directive</li> <li>• Blueprint to safeguard Europe's Waters</li> <li>• EU Action on Water Scarcity and Drought<sup>21</sup></li> <li>• Green Paper on Forest Protection and Information</li> </ul>
<b>Climate change adaptation and mitigation</b>	Enhancing ecosystem resilience and functioning, combating urban temperature extremes <sup>22</sup> (e.g. carbon retention through bog and mire restoration; flood management via the removal of barriers to river management; coastal protection by maintaining salt marshes and restoring dune systems)	<ul style="list-style-type: none"> <li>• White paper: Adapting to Climate Change</li> <li>• Floods Directive</li> <li>• EU Action on Water Scarcity and Drought<sup>23</sup></li> <li>• 2050 Low Carbon Roadmap</li> <li>• EU Forestry Action Plan</li> <li>• Green Paper on Forest Protection and Information</li> <li>• <i>Upcoming EU strategy for adapting to the impacts of climate change</i></li> </ul>
<b>Biodiversity conservation</b>	Combating biodiversity loss by protecting and improving areas of high conservation value, restoring new areas of habitat where possible and improving connectivity between existing natural areas through increasing the permeability of the wider landscape and the protection of spatial connectivity features (e.g. creating protected areas, corridors and stepping stones as an ecological network)	<ul style="list-style-type: none"> <li>• EU Biodiversity Strategy to 2020</li> <li>• Habitats and Wild Birds Directive (Natura 2000)</li> <li>• LIFE+ Regulation</li> <li>• EU Forestry Action Plan</li> <li>• Green Paper on Forest Protection and Information</li> <li>• CAP Pillar 2 – Rural development</li> <li>• Marine Framework Directive</li> <li>• Common Fishery Policy</li> </ul>
<b>Soil protection</b>	e.g. afforestation, increased use of sustainable soil management practices, sustainable agriculture and forestry, land management	<ul style="list-style-type: none"> <li>• Soil Thematic Strategy</li> <li>• EU Biodiversity Strategy to 2020</li> <li>• Green Paper on Forest Protection and Information</li> <li>• CAP Pillar 2 – Rural development</li> </ul>
<b>(Protection and enhancement of) Human health/quality of life/well-being</b>	e.g. establishing recreational areas, installing green roofs or planting urban trees to improve local climate and air quality, creating jobs and promoting rural and regional development	<ul style="list-style-type: none"> <li>• CAP Pillar 2 – Rural development</li> <li>• EU 2020 Strategy</li> <li>• Regional Policy (Cohesion Policy)</li> <li>• White paper: Adapting to Climate Change</li> <li>• Floods Directive</li> <li>• EU Forestry Action Plan and the forthcoming EU Forestry Strategy</li> <li>• Environment and Health Strategy (and Action Plan 2004-2010)</li> <li>• Natural disasters prevention and</li> </ul>

<sup>21</sup> [http://ec.europa.eu/environment/water/quantity/eu\\_action.htm](http://ec.europa.eu/environment/water/quantity/eu_action.htm)

<sup>22</sup> see [www.ginw.co.uk/climatechange](http://www.ginw.co.uk/climatechange)

<sup>23</sup> [http://ec.europa.eu/environment/water/quantity/eu\\_action.htm](http://ec.europa.eu/environment/water/quantity/eu_action.htm)

		response
<b>Sustainable management</b>	Taking actions specifically aiming to improve the ecological quality and permeability of landscapes, therein addressing multiple ecosystem services and functions and adopting a long-term perspective	<ul style="list-style-type: none"> <li>• Sustainable development strategy</li> <li>• European Spatial Development Perspective</li> <li>• Resource Efficiency Flagship under the Europe 2020 and its Roadmap</li> <li>• 6th Environment Action Programme 2002-2012) and its update</li> </ul>

**Spatial planning at local, regional and national levels** plays an important role in the development of green infrastructure. The analysis revealed that when a spatial plan is created, choices are sometimes made regarding if and how to preserve or enhance green infrastructure in a certain area and the time-span in which such initiatives have to be accomplished. Examples include inter alia integrated coastal zone management and the UK Shoreline Management Plans. The basis for spatial planning at local, regional and national levels is provided by the EU legislative framework, including SEI, EIA and ELD, which have to be transposed into national legislation. These pieces of legislations set the requirements for developing spatial plans at national as well as local and regional levels.

Spatial planning systems are already in place in many European countries and most foresee the enhancement of green infrastructure elements. The requirements set out in the regulation might have to be translated into local land use plans depending on the level at which they have been adopted and/or have to be considered in EIA and SEA. In this context, green infrastructure projects are often the result of attempts from local land use planners to adequately respond to the requirements set out by legislation. Compensation and remediation measures (e.g. for building new infrastructure or seeking to comply with the “polluter pays principle” under the ELD)<sup>24</sup> can be considered a specific tool for integrating green infrastructure aspects and initiating related projects. Accordingly, various green infrastructure projects have been carried out to compensate for grey infrastructure activities, even if they are not labelled as such. In this context, Habitat Banking - defined as “a market where credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage” (eftec et al. 2010: 2)<sup>25</sup> - could be used if carefully weighed against other compensation measures.

In general, it should be carefully assessed whether maintaining and protecting green infrastructure which supports habitat connectivity and ecosystem functioning is more cost-efficient than carrying out restoration activities (e.g. building green bridges) that might be necessary to compensate for the damages caused through grey infrastructure.

<sup>24</sup> For example, the Austrian Motorway Company built 6km of wildlife passages along a 20km motorway to compensate for the resultant fragmentation effects incurred.

<sup>25</sup> Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time. Biodiversity credits and debits in the context of this project include both habitats and species.; Source: eftec, IEEP et.al (2010): The use of market-based instruments for biodiversity protection - The case of habitat banking – Technical Report.; available at: [http://ec.europa.eu/environment/enveco/pdf/eftec\\_habitat\\_technical\\_report.pdf](http://ec.europa.eu/environment/enveco/pdf/eftec_habitat_technical_report.pdf)

Consequently, green infrastructure should be strongly considered within EIA as well as transport, water and spatial planning.

In addition to binding EU and national legislative instruments, non-binding **strategies and action plans** can also play a role in the development and implementation of green infrastructure projects. Strategies and action plans can include objectives or general principles to allow for green infrastructure to be taken into account in policy-making across policy areas and governance levels (EU, MS, local) as well as in spatial planning. In other cases, such plans announce concrete priorities and measures to be taken in specific policy fields (e.g. biodiversity) or geographic areas. Their prescriptive status can be characterised as “guidance with political commitment”. Prominent examples include *inter alia* multi-sector strategies and programmes towards climate adaptation and/or mitigation, the Agenda 21 process<sup>26</sup> or regional/national landscape programmes.

Of the analysed case studies, the Vänameri project initially sought to fulfil international and regional policy objectives related to ecosystem protection and biodiversity conservation. This project was originally developed in the context of a Baltic Sea Region initiative to develop Integrated Coastal Zone Management (ICZM)<sup>27</sup> plans. In this context, the Helsinki Commission (HELCOM) had identified coastal lagoons and wetlands as areas of major importance for the Baltic Sea environment and prioritised this in the Joint Comprehensive Action Program. The island of Vormsi (represented by the Vänameri project) was selected by World Wildlife Fund (WWF) Sweden as one of the six pilot projects. However, the project also aimed to assist the local economy by engaging in activities that benefit local populations and additionally support environmental objectives.

### Local/regional needs

A particular focus in the case studies was on the question of whether or not the objectives and activities of the projects were underpinned by clearly defined needs and evidence. This question was answered positively by most of the case studies, highlighting that the needs were predominantly analysed through scoping studies or consultation processes before developing the project.

In the case of the Transformation of the banks of the Rhone, an initial analysis revealed that different local needs exist which need to be addressed, such as urban needs, social needs, flood protection, renaturation and landscape challenges. It was thus determined that a transformation of parking spaces into green recreational side/bicycle walks along the banks of the Rhone River would serve to address these diverse needs. The Tiengemetten project arose as a result of the clear need to address flood damage/prevention and thus environmental and human health/security needs. Simultaneously, the project was also supported and encouraged as part of the National Ecological Network, representing a national priority in the area of nature conservation. The Gallecs project similarly addressed

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<sup>26</sup> Project: Greater Lyon green network - Develop and increase the urban tree canopy (France)

<sup>27</sup> ICZM is an informal approach to supporting sustainable development of coastal zones through good integration, coordination, communication and participation; this approach is currently non-binding for Member States. On the one hand, ICZM is a process that should permeate all planning and decision-making levels as a guiding principle and, on the other hand, is a tool applied for the purpose of integrated identification of potential development and conflict as well as for resolving conflicts in a non-bureaucratic manner. ([http://www.ikzm-strategie.de/dokumente/ikzm\\_englisch\\_final.pdf](http://www.ikzm-strategie.de/dokumente/ikzm_englisch_final.pdf))

local problems, in this case by responding to previous unsustainable agricultural practices which lead to negative environmental consequences and by addressing former urbanization processes which took place without proper land use planning.

As discussed in more detail in 4.2.3, the involvement of stakeholders from the very beginning of the project, including the planning phase, ensures that stakeholder can be adequately informed about the planned project and its objectives and that the needs of the stakeholders and local communities are adequately taken into account in the project design.

### Interests of private and social actors

The interests of private and social actors can act as an additional factor responsible for implementing green infrastructure projects. In some cases, projects are initiated by individuals or local/regional organisations that are not only strongly motivated and advocates of nature protection objectives, but have also gained the local community's trust and therewith strong support for such projects. Further benefits for the private sector from green infrastructure regarding securing/creating jobs and economic revenue can serve as further motivation.

Private actors can also provide financial support, driving green infrastructure projects forward. One motivation can stem from the requirements for compensating damages that have been caused by new infrastructure construction (see above) or requirements for renaturalising former extraction sites; here, the previous user (company) is asked to finance the recovery of former exploitation sites and to create new green infrastructure. Additionally, the individual interests of private donors can also drive the establishment of a green infrastructure project (e.g. the desire to improve nature conservation or reduce environmental pressures in a certain area). The interest in potential positive returns on investments in the long-run is also a consideration.

Specific illustrations from the case studies were not available, but were identified in the expert workshop and wider literature. For example, Heidelberg Cement (industry) and Birdlife (NGO) partnered together to restore areas, which are no longer exploited, and which represent potential habitats for birds. This project helped Heidelberg Cement to find an appropriate solution for formerly exploited and degraded areas and provided Birdlife with financing and new potential areas for the protection of birds. The creation of the new ecosystems/renaturation was managed by Birdlife. Such projects fit well under the umbrella of Corporate Social Responsibility objectives. More examples for private investments and motivation are presented in sections 4.2.2 and 4.2.4.

### Green infrastructure project initiation in practice

As to be expected by the range of factors driving green infrastructure projects, it follows that approaches to initiation are equally varied. The six in-depth case studies explored within this project are outlined below (in Table 6) as practical examples of such approaches, adapted to the regional circumstances and external factors driving the process.

**Table 6: Approaches to initiating green infrastructure projects, as illustrated by the in-depth case studies**

Project	Approach to initiation
<b>Väimameri</b>	The project was originally part of a Helsinki Commission (HELCOM) effort to develop an ICZM plan for the Southeast Baltic Region. World Wildlife Fund Sweden served as the lead party for HELCOM's Working Group on Management of Lagoons and Wetlands from 1993-1996 and chose to implement the Estonian management plans.
<b>Tiengemeten</b>	The national government initiated the project and also submitted the funding application to LIFE+ to (1) contribute to the achievement of a National Ecological Network and (2) restore the tidal landscape to its original form (whose functioning was damaged by the construction of dikes and sluices in the 1950s in the hopes to prevent future flooding).
<b>Alpine Carpathian Corridor</b>	The initial project idea and conduction of a feasibility study (2007) came from World Wildlife Fund (Austria) in response to a priority to safeguard the corridor and a previous scoping study from 2001. The provincial government of Lower Austria then secured funds from ERDF.
<b>Gallecs</b>	The Gallecs Rural Spaces Consortium (made up of two regional municipalities) originally had 515ha recognized as a region for tourism and organic agriculture development. The project's continuation grew out of the creation of a Master Plan from the predecessor, creating a new consortium with relevant Catalonian departments and six local municipalities.
<b>Transformation of the banks of the Rhone</b>	In 1981, the Commission "Lyon, River town" was set up by the Planning Agency of Lyon; since 1985, reflection on the transformation of the banks has taken place. The project was launched in 2001 by the newly elected Mayor of the city and President of the Urban Community, Gérard Collomb.
<b>National Forest</b>	The concept for the National Forest was developed in the 1980s, culminating in the production of the policy document 'Forestry in the Countryside' by the statutory body 'Countryside Commission' <sup>28</sup> in 1987. Activities to create the forest began in 1991 through the Countryside Commission.

## 4.2 Green infrastructure design and implementation

In evaluating the effectiveness of green infrastructure projects in contributing to various cross-sectoral objectives, it is helpful to consider the project set-up and approach to delivery/management. Relevant aspects such as the types and roles of stakeholders, approach to awareness raising and capacity building, sources of financing and monitoring/evaluation activities all help to define green infrastructure initiatives and contribute to their effectiveness. These factors are explored in more detail throughout this chapter.

<sup>28</sup> The Countryside Commission has since become 'Natural England', which is the non-departmental public body of the UK government responsible to the Secretary of State for Environment, Food and Rural Affairs ([http://www.naturalengland.org.uk/about\\_us/default.aspx](http://www.naturalengland.org.uk/about_us/default.aspx)).

## 4.2.1 Approaches to project set-up and management

The investigated in-depth case studies generally exhibited a diversity of approaches regarding their structures and the parties responsible for managing the initiatives (see Table 7). As evidenced by the case study interviews, a determining factor in setting-up projects and selecting the individuals/parties responsible for management tasks is the inclusion of a strong leader. This refers both to acting as the motivating force for action as well as to encouraging participation among other stakeholder groups, thereby driving the process forward and helping to maintain momentum throughout the implementation process.

**Table 7: Approaches to managing green infrastructure projects, as illustrated by the in-depth case studies**

Project	Approach to management
<b>Väimameri</b>	Decentralized management with approximately 100 partners involved, including NGOs and research centres; local coordination carried out by local coordinators, with large input and consultation with community members
<b>Tiengemeten</b>	A NGO currently owns and manages the island; the government coordinated and oversaw the restoration, but with advising and feedback provided by the steering and project group; an external contractor was also hired for select activities
<b>Alpine Carpathian Corridor</b>	Regional government is in charge, with strong cooperation with NGOs, universities, motorway companies and national parks; input is provided by an advisory board of stakeholders and independent experts
<b>Gallecs</b>	Originally managed by Gallecs Rural Spaces Consortium (made of 2 municipalities) and later managed by the Spaces and Parks of Natural Interest Consortium (including the Catalonian departments responsible for territorial policy, public works, environment, housing, agriculture, food and rural action and 6 municipalities); consultation took place with local communities
<b>Transformation of the banks of the Rhone</b>	Private agencies were contracted for implementing their specific projects; general management was done by Greater Lyon, together with the city of Lyon
<b>National Forest</b>	National Forest Company <sup>29</sup> is in charge of management, but with cooperation of NGOs, local stakeholders, private landowners and private companies (e.g. mineral and development companies)

Historical considerations and the political position or interests of the involved parties can also influence the project set-up. For example, the motivation of the Austrian government to demonstrate their interest in and the importance of environmental connectivity and biodiversity conservation was one factor behind their decision to lead the Alpine Carpathian Corridor project. More information is provided in the following section.

<sup>29</sup> The National Forest Company is a non-departmental public body sponsored by the Department for Environment, Food and Rural Affairs that was established by the national government ([http://www.nationalforest.org/about\\_us/](http://www.nationalforest.org/about_us/)).

## 4.2.2 Type and role of stakeholders involved

Partnerships, networks and community/stakeholder involvement have the potential to play a determining role in green infrastructure project success. Here, a shared project goal under the broader umbrella of green infrastructure serves as the unifying factor of the involved parties, despite their often diverse underlying interests or motivations. Based on the in-depth case study analysis, the following roles for green infrastructure stakeholders were identified (see Table 8). The outlined points are by no means exhaustive in terms of the potential roles these stakeholder groups could play within the context of green infrastructure projects in the future; more details regarding these additional possibilities are offered in chapter 6, incorporating insights from the expert workshop.

**Table 8: Current roles of stakeholders involved in designing and implementing green infrastructure projects**

Stakeholder type	Current roles in green infrastructure projects
EU authorities	<ul style="list-style-type: none"> <li>• Provision of funds</li> <li>• Communication and PR</li> <li>• Support for green infrastructure -related research and studies</li> </ul>
National authorities	<ul style="list-style-type: none"> <li>• Provision of funds</li> <li>• Creation of legal framework for green infrastructure measures (e.g. spatial planning - Austrian wildlife protection directive for road construction (<i>RSV Richtlinie 3.01 'Wildschutz'</i>))</li> <li>• Submission of funding application (e.g. LIFE)</li> <li>• Administration of the budget and submitting applications</li> <li>• Supervisory, coordination or management role in implementation</li> </ul>
Regional/local authorities	<ul style="list-style-type: none"> <li>• Provision of funds</li> <li>• Supervisory, coordination or management role in implementation</li> <li>• Communication campaigns and PR-activities</li> <li>• Hold training days locally to communicate background knowledge</li> <li>• Capacity building activities for stakeholders</li> </ul>
NGOs	<ul style="list-style-type: none"> <li>• Provision of funds; donations</li> <li>• Identification of funding possibilities</li> <li>• Fundraising activities</li> <li>• Conduct information/background surveys to identify project need</li> <li>• Communication campaigns and PR-activities</li> <li>• Development of educational materials,</li> <li>• Capacity building for stakeholders</li> <li>• Supervisory, management or coordination role in implementation</li> <li>• Maintenance of project, post-implementation</li> <li>• Monitoring activities</li> </ul>
Private companies <sup>30</sup>	<ul style="list-style-type: none"> <li>• Provision of funds (potentially as 'Corporate Social Responsibility' or as part of mandatory compensation/mitigation measures) - donations, sponsorships</li> </ul>

<sup>30</sup> E.g. construction, engineering, water, architecture, etc companies

	<ul style="list-style-type: none"> <li>• Technical implementation via sub-contracting jobs (e.g. construction and engineering jobs)</li> </ul>
Planning authorities	<ul style="list-style-type: none"> <li>• Development of 'calls for tender' for envisioned green infrastructure projects</li> <li>• Support project design, based on ecological data and existing regional plans</li> <li>• Integration of green infrastructure into regional spatial plans</li> </ul>
Land users/owners; local community	<ul style="list-style-type: none"> <li>• Carrying out project measures and activities (e.g. through agreements)</li> <li>• Act as consultants during project development and implementation (e.g. sharing of best practices, knowledge and experiences)</li> <li>• Maintenance of project, post-implementation</li> <li>• Abiding by land use restrictions or physically relocating, when necessary</li> <li>• Act as multipliers, passing on and sharing knowledge with other land users, inhabitants etc.</li> </ul>
Scientific/technical experts or expert groups	<ul style="list-style-type: none"> <li>• Advisory/consultative role during planning and implementation stages</li> <li>• Serve as specialist for specific theme or area of the project, supporting decision-making processes</li> </ul>
Research institutes (e.g. universities, think tanks, scientific foundations, etc)	<ul style="list-style-type: none"> <li>• Evaluation of project (including costs and benefit analysis)</li> <li>• Monitoring activities</li> <li>• Scoping studies</li> </ul>

As is evidenced above, many fundamental roles (e.g. financial contributor, managerial/supervisory responsibility, skills transfer, public outreach, etc.) are potentially applicable to numerous stakeholder groups. While such roles could be assumed by a single party, there is also the potential to share responsibilities and cooperate. Two main approaches to partnership and cooperation are applicable within this context, namely public private partnerships (PPPs) and expertise exchanges; both of these approaches assume an overarching objective or goal is shared between parties.

**Public-Private Partnerships (PPPs)** describe a form of cooperation between public authorities and economic operators and can be of a purely contractual or of an institutional nature. The need for such innovative instruments is raised in the Europe 2020 Strategy<sup>31</sup> as a means to leverage Europe's finances and pursue new avenues in using a combination of private and public finances. Within the context of green infrastructure, PPPs hold the potential to both engage the private sector and enhance public sector contributions, creating the opportunity for a more integrated approach to green infrastructure delivery. However, possible negative consequences for e.g. biodiversity<sup>32</sup> could also potentially arise from such arrangements and should therefore be adequately considered when planning PPP investments.

<sup>31</sup> European Commission (2010): Europe 2020 – A strategy for smart, sustainable and inclusive growth. [COM(2010) 2020] Brussels, 3.3.2010.

<sup>32</sup> See CEE Bankwatch Network (2010): D1 motorway Phase 1, Slovakia, which critiques the PPP financed motorway project for, among other aspects, its lack of consideration for biodiversity generally and affected Natura 2000 sites specifically.

PPPs are generally centred on financial considerations and could involve e.g. contributions to green space programs or funds, donation of land or easements by private property owners or cooperative regional development endeavours. As discussed within section 4.1, a range of interests could motivate such cooperation, a desire to demonstrate corporate social responsibility (CSR), personal interest in pursuing specific objectives (e.g. nature conservation, climate change adaptation and mitigation, etc.) or potential financial gains (e.g. long-term savings (see Box 2); investments in regional infrastructure for tourism; establishing a marketing strategy with local communities for selling cultural products). Support can accordingly come from sources beyond local project jurisdictions.

A detailed description of a successful, economically profitable green infrastructure initiative financed via a PPP in Canada is provided in Box 2 and a further example employing a 'Section 106 Agreement' in the UK is outlined in Box 3. Several additional European examples from the project database are provided in section 4.2.4 under private financing.

### **Box 2: PPPs in practice - Vancouver/Delta Gas Collection and Utilization Project**

#### **Vancouver Delta Gas Collection and Utilization Project, British Columbia (Canada)**

The City of Vancouver and the Corporation of Delta have entered into a project that expands their current Landfill Gas (LFG) collection and flare system to 156 wells and brings in a private partner, Maxim Power Corporation, to make "beneficial use" of the LFG. Under the Landfill's Operational Certificate (B.C. Ministry of Water, Land, and Air Protection), Vancouver has an obligation to manage landfill gas from the Vancouver landfill (located in Delta). The operational certificate strongly encourages movement towards "beneficial use" of LFG.

The basis of the project was to find a community partner who would beneficially use the LFG. The beneficial use contract involves a 20-year agreement between the City and Maxim Power Corp. to construct a 2.5-kilometre pipeline to link the LFG system to a cogeneration facility located at large scale tomato greenhouse operation in Delta, owned by CanAgro Produce Ltd. The electricity generated at the cogeneration plant is sold to BC Hydro under its green energy program. The heat is used in the form of hot water in the greenhouse, reducing CanGro's use of fossil fuels by 20%. Low-cost heat also supports the creation of 300 greenhouse jobs.

The majority of LFG collected at the expanded landfill would otherwise be flared to control odors and greenhouse gas emissions. Previously, approximately 3% of the collected LFG was used to provide heat and hot water for the landfill's administration building.

#### **Cost Analysis**

The total cost of the project is approximately \$10 million, invested by Maxim Power Corp. The Green Municipal Funds supported the project through a multi-million dollar loan as part of the financing. The initial projected revenues to the city for providing the LFG fuel source to Maxim were expected in the order of \$250,000 to 300,000 per year, which would help to offset the costs of operating the landfill. However, since the LFG system has been in operation, the City of Vancouver has seen higher than expected revenues in the order of \$400,000 per year. Since the annual cost of operating the LFG control system is approximately \$250,000, this means that the revenues more than offset the costs to the municipality. In addition, Delta expects to receive between \$80 and \$110,000 per year in municipal tax revenue.

Other external cost savings, social and environmental benefits include:

- Reduction in greenhouse gas emissions of approximately 200,000 tonnes per year of carbon

dioxide equivalents, similar to removing 40,000 automobiles from the road,

- Co-generation provides a larger community benefit through working with the greenhouse to lower their energy costs,
- Co-generation can recover up to 85% of available energy, much more efficient than simply electrical generation, and
- The electricity generated at the cogeneration plant will produce over 46GJ of electrical energy per year to the power grid, equalling supply for 7000 homes.

Source: Centre for Sustainable Community Development (2004). *Demonstrating the economic benefits of integrated, green infrastructure: Final Report. Prepared for the Federation of Canadian Municipalities.* (See [http://fmv.fcm.ca/fr/about\\_us/demonstrating\\_the\\_economic\\_benefits.asp](http://fmv.fcm.ca/fr/about_us/demonstrating_the_economic_benefits.asp))

### **Box 3: PPPs in practice - Using the Section 106 Agreement to mitigate the impact of housing developments**

#### **Mitigating the impact of housing on the Dorset Heathlands (UK)**

South East Dorset supports a large area of lowland heathland, much of which is protected under the EU Birds and Habitats Directives for species such as Nightjar and Sand Lizard.

The Habitats Regulations stipulate the need for avoidance or mitigation of adverse impacts of these sites, including the projected 26,000 new homes in SE Dorset. In 2006, English Nature (now part of Natural England) informed local planning authorities in the area of the heathlands that the environmental impacts of additional developments within 400m of heathland sites could not be mitigated, and that, in the absence of any mitigation, they would object to any developments in the zone from 400m up to 5km away.

In 2007, Natural England, with the local authorities, government office (SW) and the RSPB (Royal Society for the Protection of Birds) agreed on an Interim Planning Framework (IPF) to provide a mechanism for mitigation of the impacts, using the Section 106 process<sup>33</sup>. Projects were identified aimed at managing the impacts of development on the heathlands and providing suitable alternative natural greenspaces (SANGs) for residents to use instead of the heathlands.

Through a Section 106 agreement, a levy is raised through every new residential unit within 5km of the heathland. The amount was based on a predicted number of dwellings to be built in the 3-year period of the IPF. So far £3 million has been raised and is being spent by the Urban Heaths Partnership to improve local greenspaces and the purchase SANGs.

The Section 106 mechanism has worked well as a way of raising the money needed to pay for projects, especially as it can then be banked then used as and when projects are developed. However, a question remains as to whether similar section 106 agreements or CIL<sup>34</sup> funds could be directed towards environmental benefits in cases where land is not subject to international wildlife

<sup>33</sup> "Funding for infrastructure is currently provided partly through legal agreements, known as Section 106 Agreements or Planning Obligations. The power to use such agreements is taken from Section 106 of the Town & Country Planning Act 1990 and they are negotiated between the local planning authority, developers and others, to provide funding at various stages of the development for agreed infrastructure" (see [http://www.wcl.org.uk/docs/Link\\_position\\_paper\\_on\\_CIL\\_18Jul08.pdf](http://www.wcl.org.uk/docs/Link_position_paper_on_CIL_18Jul08.pdf)).

<sup>34</sup> Community Infrastructure Levy (CIL) is "an endeavor by Government to raise money from development to pay for essential infrastructure. CIL will be raised under a tariff system, with local land sub-regional authorities...assessing what infrastructure is required to support new development in their area...CIL offers the potential to provide greater funding for important infrastructure, most importantly 'Green Infrastructure'" (see [http://www.wcl.org.uk/docs/Link\\_position\\_paper\\_on\\_CIL\\_18Jul08.pdf](http://www.wcl.org.uk/docs/Link_position_paper_on_CIL_18Jul08.pdf))

designations.

Source: Wildlife and Countryside Link (2008): *Community infrastructure levy: Demonstrating the benefits of planning gain to biodiversity and landscape. Position statement by Wildlife and Countryside Link, July 2008* (see [http://www.wcl.org.uk/docs/Link\\_position\\_paper\\_on\\_CIL\\_18Jul08.pdf](http://www.wcl.org.uk/docs/Link_position_paper_on_CIL_18Jul08.pdf))

Potentially, as suggested by participants in the expert workshop, national budgets could also be invested to **foster “green partnerships”**, bringing together public, private and social actors. For example, the Green Partnership-Initiative in Denmark brings together the state, local communities and local organizations and NGOs to enhance biodiversity protection. **Expertise exchanges** relate to skills and knowledge transfer (i.e. capacity building), knowledge management, exchange of best practices and scientific contributions (scoping studies, needs and feasibility assessments, evaluations, research). The various interests and accompanying perspectives of the partners, such as focuses on e.g. nature conservation, human health or water management, complement the skills exchanges and contribute to the effectiveness of projects by creating a more holistic approach. Here, expert groups (for example in Alpine Carpathian Corridor) and cooperation between different projects with a shared greater goal (e.g. Tiengemeten as part of the National Ecological Network’s group of projects) are particularly beneficial.

Regardless of how roles are divided or shared between the stakeholder groups, communication between all involved parties and an open flow of information throughout *all* project stages have been highlighted as key factors in gaining local public and policy-maker acceptance as well as enabling a successful continuation of green infrastructure projects.

While local stakeholder consultation and partnerships can sometimes create a larger time investment for reaching a consensus, the positive effects for project implementation and continuity in the long-run were believed by interviewees and workshop participants to outweigh this drawback. Possible tools for establishing successful partnerships can include, among others: flow of information through open channels, exchanges of best practices, workshops: advisory sessions, discussion boards, environmental education and the creation of a management plan for the period after the project duration ends. These tools and others are discussed in more detail in section 4.2.3.

#### 4.2.3 Building awareness, capacity building and stakeholder involvement

The analysis of literature, the project database and in-depth case studies as well as the results from the expert workshop highlight that raising awareness among the broad public and establishing stakeholder consultation processes are important parts of many projects, where different attitudes and interests (e.g. economic development vs. nature protection) of the involved stakeholders come together. Possible consequences such as impacts on current land use practices, which can be partially linked to income foregone, can increase the need for building awareness and participatory approaches. While on the other hand, the need for such “trust building” activities might be less important in state-owned and sparsely populated areas. A need for public awareness can also arise in projects aiming to change behaviours and attract public and/or private financial support.

According to the Landscape Institute, “[a]n increasingly urbanised society has led to a detachment from the natural environment, which is seen as a place to be visited rather than

an integral part of daily life.”<sup>35</sup> The integrated approach of green infrastructure projects, however, calls for a broad understanding and acceptance of conservation issues and the green infrastructure approach. An extensive awareness-raising campaign would thus attempt to involve all sectors of local society in the conservation of its natural resources.

### Approaches to building awareness

The following four different approaches to building awareness among relevant and interested stakeholders have been identified, which are mainly determined by the target group:

- Environmental education
- Promotion of sustainable land use and tourism
- Capacity building for experts/stakeholders
- Awareness raising in institutional settings and planning instruments

These approaches, which can partly overlap in their objectives, tools applied and target groups, are described in more detail below and illustrated by practice examples in Table 9.

**Environmental education:** The aim of this approach is to increase public awareness of biodiversity values and conservation needs (e.g. of target species) among the wider public, in order to improve public attitudes and better integrate conservation sites and networking measures into communities. Education measures directed at school children, inhabitants of neighboring communities and other visitors to the area aim to disseminate knowledge on habitat requirements and conservation/restoration methods. Environmental education programmes are closely designed in accordance with the project and its objectives and often encompass a wide range of activities (see Table 9). The choice of media and message to be transferred depends heavily on the target group as well as the regional conditions and needs and do not allow for a standardized format which can be used throughout the country.

**Promotion of sustainable land use and tourism** among both local stakeholders and the public can be achieved by supporting sustainable production methods in agriculture or forestry, promoting local, sustainably produced products, and establishing ecotourism. The aim of this approach is to enhance the acceptance of conservation measures. With the intention to draw the attention of local stakeholders, inhabitants and visitors to the value of the surrounding landscape several activities are undertaken such as restoring and maintaining valuable landscapes, increasing and sustaining natural values, increasing the attractiveness of the area and creating living conditions for people involved with agriculture in sparsely populated areas. Opportunities for socio-economic development of local communities are increased (e.g. by identifying areas for enhancement), and harmonization between human activities and the natural environment improved. In order to promote a transition from intensive land use to a more extensive use, land users (e.g. farmers, foresters, fishermen) need to be also informed about available financing and marketing opportunities of regional products.

**Capacity building for experts/stakeholders:** Capacity building among key stakeholders involved in planning and implementation of green infrastructure projects (e.g. farmers, tourism operators, companies, nature managers) enhances their awareness of the need for a

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<sup>35</sup> Landscape Institute (2009): Green infrastructure: Connected and multifunctional landscape

green infrastructure approach and related measures and thus contributes to ensure long-term implementation. Tools are aimed at strengthening the current administrative and enforcement capacities and improvement and dissemination of knowledge about specific types of conservation work relevant for green infrastructure projects throughout the EU. Moreover, seminars can seek to transfer skills in sustainable land use practices.

In addition to case studies, further instruments are mentioned and highlighted in the literature. Examples include training and information measures, which are required under Article 21 of the EU Rural Development Regulation and which are offered in most EU Member States. These measures could help to make agri-environmental schemes more effective and train farmers and experts in the Farm Advisory Services on conservation and management requirements linked to wildlife (European Commission, 2010).<sup>36</sup> In this context, green infrastructure benefits and requirements could also be promoted.

In the event that green infrastructure projects are part of wider spatial planning processes, targeted workshops for involved stakeholders at project level could be developed and carried out in order to translate green infrastructure thinking into appropriate planning mechanisms and implementation.<sup>37</sup> However, in a first step, landscape professionals in green infrastructure planning need to be trained and educated to better address green infrastructure needs. Such trainings could already be part of study programmes (e.g. at universities), but should be also offered within the planning authorities and organisations to reach all relevant professionals. The box below provides an example from Germany on how capacity building activities for planners are organised at the national scale.

#### **Box 4: Example of targeted capacity building for spatial planners in Germany**

##### **The Federation of German Landscape Architects (bdla)**

In Germany, for example, landscape planners and architects are regularly informed about new legislative requirements through the 'The Federation of German Landscape Architects' (bdla), which is the professional association of landscape architects in Germany. The bdla represents the technical and economic interests of its members in the public sphere and in politics. Among a wide range of topics, the bdla works on legal issues and public relations and is supposed to be a switchboard for landscape architects as well as offering vocational training for its members. In this context, they also offer capacity building (in the form of seminars, scientific journal, brochures, etc.) for stakeholders involved in spatial planning and carrying out impact assessments. Workshop topics include inter alia targeted species protection, fauna and flora monitoring, rainwater management, etc. (for more information see: <http://www.bdla.de/seite64.htm>).

##### **UVP Association**

Further capacity building is offered by the "Association for the Promotion of the Environmental Impact Assessment (EIA)", which was founded in May 1987 as an interest lobby of those who are concerned with EIAs. The Association promotes precaution as well as the relevant planning and management instruments, including environmental impact assessment. The EIA Association can be consulted in all

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<sup>36</sup> European Commission (2010): Towards a green Infrastructure in Europe: Natura 2000 preparatory actions, Lot 3: Developing new concepts for integration of Natura 2000 network into a broader countryside.

<sup>37</sup> Mell, Ian C. (2010): Green infrastructure: concepts, perceptions. s.l.: School of Architecture, Planning and Landscape, Newcastle University

precaution matters. The focus of the activities is on the environmental impact assessment of projects, plans, programmes, policies and products, on integrated landscape and environmental planning and on environmental management systems (EMAS). The association offers, for example, seminars to communities to inform them on how to reduce urban expansion/consumption of areas, seminars to inform planners about new requirements for building new facilities or promotes the exchange of experiences on conducting an impact assessment in Natura 2000 areas. (For more information see: <http://www.uvp.de/>.)

**Awareness raising in institutional settings and planning instruments:** By addressing local and regional authorities, this approach is aiming to enhance integration of green infrastructure aspects into regional/spatial planning and other policies. One key element to this approach is building awareness and acknowledging the value of ‘green’ infrastructure in terms of its ecological, economic and social benefits (including ecosystem services delivered) for the wider community and local/regional area among the authorities. The recognition of the value of green infrastructure by policy makers is crucial to fully embed the concept of green infrastructure in landscape management practices<sup>38</sup> and secure policy support and financing instruments for related initiatives and projects.

**Table 9: Tools applied in building awareness among relevant and interested stakeholders**

Approach	Target group	Examples and tools applied/suggested
Environmental education	Wider public, schools, inhabitants of neighbouring communities etc.	<ul style="list-style-type: none"> <li>• Developing a strong vision and communication strategy</li> <li>• Communication campaigns using a broad range of media: newsletters, advertising and information booklets, informative events project brochures, magazines, layman's reports , fact sheets, websites, meetings, information leaflets, photographic exhibitions, internet presentations, films, DVD-films, radio and TV commercials</li> <li>• Guided visits and tours for schools (e.g. on conservation issues)</li> <li>• Participating in/organising specific events related to the project (e.g. local open days, wildlife gardening, general countryside event, nocturnal walk through the area, festival)</li> <li>• Project website</li> <li>• Cooperation with education programmes and institutes (e.g. cooperation with School of Nature in Gallecs project)</li> <li>• Establishment of environmental education facilities, information offices and visitors centres</li> </ul>
Promotion of sustainable land use and tourism	Farmers, foresters, tourism operators, local communities etc.	<ul style="list-style-type: none"> <li>• Using agri-environmental payments (rural development programmes) supporting extensive farming, etc.</li> <li>• Improving touristic/recreational infrastructure (e.g. marked walking and cycling trails, parks and tourism facilities)</li> <li>• Development and implementation of a visitor guidance concept</li> </ul>

<sup>38</sup> Mell, Ian C. (2010): Green infrastructure: concepts, perceptions. s.l.: School of Architecture, Planning and Landscape, Newcastle University.

		<p>supporting sustainable tourism</p> <ul style="list-style-type: none"> <li>• Promoting regional products (food and handicrafts), promote labels of origin, help create local markets of value added</li> <li>• Participating in agricultural fairs</li> </ul>
Capacity building for experts/stakeholders	Farmers, nature managers, planners, tourism operators, handicraft and food entrepreneurs etc.	<ul style="list-style-type: none"> <li>• Training and information (incl. farm advisory services)</li> <li>• Educational programmes/workshops/conferences for practitioners</li> <li>• Specialised courses for researchers, technical people, designers etc.</li> <li>• Knowledge database on best-practices green infrastructure projects, also demonstrating innovative approaches</li> <li>• Expert meetings</li> <li>• Discovery activities for nature manager</li> <li>• Cross-professional training to encourage improved, joined up working between the different disciplines involved in green infrastructure planning, design, implementation and management</li> </ul>
Awareness raising in institutional settings and planning instruments	Local and regional authorities	<ul style="list-style-type: none"> <li>• National planning policy statements on green infrastructure</li> <li>• Adopting green infrastructure strategy as a supplementary planning document</li> </ul>

The different approaches highlight that the development and presentation of different messages to the various audiences, adapting the language and terminology, is key to successfully implementing green infrastructure projects. In this context, a clear and understandable concept of green infrastructure and the benefits it can provide as well as the associated costs is needed. For the general public this understanding might rather emphasise the feeling of connection with nature in order to make the concept more accessible. This provides an opportunity to broaden the participation of people also interested in ‘ordinary’ nature, such as forests, fields, etc. For the local community and business the understanding of green infrastructure could highlight the socio-economic benefits that can be delivered by green infrastructure projects.

### Stakeholder involvement

In addition to activities trying to build awareness among relevant stakeholders and the wider public, **stakeholder participation in the planning and implementation processes** is often crucial to ensure the successful implementation of green infrastructure projects (see also 4.3.2). Reasons underlying the need for stakeholder involvement can include the need to:

- Bring different interests and points of views together (e.g. local community, farmers, foresters, business, nature conservationists);
- Address areas which have a complex historical background (e.g. stemming from former land expropriation);
- Have a cross-sectoral approach to combine different objectives, involving different responsible authorities representing agriculture, forestry, fishery, water protection,

economic development, tourism, transport, etc. (which is often part of spatial planning processes);

- Ensure the long-term sustainability of the project after external funding is phased out (e.g. the local community in the Väinameri project (Estonia), who were the main participants carrying out the agricultural, handicraft and tourism activities, were involved in the design and implementation of the project);
- Deal with different legislative items and responsible authorities from neighbouring countries in transboundary projects.

By actively participating from the planning phase of the project onwards<sup>39</sup>, stakeholders are not only able to include their views and needs, but also become aware of the need for green infrastructure and related (conservation) measures, as well as of other stakeholder and local needs. Awareness of these needs can encourage public involvement in species conservation and the long-term implementation of green infrastructure projects.

Findings from the expert workshop revealed that, in this context, a two-way communication process should be created which focuses on “listening and reacting” instead of “listening and ignoring” stakeholder wishes and concerns. Moreover, it was mentioned that green infrastructure invites the participation of nature conservationists as well as other stakeholders from e.g. the health, transport, agriculture, water management, etc. sectors. This will also facilitate the development of new, more diverse ideas and help to gain wider support for projects.

By adopting wider stakeholder participation and consultation processes, the development of partnerships to build trust and obtain an understanding of partner and stakeholder concerns can be encouraged. Moreover, ownership of the idea and responsibility for the project can be promoted amongst the local community, stakeholders and politicians at all relevant levels of government to avoid the “it’s not my business” excuse (resulting in an abandonment of or failure to successfully implement the projects). This also aids in raising community support and gaining local backing for and ownership of projects. In addition, the fit and feasibility of desired objectives and measures can be assessed by consulting with the affected local community, regional policy makers and other relevant actors.

It must also be taken into account that such stakeholder consultation activities can take many years before showing positive results and signs of success. An example is the Tiengemetten (Netherlands) project, where the consultation process with the land owners (farmers) needed approximately five years to convince the farmers to leave the land on which they were born and raised in return for compensation and replacement farms elsewhere. However, without such a “peaceful process”, there would have been protests from the local community, jeopardising the project’s long-term success.

There are formal and informal instruments for stakeholder involvement, which can include, e.g.:

- Regular meetings between involved actors (farmers, project staff and agriculture authorities, etc.) to discuss the contents and implementation of the planned project;

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<sup>39</sup> A useful example of the link between the level of stakeholder involvement and success in the implementation of GI projects, in this case regarding ecological networks, can be found in the Knowledge for Ecological Networks (KEN) project (<http://www.ecnc.org/programmes/nature-and-society-completed-projects?action=detail&id=11>)

- Establishing a steering committee, advisory board or working groups which will be consulted on a regular basis throughout the project lifecycle, but in particular when important decisions have to be made;
- Stakeholder workshops bringing together experts from diverse sectors to discuss the preliminary project proposal, focusing on scientific evidence, landscape restructuring, spatial planning and communication;
- Establishing discussion boards or advisory sessions (e.g. for regional authorities, the environmental community, the inhabitants of the area and the members of the project consortium, as in the Gallecs project (Spain). These open channels allowed for the flow of information and best practices and facilitated the reaching of a consensus, while involving all stakeholders in the decision-making processes.)
- Spatial planning: as highlighted by European Commission, spatial planning can be considered a key instrument in stakeholder involvement. "Spatial planning entails bringing together different sectors in order to decide on land-use priorities in an integrated and co-operative way. In order to engage all stakeholders in the process [of an integrated spatial plan], the concept of green infrastructure must be clearly communicated and widely understood."<sup>40</sup>

#### 4.2.4 Financing of green infrastructure projects

Due to the high diversity of aims, focus and actors involved, a wide range of possible financing sources at different levels may be used alone or in combination with one another for supporting green infrastructure projects. However, there is currently no dedicated funding instrument for green infrastructure projects at the EU level, and few such instruments exist at the national level. The ability of a green infrastructure project to be financed under a funding scheme depends strongly on the scope of the project and the links that can be drawn to "classical" themes (such as regional development or the inclusion of agriculture, fisheries, forestry and other sectors aiming towards nature conservation, climate change adaptation or ecosystem service enhancement), which are more often the core objectives of such funding programmes.

Generally, financing needs can be broken down into three different components, including the **political component** (building awareness, campaigning for promoting a specific topic, etc.), **social component** (stakeholder involvement) and **nature/physical component** (technical implementation of project). According to attendees at the expert workshop, the most important funding needs for green infrastructure projects relate to land purchases, research (to better understand the targeted ecosystem), preparation and planning, restoration work, monitoring and innovation actions.

This section thus focuses on available financing to address these needs and provides an overview of the most relevant EU, national/regional and private sources which are currently being utilised for green infrastructure projects by practitioners across the EU, as drawn from the project database and in-depth case studies. While finance related impediments confronting green infrastructure projects are touched upon at the end of this section, these

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<sup>40</sup> European Commission (2010): LIFE building up Europe's green infrastructure. Addressing connectivity and enhancing ecosystem functions.

aspects are outlined in more detail in section 4.3. Additional insights regarding possible future directions for the various green infrastructure-relevant policy levels are provided in chapter 6, drawing on input and ideas provided by the expert workshop participants and external literature.

## EU financing

A significant source of financing for green infrastructure projects is currently the diverse range of EU funds. Here, LIFE+ plays a central role as well as relevant programmes under the ERDF and EAFRD (Pillar 2 of the Common Agricultural Policy (CAP)). Both LIFE+ and ERDF channel their funds through different components and themes, which can be further divided into specific topics. Depending on their thematic focus, green infrastructure projects can be applicable under various topics, such as nature protection, water, forestry, agriculture, tourism, urban and regional planning, fishery, built environment and transport, energy. An in-depth policy analysis carried out by the parallel project “Green infrastructure efficiency and implementation” provides a useful overview of the relevance of these funds to green infrastructure projects and their applicable objectives (see Box 5).

### Box 5: Overview of EU financing currently being utilized by green infrastructure projects

#### **LIFE+, the Financial Instrument for the Environment**

Life+ (2007-2013) has not specifically addressed the development of EU green infrastructure, but in addition to contributing to co-financing the implementation of Natura 2000, several projects under the strand of nature and biodiversity and environmental policy & governance provide examples on actions which support certain green infrastructure features/elements. This in particular includes projects to enhance the connectivity of species and habitats (e.g. corridors, stopover areas for migrating birds), strengthening the resilience of ecosystems (e.g. management measures to safeguard provision of ecosystem services, restoration of wetlands, climate change adaptation), and integrated spatial planning (e.g., stakeholder cooperation, more sustainable use of urban land). By funding projects which focus on green infrastructure particularly in the context of spatial planning, LIFE+ supports efforts to improve the integration of biodiversity policy into other policy areas (e.g. Cohesion Policy), by enhancing collaborations between sectors to decide on land-use priorities in an integrated way.

#### **European Regional Development Fund (ERDF)**

Under Cohesion policy, there are a growing number of ERDF projects which are financing green infrastructure, although they are only now beginning to be explicitly recognised as such. These projects are aiming to allow species to move and adjust, but they also restore ecosystem services. Many Operational Programmes provide co-financing for managing Natura 2000 and implementing measures that support ecological coherence and connectivity in the context of regional development. These measures are often funded under the budget line for promotion of biodiversity and nature protection.

The potential to integrate GI into Cohesion Policy lies in the growing recognition that investment in nature can lead to regional economic growth, employment and social benefits. Green infrastructure has the potential to play a decisive role in integrating biodiversity into policy whilst at the same time leveraging additional economic benefits. Furthermore there is an increasing emphasis on resource efficiency across Europe which aims to see a conservation of natural resources and natural capital as well as highlighting ecosystem services. This principle is consistent with the concept of territorial cohesion that looks to support more balanced and sustainable development. This could be achieved

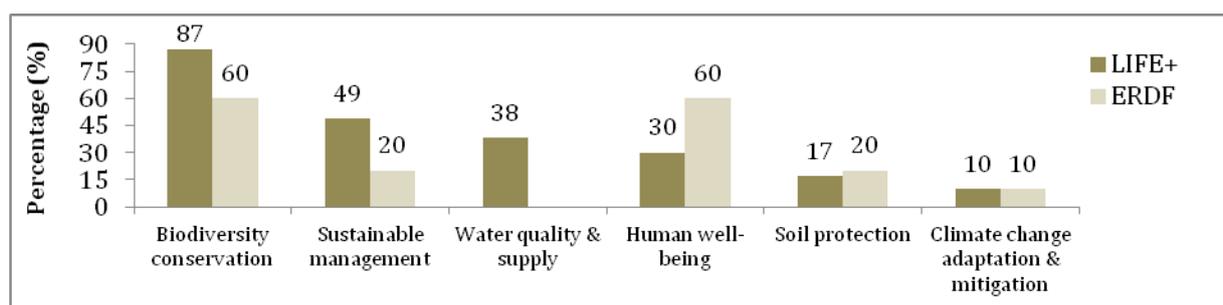
in Cohesion Policy through greater use and investment of Green Infrastructure post 2013. However, measures sometimes do not directly match the objectives of the funding mechanisms and are therefore not funded.

**European Agricultural Fund for Rural Development (Common Agricultural Policy, Pillar 2)**

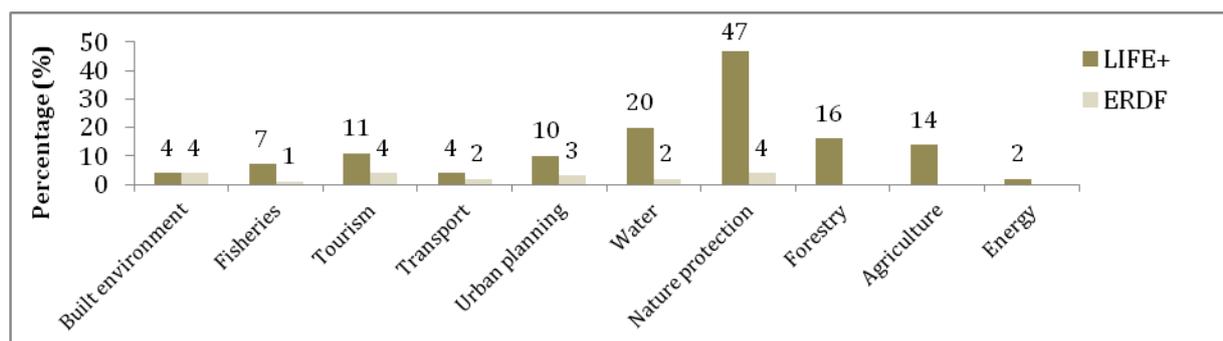
Makes indirect, but very important contributions to GI through the agri-environmental measure, the only compulsory RD measure. The agro-forestry measure (particularly the actions involving more traditional systems such as dehesa), well-designed and implemented afforestation actions, and forest-environment measure have a potential to contribute to GI as well. The measure focusing on rural heritage under the objective of improving the quality of life in rural areas allows for GI-friendly actions to restore habitats, e.g. wetlands, and to finance Natura 2000 management plans.

Source: IEEP, Ecologic, GHK, TAU, Syzygy, University of Antwerp, VITO (Forthcoming, 2011): Green Infrastructure Implementation and Efficiency. Policy area audit overview factsheets. Annexes to the Final report to the European Commission, DG Environment on Contract ENV.B.2/SER/2010/0059, Institute for European Environmental Policy, London.

In analysing the 77 projects in the database, which were either fully or partially funded with EU financing (identified from those projects for which data on financing was available), certain trends arose regarding the application of these financing options in reality. Comparing the overarching objectives and priority areas outlined for each source of financing in Box 5 and comparing these aspects with the stated green infrastructure project objectives, the LIFE+ projects were unsurprisingly found to be overwhelmingly focused on biodiversity conservation, with a secondary focus on sustainable management and water quality and quantity. Within the database, ERDF focused its support equally on projects aiming to improve human health/quality of life/well-being and biodiversity conservation. The specific breakdown of objectives as well as the sectors addressed within the EU funded projects can be seen in Figures 7 and 8.



**Figure 7: Objectives addressed in EU funded green infrastructure projects (LIFE+ and ERDF)**



**Figure 8: Sectors addressed in EU funded green infrastructure projects (LIFE+ and ERDF)**

The majority of LIFE+ financed projects received additional support from other sources, such as national/regional or private contributors (see 4.2.2 and subsequent private financing section for more information). “Ekostaden Augustenborg”, for example, was an urban regeneration initiative for the neighbourhood of Augustenborg (Malmö, SE) which recently experienced periods of socio-economic decline and suffered from floods caused by overflowing drainage systems. The town underwent major regeneration, focusing on physical infrastructural changes to create sustainable urban drainage systems. Half of the total funding was invested by MKB housing company (private) (SEK100 million, €11 million), while the remaining funds came from the LIFE programme (SEK 6 million; €658,000), the Swedish government’s Local Investments Programme for Ecological Conversion and EcoCycle Programme (SEK 24 million; €2.6 million), the Swedish Department of the Environment (SEK 4 million, €439,000) and the EU URBAN programme.<sup>41</sup> ERDF sponsored projects similarly also received funding from additional sources in the majority of cases.

The “Preservation of coastal gem” project, for example, aims to protect a sandy barrier beach on France’s Mediterranean coast from erosion. Local ecological features are to be protected and additional features are to be developed for enjoyment by locals and tourists. Of the total €23.14 million foreseen for the project (from 2007-2013), €8.1 million was contributed by the EU’s ERDF.

### National and regional financing

Member State and regional funding is also an important source of financial support for green infrastructure projects within the EU. Some projects are financed by the rural development programmes (RDP) under the second pillar of the CAP (the EAFRD fund, discussed above), for which the EU and the Member States share expenditures (co-financing). This type of mixed financing with contributions from the national government was utilised in the in-depth case study project Tiengemeten, as illustrated in Table 10 below.

<sup>41</sup> See <http://www.malmö.se/sustainablecity> for more information.

**Table 10: Tiengemeten project funders**

Funder	Level of funding	Amount	
		(€)	%
Province South Holland	Regional authority	1,036,380	15.4
Rijkswaterstaat	National authority	495,857	7.4
DLG (Dienst Landelijk Gebied)	National authority	478,414	7.1
Natuurmonumenten	National organization	817,451	12.2
Delta Natuur	Joint project of the national government, local authorities and social organizations <sup>42</sup>	2,312,136	34.5
ISLA	EU <sup>43</sup>	620,038	9.2
LIFE	EU	883,446	13.2
VROM <sup>44</sup>	National authority	66,779	1.0
<b>Total</b>		<b>6,710,521</b>	<b>100</b>

In addition, cross-national financing models can occur, mostly in Member States with only limited financial resources for environmental protection. In the Väinameri project in Estonia for example, a major component was financed by the Swedish Agency for International Development Cooperation (Sida). This financial support could stem from Sweden's national interest in the projects objectives, namely the restoration and conservation of semi-natural coastal ecosystems through a set of interrelated activities supporting rural economic development for local people and increasing the attractiveness of the area. An additional example involved a Dutch-Bulgarian partnership to address Bulgaria's growing defragmentation. This project involved research actions to support the development of a National Policy Plan for Habitat De-fragmentation across Transport Corridors in the Republic of Bulgaria and was supported by a number of governmental organizations in Bulgaria and the Netherlands, including the Dutch Royal Embassy in Sofia and the Dutch Ministry of Transport.<sup>45</sup> These examples represent successful projects employing a cross-national financing model and can serve as best practices in this regard for future green infrastructure initiatives. Accordingly, the final chapter of this report highlights the need to establish a platform or venue for transferring know-how and exchanging approaches to e.g. building partnerships across borders.

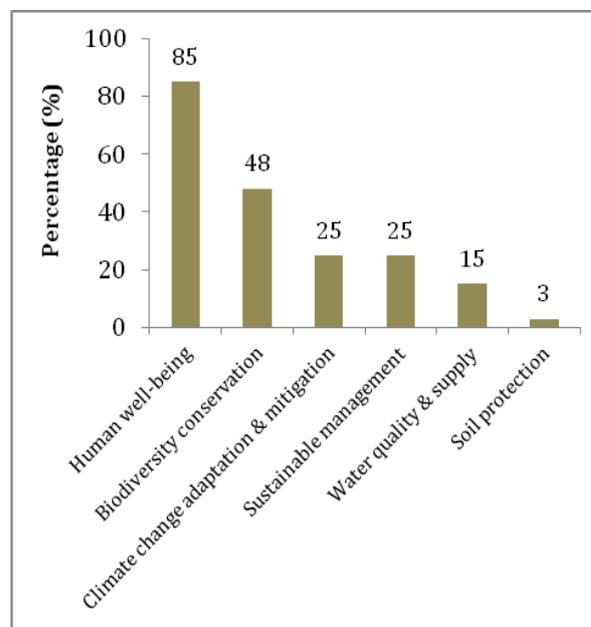
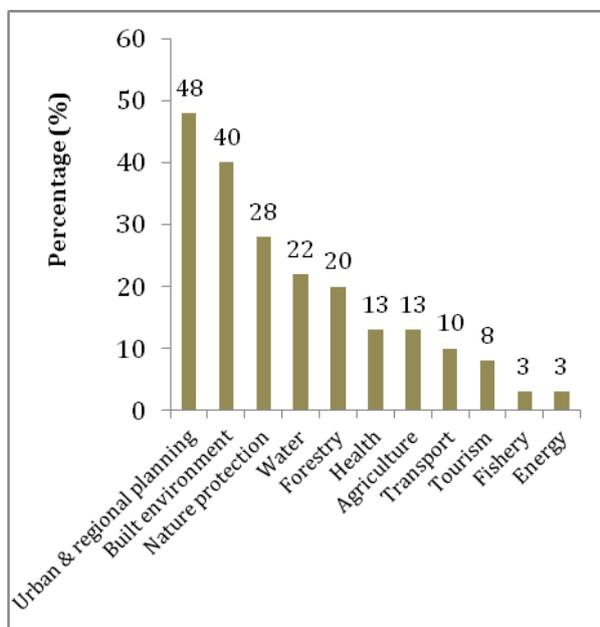
<sup>42</sup> Represented are: the Ministry of Agriculture, Nature and Food Quality, the Ministry of Transport, the Province of Ontario, the province of Noord-Brabant, the Department for Land, Forestry, Nature Society, The South Holland Landscape Foundation, Waterboard Hollandse Delta and Municipalities (see <http://www.deltanatuur.nl/>).

<sup>43</sup> ISLA is a European cooperation project with partners from national and regional governments and NGO's in NW Europe that is focusing on island specific issues and their impact on spatial development; it is co-funded through the INTERREG IIIB Community Initiative (see [www.corkcoco.ie/co/pdf/958377946.doc](http://www.corkcoco.ie/co/pdf/958377946.doc)).

<sup>44</sup> VROM = Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer [Ministry of Housing, Spatial Planning and Environmental management]

<sup>45</sup> See <http://www.roadecology-bulgaria.com/about>

Within the green infrastructure project database, there were 40 projects which were partially or fully financed by national or regional government funds. More specifically, these projects focused mainly on the objective ‘human health, quality of life and well-being’ and were concentrated in the sectors of urban and regional planning and built environment (as illustrated in Figures 9 and 10).



**Figure 9: Sectors addressed by public financing**      **Figure 10: Objectives addressed by public financing**

Additional green infrastructure projects demonstrate the potential of national governments to act as sole funders. In the “Netherlands live with water”<sup>46</sup> project, for example, the government spent €1.3 million (half spent on TV commercials, 25% on print media, 20% on outdoor media and 5% on radio) to raise national public awareness of the risk of flooding in the Netherlands. The campaign utilized a combination of radio and TV commercials, newsletters, advertising and information booklets, informative events and a website to convey the message: the climate is changing and this has implications for water management and the Dutch population.

On a more regional/local scale, the City of Stuttgart funded a project<sup>47</sup> to facilitate air exchange in the city and enhance cool air flow from the hills towards the urban areas on the valley floor and reduce air pollution problems by exploiting the role of natural wind patterns and increasing the density of vegetation. Developments which would obstruct air-flow in key strategic areas were banned, as well as the felling of trees over a certain size. In parallel, green roofs, green facades and other green infrastructure solutions were promoted in densely developed areas. Several other German municipalities have followed suit (e.g. Berlin) as well as the city of Kobe in Japan.

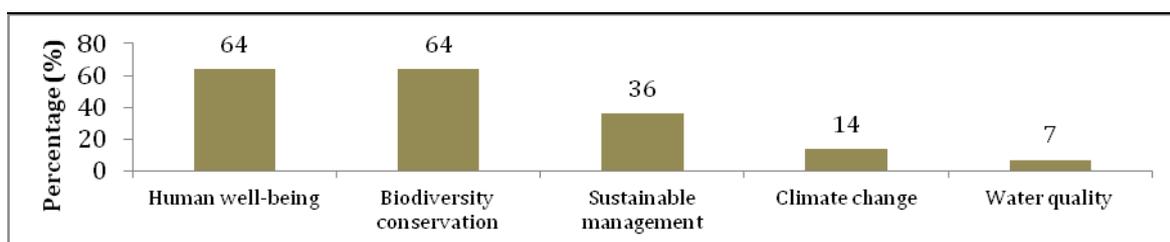
<sup>46</sup> See [www.grabs-eu.org/membersArea/files/the\\_netherlands.pdf](http://www.grabs-eu.org/membersArea/files/the_netherlands.pdf)

<sup>47</sup> “Combating heat island and poor air quality with green aeration corridors” – see Kazmierczak, A. and Carter, J. (2010): Adaptation to climate change using green and blue infrastructure. This database was also used to develop the project database (see 2.2.).

## Private financing

A third category comprises of private funds from foundations, NGOs, businesses and land owners. Unlike the formalised application procedures in public funding schemes, no general rules on how money can be obtained from private donors to implement green infrastructure projects can be derived, as the volume of funds and scope of support very much depend on the interests of the individual donors (see section 4.1 for more details).

Looking at the database projects as a starting ground for assessment, privately funded projects were found to focus equally on biodiversity conservation and human health/well-being/quality of life objectives and, to a lesser degree, on sustainable management. The distribution of objectives focused on is represented below (see Figure 11).



**Figure 11: Objectives addressed by privately financed green infrastructure projects**

Given the budget limitations of public funds, it is clear that it would be desirable for the private sector to play a stronger role in financing green infrastructure than is currently the case. Accordingly, three tools were identified in the expert workshop which can be utilized to enable increased private sector involvement: 1) creation of a **market** (such as the carbon market/carbon financing); 2) introduction of **regulative instruments**; and 3) **corporate social responsibility** (CSR).

Expanding on this foundation, additional innovative funding sources involving the private sector were also raised both by case study interviewees and workshop participants. Among these recommendations, the following opportunities were highlighted. It should be noted that some of these approaches have already been implemented (see examples), while others have the potential for greater impact in the future.

- Enhance **partnerships between NGOs and industry** (e.g. via Corporate Social responsibility and stronger references to the importance of green infrastructure)
- **Public Private Partnerships** (PPPs), e.g.:
  - The 10 year PPP between the London Borough of Lewisham and Glendale Grounds Management<sup>48</sup> for the management maintenance of the council's 43 parks, which resulted in new park facilities and improvements to park infrastructure and signage.

<sup>48</sup> See <http://www.official-documents.gov.uk/document/hc0506/hc09/0935/0935.asp> for more information.; However it should be noted that this PPP may finance the capital costs of green infrastructure, but the costs are still met by the public sector.

- The 'Donau-Ybbs Linkage' aimed to restore the natural dynamics of the River Danube and its most important tributaries in the Lower Austrian Alpine foothills after the quality of the habitat was damaged by multiple reworkings of the river and the construction of dams by the Melk Power Station. Given their role in damaging the habitat and fish breeding grounds and desire to be socially responsible, approximately one third of the €3,150,771 project was funded by Austrian Hydro Power AG; the rest came from LIFE+.
- **Renaturalisation/restoration of former extraction sites** should be paid by the party responsible for the damages, who should also financially contribute to creating new green infrastructure elements. This source of financing entails applying the "polluter pays principle", as aimed for in the Environmental Liability Directive<sup>49</sup>. Such an approach, however, requires that the company is still in operation to avoid the public sector having to pay for the incurred damages.
- **Payments for Ecosystem Services (PES)** – in general such payments are still rare in the EU (with exception of agri-environment payments)<sup>50</sup> and, accordingly, do not currently play a major role in green infrastructure projects outside the agricultural sector. However, this could change with the increasing awareness of green infrastructure as an integrated concept which generates economic benefits for a wide range of actors, thereby attracting businesses to assume increased responsibility in protecting ecosystems. Through PES, the private sectors and stakeholders who benefit from ecosystem services provided by green infrastructure should be involved in financing; two relevant examples are outlined:
  - **Restoring peatlands** (Belarus): consists of a consortium of environmental organisations from Belarus, Germany and the UK<sup>51</sup> who have combined their experience in peatland restoration and management with an innovative methodology to assess carbon emissions from peatlands. The project outlines the potential of carbon emission reductions resulting from rewetting degraded or depleted peatlands located across the Belarusian territory. By taking action in assuring that these emission reductions are verifiable and thus tradable in the voluntary carbon market, the project proposes a self-sustainable scheme, which integrates the provision of restored habitats for local/endangered species with the increase of carbon storage capacity in the country.
  - **Vittel watershed protection program** (France): "Since 1993, mineral water bottler Vittel has conducted a PES program in its 5100 ha catchment at the foot of the Vosges Mountains, in order to maintain aquifer water quality to its

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<sup>49</sup> The Environmental Liability Directive (2004/35/EC) aims to apply the "polluter pays" principle by establishing a common framework for liability in order to prevent and remedy damage to animals, plants, natural habitats and water resources and damage affecting land. Public authorities are to ensure that the operators responsible for the damages take or finance the necessary preventive or remedial measures themselves. (See [http://eur-lex.europa.eu/smartapi/cgi/sga\\_doc?smartapi!celexplus!prod!DocNumber&lg=en&type\\_doc=Directive&an\\_doc=2004&nu\\_doc=35](http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=Directive&an_doc=2004&nu_doc=35).)

<sup>50</sup> Agri-environment payments are provided and financed by the public sectors through Rural Development Programmes.

<sup>51</sup> The partnership includes the Royal Society for the Protection of Birds (RSPB), Akhova Ptushak Batskaushchyny (APB) - BirdLife Belarus, and The Michael Succow Foundation (MSF). See [http://restoringpeatlands.org/index.php?option=com\\_content&view=article&id=47&Itemid=28&lang=en](http://restoringpeatlands.org/index.php?option=com_content&view=article&id=47&Itemid=28&lang=en) for more information.

highest standard. The program pays all 27 farmers in the watershed of the “Grande Source” to adopt best practices in dairy farming...The program is fairly complex in design, combining conditional cash payments with technical assistance, reimbursement of incremental agricultural labor costs, and even arrangements to take over lands and provide usufruct rights of the farmland to the farmers. Contracts are long-term (18–30 yr), payments are differentiated according to opportunity costs on a farm-by-farm basis, and both land use and water quality are closely monitored over time. Total costs (excluding the intermediary's transaction costs) have been almost US\$25 million over 1993–2000. Through carefully researched baselines, an improvement of the service vis-à-vis the declining ES baseline is well-documented, and the high service value clearly makes the investments profitable.”<sup>52</sup>

- Explore **potential of foundations**, which often have a more general funding focus (e.g. Swiss MAVA Foundation for Nature finances the project “Ecological Continuum Initiative”<sup>53</sup> which aims to improve ecological connectivity in the Alps, approaching the Alpine mass as a whole, from France to Slovenia).
- **Biodiversity offsets**<sup>54</sup>, which require creation or restoration of green infrastructure as compensation for loss or damage to ecosystems from built development; however, it should be noted that offsets should only be considered in those cases where primary remediation is not feasible or all on-site compensation options have already been explored within impact regulation procedures. Habitat banking is one means of facilitating the delivery of offset requirements.
- Introduce a “**Green infrastructure benefits tax**”, which should be paid by the users of green infrastructure benefits (such as tourists).
- **Revolving loans** - loans provided by the private sector can help to cover the high costs which arise in the beginning of a project and can be paid back over the project's lifespan, when the benefits arise; loans could be managed e.g. by NGOs and the state (e.g. the Conservation Fund's revolving fund<sup>55</sup>)

However, despite the multitude of possibilities for private sector support, the extent to which it can be expected to pay for green infrastructure remains unclear. Certain circumstances lend themselves to private sector involvement, such as restoring environmental damage (through PPPs, offsets, environmental liability) and paying for services with private market value (e.g. water companies finance green infrastructure restoration and management) as well as possible contributions through tourism levies and donations/sponsorship motivated by CSR or altruism. Nevertheless, there are limits to the potential of these areas, largely

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<sup>52</sup> Wunder; S, Engel, S; Pagiola, S (2008): Taking stock\_ A comparative analysis of payments for environmental services programs in developed and developing counties. *Ecological Economics* 65: 834-852. Quote taken from page 838.

<sup>53</sup> For more information, see <http://www.alparc.org/the-alparc-network/a-spatial-network/the-ecological-continuum-initiative>

<sup>54</sup> For more information see study: The use of market-based instruments for biodiversity protection - the case of Habitat Banking (2010); [http://ec.europa.eu/environment/enveco/pdf/eftec\\_habitat\\_technical\\_report.pdf](http://ec.europa.eu/environment/enveco/pdf/eftec_habitat_technical_report.pdf)

<sup>55</sup> See [http://www.greeninfrastructure.net/sites/greeninfrastructure.net/files/6b\\_Connelly\\_The\\_Conservation\\_Fund\\_Green\\_Infrastructure\\_PPT.pdf](http://www.greeninfrastructure.net/sites/greeninfrastructure.net/files/6b_Connelly_The_Conservation_Fund_Green_Infrastructure_PPT.pdf)

depending on what types of ecosystem services are delivered, who the beneficiaries are and how they perceive the delivery of ecosystem services. As was outlined above, many of the services have public good aspects and will accordingly be under-provided unless these services receive public good financing, putting a limit on private sector potential.

### Project level findings

While this section has introduced current green infrastructure financing sources and outlined the potential for increased private sector involvement, there are several additional overarching considerations; these aspects are presented below (the outlined barriers are discussed in more detail in section 4.3).

The level of funding was generally found to be adequate for implementing project activities once it was secured, but interviewees highlighted the difficulties in identifying and obtaining funds in the planning phase of projects. Further, the absence of pre-financing in some EU funding schemes (see Alpine Carpathian Corridor example below) proved to be a large impediment faced by projects, making it difficult for small NGOs to lead projects or even participate without the cooperation of and pre-financing from e.g. the national government. Similarly, administrative requirements were highlighted as a large burden facing projects. Time and personnel resources needed to be dedicated to addressing these requirements, which were then no longer available for implementation and other project activities.

Several of the above considerations were encountered, for example, in the Alpine Carpathian Corridor in-depth case study. Following the conduction of a feasibility study by the WWF which also identified possible sources of financing, funds were secured from the ERDF in combination with Austrian and Slovakian public co-financing sources. Here, the lack of pre-financing provided by ERDF for the project activities required a strategic selection of the project's lead partner in order to ensure sufficient financing for the smaller project partners during the waiting periods of reimbursement. The Regional Government of Lower Austria thus assumed this lead role<sup>56</sup> and supplied up to 50% of the needed pre-financing when needed. As this instrument does not exist in Slovakia, it was necessary to find independent sources of funding for pre-financing the project activities and sometimes to solicit bank loans to ensure a stable financial flow. Finally, budgetary restrictions also required adjustments already during the proposal phase. While the original intention was to include the construction of two green bridges in the project budget, this element was required to be removed from the project. Regardless, the bridges will still be built by the Austrian motorway company ASFINAG and fulfil the original project objectives.

As another overarching consideration, the spatial character of green infrastructure requires a mixing of various funding sources stemming from different spatial levels for implementing integrated projects on the ground. A major problem thus lies within the different responsibilities among the EU Member States, hampering a clear allocation of funding roles at the different spatial levels. Accordingly, the compatibility of EU and other funding sources should be ensured in order to maximize the eligibility of relevant projects and support the achievement of green infrastructure objectives.

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<sup>56</sup> The motivation additionally stemmed from the desire for the lead partner to be an official body due to the many sectors involved (as opposed to only a protected area manager, for example). Further, choosing the regional government as lead was also important to indicate the interest of the country in actively taking a role in this area and to signify the project's importance.

Moreover, some areas, such as marine sites, face difficulties in financing due to the problem of establishing or assigning clear green infrastructure activities to these sites (with the exception of monitoring activities within green infrastructure projects and the creation of sustainable use areas). However, further potential activities which would serve as a part of larger green infrastructure projects could include e.g. the creation of new artificial reefs or restocking and/or restoring areas via, amongst other activities, the removal of litter/plastic (in the case of coastal zones).

#### **4.2.5 Monitoring and evaluation**

Monitoring and evaluation are useful tools to assess a project's success in terms of its achievement of the original objectives, benefits produced and cost-effectiveness. Moreover, such activities can help to identify further needs for adjusting the project design and activities over time (corresponding to changed external conditions, changing funding modalities, failures in technical implementation, new emerging funding opportunities and stakeholder interests, etc.). In order to assess the impacts and benefits of the project, a baseline (mapping the initial state of the ecosystem or area) must be defined.

With exception of one case study (Transformation of the banks of the Rhone), all projects analysed in detail have undertaken monitoring and evaluation activities during the project's lifecycle. The main drivers behind these actions were to assess the efficiency of the project (weighing the costs against the benefits obtained) and to inform the sponsors, involved stakeholders and wider public about the outcomes. In particular the projects receiving public financing are asked to comply with existing reporting guidelines. The Alpine Carpathian Corridor project (AT/SK), which received money from the European Regional Development Fund (ERDF), had to prove with its evaluation report that the general rules of the funding lines (ensuring sustainability, saving money, using money efficiently, etc.) were fulfilled.

By carrying out evaluation studies, positive publicity can be gained and information for knowledge transfer be produced. In the case of the Nation Forest project (UK), the evaluation and monitoring process determined that the National Forest is a successful project which delivers a good value for the tax payer money spent; has a good policy fit with national, regional and local initiatives; and generally meets its targets.

The evaluation report produced for the Väinameri project was used to support different national delegations in HELCOM to link the concrete activities of the project with broader policy making objectives. The project was very well known in the region and relevant information was widely shared amongst stakeholders in neighboring countries (e.g. Russia, Latvia and Lithuania).

The following box provides specific examples for different types of evaluation and monitoring studies carried out in the in-depth case studies.

## Box 6: Examples for evaluation and monitoring studies

**Väinameri project:** The evaluations assessed the level and extent of activities undertaken with respect to coastal restoration/ maintenance of the seminatural landscape, and in particular activities related to cattle farming, ecotourism and handicraft production during the project period. The assessments indicated that the project was successful along each of these dimensions and overall contributed to the restoration of the seminatural landscape. Moreover, the views of the participants (e.g. farmers, handicraft entrepreneurs, ecotourism operators) and views of the experts who advised and supported the local participants were included in the report.

**Gallecs (ES):** A study on the profit margins of organic agriculture in comparison to traditional agriculture is being developed in cooperation with the Agro-ecology Department of the University of Barcelona and will be available in October 2011.

**National forest (UK):** The reviews undertaken include a combination of qualitative and quantitative approaches and the reports produced include a detailed methodology for assessing economic aspects. The methodologies also detail the uncertainties, assumptions and any accepted industry practices for benchmarking or using comparator data.

**10Gemeten (NL)/Gallecs (ES):** In both projects, monitoring studies on the levels of vegetation and fauna have been established.

**Alpine Carpathian Corridor (AT, SK):** The work packages defined in the project have been used as a basis for assessing if the activities and measures being carried out are in line with the originally deliverables proposed or if the time schedule is on track. This work served most of all to assess the (cost-) efficiency and implementation and to make sure the pre-financing will be reimbursed after the project activities have been completed.

The results show that integrating evaluation and monitoring activities in the early stages of a project are very useful to report on a project's progress and success and to make adjustments in the project's set-up, if necessary. By adapting the project design accordingly, effectiveness of the project and the delivery of benefits can be improved. Moreover, lessons learned for the wider application can be identified. In addition, positive acknowledgement on behalf of a wider range of stakeholders and their support can be gained and future financing sources can be ensured.

The frequency of evaluation and monitoring activities should be determined according to the project duration and should take milestones into account, which require important decisions to be made.

## 4.3 Barriers and enabling factors

There are a number of factors which have been identified through the research as either impeding or enabling successful implementation of green infrastructure projects. Given the breadth of possibilities in terms of project design, management structures, financing possibilities, and stakeholder involvement for green infrastructure projects, it follows that there is no universal formula for ensuring successful implementation. That being said, the six in-depth case studies explored as part of this project as well as input from participants of the "Expert workshop on green infrastructure projects and policies" have revealed several important trends. Accordingly, the key barriers, enabling factors and success factors outlined in this chapter refer to those experienced in green infrastructure projects, specified by project

phase where possible. These results can be utilised by practitioners, project managers and planners and can serve to inform future guidance documents on implementation at the project level.

### 4.3.1 Key barriers to the implementation of green infrastructure initiatives at the project level

Regarding impediments, a categorization of six types of barriers relevant for green infrastructure projects has been outlined, including structural, regulatory, cultural/behavioural, contextual, capacity and technical barriers. These categories stem from the research project “Assessment of the potential of ecosystem-based approaches to climate change adaptation and mitigation in Europe”<sup>57</sup> and are outlined below (see Table 11). Illustrative examples from the in-depth case studies are outlined after the table for each type of barrier.

**Table 11: Typology of barriers**

Type of barrier	Description
<b>Structural barriers</b>	Obstacles posed by the characteristic structures and procedures of institutions and organizations. These procedures shape the way these groups function and how they identify and achieve their goals, and thus can influence against new initiatives.
<b>Regulatory barriers</b>	Hurdles set up by the means an organization or government has to regulate and control their members' interactions and the procedures they follow.
<b>Cultural/behavioural barriers</b>	Influence generated by customs, values, beliefs, interests and personalities of individuals in critical positions within a group.
<b>Contextual barriers</b>	Hindrances and thematic priorities created by external forces to which a government or organization is subject to and must respond.
<b>Capacity barriers</b>	The lack of resources, namely technical, human, financial, or other, that can bring difficulties in the integration of a new initiative into a group's strategy.
<b>Technical barriers</b>	Physical or functional impediments in constructing or implementing green infrastructure, which can delay or necessitate a revision of project plans.

It should be noted that several of these barrier types may be present at any given time within a particular phase of green infrastructure projects or they may serve as an overarching impediment throughout. Their nature and effects can thus be deeply interlaced or serve as a continual, more general condition implicit in the project set-up and implementation.

Examples of each of the barrier types are provided below, utilising examples from the in-depth case study experiences. Possible solutions for overcoming or addressing these impediments are provided in section 4.3.2.

<sup>57</sup> DG Environment, (Contract-N° 070307/2010/580412/SER/B), project team: Ecologic Institute and Environmental Changes Institute/University of Oxford

- Changes in management mid-project, cross-border considerations (language difficulties) and difficulties presented by mixed land ownership titles within the targeted area were common **structural barriers** encountered.
- The case studies unveiled regulatory barriers, including the difficulty of addressing heavy administrative procedures and burdens, for example in funding applications and the subsequent required paperwork.
- In almost all case studies in which **cultural/behavioural barriers** arose, it was in relation to a low level of public acceptance stemming from differing priorities or points of view. In the Gallecs (ES) project, for example, there were a number of rural homes and townhouses falling within the project boundary which were inhabited, but whose owners chose not to participate in the project due to hesitation about resultant obligations, concern about the project's potential negative impact on their situation or a lack of interest in the foreseen project objectives.
- Historical considerations often played a large role as a **contextual barrier** in the green infrastructure projects examined, such as landownership patterns under previous political parties and personal attachment to the area under consideration (e.g. inheritance of the land over generations). Limited windows of opportunity were also cited as a contextual barrier, referring to the small number of chances available to influence spatial plans and other long-term funding schemes, such as e.g. the revision of the CAP to support elements of green infrastructure projects.
- Insufficient funding and a lack of stability in financial flows were cited in the explored case studies as **capacity barriers** (discussed in more detail in section 4.2.4).
- Examples of **technical barriers** from the case studies include e.g. difficulties in harmonizing the green infrastructure activities (such as restoration of a canal) while still allowing for public use of the area. Delays in projects were also incurred in the explored case studies as a result of weather conditions, complicated installations, the breeding habits of birds occupying the site and other unavoidable environmental issues that had to be considered.

### 4.3.2 Enabling factors for successful green infrastructure projects

In addition to barriers, there are numerous enabling factors for the successful implementation of green infrastructure projects in the different project phases. In the following, an indicative list of factors is presented that can be relevant to the success of green infrastructure projects and which are derived from previous projects' experiences in different sectors<sup>58</sup> and complemented with interviewee responses as part of the in-depth case studies and contributions of workshop participants.

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<sup>58</sup> European Commission (2009): Towards a green infrastructure: Integrating Natura 2000 sites into the wider countryside. Proceedings of the European Commission workshop.

**Table 12: Enabling factors relevant to green infrastructure projects, delineated by project phase**

<b>Project phase</b>	<b>Enabling factors</b>
<b>Planning process</b>	Identify local/regional, national and EU needs to be addressed and gain project permission/approval where necessary
	High level of interaction between policy on spatial planning and ecological networks (embed project in larger policy, project or strategy)
	Design and objectives of consultation process (e.g. consultative vs. integrated approach; level of bureaucracy etc.)
	High level of consultation and diversity of stakeholders involved in spatial planning processes
	Priority setting within spatial planning process
	Inclusion of ecological networks as objective in relevant national or regional policies (e.g. spatial planning, wider regional development and land use strategies) to increase legislative support for the planned project
	Incorporate green infrastructure principles into other strategies, master plans and local development frameworks
<b>Project design</b>	Shared aim and clear goals of partners and stakeholders of what is to be achieved
	Appropriate number of partners, generally trying to keep the number as small as possible while still covering all relevant sectors
	In cases of cross-sectoral cooperation, ensure a diversity of beneficiaries and partners, including a mix between public and private bodies, to ensure that all parties have clearly outlined benefits from the project and are brought together around shared principles.
	Clearly defined roles and well-planned distribution of responsibilities between the various actors involved in project implementation and assessment (e.g. project managers, external contractors, expert advisors, etc)
	Flexible project structure to grant enough freedom to develop ideas throughout the implementation phases
	Consideration of ecological, economic and/or social aspects (e.g. protecting or creating jobs)
	Selection of measures (e.g. Do measures address the problem? Are measures appropriate/effective?) – targeted intervention and involvement (enabling greater efficiency with available funds)
	Project planning factors: timeframe and budget ensuring or hampering project implementation
	Adoption of ecosystem-based approach, where appropriate
	Public awareness raising and involvement of stakeholders to help determine priorities based on expert and local opinions and the feasibility of desired tasks
<b>Project implementation</b>	Level of implementation (e.g. national vs. local/regional, where the measures are in place)
	Funding sources for green infrastructure projects
	Use of a steering and/or advisory committee to guide the project and gain input across sectors from experts
	Public awareness raising and involvement of stakeholders; efforts to address public policy makers and general public, with events being seen as being particularly

	successful
	Role of education and knowledge transfer in projects, also utilising e.g. pilot/demonstration projects
	Conduct regular reviews to measure the project's progress against the original plan and objectives
	Possible limiting factors for the implementation may also include: complexity, scale, acceptance, impeding interests (economic development, investments, industries)
<b>Maintenance</b>	Development and maintenance of strong networks and relationships with other organizations, institutions, individuals, government bodies, etc. in the territory as well as with the local communities
	Secure funding sources for long-term projects that are linked to, but not embedded in, existing structures so they can survive political changes at all levels
	Development of a management plan/outline detailing maintenance requirements to enable the continued success and implementation of the project post-project completion

Source: Own findings and adapted from European Commission (2009): *Towards a green infrastructure: Integrating Natura 2000 sites into the wider countryside. Proceedings of the European Commission workshop with contributions from the expert workshop "Green infrastructure policies and projects" (Brussels 7.9.11)* and findings of the six in-depth case studies.

While these recommendations are likely to be applicable to a variety of contexts and green infrastructure projects, it should be kept in mind that there is no formula or “one-size fits all” solution for determining the right combination of factors and efforts needed to ensure a successful project. The diversity of aspects influencing implementation processes requires regular reassessments, as appropriate, within the project to determine the suitability of the implementation plan and, where applicable, areas which should be revised for subsequent project stages. The frequency of such assessments is dependent upon the length of the project and the milestones which have been outlined during the project design phase.

Taking the aforementioned barriers and enabling factors into account, a comprehensive table (see Table 13) has been created to highlight the relations between these categories. Accordingly, possible solutions, which can be applied either during the conceptual and planning phases, the implementation processes or during the final monitoring and evaluation stages are provided in conjunction with the most frequently encountered barriers. Here, inputs from the in-depth case studies as well as insights from attendees of the expert workshop accompanying this project were considered. In cases where possible solutions were intended for or directed at the European Union, national governments and/or local/regional governments, these items are labelled accordingly (EU, NG and LRG, respectively). Where no level was indicated, the points are left unlabelled.

**Table 13: Barriers to and possible solutions for successful green infrastructure projects**

Barrier	Example or clarification	Possible solution*
<b>Cultural/ behavioural barriers:</b> Low public acceptance	<ul style="list-style-type: none"> <li>Differing priorities and points of view</li> <li>Competing interests and personal agendas</li> </ul>	<ul style="list-style-type: none"> <li>Maximize flow of information, consultation, workshops, opportunities for feedback</li> <li>Budget sufficient time at the project start for stakeholder consultation (pre-implementation)</li> <li>EU/NG/LRG<sup>59</sup>: Demonstrate successes of and focus on <i>benefits</i> of green infrastructure in audience-specific, targeted campaigns (e.g. through local media) and environmental education</li> <li>Offer study tours to expose stakeholders to alternative perspectives</li> <li>EU/NG/LRG: Increase awareness and knowledge about topics and objectives at hand at all spatial scales</li> </ul>
<b>Capacity barrier</b>	Insufficient funding	<ul style="list-style-type: none"> <li>Ensure sufficient funding before project starts</li> <li>Clearly outline expectations and activities with contractors</li> <li>Reduce reliance on public funding and investigate innovative funding sources or public private partnerships</li> <li>LRG: provide conditions necessary to encourage long-term investments in green infrastructure rather than seeking short-term profits from alternative land uses or actions</li> <li>EU/NG: encourage investments from private actors (e.g. through PPPs or CSR, or incentives)</li> </ul>
	Lack of stability in financial flow	<ul style="list-style-type: none"> <li>Offering pre-financing for projects<sup>60</sup></li> </ul>
	Ineligibility of applying for original funding source a 2 <sup>nd</sup> time because projects are no longer innovative	<ul style="list-style-type: none"> <li>EU offers other sources of funding from other sectors ('outside the box')</li> <li>EU: ensure financing for promoting best-practice examples at a wider scale</li> </ul>
	Lack of political will or motivating force/actor to inspire GI action	<ul style="list-style-type: none"> <li>Encourage ownership of the idea and responsibility for the project in the local community, stakeholders and politicians to avoid the "it's not my job" excuse</li> <li>NG: impose mandatory planning conditions<sup>61</sup></li> <li>LRG: Create green infrastructure legislation, taking into account local needs and considerations</li> </ul>
	Lack of knowledge and evidence	<ul style="list-style-type: none"> <li>EU: Develop a standardized methodology for calculating the benefits of green infrastructure to improve convincing power of arguments</li> <li>EU: Encourage and support the mapping of planned green infrastructure on an EU level,</li> </ul>

<sup>59</sup> Solutions directly intended for the European Union, national governments and/or local/regional governments are labelled accordingly (EU, NG and LRG, respectively). Where no level was indicated, the solutions are left unlabelled.

<sup>60</sup> The economic stability of organizations would benefit from advanced payments in order to help the organizations implementing the project (Alpine Carpathian Corridor)

<sup>61</sup> E.g. new infrastructure would need to follow a given point system and reach a pre-specified standard in order to be approved. This system has been imposed as part of Stockholm's Regional Green and Blue Infrastructure Strategy.

		<p>helping to provide an overview of green infrastructure action (as was done with the Natura 2000 network)</p> <ul style="list-style-type: none"> <li>• EU: Support the development of appropriate indicators for GI valuation and monitoring</li> <li>• EU: Create a platform for exchanging best practices and sharing expertise</li> <li>• NG: Set targets and establish standards (for monitoring, measuring GI, etc)</li> </ul>
<b>Contextual barriers</b>	<ul style="list-style-type: none"> <li>• Historical factor</li> <li>• Limited windows of opportunity</li> <li>• Low levels of existing drinking water infrastructure</li> <li>• Lack of synergies and integration between different sectors relevant for GI</li> <li>• Disconnect between policy and practice</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain a high awareness of relevant political considerations outside project scope, e.g. spatial plans, EU policies, regional/national elections</li> <li>• Consideration of local vision in project design/timing</li> <li>• EU: Increase coherency between EU policies across relevant sectors</li> <li>• EU/NG: Ensure that spending and programming is compatible with green infrastructure objectives and principles</li> </ul>
<b>Structural barriers</b>	<ul style="list-style-type: none"> <li>• Changing of management mid-project</li> <li>• Cross-border considerations (e.g. languages, different legal systems)</li> <li>• Mixed landownership titles being dealt with (private/public)</li> <li>• Overly detailed and rigid planning of GI projects</li> </ul>	<ul style="list-style-type: none"> <li>• Hire a translator from the project's start</li> <li>• Have a consistent national contact person</li> <li>• Increase knowledge/awareness of landowners and focus on <i>benefits</i></li> <li>• Design projects to allow for flexibility during implementation</li> </ul>
<b>Regulatory barriers</b>	<ul style="list-style-type: none"> <li>• Funding application and subsequent required paperwork</li> <li>• Conflicts between funders and requirements (e.g. different ERDF eligibility regions within a single project)</li> <li>• Differing definitions of GI on local/regional, national and EU levels</li> </ul>	<ul style="list-style-type: none"> <li>• More funding should be made available for addressing administrative requirements or the amount of requirements should be reduced Need for harmonization of definitions, or the flexibility to adjust EU definitions/requirements to local considerations</li> <li>• EU: provide 'big picture', clarifying the concept of green infrastructure and the vision for long-term oriented future goals/action</li> </ul>
<b>Technical barriers</b>	<ul style="list-style-type: none"> <li>• Harmonizing activities while still allowing for public use of the area</li> <li>• Delays due to weather , breeding habits of birds, other environmental considerations</li> </ul>	<ul style="list-style-type: none"> <li>• Include public awareness campaigns in the planning phase of the project, especially targeting local communities potentially affected by project activities</li> <li>• Allow flexibility in the timeline of projects to ensure adaptability concerning external factors</li> </ul>

\*Note: Solutions directly intended for the European Union, national governments and/or local/regional governments are labelled accordingly (EU, NG and LRG, respectively). Where no level was indicated, the solutions are left unlabelled.

## 4.4 Concluding remarks

Taking the fundamental aspects of green infrastructure projects outlined throughout this chapter into account, several important conclusions can be drawn. First, the wide variety of drivers underlying the motivation to initiate a green infrastructure project, including policy and strategic drivers at different spatial levels, local and regional needs and/or the interests of private and social actors, demonstrates how green infrastructure activities can be encouraged and enhanced. A targeted policy framework and in particular spatial planning

legislation are considered the most powerful instruments for the development of green infrastructure and thus call for action at national and local/regional levels to better integrate green infrastructure into existing policies and legislation.

The large majority of projects being implemented at the local/regional level indicate the potential importance of the role of regional political and community support and, subsequently, the value of involving local stakeholders and integrating capacity building and awareness raising activities into project design. Raising awareness among the public and establishing stakeholder consultation processes are required where different attitudes and interests come together and “trust building” activities are needed to ensure engagement of relevant stakeholders and successful implementation of the project. Moreover, such approaches can help to change behaviours and attract public and/or private financial support.

The results also highlight the need for coordination at a national and ideally EU level for the exchange of information, experiences and best practices to optimize local/regional implementation and planning processes and spread know-how.

The cross-sectoral nature of green infrastructure projects and the subsequent diversity of objectives addressed indicate the high potential of such initiatives to contribute to and support a range of EU policies and strategies. As the majority of explored projects have several objectives, single projects can simultaneously attend to multiple local/regional needs and thereby assist broader EU goals. Recognizing this potential, increased effort is necessary to improve the coherency of EU policies and ensure that complementary activities are supported (see 6.1). Such an integrated approach calls for a broad understanding and acceptance of conservation issues and the green infrastructure approach. An extensive awareness-raising campaign would thus attempt to involve all sectors and relevant/interested stakeholders.

The high diversity of aims, focus and actors involved is also linked to a wide range of possible financing sources at different levels, which may be used alone or in combination with one another for supporting green infrastructure projects. As there is currently no dedicated funding instrument for green infrastructure at the EU level and few such instruments and dedicated resources exist at the national level, potential financing sources and their respective instruments (from all relevant sectors and policies) must be better explored and utilised. In addition, the untapped role of private actors in financing green infrastructure must be clearly outlined and their involvement and engagement into green infrastructure investments should be motivated, encouraged and maybe even incentivised. The analysis revealed four tools which can be utilized to enable increased private sector involvement, including: the creation of a market (such as the carbon market/carbon financing); introduction of regulative instruments (e.g. a tax or fee or off-setting requirements); tax deductions; and voluntary approaches such as corporate social responsibility. In particular, helping to establish and promote public-private partnerships by the EU as well as national and regional policy makers was highlighted as one important action.

However, not only availability of financing was considered as an important success factor. The results also showed that integrating evaluation and monitoring activities in the early stages of a project are very useful to report on a project’s progress and success, to bring up the benefits delivered, to make adjustments in the project set-up and to gain positive acknowledgement on behalf of a wider range of stakeholders as well as their support.

The systematic review of barriers faced in the in-depth case studies, which was complemented by expert knowledge, enabled the compilation of a comprehensive overview on structural, regulatory, cultural/behavioural, contextual, capacity and technical barriers and possible solution to these. In addition, numerous factors which serve as enabling factors for the successful implementation of green infrastructure projects in the different project phases (planning, setting, implementation and maintenance) have been identified. Even if both overviews are not exhaustive, they can provide very useful insights and recommendations for practitioners responsible for the development of green infrastructure projects as well as for policy makers and respective authorities to set priorities and determine corresponding activities for creating a green infrastructure supporting policy framework. The development of a spatial green infrastructure plan (at the desired level) can help to connect the variety of projects and existing green infrastructure elements as well as channel financing from the different sectors and actors.

## 5 Cost and benefits of green infrastructure projects

This section provides an analysis of the costs and benefits of green infrastructure projects. It defines a typology of costs and benefits, and then reviews quantitative and qualitative evidence of these benefits from the project database, six in depth case studies, and wider literature. The value of costs and benefits of individual projects is compared as far as evidence permits, and conclusions are drawn about how this evidence may be improved in future.

### 5.1 Introduction and methods

Understanding the costs and benefits of green infrastructure projects is a key element in this study. The work has involved:

- **Defining a typology of costs and benefits** of green infrastructure projects, in order to inform the collection and analysis of data;
- Collecting and summarising available evidence of the costs and benefits of 127 green infrastructure projects, through the literature review, and entering this into the **project database**;
- More detailed analysis of the costs and benefits of the six in-depth **case study projects**. Data were collected through interviews with partners and stakeholders, and from a review of documents and data, using a structured topic guide, based on the typology of costs and benefits.

The following sections summarise the evidence on costs and benefits collected in the database and through the in-depth case studies.

### 5.2 Costs of green infrastructure

#### 5.2.1 Types of costs

The costs of green infrastructure broadly include:

- Financial costs – the value of the resources deployed in defining, protecting, managing and developing green infrastructure, which include the costs of labour, materials, energy, equipment and other purchased goods and services.
- Opportunity costs – the value of economic opportunities foregone as a result of protecting green infrastructure. These may include foregone development, restrictions on resource use, restrictions in output from land management, and loss of socio-economic opportunities (e.g. use of land for regeneration or community uses).

It should be noted that financial and opportunity costs may overlap to some extent – for example if the authorities pay compensation to land owners or managers, which reflects foregone income or development opportunities. To avoid risk of double counting, it is helpful to distinguish between opportunity costs for which compensation is paid and those for which it is not.

Opportunity costs often arise as a result of wider policies to protect green infrastructure (e.g. protected areas policies) and are therefore not necessarily attributable to the projects themselves.

A typology of costs can also distinguish between:

- One-off costs – capital costs of activities to define, research, designate, purchase, protect, restore or create green infrastructure that need to be completed only once;
- Ongoing costs – recurrent costs of activities to protect, manage and monitor green infrastructure that need to be undertaken on a regular basis over time.

We can also distinguish between:

- Administrative, management and information costs - i.e. the ‘intangible’ costs incurred by green infrastructure projects;
- The costs of green infrastructure works – i.e. the costs of maintaining or enhancing the green infrastructure itself – including creation, restoration and ongoing management costs.

These main cost elements are summarised in Table 14.

**Table 14: Typology of costs of green infrastructure projects (applied in the in-depth case studies)**

<b>Financial Costs</b>	One-Off Costs	Administrative, management and information costs	<ul style="list-style-type: none"> <li>• Establishing management bodies</li> <li>• Surveys</li> <li>• Research</li> <li>• Consultation</li> <li>• Management plans</li> </ul>
		Costs of green infrastructure provision	<ul style="list-style-type: none"> <li>• Land purchase</li> <li>• One-off compensation payments</li> <li>• Creation of green infrastructure</li> <li>• Restoration of green infrastructure</li> </ul>
	Ongoing Costs	Administrative, management and information costs	<ul style="list-style-type: none"> <li>• Running of administrative bodies</li> <li>• Monitoring</li> <li>• Ongoing management planning</li> <li>• Communications</li> </ul>
		Costs of green infrastructure provision	<ul style="list-style-type: none"> <li>• Maintenance of green infrastructure</li> <li>• Costs of management agreements</li> <li>• Costs of protective actions (e.g. ongoing planning controls, site wardening)</li> </ul>
<b>Opportunity Costs</b>		Foregone development opportunities	Value of potential development foregone

<b>(uncompensated)</b>	Foregone resource use	<ul style="list-style-type: none"> <li>• Loss of mineral extraction</li> <li>• Loss of water abstraction</li> <li>• Loss of land development rights</li> </ul>
	Foregone output from land management	<ul style="list-style-type: none"> <li>• Foregone agricultural output</li> <li>• Foregone forestry output</li> </ul>
	Foregone socio-economic opportunities	<ul style="list-style-type: none"> <li>• Loss of regeneration opportunities</li> <li>• Loss of community uses of land</li> </ul>
	Reductions in land values	Price of land

Adapted from the following reports: Kaphengst et al. (2010): *Taking into account opportunity costs when assessing costs of biodiversity and ecosystem action, final report*; and Gantioler et al. (2010): *Costs and Socio-Economic Benefits associated with the Natura 2000 Network. Final report to the European Commission, DG Environment on Contract ENV.B.2/SER/2008/0038. Institute for European Environmental Policy / GHK / Ecologic, Brussels 2010.*

Costs can also be attributed in different ways, for example, according to:

- Green infrastructure elements – e.g. different habitats, features or land uses;
- Objectives – particularly in projects or programmes with multiple objectives e.g. biodiversity conservation, recreation, provision of different ecosystem services;
- Cost items – e.g. land, equipment, materials, labour, energy, services; and
- Private and public sector costs.

## 5.2.2 Evidence from the database

The database provides cost data for 90 of the 127 projects (74% of the total). No cost data were recorded in the database for the remaining 32 projects (26% of the total) because details were not given in the documents and web pages consulted. For most projects, the only data available relates to the budgetary costs of the work undertaken. No information was available regarding the opportunity costs of the different projects.

**Table 15: Evidence of the overall costs of 127 green infrastructure projects in the database**

Type of Data	Number of projects
Data available on budgetary costs	94
No cost data available	33
<b>Total</b>	<b>127</b>

The total financial budgets for these 90 projects are summarised in Table 16. The table shows that most green infrastructure projects had a budget of between €0.5 and €5.0 million. However, 5 very large projects, all in the UK, each had an overall budget of more than €25 million. These were: the Newlands project, a peri-urban woodland project with a budget of €67 million; the South Yorkshire Coalfields project, a project to transform former coalfields

into community woodlands (€64million); Mile End Park, involving creation of an urban green space in London, (€29million); restoration of the Kennet and Avon Canal (€44m); and the creation of the UK National Forest, with a budget of €177 million. These five projects raised the average size of the budget for the 90 projects to €8.15 million.

**Table 16: Summary of financial budgets for green infrastructure projects in database**

Budget	Number of Projects
€0 to €0.5million	5
€0.51 to €1.0million	16
€1.01 to €2.0million	21
€2.01 to €5.0million	26
€5.01 to €10.0million	13
€10.01 to €25.0million	8
>€25.0million	5
<b>Total</b>	<b>94</b>
<b>Average project value</b>	<b>€8.15million</b>

Costs vary according to the scale of the project. Most projects are local or site based initiatives, but some of the larger projects such as the UK ones involve actions to create or restore green infrastructure at a sub-regional scale (e.g. the National Forest, which covers a wide area of central England). One Bulgarian project involved a study to assess the feasibility of restoring ecological networks across transport corridors in Bulgaria. This estimated that the costs of a national programme of such defragmentation measures, designed to facilitate the movement of species and to connect habitats, would amount to €132 million over a 15 year period up to 2025, at an average annual cost of just less than €10 million. These figures do not represent a total cost, as they do not include the costs for planning and designing the specific measures, nor do they include the costs for purchasing land if any additional (non-governmental) land is needed to allow for proper habitat development and management in “buffer-zones” around the entrances of the wildlife passages.

Estimating the unit costs of provision of green infrastructure can be problematic as a result of missing data, and because of the multiple actions undertaken by many projects. For example, the recorded costs often relate to a variety of green infrastructure conservation, enhancement and creation activities, as well as other actions such as awareness raising and research, and costs are not usually broken down between these different activities. Estimates of unit costs can be made more easily where the outputs of a project can be summarised using a single main indicator (e.g. area of habitat restored), though calculating unit costs on this basis may lead to overestimates if the project involved additional activities and outputs. Examples of the estimated unit costs of a selection of the projects in the database are given in Table 17.

**Table 17: Unit costs of green infrastructure restoration**

Project	Cost (€)	EU Funding	Green infrastructure delivered	Estimated unit costs
Actions for the valleys and turf moors of Criox Scaille, Belgium	2,116,700	LIFE	Clearance of 170 ha of conifers; restoration of 85 ha of river valley habitats and 44 ha of peatbogs	€7,080 per ha of habitat restored
Rehabilitation of heath and mires on the Hautes-Fagnes plateau, Belgium	4,500,000	LIFE	Restoration of 1800 ha of peaty and wet habitats, including through conifer removal, restructuring of plantations and restoration of wetlands	€2,500 per ha of habitat restored
Conserving <i>Acrocephalus paludicola</i> in Poland and Germany	5,457,109	LIFE	Creation of 1500 ha of new habitat and restoration of 1500 ha of existing habitat, as well as conservation and awareness measures	€1,819 per ha of habitat created/restored – likely to be an overestimate as the project also involved awareness and conservation actions
Gulf of Finland - Management of wetlands along the Gulf of Finland migratory flyway	3,290,718	LIFE	Increasing meadow area by 200 ha by mowing, grazing and clearing trees; increasing open water by 70 ha by removing aquatic vegetation, extending area of mosaic habitats by 190 ha. Improving hydrological conditions of 70 ha of coastal meadows.	€6,209 per ha of habitat created/restored
Restoration of Scottish raised bogs, UK	2,139,262	LIFE	Restoration of 1256 ha of active raised bog and increasing the area of active bog by 315 ha through removal of trees, scrub and heather; promotion of conservation management on 3700 ha of bog	€1362 per ha of bog restored; this overestimates restoration costs as project also promoted conservation management over wider area
LIFE peatlands project, Scotland	4,547,869	LIFE	Restoration of blanket bog through removal of commercial forestry (1,556 ha) and blocking of drains (16,600 ha).	€250 per ha of blanket bog restored
Restoring active blanket bog in the Berwyn and Migneint SACs in Wales, UK	3,765,394	LIFE	Restoration and conservation actions over 5,479 ha of two upland SACs	€687 per ha benefiting from conservation action/ restoration
Restoration of the mid Cornwall Moors for the <i>Euphydryas aurinia</i> , UK	1,843,502	LIFE	Increase in favourable condition of habitat for marsh fritillary butterflies on about 130 ha	€14,185 per ha of habitat reaching favourable

			across the project sites	condition
Coastal Meadows and Wetlands in the Agricultural Landscape of Öland, Sweden	3,362,119	LIFE	998 ha of land restored through scrub clearance	€3,368 per ha of land restored
Enhancing urban green space - Sheffield Botanical Gardens, UK	7,160,775	No	Restoration of a 7.6 ha botanical garden and associated buildings	€942,207 per ha or garden
Mersey Forest, UK	7,981,756	Structural Funds	Creation of 8,000 ha of community woodlands	€997 per ha of woodland created
Glasgow Green, UK	17,673,888	Structural Funds	Renewal of 55 ha urban park	€321,343 per ha of park restored
Natural Forests and mires in the "Green Belt" of Koillismaa and Kainuu, Finland	1,174,348	LIFE	601 ha of forest restored	€1,953 per ha of forest restored
Restoration of habitats and wildlife of the Skjern River, Denmark	7,357,250	LIFE	1200 ha of grassland habitats restored/ enhanced	€6,131 per ha of grassland restored/ enhanced; this is an overestimate as project also restored wetland habitats

The figures in Table 17 indicate a wide range of per hectare costs for different green infrastructure projects, with capital costs ranging from €250 to almost €1 million per hectare. The latter figure is atypical, relating to intensive restoration works in an urban green space, including restoration of buildings. Some general conclusions can be drawn:

- Per hectare costs tend to be lowest for restoration of very extensive habitats such as upland blanket bogs, and highest for very intensive restoration works targeting small areas of land. The finding that per hectare costs decline with site size is typical of nature conservation projects<sup>62</sup>;
- Restoration of urban parks and green spaces tend to have very high costs per hectare, especially where this involves work on buildings and gardens;
- Targeted species conservation work focusing on specific sites (e.g. site restoration for butterflies) tends to have relatively high costs per hectare;
- Labour intensive restoration work (e.g. involving tree and scrub removal) tends to have higher per hectare costs than more extensive conservation action (e.g. reintroduction of grazing);
- The estimated per hectare costs are often inflated where projects involve wider activities in addition to land management (e.g. awareness raising).

<sup>62</sup> See for example Gantioler et al (2010) Costs and socio-economic benefits of the Natura 2000 network

## 5.2.3 Evidence from the case studies

### Financial costs of green infrastructure

The case studies record the financial costs incurred in implementing each of the six green infrastructure projects.

Four of the six projects (Alpine Carpathian Corridor, Gallecs, Transformation of the banks of the Rhone, Tiengemeten) involved two distinct phases. The first of these involved a project phase comprising one-off expenditures to establish the need for action and to implement the necessary investments required. The second involved an ongoing operational phase involving recurrent expenditures in protecting and maintaining green infrastructure.

The Väinameri project differed in comprising one-off expenditures only. The project was completed between 1997 and 2004 and no longer operates as a distinct entity.

The UK National Forest project also differs from the others in involving a very long term programme of investment in woodland expansion. Expenditures on the creation, restoration, enhancement and public awareness of green infrastructure have been ongoing since 1995 and will continue into the future. As a result both past and current expenditures include elements of both capital and revenue costs.

Table 18 records the one-off or historic costs incurred by the six projects. An attempt has been made to categorise these as far as possible to facilitate comparisons between projects. However, caution is needed in interpreting the figures, because there is no standard accounting of costs between projects, and there are therefore some overlaps between categories, and differences in definitions, between projects. Similarly the absence of a figure in a cell may simply occur because costs were not categorised in that way, not that no such expenditure has been made.

**Table 18: One-off/historic costs of green infrastructure projects (€)**

	Alpine Carpathian Corridor	Gallecs	Transformation of the banks of the Rhone	National Forest*	Tiengemeten	Väinameri	Total	%
	2002-2012	2002-2004	2004-2008	2003-2010	2008-2011	2000-2003		
Planning, surveys, preparatory studies	1,015,000	1,501,183	1,100,000		530,548		4,146,731	3%
Communication and consultation	440,460				272,748		713,208	0%
Project management and administration	205,000		4,697,000	11,357,206		631,357	16,890,563	12%
Spatial planning	67,500						67,500	0%
Land purchase					30,000,000		30,000,000	21%
Compensation payments					14,000,000		14,000,000	10%
Buildings and								6%

infrastructure					8,829,046		8,829,046	
Purchase of livestock					82,835		82,835	0%
Land management and restoration works	130,850		37,089,000	18,907,908	4,769,026		60,896,784	43%
Creation of connectivity features	3,000,000						3,000,000	2%
Other/ unspecified				4,220,828			4,220,828	3%
<b>Total</b>	<b>4,858,810</b>	<b>1,501,183</b>	<b>42,886,000</b>	<b>34,485,943</b>	<b>58,484,203</b>	<b>631,357</b>	<b>142,847,496</b>	<b>100%</b>

*\*Figures for the National Forest are accumulated costs between 2003 and 2010 and include both capital and revenue expenditures; no data are available for 1995 to 2002 period. The administrative and other costs include other elements such as communications, education, studies and research.*

The combined cost of implementing the six projects is estimated at €143 million, ranging from €0.6 million for the Väinameri project to €58 million for the Tiengemeten project.

The figures show that the six projects involved rather different types of activities, and that this affected the different types of costs incurred.

The largest element of costs relates to **land management and restoration works**, comprising 43% of the overall total. These costs were significant at four of the six projects – the other two, the Gallecs and Väinameri projects – focused more on information and planning rather than funding land management works. The costs of land management and restoration works were greatest at Lyon (where substantial capital works were required for bank and river restoration) and the National Forest (where there has been a substantial ongoing programme of forest creation and restoration). The Tiengemeten project involved substantial expenditures on land purchase and on the compensation of farmers for changes in land use, as well as significant investments in buildings and infrastructure.

Table 19 shows the recurrent annual costs of the six projects. These costs amount to a total of €7.9 million per year, only 6% of the €143 million of one-off costs incurred by these projects. The largest ongoing costs relate to the management and maintenance of land and buildings, accounting for 68% of the total. This is followed by project management and administration, at 25%.

The **Väinameri** project was completed in 2004 and therefore no longer incurs ongoing costs, while the other five are ongoing in some way. The highest ongoing annual expenditures are recorded by the UK **National Forest**, at €4.2 million – these include ongoing capital costs of forest creation and restoration as well as revenue expenditures. These expenditures will continue in the future as the project is ongoing, and aims to increase forest cover to approximately one third of total land area, compared to the current 18% of land area. The **Transformation of the banks of the Rhone** project also incurs substantial annual costs in the maintenance and cleaning of river banks. The **Tiengemeten** project incurs expenditure of €630,000 annually in the maintenance and management of the island, and €240,000 in maintaining and operating the ferry. There have been savings in the costs of agricultural subsidies and the maintenance of coastal flood defences. The **Alpine Carpathian Corridor** project has yet to be completed and therefore incurs additional project management costs,

as well as annual monitoring costs of €20,000. There are plans to construct further green bridges at a cost of about €4 million each. The **Gallecs** project differs from the others in that the initial project phase, which was largely a master planning exercise, has led on to a broader programme of activities and expenditures – as well as the core costs of the consortium, expenditures are now incurred in maintaining the architectural heritage, recreational, nature and forested areas, in outreach and education, and in research and monitoring. As a result annual costs have increased.

**Table 19: Recurrent Costs of Green Infrastructure Projects (€ per year)**

	Alpine Carpathian Corridor	Gallecs*	Transformation of the banks of the Rhone	National Forest* *	Tien-gemetten	Väinameri	Total	%
Rent			100,000			-	100,000	1%
Land Management, Buildings Maintenance		265,423	1,785,823	2,669,136	630,000	-	5,350,382	68%
Transport equipment and fuel					240,000	-	240,000	3%
Other equipment				39,400		-	39,400	0%
Project management and administration	80,000	372,270		1,491,418		-	1,943,688	25%
Communications and education		120,000				-	120,000	2%
Research and monitoring	20,000	60,000		47,378		-	127,378	2%
<b>Total</b>	<b>100,000</b>	<b>817,693</b>	<b>1,885,823</b>	<b>4,247,332</b>	<b>870,000</b>	<b>-</b>	<b>7,920,848</b>	<b>100%</b>

\*This is the “normal” scenario budget, rather than the “minimum” budget, and assumes no cuts in costs take place

\*\*Includes ongoing capital costs of forest creation and restoration

It should be noted that the ongoing costs recorded by the projects do not necessarily reflect the full costs of managing green infrastructure in their respective areas. Additional costs may be incurred through mainstream land management programmes (e.g. agri-environment and forestry schemes) as well as in public administration. No estimates are available of the extent of any additional costs above those recorded by the projects.

### Opportunity costs

Opportunity costs are considered insignificant in three projects (Alpine Carpathian Corridor, Lyon and Väinameri), and in the latter two cases are believed to have stimulated significant new development opportunities.

The National Forest and Tiengemetten projects have reduced agricultural production, resulting in foregone income to land owners, compensation for which is included in the financial costs of the projects detailed above (under “Land Management” in Table 8). In both cases (and especially the National Forest), reduced agricultural production has been offset

by new opportunities for development and diversification. Only the Gallecs project is likely to have resulted in substantial opportunity costs for the local economy – in this case there have also been new economic opportunities, and it is argued that the project is likely to have shifted built development to other locations rather than reducing it overall.

A discussion of the opportunity costs of individual projects is provided as follows:

- **Alpine Carpathian Corridor** – the project resulted in no significant additional changes in land use, or restrictions on development, so is not considered to have given rise to opportunity costs, over and above those relating to existing designations in the area.
- **Gallecs** – Opportunity costs are likely to be significant, given the stated objective of the project to protect Gallecs from urban and industrial pressures, maintaining a buffer zone from rapidly urbanizing areas around it. By protecting 7.5 million m<sup>2</sup> of land from urbanisation, it is likely that the project has resulted in significant levels of development being foregone. On the other hand, project consultees comment that economic activity has been enhanced through the promotion of sustainable farming techniques (with organic agricultural products commanding high profit margins) and strategic urban-rural planning. Furthermore, the net opportunity costs at regional level are more debateable, since the project is likely to have shifted development to areas where the natural and agricultural potential was not as significant.
- **Transformation of the banks of the Rhone** – the project has not resulted in any reductions in economic activity. Instead, it has helped to stimulate water-based leisure activities, with more people using the banks of the river and an increase in numbers of barges with restaurants, bars and night clubs on board.
- **National Forest** – In overall terms, the project is not considered to have restricted economic development opportunities in the area, despite involving a significant conversion of land to woodland, with consequent reductions in agricultural production. Much of the land converted to woodland has been in former mining areas with few development opportunities, and by regenerating the area the project is therefore considered to have brought significant opportunities for economic development and diversification. A report by ettec (2010) on the costs and benefits of the project noted that the opportunity costs of converting land to forest (e.g. costs of foregone agricultural production) are likely to have been reflected in the payments made to landowners (included in land management costs in the tables above) – the cost benefit analysis therefore made no additional estimate of opportunity costs. It also commented that opportunity costs are likely to be negative in many cases, since the project has stimulated new development in areas where opportunities were previously limited.
- **Tiengemetten** – the project reduced agricultural production by re-creating coastal habitats on farmland, which previously occupied 700ha of the 1000ha island. Farmers were compensated for these losses through the purchase of land or the payment of compensation for foregone production. The land purchase costs of €30 million and compensation payments to farmers of €14 million can be regarded as an estimate of the capitalised value of agricultural profits foregone. However, it should be noted that these figures are inflated by agricultural subsidies, and that the profitability of agriculture on the island was considered to be low.

- **Väinameri** – the project is not considered to have had opportunity costs. Its objective was to increase economic activity in the region—that is, taking protected areas that could not be used for intensive agriculture or other intensive development activities and providing opportunities to preserve the coastal landscape through sustainable use.

## Unit costs of green infrastructure provision

Table 20 examines the unit costs of green infrastructure provided by the case study projects. The figures demonstrate the wide variety of costs per hectare of green infrastructure.

**Table 20: Case study projects – Unit costs of green infrastructure provision**

Project and green infrastructure element	Extent	Unit	Cost (€)	Unit cost	
<b>Alpine Carpathian Corridor</b>					
Provision of green bridges				4,000,000	per green bridge
<b>Gallecs</b>					
One off cost of green infrastructure strategy/ management plans	753	ha	1,501,183	1,994	per ha
Annual costs of green infrastructure protection and maintenance	753	ha	817,693	1,086	per ha per year
Annual maintenance of forests	160	ha	20,000	125	per ha per year
Maintenance of recreational/green areas	3.82	ha	65,000	17,016	per ha per year
Maintenance of agricultural land	535	ha	24,000	45	per ha per year
<b>Transformation of the banks of the Rhone</b>					
Restoration of urban riparian area	10	ha	42,886,000	4,288,600	per ha
Maintenance of urban riparian area	10	ha	1,885,823	188,582	
Provision of lawns				30,000 to 300,000	per ha
provision of meadows				50,000 to 230,000	per ha
Maintenance of trees	500	trees	25,000	50	per tree
<b>National Forest</b>					
Land purchase				20,487	per ha
Forest creation through grants				15,074	per ha
Creation of Swadlincote urban woodland park	32	ha	811,188	25,350	per ha
Habitat restoration at Croxall Lakes Nature Reserve	50	ha	196,923	3,938	per ha
Woodland creation at Pick Triangle, including land purchase	29.9	ha	251,748	8,420	per ha
<b>Tiengemetten</b>					
Land purchase	1,000	ha	30,000,000	30,000	per ha

Compensation for relocated farmers	700	ha	13,600,000	19,429	per ha
Restoration	700	ha	6,710,521	9,586	per ha
Annual maintenance	1000	ha	630,000	630	per ha per year

The figures indicate that:

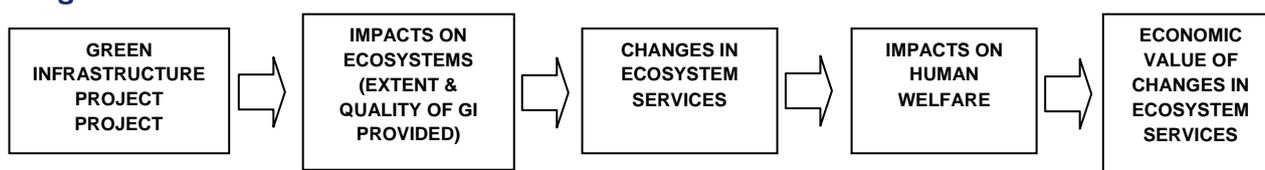
- Provision and maintenance of green infrastructure in urban areas (Lyon, Gallecs) can have very high costs per hectare;
- The Gallecs project indicates that the costs of research, spatial and management planning measures designed to protect green infrastructure at a wide scale can be substantial compared to direct land management costs;
- The National Forest and Tiengemetten projects demonstrate that land purchase and compensation payments can add substantially to the costs of green infrastructure provision and maintenance;
- Most examples show that the capital costs of green infrastructure provision and maintenance are much higher than the annual ongoing management costs.

## 5.3 Benefits of green infrastructure

### 5.3.1 Types of benefits

The benefits of green infrastructure can be measured in different ways and at different levels. Figure 12 provides an illustrative framework for understanding the benefits of green infrastructure projects at different stages of the value chain.

**Figure 12: Benefits of Green Infrastructure**



Source: Adapted from Defra (2007) – Framework for Ecosystem Services Valuation

The benefits of green infrastructure projects may be assessed by examining different indicators relating to:

- Changes in the provision of green infrastructure - the extent and quality of habitats, corridors, ecosystems, green spaces and features (measured in purely environmental terms);
- Changes in the provision of ecosystem services - e.g. volume of carbon stored, level of reduction of flood risk, number of recreational users of green space or recreation days, etc. (measured in the provision of the service and its use by people);
- Changes in the socio-economic value of provided ecosystem services - e.g. value of carbon storage, value of reductions in property damage due to flooding, value placed by the public on changes in biodiversity (measured in monetary terms); and,

- The economic and social impacts of GI projects, i.e. their impacts on employment, GDP and local communities (measured in terms of output and employment).

A framework for assessing these benefits is presented in Table 21.

**Table 21: Framework for assessing the benefits of green infrastructure projects**

Type of Benefit	Description	Examples
<b>Green Infrastructure Provision</b>	Benefits that are measured purely in environmental terms – i.e. the extent and quality of the Green Infrastructure itself	<ul style="list-style-type: none"> <li>• Area of habitat created/ maintained/ restored</li> <li>• Length of corridors provided</li> <li>• Area of floodplain restored</li> <li>• Area of urban green space provided/ maintained</li> <li>• Number of trees planted</li> <li>• Number of green roofs provided</li> </ul>
<b>Ecosystem Services</b>	Services that green infrastructure provide to people, including provisioning, regulating and cultural services. These can be quantified in different units, measuring the provision of the service and its use by people.	<ul style="list-style-type: none"> <li>• Number of recreational users of green space</li> <li>• Number of people benefiting from enhanced air quality</li> <li>• Volume of carbon stored</li> <li>• % Reduction in flood risk</li> <li>• Improvements in water quality</li> <li>• Reduction in loss of soils through erosion</li> <li>• Number of people benefiting from enhanced wildlife, landscape, visual amenity</li> <li>• Number of people experiencing improvements in health as a result of air quality and/or recreational space</li> </ul>
<b>Socio-economic Benefits</b>	The value of services and benefits to people, measured in monetary terms.	<ul style="list-style-type: none"> <li>• Value of damage avoided due to climate change, flooding, other natural hazards</li> <li>• Reduction in expenditure on water treatment or flood defences</li> <li>• Market value of food, fibre, genetic resources</li> <li>• WTP for recreational visits</li> <li>• WTP for improvements in biodiversity and landscape</li> </ul>
<b>Socio-economic Impacts</b>	The effect of green infrastructure on the economy, measured in terms of output and employment.	<ul style="list-style-type: none"> <li>• Temporary impacts of green infrastructure provision (employment, GVA)</li> <li>• Ongoing impacts of maintenance (employment, GVA)</li> <li>• Indirect and induced effects resulting from supplier and employee expenditures (employment, GVA)</li> <li>• Effects on wider economy (tourism, inward investment – value of investment and expenditure, effect on employment and GVA)</li> </ul>

Table 22 provides a summary of different categories of ecosystem services, as set out in the Millennium Ecosystem Assessment (2005).

**Table 22: Overview of ecosystem services according to MA 2005**

<b>Ecosystem service</b>
<b>Provisioning Services</b>
<b>Food</b> Sustainably produced / harvested crops, fruit, wild berries, fungi, nuts, livestock, semi-domestic animals, game, fish & other aquatic resources etc.
<b>Fibre / materials</b> Sustainably produced / harvested wool, skins, leather, plant fibre (cotton, straw etc.), timber, cork, etc.
<b>Fuel</b> Sustainably produced / harvested firewood, biomass etc.
<b>Ornamental resources</b> Sustainably produced / harvested ornamental wild plants, wood for handcraft, seashells etc.
<b>Natural medicines</b> Sustainably produced / harvested medical natural products (flowers, roots, leaves, seeds, sap, animal products etc.
<b>Biochemicals &amp; pharmaceuticals</b> The ecosystem is a (once-off or continuous) for ingredients / components of biochemical or pharmaceutical products
<b>Water quantity</b>
<b>Regulating services</b>
<b>Climate / climate change regulation</b> Carbon sequestration, maintaining and controlling temperature and precipitation
<b>Water regulation</b> Flood prevention, regulating surface water run off, aquifer recharge etc.
<b>Water purification &amp; waste management</b> Decomposition / capture of nutrients and contaminants, prevention of eutrophication of water bodies, etc.
<b>Air quality regulation</b>
<b>Erosion control</b> Maintenance of nutrients and soil cover and preventing negative effects of erosion (e.g. impoverishing of soil, increased sedimentation of water bodies)
<b>Natural hazards control</b> Avalanche control, storm damage control, fire regulation (i.e. preventing fires and regulating fire intensity)
<b>Biological control</b> Maintenance of natural enemies of plant and animal pests, regulating the populations of plant and animal disease vectors etc.
<b>Pollination</b> Maintenance of natural pollinators and seed dispersal agents (e.g. birds and mammals)
<b>Disease regulation of human health</b> Regulation of vectors for pathogens
<b>Genetic / species diversity maintenance</b> Protection of local and endemic breeds and varieties, maintenance of game species gene pool etc.
<b>Cultural &amp; social services</b>
<b>Ecotourism &amp; recreation</b> Hiking, camping, nature walks, jogging, skiing, canoeing, rafting, recreational fishing, animal watching etc.
<b>Cultural values and inspirational services, e.g. education, art &amp; research</b>
<b>Landscape &amp; amenity values</b> Amenity of the ecosystem, cultural diversity & identity, spiritual values, cultural heritage values, etc.

Other assessments have grouped these services in different ways. For example, the Natural Economy North West programme in England has developed a framework of 11 economic benefits provided by green infrastructure<sup>63</sup>.

### 5.3.2 Evidence from the database

Of the 127 green infrastructure projects documented in the database, the benefits of 77 are described in qualitative terms, while 31 lack information about their benefits. Quantitative evidence of benefits is provided for only 19 projects (Table 23).

**Table 23: Projects in green infrastructure database: Evidence of benefits**

Type of Evidence	Number	% of total
Quantitative evidence of benefits	19	15%
Qualitative description of benefits	77	61%
No evidence of benefits	31	24%
<b>Total</b>	<b>127</b>	<b>100%</b>

Table 24 categorises the types of benefits identified by these projects. It indicates that more than 50% of projects identified socio-economic benefits, wildlife benefits and ecosystem service benefits; 55% of projects reported more than one of these types of benefits.

**Table 24: Type of benefits identified by green infrastructure projects in the database\***

Type of Benefit	Number of Projects	% of Projects identifying benefits
Ecosystem services	50	54%
Wildlife benefits	49	53%
Socio-economic benefits	56	60%
Multiple benefits (environmental, social, economic)	51	55%

\*55% of projects identified more than one of these benefits, so percentages add up to more than 100%

Examples of the types of benefits identified include:

- Ecosystem services – regulation of air quality, climate (carbon storage and micro-climate), soils, water and natural hazards; recreation and ecotourism, education; production of food and timber.
- Wildlife benefits – enhancement of habitats and protected areas, species conservation, improved habitat connectivity and resilience, wildlife corridors.
- Socio-economic benefits – stimulating tourism growth, job creation, skills development, health benefits, facilitating urban growth and regeneration, public access to countryside,

<sup>63</sup> <http://www.natureconomynorthwest.co.uk/green+infrastructure.php>

rural development and agricultural diversification, enhanced living and working environment, increased property values, social cohesion, cost savings.

Detailed evidence of benefits was available for the Skjern River restoration project in Denmark (Box 7).

### **Box 7: Benefits of the Skjern River restoration project, Denmark**

#### **Conservation Benefits**

The main project objectives were met with regard to restoration of wetland habitats. This included successful construction of more than 20 km of new riverbeds in the eastern part of the project site. About 1,200 ha of grassland were established, less than originally foreseen (1600 ha), because of the creation of increased areas of wetland and shallow lake areas, with benefits for important species like Spotted Crake, Avocet and Bittern. Targets set up at the start of project for the site to qualify for Special Protection Area (SPA) status were met, as follows: - In 2002, *Botaurus stellaris*, 4 pairs were breeding; *Recurvirostra avosetta*, 85 pairs; *Sterna hirundo*, 1 pair, *Porzana porzana*, 7-9 pairs, *Philomachus pugnax*, increased number of migrants. In 2000, there were no pairs of any of these birds. In 2002, the area had become a roosting locality for *Anser brachyrhynchus* (1,780 individuals in spring 2003 and around 2,000 individuals in autumn 2002 and 2003) with 0.7 % of European winter population (> 290,000 individuals). Therefore, the restored wetlands reached the qualifying interests for SPA designation by the end of the project. The official designation of the new SPA took almost two years and was finally successfully completed in August 2006.

Most of the expected environmental and nature conservation objectives were met, except for the expected result concerning nutrient retention, which was still only around 10% at project end. With regard to flooding, the project was elaborated so as not to increase the risk of this happening outside the area, which might have negative effects on the drainage of farmland. The monitoring results have indicated a water-level increase inside the area but no negative impact outside. A new shallow lake, Hestholm Lake, of around 5 km<sup>2</sup> was created. The project has created potential synergies with previous LIFE-Nature projects aimed at restoration of wetlands along the western coast of Jutland and the Palaearctic flyway, and has benefited some plant and animal species listed on Annex II of the Habitats Directive, such as water plantain (*Luronium natans*), otter and salmon.

#### **Socio-economic Benefits**

The site has attracted an increased number of visitors - by the end of the project it was estimated that 350,000-400,000 people had attended the site. With the system of 17.4 km of trails and 3 observation towers or hides, financed by the project, large parts of the project sites and its birdlife are accessible without any disturbing impact. Compensations to private landowners to allow for public access were paid by the project (approx. €20,000).

#### **Benefit: Cost Analysis**

An analysis by the Royal Danish Agricultural University in 2002 concluded that the projects along the Skjern River are beneficial at a discount rate of 5% or less on a 20 year time scale, and on an infinite time scale even at 7%, i.e. a good public investment. It was also stated that the overall cost of the project (which is substantial) will be more than compensated for by the local economic opportunities generated through this work. Even if the criteria used for the analysis have the subject of some debate, the study nevertheless deserves credit as a model for this kind of analysis. It clearly demonstrated that investments in nature conservation and restoration have a potential to be beneficial long-term also from the economic perspective, and that it may be too one-sided to consider just the cost of Natura 2000 without considering the financial benefits that may be incurred as well.

Table 25 summarises the quantifiable benefits from other projects in the database. These benefits include:

- Increases in areas of wildlife habitats (quantified increase recorded for 7 projects);
- Increases in populations of species (2 projects);
- Economic impacts, including job creation (7 projects), benefits to property and development (6 projects, including property occupancy, new development, property values, rents and local taxes), tourism expenditure and income (3 projects), and savings in energy costs (1 project);
- Recreational and health benefits (7 projects), including visitor numbers, visitor infrastructure and the value of health benefits;
- Provision of ecosystem services (2 projects), including water regulation, nutrient retention.

**Table 25: Examples of Benefits Quantified by Green Infrastructure Projects**

Project	Location	Benefits
Ekostaden Augustenborg (urban regeneration initiative)	Malmö, Sweden	Decrease in rainwater runoff rates (by half); improved image of the area; biodiversity has increased by 50% (green roofs have attracted birds and insects and open storm water system provides better environment for the local plants and wildlife); decreased environmental impact (20% less) ; unemployment fell from 30 to 6%; turnover of tenancies decreased by 50%
Crewe Business Park, Cheshire	Cheshire, UK	Job creation, High quality office environment through protection of natural features and community well-being. The business park has generated over £4.5 million in capital receipts and created over 2,800 jobs.
Cydcoed: Using trees and woodlands for community development in Wales	UK (Wales)	Health and wellbeing (e.g. exercise, recreational); social and human capital (e.g. education, community activities); Environmental (80 new woodlands, 240 new sustainable woodland management plans); Economic (local economy and employment)
National Forest Creation, West/East Midlands	UK	Economic benefits (e.g. 55.5 new forest-related jobs were created and 12 jobs safeguarded between 2003/4 and 2009/10. In total there have been 333.5 Forest-related jobs created / safeguarded since 1990/1). Environmental improvements. Human health and well-being
The Mersey Forest, Merseyside	UK	Total benefits estimated at £1.96 million per year, with a present value of £70.8 million over 50 years. Largest benefits are for landscape (Present Value - £34.2m for residents and visitors); recreation (£14.7m); and tourism (£9.2m); products from the land (£6.0m); air pollution regulation (£2.7m) and carbon sequestration (£1.4m).
Natural Economy North West (NENW)	UK	Human health/well-being, social, environmental, economic (e.g. direct gross value added (GVA) from the environment calculated at £2.6bn, supporting 109,000 jobs in environmental and related fields.)

Kennet and Avon canal restoration	UK	Safeguarded habitats, improved waste management, tourism, economic (direct and indirect employment totalling 150-210 FTE jobs between 1997 and 2002. The total number created and safeguarded 1198-1353 Full-time employment (FTE) jobs
Sunart Oakwoods Initiative	UK	Tourism and recreation; training and skills courses, community benefits, rural development, economic (higher value timber, creation of 8 FTE jobs, total of 9.6 direct, indirect and induced jobs), environmental (216 ha of ancient woodland safeguarded, additional 510 ha sustainably managed)
Dearne Valley Green Heart Project	UK	Environmental (creation of 300ha of wetlands, innovative approaches to managing floodland, new wildlife habitats), economic (creation of 11 new FTE in 2 years, from 6 in 2002), social (visitor numbers increased from 12,000 to 50,000 per annum)
Fishing Wales	UK	Habitat improvements, population increase (e.g. increase of >2,000 adult salmon and trout each year), return on marketing investment of 20:1, forecasts of £10 million of increased income, employment (min. 75 additional FTE jobs), tourism (additional £2.1 million per year)
Glasgow Green	UK	Stimulated the development of new residential properties (net impact 500-750 new residential properties), enhanced average house prices and the total value of property transactions (net £3 m–£4.5 m), a 47% increase in council tax yield (additional £0.8 m–£2 m). The value of the land increased from a nominal £100,000 per hectare to £300,000.
Mesnes Park	UK	Environmental, human health and well-being, economic (significant investment in new housing alongside the park), social (number of local people using the park increased from 15,000 to 180,000)
Queen square, Bristol	UK	Human health and well-being, economic (properties facing square command a 16% premium)
Mile End Park, London	UK	Social, economic (boosted local business, 7% uplift in value for residential properties), human health and well being
Green Roof Building Regulations	Basel, Switzerland	23% of Basel's flat roof area is now green (estimated in 2007 as 700,000m <sup>2</sup> ); protection of endangered invertebrate species; 4 giga watt-hours savings per year across Basel (1st incentive program) and 3.1/year (2nd program); profiting of local businesses from sales of materials and supplies relating to the installation of green roofs; energy savings for business owners; recognition of Basel worldwide for achievements
REMAB - Restoration of Meadow Bird Habitats	Denmark	<ul style="list-style-type: none"> <li>• Improvements in the hydrological conditions of the targeted habitats for the meadow birds were achieved at all four sites covering a total area of approximately 1 900 ha meadows;</li> <li>• Actions focusing on the clearance of trees and reeds resulted in restoration of habitats for the meadow birds – including 220 ha of wet grasslands and 18 ha of Atlantic salt meadows;</li> <li>• Actions to reduce eutrophication in order to improve water quality on 975 ha of the Habitats Directive-listed water bodies supporting vegetation of Chara spp, helping to improve breeding and feeding habitats for bird species, notably bittern (<i>Botaurus stellaris</i>) and Black tern (<i>Chlidonias niger</i>) at Vestlige Vejler project site;</li> <li>• Appropriate grazing regimes on 900 ha of bird habitats. Establishment of a grazing society at the Nyord site, and development of a management plan</li> </ul>

		<p>at the Vestlige Vejler site;</p> <ul style="list-style-type: none"> <li>• Artificial fox dens (25) were created and a fox- blocking gate erected at a bridge, to help to reduce the predation by foxes on meadow birds at two project sites (Nyord and Vestamager);</li> <li>• Visitor access to view the birds at close hand at the Vestamager site with construction of 5 km footpath and bird observation platform.</li> <li>• Swedish, German, Norwegian, Finnish, English and Greek nature managers (60) attended a seminar organised by the project to share experiences on improving conditions for birds, helping to raise awareness of the management of species across the EU.</li> </ul>
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Source: Database of Green Infrastructure Projects

### 5.3.3 Evidence from the case studies

#### Green infrastructure provision

All six of the in-depth case study projects recorded quantified benefits in terms of the provision of green infrastructure. These varied from a few hectares of habitat for some projects (such as Gallecs and Lyon) to the creation of 6,229 ha of new woodland in the UK National Forest. The effects on green infrastructure varied according to the scale of the project, the area covered, and the types of activity involved. For example, the Lyon project involved a significant level of capital works in a small area, while the National Forest and Tiengemeten projects involved more extensive habitat creation activities over large areas of land. The Gallecs project was more focused on mapping, designation and planning activities than on land management works.

**Table 26: Case study projects - Provision or maintenance of green infrastructure**

Project	Green Infrastructure Measure	Quantity
<b>Alpine Carpathian Corridor</b>	Area of land mapped, designated and maintained (ha)	10,000
	Length of cycle path maintained (km)	150
	No of green bridges developed	1
<b>Gallecs</b>	Area of wetlands restored (ha)	0.51
	Area of reforestation on former extraction areas (ha)	2.31
<b>Transformation of the banks of the Rhone</b>	Area of green space designated and maintained (ha)	2.1
	Number of trees planted	500
	Number of bushes planted	4,500
	Area of meadow sown (ha)	0.6
	Number of grasses, perennials and bulbs sown/planted	26,000
<b>National Forest</b>	Area of new woodland created (ha)	6,229
	% increase in woodland cover	207%
	Area of lowland dry acid grassland created (ha)	53.3
	Area of lowland heathland created (ha)	54.0
	Area of lowland wood pasture created (ha)	336.3
	Area of neutral grassland created (ha)	397.9
	Area of reedbed created (ha)	27.2

	Area of wet grassland and marsh restored (ha)	93.2
	Area of wet grassland and marsh created (ha)	119.1
	Area of wet woodland created (ha)	22.2
	Number of trees planted	7,800,000
	Length of new cycle ways created (km)	86.0
	Number of new sports and recreation facilities provided	45.0
<b>Tiengemeten</b>	Area of intertidal habitats re-created/restored/protected (ha)	660
	Area of sustainably managed agricultural land protected/maintained (ha)	40
	Km of waterways created	7
	Number of trees planted	1,200
	Km of pathways provided	18
<b>Väinameri</b>	Area of coastal pasture restored/maintained (ha)	2,907
	Area of wooded meadow restored/maintained (ha)	92
	Area of wooded pasture restored/maintained (ha)	32
	Area of coastal grasslands restored (ha)	3,000

The Tiengemeten project in particular recorded significant benefits in terms of species conservation. Favourable conditions provided for many species of birds, amphibians, fish, and mammals including species targeted under Appendix I (European kingfisher, short-eared owl, marsh harrier, corncrake, bluethroat, common shelduck, great bittern, great white heron, little egret, spoonbill, avocet, ruff, spotted crake, osprey, white-tailed sea eagle, peregrine falcon, and tundra swan) and Appendix II (tundra vole, beaver, pond bat, and sturgeon) of the Habitats Directive. The island contributes to the national ecological network and is important for international migrating species (particularly birds and fish).

### Ecosystem services

While all of the case study projects delivered some increase in ecosystem services, few data are available to quantify these benefits. The most detailed estimates are available for the UK National Forest, which is estimated to attract 8.7 million visitor days annually and to have sequestered 66,000 tonnes of carbon to date. Estimates of visitor numbers are also available for Gallecs and Tiengemeten (Table 27).

**Table 27: Changes in ecosystem services at case study sites**

Project	Service	Measure	Quantity
<b>Alpine Carpathian Corridor</b>	Recreation and ecotourism	Increase in number of recreational visitors	Unquantified
<b>Gallecs</b>	Recreation and ecotourism	Increase in number of recreational visitors	750,000
	Regulating services (water, air, climate)	Area of land protected from urbanisation, maintaining regulating services (ha)	750
<b>Transformation of the banks of the Rhone</b>	Recreation	Number of visitors to river bank	"Dozens of thousands on sunny days, and up to 1,000 people on the terraces of Guillotière at 4am on Thursday to Saturday nights"
<b>National Forest</b>	Climate regulation	Total carbon sequestered to date (tonnes C)	66,000
	Biodiversity, landscape and amenity values	Area of woodlands created (ha)	6,229
		Area of other habitats created or returned to management (ha)	1,750
		% of local population satisfied by landscape improvements	84%
	Fuel	Number of woodfuel installations provided	6
	Recreation	Number of visitor days per year	8,686,500
<b>Tiengemetten</b>	Natural hazard management	Ha of space to regulate coastal flooding	700
	Recreation	Number of visitors per year	40,000
	Cultural heritage	Museums provided	2
		Major historic buildings restored	5
		Number of breeding bird species on Netherlands Red List	20
<b>Väinameri</b>	Food provision	Sustainably produced beef and lamb	Unquantified
	Fibre provision	Sustainably produced wood, wool and reeds	Unquantified
	Genetic diversity	Protection of local and endemic species—birds, mammals, amphibians, reptiles, fish, plants	Unquantified
	Water purification/waste management	Eutrophication prevention in the Baltic Sea	Unquantified
	Ecotourism and recreation	Hiking, nature walks, bird watching	Unquantified
	Landscape and amenity values	Ecosystem, cultural identity, heritage values	Unquantified

The lack of any quantifiable evidence of the delivery of ecosystem services by most of the case study projects makes it difficult to analyse their benefits, to compare benefits between projects, or to assess benefits relative to costs. However, the available evidence does indicate the diversity of the six projects in terms of the scale, intensity and types of benefits delivered.

### Economic value of benefits

The only overall attempt to value the services delivered by the case study sites has been made at the UK National Forest (Box 8). A report by eftec (2010) estimated that the present value of the overall benefits of the National Forest would total £909 million (€1005 million) over the period 1990 to 2100. The study estimated the value of timber production (based on average timber prices and yields), carbon storage (using a shadow price for carbon) and recreational, landscape, biodiversity and regeneration benefits, using values transferred from other studies). Recreational benefits were estimated to account for more than 60% of the value of these benefits, and carbon sequestration a further 20%.

**Table 28: Value of benefits delivered by case study sites**

Site	Service	Measure	Value (€ million)
National Forest	Timber	Present value of timber production (1991-2100)	11
	Recreation	Present value of recreational use (based on £2.50 to £12.50 per visit)	628
	Carbon	Present value of carbon sequestered (based on £50/t of CO <sub>2</sub> )	209
	Landscape	Present value of landscape improvements (based on £40-400/ha)	57
	Biodiversity	Present value of biodiversity benefits (based on £30-300/ha)	56
	Regeneration	Present value of regeneration benefits (based on £0.05 per household per hectare)	44
	<b>Total</b>	<b>Total present value of benefits (1991-2100)</b>	<b>1,005</b>
Tiengemetten	Recreation	Annual ferry fares paid by visitors	0.06
	Amenity	Annual rents paid by residents and businesses	0.25

The only other estimates of the economic value of benefits are for Tiengemetten, where data are available for annual ferry fares paid by visitors and annual rents paid by residents and visitors. These do not provide a measure of the benefits of the project itself, and no economic evidence is available for the other benefits delivered by the project.

### Economic and social impacts

Four of the six projects recorded positive impacts on the local economy and community (Table 29). These socio-economic benefits include:

- Creation of temporary jobs in creation and restoration of green infrastructure
- Creation of permanent jobs in maintenance of green infrastructure
- Benefits for businesses, including contractors, tourism and leisure businesses, land and natural resource based enterprises and the creative industries
- Social benefits through education, skills, volunteering and community engagement.

**Table 29: Social and economic impacts of green infrastructure projects**

Project	Measure	Value
<b>Transformation of the banks of the Rhone</b>	Number of enterprises involved in project works	17
	Number of workers on site during project works	60-120
	Number of FTE jobs in bank maintenance	5.4
	Business benefits through increased use of area	Unquantified
<b>National Forest</b>	Number of forest-related jobs created/safeguarded	333
	Number of new forest related businesses created	5
	Number of people trained in forest related business activities	78
	Number of wood fuel feasibility studies completed	23
	Number of new tourism attractions opened	20
	Value of tourism to local economy (€m)	321
	Value of forest creation grants awarded (€m)	57
	Number of visitors to National Forest	8,686,500
	Number of people involved in forest related projects (1995-2010)	340,000
	Number of children involved in environmental education (1995-2010)	186,000
<b>Tiengemeten</b>	Number of permanent jobs created	15
	Number of volunteer positions created	90
	Number of temporary jobs created during project phase (per year, 3 years)	60
<b>Väinameri</b>	Increase in number of beef cattle	283
	Increase in number of sheep	400
	Number of jobs created (handicrafts and nature guides)	18

No quantified estimates of socio-economic benefits are available for the Alpine Carpathian Corridor and Gallecs projects, other than the increases in visitor numbers identified in Table 27 above.

Of the individual projects:

- The **UK National Forest** records the largest scale benefits. It is estimated that 333 forest related jobs have been created or safeguarded, and that the number of visitors has increased to 8.7 million. Active efforts have been made to encourage business creation and growth and to engage local communities and schoolchildren;
- The **Transformation of the banks of the Rhone project** records significant benefits for businesses and employment, particularly the temporary impacts of the capital works;
- The **Tiengemeten project** also created temporary employment in project works and has created new employment in tourism, leisure and education related to the natural environment and cultural heritage, offsetting reductions in agricultural activities;
- The **Väinameri project** has helped to create new jobs in nature tourism and the creative industries, and to encourage sustainable agricultural development.

## 5.4 Comparison of costs and benefits

For most green infrastructure projects, direct comparison of costs and benefits is not possible. While the costs of establishing and maintaining green infrastructure are known for most projects, the benefits are much more difficult to value. Benefits are often assessed in purely qualitative terms, or quantified only in terms of the extent of green infrastructure protected or maintained. There is much less quantitative evidence of the ecosystem services provided by green infrastructure, and of the value of these services. The lack of evidence of ecosystem service delivery makes it difficult even to speculate on the value of services that may have been delivered by most of the projects.

The only direct comparisons of the costs and benefits of green infrastructure provision we could find were made for the UK National Forest project (Box 8; one of the six case study projects), and two projects from the wider database - the Mersey Forest project (Box 8) and the Skjern River project (Box 6 above).

### Box 8: Costs and Benefits of the UK National Forest

Eftec (2010) was commissioned by the UK Department for Environment, Food and Rural Affairs (Defra) to assess the costs and benefits of the UK National Forest project. The analysis focused on the public benefits gained as a result of the public funds invested in this long term woodland creation project in central England over the period 1990 to 2100. This long time-scale was necessary to appraise fully the benefits of forest development, which involve decades for trees to mature and their full benefits to be realised. The present value (PV) of costs and benefits over this period was estimated using a discount rate of 3.5% (for costs and benefits up to 30 years into the future), 3.0% (years 31-75) and 2.5% (years 76-100).

The costs of the project include the annual grant in aid from Defra to the National Forest Company (NFC) and Forestry Commission grants. The costs over the 1990 to 2100 period were estimated to have a present value of £188 million (€210 million).

The following categories of benefits were assessed, using benefits transfer and market pricing methods:

- Regeneration – The benefits of the forest to the regeneration of the area were estimated at £0.05 per household per hectare of forest created, giving a PV of £39 million (€44m);
- Biodiversity, wildlife and non-use values – PV of £50 million (€56 million);
- Landscape – The contribution of woodland to landscape enhancement was valued using estimates transferred from other studies, of £400/ha in peri-urban and £40 per ha in rural areas, giving a PV of £51 million (€57 million);
- Recreation – The number of recreational visits to the area was modelled and valued at £12.50 per visit for “high access” visits (with facilities and interpretation) and £2.50 per visit for informal “low access” visits, giving a PV of £561 million (€628 million);
- Carbon sequestration – The study modelled rates of carbon sequestration and valued these at £50 per tonne of carbon, giving a PV of £187 million (€209 million); and
- Timber production – The value of timber production was estimated using forecast yields and market prices to have a PV of £10 million (€11 million).

Some other potential benefits (water supply, purification and regulation; air quality; cultural heritage benefits) could not be valued. The authors suggested that these could be significant but were likely to have lower value than those estimated.

The benefits were estimated to have a total present value of £909 million (€1017 million), exceeding

the costs by £721 million (€807 million), and giving an estimated benefit: cost ratio of 4.8 to 1. The benefits were also found to exceed the costs by a factor of 2.6 to 1 over the 1990 to 2010 time period; the benefit: cost ratio was therefore found to increase over time. These overall conclusions were not found to be sensitive to the individual assumptions employed.

### Box 9: Costs and Benefits of the Mersey Forest Project

The Mersey Forest Objective 1 project, funded through ERDF, involved investments of £7 million (€7.8 million) in more than 100 projects in the Merseyside area of North West England. This resulted in a total of 418 hectares of habitat being managed and/or improved.

The benefits of these investments were estimated by Regeneris (2009) to total €2.2 million per annum, after allowing for displacement of benefits from other areas. This gives a present value of benefits of €79 million over 50 years, suggesting an overall benefit:cost ratio of more than 10:1. Regeneris estimated that each £1 invested in the project gave overall benefits of £10.20, of which £2.30 represented an increase in gross value added, £0.70 comprised social cost savings, while non-market benefits (in terms of enhanced wellbeing) amounted to £7.20.

Landscape, recreation and tourism benefits accounted for the majority of the total, though provisioning services and regulation of air quality and climate were also important. The estimates were based largely on the transfer of values from other studies.

#### Summary of the Estimated Benefits of the Mersey Forest Project

Benefit	Annual Value (€m)	Present Value over 50 years (€ million)
Carbon sequestration	18	1,553
Biodiversity	43	1,538
Products from the land	83	6,673
Landscape – views from home	461	16,784
Landscape – views while travelling	590	21,475
Recreation	453	16,508
Tourism	283	10,293
Health and well being (cost savings and contribution to GVA)	37	1,338
Air pollution absorption	130	3,040
<b>Total benefits</b>	<b>2,196</b>	<b>79,217</b>

The results for the National Forest and Mersey Forest both suggest that amenity and recreational benefits account for a large proportion of the total; regulating and provisioning services are estimated to have relatively less value, but still to be important when compared to the costs of these projects. In both cases it was found that most regulating services could not be valued in money terms, but were identified as being important and delivered significant benefit.

Monetary estimates of the benefits of the Skjern River project in Denmark were also compared with the costs. It was estimated that the benefits exceed the costs over a 20 year evaluation period, if a discount rate of 5% or less is used, and over an infinite evaluation period if a discount rate of 7% is used. The largest costs of the project comprised capital costs of DKK 145 million (€19.5million). The largest benefit estimates were for outdoor recreation (DKK 4million (€0.5million) pa), angling (DKK 2.8-4.6million (€0.4-0.6million) pa), and the existence value of biodiversity (DKK 2.7million (€0.4million) pa), followed by reductions in nitrogen, phosphorus and ochre, and enhancements in land allocation.

Further estimates of the benefits of green infrastructure projects have been made using the green infrastructure valuation toolkit developed in North West England (Box 10). These examples demonstrate the benefits of green infrastructure in economic development, including its role in facilitating inward investment and job creation, and in enhancing urban property values and quality of life. The value of other ecosystem services in these examples is found to be more modest. The estimated ratio of benefits to costs ranges between 1.0 and 6.0 in these examples.

#### **Box 10: Costs and benefits of green infrastructure projects – Case studies from the Green Infrastructure Valuation Toolkit User Guide**

##### **Erith Marshes & Belvedere Links, Belvedere, London Thames Gateway**

This project involved capital expenditure of £10.5 million (€12million) in infrastructure improvements accompanying the development of a major (12.5 ha) employment site, including green infrastructure measures such as the restoration of adjacent marshland (156 ha). The capital costs included a major road scheme, and only £1.84 million (€2.1million) related to investments in landscape improvements.

The benefits generated by the improvements were estimated to have a total present value of £53.1 million - £55.8 million (€61-65million). Just over half of this (56%) was accounted for by the site's increased employment potential which was considered attributable to the green infrastructure. The other significant benefits included land and property uplift, improved labour productivity from fewer working days lost, enhanced health and well-being, recreation and flood alleviation. The case study demonstrates that green infrastructure improvements can complement and add value to development of built infrastructure, and in doing so can generate benefits greatly exceeding their costs.

##### **Knowledge quarter, Liverpool**

The project mapped existing green infrastructure around a major employment site in NW England, and identified opportunities for its extension. It proposed a net gain in green cover of 7.7ha, primarily in the form of street trees and green roofs, with some additional green spaces, at a total cost of £29.7 million (€34million). The principal benefits of these improvements would be to increase employment creation on the site and to reduce energy costs.

Use of the toolkit estimated that the green infrastructure benefits would have a present value of between £29.3 million and £45.6 million (€34-53million), with 70%–78% of this accounted for by increased employment and 10%-12% by reduced energy costs. The ratio of benefits to costs was therefore estimated at between 1.0 and 1.5 to one.

##### **Ropner Park, Stockton-on-Tees**

Ropner Park is a Victorian urban park, in an industrial town in North East England. It covers an area of 15.5ha. In 2006 Ropner Park underwent a £3.5 million (€4million) refurbishment, with substantial landscape restoration, construction of a pavilion, tennis courts, a play area and the installation of an

art feature.

Using the green infrastructure valuation toolkit, the benefits of the investment were estimated at £21 million (€24million). 90% of these benefits were accounted for by an increase in the value of adjacent properties. The other largest other benefits are related to tourism and recreation.

These findings are consistent with the results of assessments of the benefits of protected areas programmes. For example:

- Jacobs (2004) estimated that the benefits of the Natura 2000 network in Scotland outweigh the costs by a ratio of 7:1;<sup>64</sup>
- GHK (2011) found that the benefits of expenditures on Sites of Special Scientific Interest (SSSIs – nationally designated protected areas) in England and Wales exceed public expenditures on the policy by a ratio of 8:1;<sup>65</sup>
- Hernandez and Sainteny (2008) estimated that the benefits of Plaine de la Crau, a Natura 2000 site in France, exceeded the costs by a ratio of approximately 7:1.<sup>66</sup>

Overall, the evidence suggests that green infrastructure projects give rise to certain and readily estimated costs, as well as a wide variety of benefits, many of which are more uncertain in extent and difficult to value. A large proportion of costs relate to capital costs, which are incurred up-front, while benefits (through enhanced ecosystem service delivery) may be expected to accrue long into the future. This indicates the need to take account of the present value of future flows of costs and benefits in appraising green infrastructure projects.<sup>67</sup> Assessing costs and benefits over longer time horizons can be expected to enhance the measured viability of green infrastructure projects. Even partial assessments of the value of the benefits of green infrastructure indicate that they can significantly exceed the costs; improving our understanding of ecosystem services and their value would allow more comprehensive valuations and might expect the relative balance of benefits and costs to change further.

## 5.5 Discussion of grey vs. green infrastructure options

One of the benefits of green infrastructure is to provide services that might otherwise require investment in man-made, or “grey” infrastructure. Examples include the role of ecosystems in purifying air and water (reducing the need for investment in pollution control and treatment),

<sup>64</sup> Jacobs (2004). Environment Group Research Report: An Economic Assessment of the Costs and Benefits of Natura 2000 Sites in Scotland, 2004 Final Report, The Scottish Government. 75 pp URL: <http://www.scotland.gov.uk/Resource/Doc/47251/0014580.pdf>

<sup>65</sup> GHK (2011). Benefits of Sites of Special Scientific Interest. Final report for Defra

<sup>66</sup> Hernandez S. and Sainteny G. (2008). Evaluation économique et institutionnelle du programme Natura 2000: étude de cas sur la plaine de la Crau. Lettre de la direction des études économiques et de l'évaluation environnementale. Hors Série N°08 – Juillet 2008. URL: [http://www.natura2000.fr/IMG/pdf/CREDOC-D4E\\_4pages-natura2000\\_2008.pdf](http://www.natura2000.fr/IMG/pdf/CREDOC-D4E_4pages-natura2000_2008.pdf)

<sup>67</sup> This involves forecasting future flows of costs and benefits over time, and using an appropriate discount rate to assess the present value of these. By summing the costs and benefits expressed in present value terms, the net present value of the GI project can be assessed

in regulating water flows and coastal processes (reducing the need for investment in flood defences), in contributing to urban drainage, and in sequestering carbon (potentially reducing the need for investments in mitigation and adaptation). These services may be provided alongside other benefits to people and the natural environment, thus making green infrastructure attractive as a multi-purpose investment. Employing the ecosystem-based<sup>68</sup> approach to examine the range of services provided by green infrastructure helps its benefits to be understood and compared to those of grey infrastructure investments.

Using green infrastructure to take the place of grey infrastructure did not, in general, feature as a primary objective of the six in-depth case studies investigated in this project. Most of the projects were motivated primarily by nature conservation or broader environmental objectives, rather than the need to deliver specific services.

For four of the projects, green infrastructure was not seen as a substitute for grey infrastructure but played a distinctive role in providing essential services that have been lost as a result of built development. The Alpine Carpathian Corridor project was set up to mitigate the negative effects of grey infrastructure on wildlife, by providing green bridges, corridors and other features to connect otherwise fragmented habitats. The Gallecs project sought to protect undeveloped land in a rapidly urbanizing region, to maintain the benefits that it provides to people and wildlife. The English National Forest is using woodland creation to regenerate a former mining area that has faced environmental, social and economic decline. Some of the benefits of the project might have been achieved through investments in the built environment, though green infrastructure has played a central and distinctive role in the regeneration of the area. Similarly, urban planning in “Transformation of the banks of the Rhone” does not see green and grey infrastructure as substitutes, but seeks a balance between the two - green elements are an integral part of urban planning, delivering important amenity and leisure benefits as well as contributing to ecosystem services.

The Tiengemeten and Väinameri projects were designed primarily as nature restoration projects, rather than to provide specific ecosystem services. The Tiengemeten project involved the restoration of intertidal areas through the removal of grey infrastructure (dykes and sluices) that had been built to reclaim coastal areas for agriculture. This has reduced the ongoing costs of maintaining flood defences, though reducing the cost of maintaining grey infrastructure does not appear to have been a primary objective.

Of the 127 projects in the database, only a few sought to use green infrastructure as a substitute for investments in grey infrastructure. Most projects aimed primarily to meet nature conservation objectives and/or to create and maintain green space for recreational, amenity and landscape purposes, with the delivery of regulating services often a secondary aim. Projects where green infrastructure has played a potential role in reducing the need for grey infrastructure investments include:

- The Netherlands “Live with Water” project, which aims to raise awareness of the implications of climate change for flooding and water management, and the role of

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<sup>68</sup> The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. (CBD COP5, Decision V/6 (see <http://www.cbd.int/ecosystem/>). The ecosystem approach aspires to maintain the natural structure and functioning of ecosystems and recognizes that humans and their action are an integral component of ecosystems.

green infrastructure in providing natural solutions, reducing the need for engineered flood defences;

- The Ekostaden Augustenborg initiative in Malmö, Sweden, which has used sustainable urban drainage systems, including ditches, retention ponds, green roofs and green spaces, to combat problems of flooding caused by inadequate drainage infrastructure;
- The “Multi-functional climate buffers and ecological hubs in the Netherlands” project, which has restored meadows and other habitats to develop multi-functional natural climate buffers to increase the space available for flood storage; and
- The Farming Floodplains for the Future project in Staffordshire, UK, which has aimed to understand and demonstrate at 8 sites how the farmed landscape can be viably managed in ways that reduce flood risk downstream, whilst enhancing the natural environment. The project demonstrated how simple, natural, low-tech solutions can deliver sustainable, cost-effective flood management solutions that require minimal maintenance and fit comfortably alongside existing farm enterprises.

There are also examples where investments in grey infrastructure have been required to protect semi-natural habitats. For example, the LIFE funded project “Tackling Climate Change-Related Threats to an Important Coastal SPA in Eastern England” has funded the strengthening of two sea walls to protect important freshwater habitats threatened by sea level rise at Titchwell, Norfolk, UK. A third sea wall is being breached to create intertidal habitats through managed realignment.

Some examples in the wider literature demonstrate the ability of green infrastructure investments to deliver cost savings compared to expenditures on grey infrastructure. For example:

- **Flood management** – Management of surface runoff from the city of Nummela, Finland, through wetland restoration has been shown to be more sustainable and cost effective than manmade solutions, as well as providing recreational and wildlife benefits. Restoration costs for 1 ha of wetland totaled €62 000, providing cost savings compared to manmade infrastructure costs of €50 000 per 100 metres<sup>69</sup>.
- **Coastal flood defence** – The Alkborough Flats managed realignment scheme on the Humber Estuary, England, has delivered benefits for coastal flood protection and reduced and deferred expenditures on man-made coastal defences. The scheme is estimated to deliver an annual flood protection benefit of £400,667(€465,000), giving total benefits with a present value of £12.2 million (€14million), as well as other benefits for wildlife and ecosystem services. The scheme cost £10.2 million (€11.8million) and involved the restoration of tidal habitats on 440 ha of agricultural land<sup>70</sup>.

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<sup>69</sup> Kettunen (2011) Water, ecosystem services and nature: putting the ‘green’ into green economy. Presentation to World Water Week, Stockholm. [http://www.worldwaterweek.org/documents/WWW\\_PDF/2011/Tuesday/T5/Water-and-Growth-Examining-the-Links/Water-ecosystem-services-and-nature.pdf](http://www.worldwaterweek.org/documents/WWW_PDF/2011/Tuesday/T5/Water-and-Green-Frowth-Examining-the-Links/Water-ecosystem-services-and-nature.pdf)

<sup>70</sup> Environment Agency (2009) Ecosystem Services Case Studies. <http://publications.environment-agency.gov.uk/PDF/SCHO0409BPVM-E-E.pdf>

- **Water purification** - Vittel natural mineral water (France) depends on high quality water from Vosges Mountains, and no pre-treatment is allowed by law. The costs of managing upstream ecosystems to guarantee clean water are lower than the costs of moving the sourcing of water elsewhere. Farmers are therefore paid to adopt low-impact farming practices<sup>71</sup>.

It appears that such examples of green infrastructure yielding cost savings compared to grey infrastructure investments are relatively scarce in the EU. However, green infrastructure projects have the advantage of delivering multiple benefits compared to grey infrastructure investments, which often meet a single objective such as flood control or water treatment. Taking account of the wider benefits to people and wildlife often enhances the balance between estimated benefits and costs of green infrastructure investments.

## 5.6 Issues regarding measurement and monitoring

The analysis above suggests that:

- The financial costs of green infrastructure projects are generally well understood and monitored, especially as most projects involve public expenditure, and are often financed through external funding bids, including from EU programmes such as LIFE and the Structural Funds as well as national schemes;
- While the opportunity costs of many green infrastructure projects are likely to be significant, they are much less well understood and documented than the financial costs of green infrastructure provision;
- The benefits of green infrastructure can be measured using different types of indicators:
  - In general, the best data are available for the provision of green infrastructure itself (the extent of habitats, features and green spaces created, protected, restored and maintained).
  - Quantitative data on the delivery of ecosystem services is limited or completely lacking for most projects, though some services (such as recreation, carbon sequestration and provisioning services) are more easily quantified than others (e.g. most regulating services).
  - Evidence from a few studies demonstrates that it is possible to value the services delivered by green infrastructure in monetary terms, but that this has been attempted for only a small number of green infrastructure projects. Monetary valuation usually relies on benefits transfer, and often the difficulty of measuring ecosystem service delivery is as much a barrier to valuation as the availability of usable value estimates.
  - The economic and social impacts of green infrastructure projects are often easier to estimate than the value of ecosystem services delivered, and estimates are available for a number of projects.

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<sup>71</sup> Kettunen (2011) op cit.

Further work to investigate and monitor the opportunity costs of green infrastructure projects, their effects on the delivery of ecosystem services, and the value of these services, would be beneficial in enhancing our understanding of the costs and benefits of green infrastructure investments.

Since most assessments of the benefits of green infrastructure rely on the transfer of benefits from other studies, standardised assessment tools have the potential to improve our understanding of the potential benefits of individual projects. An example is the prototype Green Infrastructure Valuation Toolkit calculator developed in North West England (Box 11), which has now been applied to a variety of projects in England (Box 10).

### Box 11: Green Infrastructure Valuation Toolkit, North West England

A multi-partner project in North West England has developed a valuation framework for assessing the potential economic and wider returns from investment in green infrastructure and environmental improvements. A Green Infrastructure Valuation Toolkit has been made available as a prototype and free open source resource available over the web. The Toolkit has two components:

- A **User Guide** provides details of what the Toolkit is for and a step by step guide on how to use it. The User Guide sets out the evidence base and rationale supporting each of the assessment tools, and provides case studies giving practical examples of how the Toolkit can be applied and the results presented. The Guide also discusses the strengths and weaknesses of the Toolkit and highlights areas where further research or development work is needed.
- The **Calculator** consists of a set of individual spreadsheet-based tools to assess the value of green assets or projects across a wide range of potential areas of benefit – such as climate change, health, or property values. Wherever possible results are given in monetary terms.

The Toolkit aims to inform the assessment of a wide range of benefits from green infrastructure, in order to facilitate the appraisal of green infrastructure investments. Users are required to input data regarding green infrastructure projects (e.g. area, land cover, conservation activities, number of local residents and users). Using standard ratios and transferable values, the calculator estimates a variety of benefits of the green infrastructure project, to climate, water, property, health, investment, labour productivity, tourism, recreation, biodiversity and land management. These benefits are valued in money terms and compared to the costs of the project.

It is acknowledged that the Toolkit is by no means perfect, facing limitations with regard to data gaps and the applicability of standardized benefit estimates to different local contexts. Nevertheless the consortium believes that the products that have emerged from the project represent an important contribution to broader efforts to develop improved techniques for environmental valuation and are an important step forward. The project is being made available as a prototype toolkit so that the progress made so far can be more broadly understood and the lessons learned can contribute to further improvements to the evidence base allowing more and better tools to be developed within a more rigorous framework.

Source: [www.bit.ly/givaluationtoolkit](http://www.bit.ly/givaluationtoolkit)

It is recognised, however, that the benefits of green infrastructure are often location specific and sensitive to differences in local context. The North West England toolkit aims to be flexible to the local context by requiring inputting of locally specific data, and allowing assumptions and values to be varied according to local circumstances. However, while ecosystem services (such as climate regulation and recreation) are amenable to standardised measurement, others such as water purification and regulation are highly

locationally specific. Standardised toolkits, while they may help to inform indicative estimates of potential benefits, should not be seen as a substitute for local analysis of the benefits of particular projects.

## 5.7 Concluding remarks

The creation, restoration and maintenance of green infrastructure often require substantial investments. This research has provided much evidence of the financial costs of green infrastructure projects. However, difficulties in quantifying and valuing the benefits of these projects make it difficult to compare them with the respective costs, except for a small number of projects. Where attempts have been made to value the multiple benefits of green infrastructure projects, they have demonstrated that these can significantly exceed the costs involved.

Some of the key findings of the analysis above are that:

- The capital costs of identifying, mapping, planning, creating and restoring green infrastructure represent a large proportion of total costs of green infrastructure initiatives. The costs of ongoing maintenance are also important, but may not be captured in the budgets of the initiatives themselves.
- The opportunity costs of maintaining green infrastructure may also be significant, particularly for green areas in urban fringe locations. However, they are rarely documented or quantified.
- The costs per hectare of creating or restoring green infrastructure vary very widely between projects. They tend to be highest in urban areas and lowest in remote rural locations, such as upland heaths and bogs.
- Green infrastructure projects give rise to a wide range of benefits for people and biodiversity. The benefits of most green infrastructure projects can be described qualitatively, but in relatively few cases are ecosystem services quantified or valued. The most easily frequently benefit of green infrastructure initiatives is the provision of the green infrastructure itself.
- Relatively few attempts have been made to value the benefits of green infrastructure projects in a comprehensive way. Where evidence is available, it suggests that the value of benefits is often several times higher than the costs.
- Cost benefit analyses need to recognise that green infrastructure projects often incur substantial one-off costs but deliver a flow of benefits over a long time period – the present value of costs and benefits over time needs to be estimated so that comparisons can be made.
- Green infrastructure may serve as a substitute for grey infrastructure in certain instances. However, it often plays a distinctive role in providing essential services lost as a result of built development, and can be an essential complement to grey infrastructure in built up areas.
- Further work to quantify the services and value the benefits of green infrastructure would be desirable, especially as the costs tend to be easily quantifiable and the benefits less well understood.

- Standardised valuation tools, such as the Green Infrastructure Valuation Toolkit developed in North West England, offer the potential to improve our understanding of the benefits of green infrastructure and their value in a cost effective way. However, further validation of such tools would be beneficial, while the location specific nature of many of the benefits and values of green infrastructure also needs to be emphasised.

## 6 Outlook/wider implications for EU and national and regional policy action

This section aims to inform developments on the upcoming EU Green Infrastructure Strategy and provide recommendations for EU Member States and policy makers working at local and regional level. Some general aspects which are relevant for all spatial levels encompass:

- **Exploring and using opportunities for cross-sectoral integration** of green infrastructure in EU/national and regional policies
- **Increasing awareness of** green infrastructure, promoting capacity building, and facilitating stakeholder involvement and consultation in policy processes - where appropriate; and creating platforms for exchanges of knowledge and best practices across EU, national, regional/local level initiatives
- **Highlighting the benefits received by various sectors and stakeholders** – create an enabling environment to encourage public and private investments in green infrastructure, discussing for example cost effectiveness of green vs. grey infrastructure

Further recommendations for the EU as well as national and local/regional policy making levels and actors are presented in more detail in the following sections. While recommendations for practitioners are not discussed in this chapter, they can be found in section 4.3.2, and particularly in Table 12.

### 6.1 Recommendations for EU policy actions

This report has explored the effects of existing EU legislation and financing opportunities on implementation of green infrastructure projects across Europe. Barriers and limitations (as well as possible solutions to address these issues) have been highlighted throughout, and a number of recommendations can be made regarding future EU policy action to address these. The following section thus addresses current needs and future opportunities within EU policy, drawing on the expert workshop discussions, external literature and case studies.

Several general recommendations for future green infrastructure action, as introduced above, are applicable to all spatial scales and are therefore not repeated within this section. Instead, a strong focus is placed on the potential of an EU green infrastructure framework, including the need for an appropriate concept of green infrastructure, participation of stakeholders and good governance, standards to assess green infrastructure projects, policy coherence and sufficient and targeted financing.

#### Create an EU legislative framework

One of the most important roles foreseen for the EU is the delineation of a common vision and strategic goals for the future direction of green infrastructure, through an EU strategy in addition to the development/adaptation of relevant regulative instruments. Ideally, the development of an appropriate concept for green infrastructure (including a definition, typology of initiatives, objectives and targets, outlined opportunities and benefits) will

encourage efficient project designs which adopt an integrated land use approach, encourage and facilitate the uptake of ecosystem-based approach<sup>72</sup> and help to integrate the concept into spatial planning processes. Clear targets for protecting, maintaining and creating green infrastructure (measurable in quantitative and qualitative terms) should also be included.

As recommended by workshop participants, the EU strategy on green infrastructure should refer to the “no net loss’ approach, adopted in the EU biodiversity strategy to 2020. In order to achieve the objective of “no net loss of biodiversity and ecosystem services by 2020” this approach should also include no net loss of green infrastructure. This could provide the Member States (MS) with a framework for implementing a system by which any ecosystem service or biodiversity lost through a development should be compensated by the developer. Existing planning policies including the Strategic Environment Assessment, the Environmental Impact Assessment and the Environmental Liability Directive can play an important role in integrating and boosting green infrastructure projects throughout the EU. These policies, which have to be transposed into national legislation, address all environmental media, such as water, biodiversity, soil, climate, air and landscape and thereby also allow green infrastructure to be addressed in a holistic matter. A clear focus should be on the maintenance and protection of green infrastructure as restoration and compensation measures often result in higher costs.

Furthermore, a workable definition of green infrastructure should be established which allows for flexibility in its application while also ensuring a sufficient level of understanding for guiding related activities across the MS. As introduced earlier in this study, the following definition has been developed in this project (see also 3.1) and is recommended for wider use:

**Green infrastructure** is the network of natural and semi-natural areas, features and green spaces in rural and urban, and terrestrial, freshwater, coastal and marine areas, which together enhance ecosystem health and resilience, contribute to biodiversity conservation and benefit human populations through the maintenance and enhancement of ecosystem services. Green infrastructure can be strengthened through strategic and co-ordinated initiatives that focus on maintaining, restoring, improving and connecting existing areas and features as well as creating new areas and features.

In establishing the green infrastructure legislative framework (strategy and assigned planning policies), the EU can also play a significant role in communicating its understanding of green infrastructure alongside the potential benefits. Here, the typology utilised throughout this study could be a useful tool to better describe and categorise green infrastructure projects and initiatives. Concurrently, the EU should highlight best practice examples being implemented across the MS and provide tools for standardising, including cost-benefit assessments. Here, the green infrastructure Valuation Toolkit<sup>73</sup> which has been developed

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<sup>72</sup> The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. (CBD COP5, Decision V/6) The ecosystem approach aspires to maintain the natural structure and functioning of ecosystems and recognizes that humans and their action are an integral component of ecosystems.

<sup>73</sup><http://www.greeninfrastructurenw.co.uk/html/index.php?page=projects&GreenInfrastructureValuationToolkit=true>

and is currently being applied throughout the UK could serve as a foundation to build upon. Similarly, appropriate indicators to facilitate monitoring and evaluation should be further developed, with support from the EU.

Targeted campaigns directed at specific stakeholders and sectors are also recommended for increased awareness and uptake throughout the MS. In such efforts, the element of resilience can also be emphasised in order to help regions adapt to climate change, thereby also increasing the relevance of green infrastructure to urban areas. If the definition of green infrastructure were to be linked with ecosystem services such as flood protection and clearly identify potential beneficiaries, the concept could increase its relevance for policy-making and politicians. A special focus should be on providing capacity building and guidance for experts and stakeholders involved in planning and implementation of green infrastructure projects (such as planning authorities, farmers, tourism operators, companies, nature managers). As regards landscape planners, capacity building measures should be designed to strengthen the current administrative and enforcement capacities and improvement and dissemination of knowledge about specific types of conservation work relevant for green infrastructure projects throughout the EU. Moreover, capacity building amongst all stakeholders involved in the planning and implementation of green infrastructure projects is necessary to enhance awareness of the need for a green infrastructure approach and related measures and thus contribute to ensuring long-term implementation.

### Improve coherence of existing EU policies and maximise potential to support green infrastructure

Although holistic green infrastructure strategies can only be found to a limited extent in EU Member States, a wide range of policy initiatives currently exists, relying on a variety of tools, instruments and measures to support elements of Europe's green infrastructure at various scales of governance. While some are designed to deliver one particular objective, others contribute to meeting multiple objectives. The green infrastructure concept offers an opportunity to integrate them and maximise their potential to optimise the delivery of ecosystem services at EU level.

Macro-regional development concepts which have been developed in recent years, such as the EU Strategy for the Danube Region (DG Regio),<sup>74</sup> present good attempts at establishing coherent policy approaches. These concepts may have a strong impact on future funding instruments and result in better harmonization between different policies.

Building upon current legislative items, there is a general need for increased policy coherence at an EU level across all relevant policy sectors to address future green infrastructure ambitions and thereby to support the expansion of the Natura 2000 Network and facilitate the implementation of the EU Biodiversity Strategy to 2020. Throughout this study and with contributions from the expert working group and case study interviewees, recommendations regarding the potential of EU policies to support the development of green infrastructure, findings from the IEEP-project "Green Infrastructure implementation and efficiency" and work in a complementary fashion have been generated. These recommendations as well as areas in which potential exists for increasing the support of green infrastructure in the future are summarised below in Table 30. In agriculture policy, for

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<sup>74</sup> [http://ec.europa.eu/regional\\_policy/cooperate/danube/index\\_en.cfm](http://ec.europa.eu/regional_policy/cooperate/danube/index_en.cfm)

example, the EU should set clear objectives which are in support of green infrastructure measures while leaving MS to still decide on how and to what extent they implement these.

**Table 30: Cross-sectoral integration – The potential of EU policies<sup>75</sup>**

Policy area	Relevant EU policies & Instruments	Potential and recommendations for supporting green infrastructure
Agriculture and rural development	<ul style="list-style-type: none"> <li>• Common Agricultural Policy (CAP) Pillar 2 - EAFRD Funding</li> <li>• CAP Pillar 1 - European Agricultural Guidance and Guarantee Fund (EAGGF)</li> <li>• Legal proposals for the CAP after 2013</li> </ul>	<ul style="list-style-type: none"> <li>• Guidance on use of rural development plans to promote more co-ordinated GI strategies</li> <li>• Establish appropriate conditionalities</li> <li>• Focus efforts on making changes in the negotiation period (reform of CAP after 2013)</li> <li>• Strengthen support for green infrastructure measures (e.g. restoring important forest areas within ecological corridors to act as stepping stones) through RDP and proposed “green payments” in the first pillar</li> <li>• Eliminate perverse incentives of the EAGGF (decoupled payments oriented towards historic production levels)<sup>76</sup> leading to intensification of agriculture and loss of green infrastructure landscape elements</li> <li>• Use farm advisory services and training/information to inform farmers on GI relevant measures (e.g. linked to agri-environment schemes)</li> </ul>
Forestry	<ul style="list-style-type: none"> <li>• EU Forest Strategy and the Forestry Action Plan</li> <li>• Green Paper on Forest Protection and Information</li> </ul>	<ul style="list-style-type: none"> <li>• Promote green infrastructure in forest-environment schemes, emphasizing the role of forests in adapting to and mitigating climate change and other ecosystem services (e.g. water purification and supply)</li> <li>• More strongly encourage sustainable forest management, habitat restoration and reduction of forest fragmentation and emphasize the role of GI and its linkages to these activities (including the provision of public financing and enhancing private sector support)</li> </ul>
Biodiversity & Nature	<ul style="list-style-type: none"> <li>• Birds Directive (BD)</li> <li>• Habitats Directive (HD)</li> <li>• LIFE+ Regulation</li> <li>• EU Biodiversity Strategy (BS)</li> </ul>	<ul style="list-style-type: none"> <li>• Update directives (e.g. revise species lists to prioritize species needing more attention and remove those with improved statuses)</li> <li>• HD – revise guidance for articles 6 and 10 where needed to support green infrastructure approach (in particular in land use planning)</li> <li>• HD – extend article 12 to encourage MS to support (GI) measures to increase resilience to climate change in addition to coherency</li> <li>• LIFE+ – ensure funding for best-practice examples for GI (also targeting multiple benefits)</li> <li>• BS – Amend strategy (as for example by the EU green infrastructure strategy) to give clear strategic signals in support of green infrastructure approach</li> </ul>

<sup>75</sup> A comprehensive policy review was undertaken by the project “Green Infrastructure implementation and efficiency (led by IEEP). In total 36 SWOT analyses of green infrastructure relevant policy documents have been carried out.

<sup>76</sup> Usubiaga, Arkaitz et al. (2011): EU Subsidies for polluting and unsustainable practices. Wuppertal Institute for Climate, Environment and Energy, Ecologic Institute, Brussels, commissioned (see page 22).

		and associated objectives (and set qualitative and quantitative targets for GI; strengthen support for GI in all upcoming biodiversity strategies
Water Policy	<ul style="list-style-type: none"> <li>• Water Framework Directive (WFD)</li> <li>• Floods Directive</li> <li>• EU Action and communication on Water Scarcity and Drought</li> <li>• Blueprint to safeguard Europe's Waters (BSEW)</li> </ul>	<ul style="list-style-type: none"> <li>• WFD offers room for using green infrastructure to implement the Directive and achieve its objectives addressing water quality and supply, e.g. actions on water purification and regulation such as improvement of riparian vegetation, wetland restoration and floodplain restoration</li> <li>• WFD – integration of green infrastructure considerations in River Basin Management Plans and Programmes of Measures</li> <li>• Include GI as potential instrument to address floods and droughts (e.g. by restoring floodplains or wetlands)</li> <li>• BSEW: Integrate maintenance and development of GI as one relevant principle and enhance GI relevant land management measures (e.g. floodplain restoration and sustainable urban drainage systems)</li> </ul>
Climate Change Policy	<ul style="list-style-type: none"> <li>• White paper: Adapting to Climate Change (WP)</li> <li>• Low Carbon Economy Roadmap 2050</li> <li>• Planned EU Adaptation Strategy (prepared in 2012) (AS)</li> </ul>	<ul style="list-style-type: none"> <li>• Increase connection to biodiversity policy, recognizing the role of climate change in driving biodiversity loss (e.g. wetland loss)</li> <li>• Increase considerations of features for climate change adaptation/mitigation for e.g. flood prevention, water storage, CO<sub>2</sub> intake</li> <li>• Promote targeted actions such as: carbon retention through bog and mire restoration; flood management via the removal of barriers to river management; coastal protection by maintaining salt marshes and restoring dune systems)</li> <li>• AS: Highlight benefits of GI and promote coordinated and integrated approach at EU level (to strengthen the implementation of adaptation measures at regional/national level)</li> </ul>
Green Growth: Territorial Cohesion and innovative financing (Agenda 2020, Resource efficiency, Jobs)	<ul style="list-style-type: none"> <li>• Cohesion Policy (CP)</li> <li>• Innovative financing</li> <li>• Regional Strategies (RS)</li> <li>• Europe 2020 Strategy</li> <li>• Resource Efficiency Flagship under EU 2020 and its Roadmap</li> </ul>	<ul style="list-style-type: none"> <li>• CP - support implementation of Adaptation Strategy due in 2013, especially regarding disaster risk reduction and reduction of vulnerability through 'softer' measures which would achieve cost-effective impact reductions</li> <li>• Prioritise measures (financed by structural and cohesion funds) to create GI to ensure the delivery of ecosystem services and to avoid further landscape fragmentation; ensure appropriate safeguards and require offsets to achieve no net loss through cohesion funded projects</li> <li>• CP – Highlight GI benefits such as regional economic growth, employment and social benefits</li> <li>• RS - refer to current regional green infrastructure initiatives and identify existing underperforming natural assets and degraded ecosystems which could be made more productive/resilient through transboundary green infrastructure projects</li> </ul>
Transport & Energy	<ul style="list-style-type: none"> <li>• Trans-European Transport Network (TEN-T)</li> <li>• Regulation on establishing the connecting Europe facility (proposal)</li> </ul>	<ul style="list-style-type: none"> <li>• Establish appropriate conditionalities</li> <li>• The need to minimise impacts on green infrastructure and seize opportunities to strategically develop GI alongside grey infrastructure should be explicitly mentioned</li> </ul>

	<ul style="list-style-type: none"> <li>• EU White paper on transport Impact Assessment</li> <li>• Trans-European Energy Network (TEN-E)</li> <li>• Renewable Energy Roadmap 2050 (RE) and Energy Efficiency Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Provide drivers to ensure there is a strong spatial planning element in the development of renewable energy policy, instead of on a project-by-project basis (especially for marine areas)</li> <li>• TEN-T/TEN-E/RE: Explicit consideration of potential impacts on GI through building new energy and transport infrastructure and renewable energy projects in planning process (and within SEA/EIA)</li> <li>• Include GI in the design of new energy/transport projects (e.g. green road verges, providing wildlife corridors)</li> <li>• TEN-T: Re-evaluate the TEN-T policy to ameliorate its potentially negative impact on GI</li> </ul>
Impact Assessment, Damage prevention and remediation	<ul style="list-style-type: none"> <li>• EIA Directive</li> <li>• SEA Directive</li> <li>• Environmental Liability Directive (ELD)</li> </ul>	<ul style="list-style-type: none"> <li>• ELD – widen scope for off-setting</li> <li>• Strengthen EU support for the integration of biodiversity/GI concerns into regional and urban development</li> <li>• EIA/SEA – Include GI as an environmental media to be considered and prioritise the maintenance of GI (also taking into account the costs for restoration/compensation of destroyed GI); special focus should be on Article 6 (3),(4) of the Habitats Directive when carrying out an EIA</li> <li>• EIA/SEA: Use opportunities to preserve existing and create new GI (e.g. through off-setting and compensation measures)</li> </ul>
Spatial Planning	<ul style="list-style-type: none"> <li>• European Spatial Development Perspective (ESDP)</li> <li>• ESPON 2013 Programme</li> <li>• Territorial Agenda of the EU 2020 (TA)</li> <li>• EC 2006 Thematic Strategy on the Urban Environment (TS)</li> </ul>	<ul style="list-style-type: none"> <li>• Strengthen EU support for the integration of biodiversity/GI concerns into regional and urban development; integrate GI as strategic priority</li> <li>• TS - Revise the strategy to acknowledge the benefits of GI and its key role in sustainable urban development</li> </ul>
Marine and Coastal zones Policy	<ul style="list-style-type: none"> <li>• Marine Strategy Framework Directive (MSFD)</li> <li>• EU Maritime Spatial Planning Communication (MSP)</li> <li>• 2002 Recommendation on Integrated Coastal Zone Management (ICZM)</li> <li>• New proposals to follow-up to the EU ICZM Recommendation, in conjunction with Maritime Spatial Planning (end of 2011)</li> <li>• Common Fishery Policy (CFP), European Fishery Fund (EFF)</li> </ul>	<ul style="list-style-type: none"> <li>• MSFD - Use reporting by 2014 to highlight the role of GI in marine areas and identify gaps (in information, further advice and guidance, etc.)</li> <li>• EFF – Check priority axis 4, sustainable development of fisheries areas and coastal communities, for potential GI synergies and financing possibilities; encourage projects supporting habitat restoration (Natura 2000 sites); use upcoming reform to integrate GI</li> </ul>
Environment & Health	<ul style="list-style-type: none"> <li>• Environment and Health Action Plan 2004-2010</li> </ul>	<ul style="list-style-type: none"> <li>• Incorporate green spaces into urban planning to combine opportunities for protecting biodiversity, reducing air pollution and addressing climate change with health benefits to the population<sup>77</sup></li> </ul>

<sup>77</sup> Science for Environment Policy - Future Briefs (2011): Biodiversity and Health. <http://ec.europa.eu/environment/integration/research/newsalert/pdf/FB2.pdf>

		<ul style="list-style-type: none"> <li>Promote further research to characterize the nature of the links that tie human well-being and health to GI within the urban environment</li> </ul>
Research and Innovation	<ul style="list-style-type: none"> <li>Thematic programmes under the 7<sup>th</sup> Framework Programme for Research (FP7)</li> <li>Follow-up through the Horizon 2020 for the period 2014-2020 (FP8)</li> </ul>	<ul style="list-style-type: none"> <li>FP 7/8- Provide funding for research projects analyzing the benefits resulting from GI and ecosystem-based approaches in detail and its role in coping with different environmental and economic challenges to provide a sound evidence base for future policy making; conduct further research on the cost-effectiveness of GI (projects) and the development of practical guidelines to assess costs and benefits at a project and wider spatial level</li> </ul>

Sources: IEEP et al. (2011): *Green Infrastructure implementation and efficiency – Report on the four different options for a future green infrastructure strategy (Task 5)*; DG Environment on Contract ENV.B.2/SER/2010/0059, Institute for European Environmental Policy, London.; results from the expert workshop, case studies and wider literature review.

More generally, there is also the need to enhance further land use concepts, allowing for trade-offs and to try and minimise conflicts with a comprehensive spatial planning concept. Additionally, future EU communication and financing regarding green infrastructure should incentivise the prioritisation of green infrastructure projects over grey infrastructure projects when the cost-benefit ratio are the same; here, the most important trade-offs in such a decision should be clearly identified.

### Maximise efficiency of EU financing

Given the limitations of existing EU funds (including regional funds, agricultural funds, LIFE+, etc), it is clear that additional sources will likely be necessary to address the needs of all GI related work. Nevertheless, available funds potentially have a determining role to play and should accordingly be better targeted in terms of objectives, beneficiaries and benefits in order to maximise their support of green infrastructure. It would thus be beneficial for the EU to begin by taking two overarching actions:

1. Identify the financial needs for green infrastructure at EU-level to negotiate for funding (e.g. as was done for Natura 2000); and
2. Outline which benefits will be delivered by green infrastructure to target the beneficiaries better, help to explore new funding opportunities and increase payments/investments by beneficiaries.

Alongside these considerations, a criteria system for **biodiversity proofing of EU spending/funds** is recommended to ensure coherency with both green infrastructure and biodiversity objectives (as with 'climate proofing'). This mechanism would aim to minimise funding streams that harm biodiversity and remove perverse funding which hampers the development of green infrastructure. Ultimately, a proofing system could also increase the support of article 6 of the Habitats Directive to 'avoid damaging activities' and conduct 'appropriate assessments' while contributing to the policy coherency discussed previously, integrating e.g. the need for ecological connectivity in spending decisions.

The main sources of EU funding currently utilised by the explored green infrastructure projects, as discussed in section 4.2.4, are LIFE+ and the ERDF. Generally, these resources are combined with national or local/regional finances and/or private investments. Despite this relatively focused EU support to date, however, financing potential also exists across other

sectors. While these areas have been touched upon in Table 30, additional financing potential lies in the following sectors/funds which have not yet been well utilised within the area of green infrastructure:

- **Disaster response and prevention (EU Solidarity Fund and Structural and Cohesion Funds)** - these funds have potential synergies with disaster prevention, which could in part be addressed by targeted green infrastructure measures
- **Competitiveness and Innovation Framework Programme** - supports innovative activities and entrepreneurship including eco-innovation, which can play a role in green infrastructure (e.g. green waste water treatment)
- **European Fisheries Fund** - supports the development of fisheries and contributes to diversification of activities; priority axis 4, sustainable development of fisheries areas, could potentially contribute to green infrastructure financing
- **Research (7<sup>th</sup> Research Framework Programme)** – the scope of financed projects could be extended to include pilot projects of nature protection or implementation of other green infrastructure elements
- **European Agricultural Fund for Rural Development (EAFRD)** – rural development measures from axis 2 include activities favouring green infrastructure, especially for species relying on semi-natural agricultural habitats; awareness and application of these funds to green infrastructure projects should be increased

Despite this potential, however, it should be noted that developing green infrastructure should not only be seen as a public responsibility. To maximise the implementation and effectiveness of green infrastructure, private sectors also need to understand the concept and the associated benefits. In this context, it is necessary to think about how the benefits of green infrastructure can best be reaped and marketed and, accordingly, the most strategic methods for approaching this task.

Links with other policies need to be reinforced (as outlined above) alongside support for innovative financing opportunities. **Increased cooperation with and involvement of the private sector**, for example, has the potential to bring together additional actors and resources from various spatial levels and sectors. However, the extent to which this can be expected remains unclear. Certain circumstances lend themselves nicely to such contributions, e.g. restoring environmental damages through **public private partnerships (PPPs)**, but there are limits to this potential. Such cooperation is largely dependent on the types of ecosystem services being delivered and who the beneficiaries are. Many of the services have public good aspects and will therefore be under-provided unless they receive public good funding, thereby placing a limit on the scope for private funding<sup>78</sup>. That being said, the EU should nevertheless highlight the possibilities for private sector involvement and support such integration where possible.

The following box briefly summarises the recommendations for EU policy makers.

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<sup>78</sup> Additional examples of potential private sector involvement in financing GI is provided in section 4.2.4; this chapter limits itself to PPPs given the relevance for and potential involvement of the EU in such arrangements.

## Box 12: Recommendations for policy actions at EU level

- **Create a legislative framework**
  - Develop an EU strategy on green infrastructure including a common vision and strategic goals for the future direction of green infrastructure
  - Establish a workable definition of green infrastructure and typology of green infrastructure initiatives, which allows for flexibility in its application across the MS
  - Set clear targets for protecting, maintain and creating green infrastructure (measurable in quantitative and qualitative terms)
  - Increase policy coherence at EU level (by integrating green infrastructure into all relevant policies as one objective, highlighting the link and potential benefits received)
  - Integrate green infrastructure as a cross-cutting issue into binding spatial planning policies such as the Strategic Environment Assessment, the Environmental Impact Assessment and the Environmental Liability Directive
- **Increase awareness and facilitate knowledge transfer across the EU Member States**
  - Run campaigns targeted at specific stakeholders and sectors to increase understanding and acceptance for green infrastructure initiatives
  - Highlight best-practice examples and demonstration projects being implemented in the EU Member States and encourage the exchange of relevant know-how and experiences (e.g. through a platform)
  - Support the development of tools for measuring benefits and costs in a standardised way and disseminate these tools
- **Maximise efficiency of EU funding**
  - Better target available funds in terms of objectives, beneficiaries and benefits (to maximise their support of green infrastructure)
  - Identify the financial needs for green infrastructure at EU level
  - Outline benefits delivered by green infrastructure and the different groups that receive them
  - Increase support of public private partnerships (PPPs) and other forms of innovative financing (informing relevant parties about these possibilities)
  - Promote development of PES schemes (both public and private) in order to reward provision and maintenance of GI

## 6.2 Recommendations for regional and national policy actions

Various opportunities exist at local/regional and national levels to promote and strengthen green infrastructure and encourage related projects and initiatives. As introduced at the start of this chapter, general actions that are necessary include a cross-sectoral integration of green infrastructure issues at the policy and planning levels to achieve maximum coherence, promotion of the concept of green infrastructure and the provision of assistance for capacity building measures. More specific opportunities for actions at this level are summarised in the text below. It should first be noted, however, that all actions outlined in this section would demand that governments put green infrastructure on the political agenda and set principles

for green infrastructure, which need to be interpreted as appropriate on local/regional and national levels. It must be clear, that the links between the national and local level are important as engagement at the local level for implementation are key for successful implementation of green infrastructure projects.

### Create legislative framework and develop a targeted strategy

There are different ways to promote green infrastructure linked to the policy framework, including voluntary as well as mandatory instruments. Establishing a national strategy on green infrastructure and integrating planning conditions on existing spatial planning laws are considered as the most powerful approaches and can form an **overarching and supporting framework** which guides work and supports investment in green infrastructure. By doing so, a coherent and coordinated approach can be created and investments in green infrastructure can be maximised.

As national governments are asked to provide a “big picture” and political support for green infrastructure, the planned European green infrastructure strategy could include requirements for Member States to **develop a national strategy on green infrastructure** (e.g. in the form of a green infrastructure framework directive). With such a strategy, the Member States would not only declare that green infrastructure is a priority on the political agenda, but also recognise its importance. Moreover, the national strategies can set targets and provide guidelines for the national as well as local/regional levels, ensure that projects are established in a coordinated way and highlight the benefits resulting from green infrastructure, which are used and perceived (consciously or unconsciously) by different stakeholders and sectors (agriculture, water, forestry, transport, tourism, health, etc.). Therewith, awareness and engagement among relevant stakeholders and the wider public can be gained, enabling the initiation and successful implementation of green infrastructure projects and exploring new financing sources. This is also beneficial as local policy makers prefer to be able to link their local action to national level priorities.

In the context of such a strategy, the creation of targeted regional/national programmes should be encouraged and adequate funding should be ensured. In addition, the strategy should create the conditions necessary to encourage long-term investments in green infrastructure rather than seeking short-term profits from alternative land uses or actions. Therefore, the strategy must clearly highlight the potential benefits (in relation to emerging costs) and adjust the financing framework accordingly.

Some examples already exist or under development which illustrate national green infrastructure strategies in practice, such as in Ireland, Sweden and France. Experiences gained in the process of initiating, designing and implementing these strategies can provide further Member States with useful insights and recommendations. In addition, different European cities and municipalities (e.g. Stockholm, Cambridgeshire, Liverpool, Buckinghamshire) have started developing regional strategies to create a framework addressing regional needs and setting specific targets for the entire community (which could either be binding or of a steering nature).

A further key instrument for establishing green infrastructure at national level is existing and binding **legislation for spatial planning**, including *inter alia* EU legislative instruments such as the Environmental Impact Assessment (EIA), Strategic Environmental Assessment (SEA) and the Environmental Liability Directive (ELD). The spatial planning instruments at national

(and, if they exist, at local/regional) levels need to be adjusted by integrating the planning, development and maintenance of green infrastructure as one key element. There are different potential approaches to integrate green infrastructure, e.g.:

- Integrate green infrastructure which encompasses different key elements, such as flora and fauna, climate, soil, landscape, into future urban and regional planning;
- Introduce a point system for approval of new infrastructure needs and/or setting higher standards for permitting new infrastructure;
- Create legislation that requires grey infrastructure plans to include mitigation measures aiming to reduce fragmentation effects created; and
- Emphasise the creation of infrastructure where compensation and/or remediation measures must be carried out by a “polluter” (in the context of the ELD).

National spatial plans also have the potential to highlight the importance of green infrastructure and to help the national governments to promote and support its development. In this context, spatial plans should encourage the uptake of the ecosystem-approach and thereby define an adequate project size by functional considerations rather than by zoning or administrative boundaries. By expanding the “window of opportunity” planners would be allowed to integrate green infrastructure needs on demand and not only (for example) every 10 years.

In addition to spatial planning instruments, green infrastructure should be protected and enhanced by further relevant national policies such as biodiversity, agriculture, forestry, water protection, tourism, health, etc. and thus be mentioned explicitly in the corresponding policy and legislative documents. In this way, the benefits received by the different sectors can be highlighted and the value of green infrastructure can be recognised. Moreover, spatial planning as well as all other relevant policies are asked to establish targets for the creation and maintenance of green infrastructure.

The right framework and mechanisms should be put in place at the national level, but flexibility should be maintained for these to be implemented at the local level in a way that suits the local context and ecosystem considerations. In some circumstances, iteration between the local and national level could be useful e.g. when the national government aims to support specific land use schemes which need to be explored and supported at the local/regional level to address the local needs and successfully implement such projects.

### **Provide financing and explore potential financing instruments**

Managing and providing financing for green infrastructure projects at a national (and respectively regional) level is a very complex and challenging task due to the variety of public funds available which address green infrastructure directly or indirectly and are used to different extents (see 6.1). Here, the challenge is to identify and encourage private financing in addition to public money as well as to determine the budget and its requirements to be spent on green infrastructure activities on behalf of the public authorities. One overall remark is that the national government has to ensure that government funding and programming is in line with green infrastructure objectives.

Following the recommendations and observations on potential sources for financing green infrastructure stemming from EU policies, national and regional policy makers are asked to fully explore these opportunities, highlight the potential financing instruments in the

respective policies and thereby secure funding from all benefiting sectors. Alternatively, an overview on all available public financing instruments at a national level can be prepared and disseminated among the relevant networks and on relevant websites.

There are certainly limitations to finance green infrastructure activities only with public money. Thus, key priorities should be set on which activities to financially support. Experiences from practitioners suggest that governments should *inter alia* i) provide basic funding for administration (also after implementation of the project), ii) ensure the success and continuity of such projects by supporting the sustainable assurance of the invested money and the realisation of the planned measures together with the relevant authorities and provide pre-financing where possible to enable stable financial flows for the participation of smaller NGOs and organizations; and iii) specifically support projects which follow an integrated approach combining nature conservation and recreation in a balanced way. The latter highlight also the need for establishing adequate financing conditions encompassing pre-financing, adequate level of administrative reporting and monitoring (as regards frequency and extent) and a certain level of flexibility, allowing to adapt and increase financing during the project's life cycle to adjust to the real costs of the work and address unpredicted events or circumstances.

In general, governments should promote financing and administrative conditions which enable and encourage a wider uptake of green infrastructure initiatives and projects in a coordinated manner. Public financing should focus on long-term objectives for green infrastructure rather than projects seeking short-term profits from alternative land uses or actions.

Regional and national governments are in particular asked to involve private actors through public-private partnerships (PPPs), for example by fostering “green partnerships” bringing together public, private and social actors. Moreover, public investments should encourage and promote innovative approaches as well as joined-up thinking (such as in agriculture and forestry as both can contribute to CO<sub>2</sub>-sequestration). Providing incentives for demonstration and pilot projects (which show that integrated projects work) would be one opportunity.

One issue that has not yet been addressed explicitly in policy discussions is how existing grey infrastructure can be substituted with green infrastructure (and how such a change can be financed). Incentives from the regional/provincial level are considered as one possibility to encourage such changes. However, this question would require more research and discussion among relevant stakeholders, including national authorities.

### Networking, monitoring and research

In order to implement the strategy/strategies on green infrastructure, national and regional governments are asked to promote the concept of green infrastructure and to emphasize in this context the related benefits in audience-specific, targeted campaigns. Such action can help to encourage the development and implementation of green infrastructure initiatives at different levels.

Regional and national governments can moreover benefit from existing networks, initiatives in and outside the country through e.g. cooperation with existing nature protection networks, enhancing the exchange of best practices between regions and with neighboring countries and strengthening cooperation and exchange of experiences between national (regional) authorities and stakeholders implementing the project at local/regional level. Such

cooperation can also help to identify gaps in knowledge and, thus, develop targeted capacity building for the different types of stakeholders involved in green infrastructure design, implementation and maintenance, ranging from the authority level, to planning agencies and practitioners. Moreover, governments can support the creation of national green networks by bringing together existing local/regional green network projects.

The national government should also carry out monitoring activities at the national and regional levels. In order to prepare for the measurement of progress made in the development of green infrastructure, the existing green infrastructure must be mapped at the national level (preferably by using a geographic information system). Such work would allow for an overview of the country's green infrastructure network to be obtained and for the establishment of a baseline. First steps in this direction have been already made at the EU-level by the European Environmental Agency (EEA) and the Joint Research Centre (JRC).

In this context, a screening of current projects/initiatives that fall under the green infrastructure umbrella should take place. The work undertaken by IEEP et al. (2011), which included the elaboration of country profiles describing relevant green infrastructure initiatives, could serve as a useful foundation for this process.

As shown in the case study analysis and confirmed by the literature, it is very difficult to value the benefits of green infrastructure in monetary terms, largely due to the site specific nature of many green infrastructure services and benefits, and scientific uncertainties concerning the measurement of ecosystem services. National governments should encourage research on developing applicable methodologies to quantify and value the benefits of green infrastructure, and also commission targeted cost-benefit analyses of such green infrastructures projects to expand the evidence base and arguments for such projects.

The following box summarises briefly the recommendations for local/regional and national policy makers.

### **Box 13: Recommendations for policy actions at national and local/regional level**

- **Create an overarching and supporting framework at a national level by**
  - Developing national strategies on green infrastructure;
  - Adjusting spatial planning legislation and instruments;
  - Integrating green infrastructure (including its creation, protection and maintenance) in all relevant policies (biodiversity, agriculture, forestry, water protection, tourism, health etc.)
  - Establishing targets for the maintenance and creation of green infrastructure
- **Provide financing and explore potential financing instruments**
  - Explore available financing sources at EU level and encourage a broader sector-involvement (which goes beyond nature protection)
  - Focus on long-term objectives for green infrastructure
  - Ensure funding to stimulate pilot projects (e.g. adopting an integrated approach, developing innovative approaches), cover administrative costs of projects and maintenance costs
  - Establish adequate funding conditions (e.g. pre-financing, flexible management of money)
  - Encourage public-private partnerships (e.g. green partnerships)

- **Promote networking, monitoring and research**

- Support the creation of national green networks
- Encourage exchange of best practice in and outside the country/region
- Map existing green infrastructure features at national level
- Conduct screening of current projects/initiatives that fall under the green infrastructure umbrella
- Commission research projects to support the development of tools/methods to measure green infrastructure benefits and project-related cost and benefit analyses

## Annex: Project fiches

As part of the project, a shortlist of 11 green infrastructure projects (out of the 127 projects from the project database) have been identified as potential case studies applying a set of relevant criteria (see typology provided in 3.2). These 11 projects were further analysed to select a final list of six in-depth case studies, also taking into account the data availability/willingness to cooperate of the contacted project representatives (see 3.4). For each of the 11 projects, a project fiche was prepared including characteristics such as contact details, costs, benefits, beneficiaries, etc. The first six projects listed present the case studies that have been examined in detail and thus partly contain more extensive information than the remaining five fiches.

PROJECT FICHE (N°1)		
<b>VÄINAMERI PROJECT</b>		
<i>“LINKING RURAL LIFE AND COASTAL NATURE”</i>		
<b>BASIC INFORMATION</b>	<b>Location (spatial scale)</b>	Väinameri, Estonia (local/regional)
	<b>Relevant sector(s)</b>	Agriculture, tourism, nature protection
	<b>Project setting</b>	Rural
	<b>Duration/state of implementation</b>	1997 – 2004, implemented
	<b>Website</b>	<a href="http://www.arhipelaag.ee/vainameri/enindex.php">http://www.arhipelaag.ee/vainameri/enindex.php</a> <a href="http://www.wwf.se/source.php?id=1119653">www.wwf.se/source.php?id=1119653</a>
<b>OBJECTIVES AND RELEVANT POLICIES</b>	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• human health/quality of life/well-being</li> <li>• sustainable management</li> <li>• climate change adaptation and mitigation</li> <li>• biodiversity conservation</li> </ul>
	<b>Project summary</b>	The project aimed to restore and conserve semi-natural coastal ecosystems through a set of interrelated activities that support rural economic development for local people and increase the attractiveness of the area. The project was originally part of a Helsinki Commission (HELCOM) effort to develop an Integrated Coastal Zone Management (ICZM) plan for the Southeast Baltic Region, thus encompassing a semi-enclosed area in Estonia covering ca. 2,000 km <sup>2</sup> . Activities were focused on restoring the semi-natural coastal grasslands through a combination of cattle farming (mowing, grazing and clearing activities), sustainable extraction for handicraft production and ecotourism, as well as ecological education and awareness-building efforts.
	<b>Relevant strategy/policy</b>	The area being addressed in this project was designated by the Ramsar Convention as being a wetland of international importance. Birdlife International also classified the area as an “Important Bird Area”. The project was also originally designed as one of six pilot projects to develop and implement Integrated Coastal Zone Management (ICZM) plans for the sustainable development of lagoons and wetlands in order to protect the ecology of the Baltic Sea.
<b>DESCRIPTION</b>	<b>Beneficiaries</b>	Local communities, farmers, artisans, tourism service providers, tourists, food industry
	<b>Ecosystem/habitat covered</b>	Coast, grassland, wetland
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• Restoration zones</li> <li>• Sustainable use areas</li> <li>• Multifunctional zones</li> <li>• Protected areas</li> </ul>
	<b>General actions/measures</b>	<ul style="list-style-type: none"> <li>• Conservation</li> <li>• Increasing public awareness</li> </ul>

<b>COSTS/BUDGET</b>		<ul style="list-style-type: none"> <li>• Restoration</li> </ul>
	<b>Specific project activities and initiatives</b>	<ol style="list-style-type: none"> <li>1. Landscape and grassland management: increased cultivation of naturally unfertilized grasslands to maintain the area's natural values (model pastures/meadows, establishment of high-quality beef cattle herds, education, study visits, indicator species survey)</li> <li>2. Handicrafts: utilization of the area's natural resources, which are obtained by maintaining the landscape – ensures long-term subsistence for local residents (promotion of handicrafts based on coastal grassland management, education, establishment of new marketing solutions, study visits, information leaflets, labeling (Väinameri brand), international contacts (Swedish handicraft association), improvement of wool quality (sheep breeding)</li> <li>3. Nature tourism: increase the attractiveness for small-scale nature tourism, adding to the local residents' earning potentials (education, information leaflets, study visits); development of network including international nodes, the WWF member test case, fulfillment of tourist network including international contacts</li> <li>4. Awareness and outreach: outreach of information, experiences and result to general public, media and authorities</li> </ol>
	<b>Stakeholders involved</b>	<ul style="list-style-type: none"> <li>• WWF Sweden</li> <li>• National Coordinator: Archipelaag</li> <li>• Media and information campaigns: Estonian Fund for Nature</li> <li>• Coordinator in Matsalu: Matsalu Nature Reserve (National Park administration)</li> <li>• Coordinator in Vormsi: Läänerannik(NGO)</li> </ul>
	<b>Source(s) of funding</b>	<ul style="list-style-type: none"> <li>• WWF Sweden – 2.9 million SEK</li> <li>• Sida (Swedish Agency for International Development Cooperation) – 3.4 million SEK</li> <li>• Local initiatives have since ensured long-term financial sustainability of the endeavor</li> </ul>
	<b>Overall budget</b>	Overall costs - 6.2 million SEK
	<b>Financial costs</b>	Printing and publishing, salaries, equipment, consultants, travel
	<b>Opportunity costs</b>	N/A
<b>BENEFITS</b>	<b>GI provision</b>	Coastal restoration/maintenance of seminatural landscape (including restoration of pasture/grazing area, wooded meadow and coastal grasslands; bush cutting and mowing to restore/maintain grasslands)
	<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>• Maintained and restored biodiversity</li> <li>• Shifts in the approaches to balanced ecosystem management, agricultural and regional development policies</li> <li>• Water purification/waste management</li> </ul>
	<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>• Increased regional ecotourism and income from local production</li> <li>• Increased awareness in Estonia and neighboring countries</li> <li>• Creation of complete production chains (meat, handicraft, tourism) including international links and capacity building of local authorities for enterprise support, giving the project a 'market-oriented' base</li> </ul>

PROJECT FICHE (N°2)		
TIENGEMETEN		
“RESTORATION OF FRESHWATER TIDAL AREA IN THE HARINGVLIET ESTUARY”		
BASIC INFORMATION	<b>Location (spatial scale)</b>	Zuid, Holland (local/regional)
	<b>Relevant sector(s)</b>	Water, nature protection
	<b>Project setting</b>	Rural
	<b>Duration/state of implementation</b>	1990 - 2007; implemented
	<b>Website</b>	<a href="http://www.tiengemeten.deltanatuur.nl/content.asp">http://www.tiengemeten.deltanatuur.nl/content.asp</a>
OBJECTIVES AND RELEVANT POLICIES	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Water quality and supply</li> <li>• Biodiversity conservation</li> <li>• Human well-being</li> </ul>
	<b>Project summary</b>	In response to flooding damages and as part of the development of the National Ecological Network, the project aimed to restore a 660ha large freshwater tidal landscape on the island of Tiengemeten in which nature, recreation and the island’s cultural history could co-exist. Part of the island was restored to its original state, traditional farmland, while dikes were removed in other areas to create the tidal landscape. The project was highly successful and saw the construction of a new visitor’s centre, the completion of the opening of the dams, efficient flooding of the island, and the social acceptance of the transformation of 700ha farmland into tidal ecosystems.
	<b>Relevant strategy/policy</b>	The area addressed in this project is part of the Natura 2000 network and addresses several EC directives (e.g. Birds and Habitats Directives). It’s also designated as part of the Dutch National Ecological Network (EHS) and is part of the Dutch National Landscape Patter, National Green Space Structure Plan and “Nature for people, People for Nature” project. On a regional level, it is part of the Regional Plan Zuid-Holland Zuid and Provincial Policy on Nature and Landscape.
DESCRIPTION	<b>Beneficiaries</b>	Dienst Landelijk Gebied (Government Service for Land and Water Management - DLG)
	<b>Ecosystem/habitat covered</b>	Freshwater tidal landscape: Alluvial forests, Lowland hay meadows, Estuaries, Natural eutrophic lakes, Rivers with muddy banks, Hydrophilous tall herb fringe communities
	<b>Species covered</b>	Not applicable.
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• <b>Restoration zones</b> - transforming farmland into their previous nature of tidal ecosystems, including removing grey infrastructure (roads)</li> <li>• <b>Sustainable use areas</b> – there is some agricultural use at one side of the island and cattle are allowed to roam the majority of the island freely, grazing the landscape and bathing in the rivers.</li> <li>• <b>Protected areas</b> – the whole island is protected and has restrictions on use and, outside of one area, has limited human interference</li> <li>• <b>Natural connectivity features</b> – the island as a whole serves as a stepping stone within the EHS and, more specifically, within the Haringvliet delta for migrating bird and fish species</li> </ul>

		<ul style="list-style-type: none"> <li>• <b>Multifunctional zones</b> – the island is available for different combined uses, including agriculture and grazing, recreation (bike paths, hiking areas, camping), education (museums, visitor centre, school visits) and nature conservation in a complementary fashion</li> </ul>
	<b>General actions/ measures</b>	<ul style="list-style-type: none"> <li>• Restoration</li> <li>• Conservation</li> <li>• Increasing public awareness</li> <li>• Connecting habitats and features (the whole area increases the connection between large natural areas)</li> </ul>
	<b>Specific project activities and initiatives</b>	<ul style="list-style-type: none"> <li>• Designation of Tiengemeten a part of national ecological network and purchase of island</li> <li>• Establishment of steering committee and project group</li> <li>• Relocation of farmers</li> <li>• Development of plans for Tiengemeten and production of specialist reports</li> <li>• Execution activities (construction of new embankments, removal of asphalt roads, creation of new paths and tracts, new water structure by excavations, restoration of select existing buildings, removal of trees, remediation of point source pollution, etc)</li> <li>• Ongoing nature management and monitoring activities</li> </ul>
	<b>Stakeholders involved</b>	<ul style="list-style-type: none"> <li>• Dienst Landelijk Gebied (the Government Service for Land and Water Management - DLG)</li> <li>• Deltanatuur</li> <li>• Rijkswaterstaat</li> <li>• Natuurmonumenten</li> <li>• Province of Zuid-Holland</li> <li>• Korendijk Municipality</li> <li>• Steering committee and project group</li> </ul>
<b>COSTS /BUDGET</b>	<b>Source(s) of funding</b>	LIFE+, province South Holland, Rijkswaterstaat, DLG, Natuurmonumenten, Delta Natuur, ISLA, VROM
	<b>Overall budget</b>	6,378,552 EUR; EU contribution 1,722,209.00 €
	<b>Financial costs</b>	Management and administrative activities: Preparation work, compensation for farmers, communication activities, installing sewage system, education center, infrastructure, demolition of buildings, purchasing cattle, maintenance/running of ferry
	<b>Opportunity costs</b>	Compensation paid to farmers can be taken as a proxy for these costs.
	<b>GI provision</b>	Land purchase, restoration of Weemoed, core middle area, harbor, restoration of Idahoeven, restoration of Wealth and Wilderness, overall maintenance of the island
<b>BENEFITS</b>	<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>• Securing biodiversity (rare and endangered species)</li> <li>• Habitat creation and planting of trees</li> <li>• Restoration of a tidal landscape</li> <li>• Water regulation</li> </ul>
	<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>• Recreation and education opportunities</li> <li>• Revenue from tourism</li> </ul>

PROJECT FICHE (N°3)		
ALPINE CARPATHIAN CORRIDOR		
BASIC INFORMATION	<b>Location (spatial scale)</b>	Austria, Slovakia (transnational)
	<b>Relevant sector(s)</b>	Urban/regional planning, transport, tourism, nature protection
	<b>Project setting</b>	Combined (mostly rural, but also includes intersection with highways and traffic routes)
	<b>Duration/state of implementation</b>	Initiative started in 2002; 2009-2012 implementation (ongoing)
	<b>Website</b>	<a href="http://www.alpenkarpatenkorridor.at/">http://www.alpenkarpatenkorridor.at/</a>
OBJECTIVES AND RELEVANT POLICIES	<b>Overall objectives</b>	biodiversity conservation (species migration across traffic network)
	<b>Project summary</b>	The project aimed to construct and preserve a coherent 120 km corridor from the Alps to the Carpathians in response to the increasing fragmentation caused by agriculture intensification, the rapid expansion of built-up areas and expanding transport infrastructure. The main objectives are to safeguard these habitats and enable the migration and genetic exchange between wild animal populations. From 2009-2012, implementation measures are planned within the framework this cross-border and cross-sectoral project (AT and SK), such as improving the traffic network by building 'green bridges' over highways at key points/bottlenecks as well the creation of suitable habitat patches or stepping stones within the corridor. Public awareness campaigns and environmental education for schools within the region are also part of the project.
	<b>Relevant strategy/policy</b>	This project is part of the Alpine Carpathian Project (ERDF) and is governed by Austrian federal law (requiring construction of one green bridge per year over existing highways as well as over all major new roads). The project is also mentioned in the Joint Regional Development Strategy (JORDES+), CENTROPE and the European Strategy for the Danube Region.
DESCRIPTION	<b>Beneficiaries</b>	Regional wildlife populations, inhabitants, hunters, spatial planning processes
	<b>Ecosystem/habitat covered</b>	The project covers the corridor connecting the Alps and Carpathian mountain ranges along with a chain of close natural sites, such as the Leithagebirge and the Danube floodplains. Habitats covered in this corridor are predominantly forests and agricultural sites, also including vineyards, hillsides and floodplains. Red deer ( <i>Cervus elaphus</i> ) has been chosen as indicator species for the project as its survival and successful migration will ensure the benefit of other species as well (Bear ( <i>Ursus arctos</i> ), lynx ( <i>Lynx lynx</i> ), wolf ( <i>Canis lupus</i> ), elk ( <i>Alces alces</i> )).
	<b>Species covered</b>	Large mammals: e.g. brown bear, red deer and lynx
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>Natural connectivity (stepping stones/corridor)</li> <li>Artificial connectivity</li> <li>Restoration zones (restoration of habitat patches)</li> </ul>
	<b>General actions/measures</b>	<ul style="list-style-type: none"> <li>Identification/mapping</li> </ul>

		<ul style="list-style-type: none"> <li>• Spatial planning</li> <li>• Maintenance/protection</li> <li>• Research/analysis</li> <li>• Public awareness</li> <li>• Creation of green infrastructure</li> </ul>
	<b>Specific project activities and initiatives</b>	<ul style="list-style-type: none"> <li>• Information and publicity</li> <li>• Project management</li> <li>• Planning and supervision of green bridge</li> <li>• International conference and memorandum of understanding</li> <li>• Basic study on habitat fragmentation, networking and wildlife</li> <li>• Capturing the ecological network between the Alps and Carpathians</li> <li>• Detailed corridor model for bottlenecks</li> </ul>
	<b>Stakeholders involved</b>	<ul style="list-style-type: none"> <li>• The Land (province) of Lower Austria (leading partner)</li> <li>• Weinviertel Management</li> <li>• ASFINAG Autobahnen- und Schnellstraßenfinanzierungs-Aktiengesellschaft</li> <li>• National Park Donau floodplains GmbH</li> <li>• NDS a.s.</li> <li>• Slovenská technická univerzita, fakulta architektúry</li> <li>• Štátna ochrana prírody SR, Správa CHKO Záhorie</li> <li>• WWF Austria</li> <li>• UNEP - Interim Secretariat of the Carpathian Convention</li> <li>• Daphne - Institute for applied Ecology</li> <li>• Universität für Bodenkultur Wien, Institut für Vermessung, Fernerkundung</li> </ul>
<b>COSTS /BUDGET</b>	<b>Source(s) of funding</b>	ERDF, Federal Ministry of Agriculture, Forestry, Environment and Water Management; Department of Spatial Planning and Regional Policy of Lower Austria; Dept. of Nature Protection of Lower Austria; Regional Management Burgenland; National co-financing Slovakia; DAPHNE
	<b>Overall budget</b>	Ca. €1,750,000
	<b>Financial costs</b>	communication, implementation and communication, project management, background and planning measures
	<b>Opportunity costs</b>	N/A
<b>BENEFITS</b>	<b>GI provision</b>	Remarketing of 150km of bike path and provision of information and materials along the route
	<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>• Improvement of habitat-structure and spatial plans according to corridor model</li> <li>• Protection and maintenance of corridor area</li> <li>• Maintenance of a network of green zones</li> <li>• Mitigation of the negative effects of climate change</li> </ul>
	<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>• Environmental education and communication</li> <li>• Recreational area (e.g. bike path)</li> </ul>

PROJECT FICHE (N°4)		
TRANSFORMATION OF THE BANKS OF THE RHONE		
"FROM A CAR PARK TO PUBLIC PARKS"		
BASIC INFORMATION	<b>Location (spatial scale)</b>	Lyon, France (local/regional)
	<b>Relevant sector(s)</b>	Urban/regional planning, built environment, health
	<b>Project setting</b>	Urban
	<b>Duration/state of implementation</b>	2005 – 2007; implemented
	<b>Website</b>	<a href="http://www.grandlyon.com/">http://www.grandlyon.com/</a>
OBJECTIVES AND RELEVANT POLICIES	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Human health/quality of life/well-being</li> <li>• Climate adaptation and mitigation</li> <li>• Water quality and supply</li> </ul>
	<b>Project summary</b>	<p>Historical flooding of the Rhone River in France resulted the building of bridges, and construction of dams as flood control mechanisms, enabling the urbanisation of the banks. In the 1960s, the banks became a car park and the link between inhabitants of Lyon and the river was broken. A transformation project began in 2001, covering 10 ha over 5 km on the left river bank. The goal was to restore the banks with grass, plants and trees (creating new habitats for e.g. beavers), support sustainable land use activities (e.g. recreation) and connect the two green urban parks (linking the river and the streets above the banks). The project was launched in 2001, by the newly elected Mayor of the city and President of the Urban Community, Gérard Collomb, and financed through a budget of €42,886,000 from Greater Lyon, the city of Lyon and the Rhone-Alpes region.</p>
	<b>Relevant strategy/policy</b>	<p>This project relates to Agenda 21, the climate mitigation (to some extent adaptation) strategy and the Tree Charter (published in 2000; to be updated in 2011). The project also falls under the planning tool 'PLU – Local urban plan 2014'.</p>
DESCRIPTION	<b>Beneficiaries</b>	Lyon population
	<b>Ecosystem/habitat covered</b>	Banks (elevated side of the river), riparian forests; habitat for beaver, water birds and fish fauna
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• Green urban features</li> <li>• Natural and artificial connectivity features (tree rows, green walls)</li> <li>• Sustainable use areas</li> </ul>
	<b>General actions/measures</b>	<ul style="list-style-type: none"> <li>• Spatial planning</li> <li>• Connecting features</li> <li>• Creating GI elements</li> <li>• Research and development</li> <li>• Increased public awareness/information</li> <li>• Voluntary measures</li> <li>• Restoration measures</li> </ul>

<b>COSTS/ BUDGET</b>	<b>Specific project activities and initiatives</b>	<ul style="list-style-type: none"> <li>• Construction of underground car parks (over 2 years);</li> <li>• Removal of outdoor car parks on the banks (almost instantaneous);</li> <li>• Development and planning of 100,000m<sup>2</sup> on the side of the river (over 2 years);</li> <li>• Conservation of the topography and of the stone wall.</li> </ul>
	<b>Stakeholders involved</b>	Lyon Greater Urban Community (trees and landscape department); IN SITU, Jourda, Coup d'eclat, subcontractors
	<b>Source(s) of funding</b>	Lyon Greater Urban Community, City of Lyon, Rhone-Alpes region
	<b>Overall budget</b>	€42,886,000
	<b>Financial costs</b>	Cleaning of the banks, project management, information barge, maintenance activities
	<b>Opportunity costs</b>	To be specified.
<b>BENEFITS</b>	<b>GI provision</b>	Maintenance of lawn and green elements Maintenance of trees
	<b>Environmental benefits/ ecosystem services</b>	Long-term maintenance of biodiversity, improved water quality, climate change adaptation and mitigation, reduction of air pollution
	<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>• Reduced urban heat island effect</li> <li>• Recreational opportunities</li> </ul>

PROJECT FICHE (N° 5)		
<b>GALLECS</b>		
<i>“DEMONSTRATIVE PROJECT ON LAND USE AND ENVIRONMENTAL MANAGEMENT OF THE PHYSICAL PLANNING IN GALLECS AS A BIOLOGICAL AND STABLE CONNECTOR IN THE FRINGE AREAS OF BARCELONA METROPOLITAN AREA”</i>		
<b>BASIC INFORMATION</b>	<b>Location (spatial scale)</b>	Cataluña, Spain (local/regional)
	<b>Relevant sector(s)</b>	Urban and regional planning (nature protection, agriculture, energy, forestry, health, tourism)
	<b>Project setting</b>	Peri-urban/Combined (both rural and urban) – fringe areas of Barcelona metropolitan area
	<b>Duration/state of implementation</b>	1 Dec 2001 – 30 Nov 2004 (LIFE+); Gallecs area - ongoing
	<b>Website</b>	-
<b>OBJECTIVES AND RELEVANT POLICIES</b>	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Human health/quality of life/well-being</li> <li>• Sustainable management</li> <li>• Soil protection</li> <li>• Biodiversity conservation</li> </ul>
	<b>Project summary</b>	The objective of the project was to protect the region ‘Gallecs’ from urban and industrial pressures and subsequent environmental degradation. The aim was to strengthen the area’s function as a “biological interface”, i.e. a buffer zone between the urban fringe and the countryside beyond. Improved environmental conditions were to result in a higher quality of life for the inhabitants of the areas on the outskirts of Barcelona. An integrated approach was developed with a view to achieving sustainable land-use in the area. The strategic plan comprised a series of actions to control and manage urban sprawl, as well as to mitigate its detrimental impact on the environment. Activities included initiatives in the following areas: the restoration of natural habitats, sustainable agricultural and forest management, the use of renewable energy, and environmental education.
	<b>Relevant strategy/policy</b>	The project is embedded in the 2005 Master Plan, which is a supra-municipal urban plan.
<b>DESCRIPTION</b>	<b>Beneficiaries</b>	Local citizens and regional biodiversity
	<b>Ecosystem/habitat covered</b>	Arable land, rural and peri-urban areas; agricultural activities focus on cereals, legumes and greens
	<b>Species covered</b>	Not relevant
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• Restoration zones</li> <li>• Sustainable use areas</li> </ul>
	<b>General actions/measures</b>	<ul style="list-style-type: none"> <li>• Spatial planning</li> <li>• Conservation</li> <li>• Creating new GI components</li> </ul>

<b>COSTS/BUDGET</b>		<ul style="list-style-type: none"> <li>Increasing public awareness</li> </ul>	
	<b>Specific project activities and initiatives</b>	<ul style="list-style-type: none"> <li>Creating wetland</li> <li>Recovering the flow of the riverstream</li> <li>Recovering several devastated areas</li> <li>Maintaining the shrub division between the fields</li> <li>Follow-up and evaluation</li> <li>Managing agriculture and forest in a sustainable way</li> <li>Introducing alternative sources of energy</li> <li>Instituting environmental education</li> </ul>	
	<b>Stakeholders involved</b>	Consorti de l'Espai Rural de Gallecs" (Consortium of Gallecs' Rural Areas) - local authority	
	<b>Source(s) of funding</b>	LIFE+; generalitat (autonomous community), municipal councils, Conveni Incasol (agreement with Catalan Institute of Land)	
	<b>Overall budget</b>	1,501,183 EUR; EU contribution: 700,691.00 €	
	<b>Financial costs</b>	Maintenance, outreach and education, research and monitoring (environmental education, agricultural promotion, studies)	
	<b>Opportunity costs</b>	N/A	
	<b>BENEFITS</b>	<b>GI provision</b>	Maintenance of forest areas, natural and recreational areas and studies on biodiversity, mammals, and fauna
		<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>Enablement and improvement of the biological connection by means of recovered forests, river banks and shrub divisions.</li> <li>Reduction of the impact on the landscape caused by the flow increase of the torrent known as Caganell by means of abating it.</li> <li>Sustainable use of available water due to the introduction of a continuous drip irrigation system.</li> <li>Boost in biodiversity by re-introducing new species such as the white stork (<i>Ciconia ciconia</i>) and the common barn-owl (<i>Tyto Alba</i>).</li> <li>Improvement of the connection between the rural and urban areas.</li> <li>Use of wind energy as an example of how renewable energies can be utilized.</li> <li>Improved public and social use of the common areas.</li> <li>Introduction of new environmentally friendly production systems.</li> </ul>
		<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>Improving the economy by sustainably managing regional agriculture. Expensive crop varieties are labeled with the well-known brand name "Gallecs".</li> <li>New jobs created by the project from increased activities in the environmental and agricultural fields and forests.</li> <li>Creating new associations of producers to improve their production and help them launch their agricultural products.</li> <li>Encouraging the creation of new projects addressed to the women living in Gallecs, to promote Gallecs food and support the commercialisation of small producers and artisans and exchange experiences with other European regions.</li> <li>Diversification of the rural economy, supporting the primary sector.</li> </ul>

PROJECT FICHE (N°6)		
<b>NATIONAL FOREST CREATION</b>		
<i>“CREATING A LARGE-SCALE, ATTRACTIVE FOREST IN LOWLAND BRITAIN THAT BLENDS COMMERCIAL FORESTRY WITH ECOLOGICAL, LANDSCAPE AND PUBLIC BENEFIT”</i>		
<b>BASIC INFORMATION</b>	<b>Location (spatial scale)</b>	Regional
	<b>Relevant sector(s)</b>	Forestry
	<b>Project setting</b>	Rural / Peri-urban
	<b>Duration/state of implementation</b>	Ongoing (underway since 1990)
	<b>Website</b>	<a href="http://www.nationalforest.org/">http://www.nationalforest.org/</a>
<b>OBJECTIVES AND RELEVANT POLICIES</b>	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Human health and well-being</li> <li>• Climate change and adaptation/mitigation</li> <li>• Biodiversity Conservation</li> <li>• Sustainable management</li> </ul>
	<b>Project summary</b>	The National Forest idea was conceived in the Government policy document ‘Forestry in the Countryside’ published in 1987. The concept was to create a vast, new forest for the nation in lowland Britain that demonstrated the principles of multi-purpose forestry and improved an area badly scarred by past mineral workings. Further, the aim was to demonstrate in lowland Britain that a large scale, attractive forest could be created, blending commercial forestry with ecological, landscape and public benefit. Economic regeneration was to come from the restoration of mining sites and the future of agriculture was to be supported through opportunities for rural diversification. Commercial forestry was therefore blended with a range of additional objectives and benefits including economic regeneration, landscape and ecological enhancement, rural diversification and community engagement, and creation of a new recreational and tourism resource. The Forest area spans 518 km <sup>2</sup> , representing an increase from 6% to nearly 19% since 1990.
	<b>Relevant strategy/policy</b>	The idea of a new multi-purpose forest demonstrating best practice in lowland forest creation and management was first introduced in the Countryside Commission’s 1987 policy document ‘Forestry in the Countryside’.
<b>DESCRIPTION</b>	<b>Beneficiaries</b>	Local communities, business community, wider community
	<b>Ecosystem/habitat covered</b>	Woodland (87% of tree planting has been broadleaf and 13% conifer) 19,000ha of new and existing woodlands, hedgerows, meadows, heathlands and wetlands
	<b>Species covered</b>	9 priority species feature in the National Forest BAP: otters, bats, adder, bluebell, black poplar, rudder darter dragonfly, water vole, redstart and barn owl
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• Restoration zones</li> <li>• Sustainable use areas</li> <li>• Multifunctional zones</li> <li>• Natural connectivity</li> </ul>

<b>COSTS /BUDGET</b>	<b>General actions/ measures</b>	<ul style="list-style-type: none"> <li>• Maintaining/Protecting (Conservation)</li> <li>• Identification / Mapping</li> <li>• Creation</li> <li>• Connectivity of natural features</li> <li>• Restoration</li> <li>• Research</li> <li>• Public awareness</li> <li>• Restoration</li> </ul>
	<b>Specific project activities and initiatives</b>	<ul style="list-style-type: none"> <li>• Planting / Creating – including:                             <ul style="list-style-type: none"> <li>- The Changing Landscapes Scheme: funding to landowners for creating new woodlands and associated habitats (for sites over 1 ha)</li> <li>- Freewoods Scheme: to help design and create small woodlands to fit within other land uses (for land that falls within 200 square miles of the National Forest and is less than 1 ha in size)</li> <li>- Programme Development Fund: funds for projects that directly benefit the National Forest. Funding is available for site development; access and conservation (e.g. orchards and hedgerows), heritage, communities, partnerships and management</li> </ul> </li> <li>• Conservation</li> <li>• Woodland management</li> <li>• Public participation, education and recreation</li> <li>• Volunteering</li> <li>• Investment and regeneration – including:                             <p>Woodland Economy Business Programme (WEBS) (2005/6 to 2007/8), followed by the National Forest Company Grants programme in 2008/9: supports woodland and forestry business to develop new and existing forest related businesses by offering specialist advice to woodland businesses, capital grants for new developments, woodland skills training, signposting to other business support providers, as well as feasibility studies to local organisations considering installation of wood fuel boilers.</p> </li> </ul>
	<b>Stakeholders involved</b>	<ul style="list-style-type: none"> <li>• The National Forest Company</li> <li>• Forestry Commission</li> <li>• Woodland Trust</li> <li>• Wildlife Trusts</li> <li>• Local authorities (six District Council and three County Councils)</li> <li>• Private sector companies (as sponsors)</li> <li>• Private landowners</li> <li>• Communities</li> </ul>
	<b>Source(s) of funding</b>	<p>The idea of a new forest for England was proposed by Government as a national project. Central Government, (Defra) provides £3.5m pa. Additional public sector money is levered in for projects, whilst private sector companies sponsor activity and tree planting. The voluntary sector (e.g. Wildlife Trusts and Woodland Trusts) draws in its resources to manage some of the woodlands in the Forest.</p>
	<b>Overall budget</b>	<p>Net expenditure amounts to roughly between £2.5 and £3 million a year (based on annual reports)</p>
	<b>Financial costs</b>	<p>Site development and projects, National Forest tender scheme,</p>

BENEFITS		Changing Landscape Scheme, Programme Development Fund, Cycle Centre Project, Freewoods
	<b>Opportunity costs</b>	N/A
	<b>GI provision</b>	Programme covers woodland creation within a 200 square mile area in the centre of England
	<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>• 7.8 million trees planted.</li> <li>• Wooded cover increased from initial 6% to 18.4%. The aim is for around a third cover at the completion of planting.</li> <li>• In 2006, 38% of existing woodlands were under management (1140ha)</li> <li>• 6,230ha of new Forest creation secured since 1995, through the National Forest Tender Scheme, land acquisition, restoration of mineral workings and derelict land and development-related planting.</li> <li>• In 2009/2010, 204ha of creation was added to the total. As a comparison, this would equate to nearly 10% of England's total of 2,100ha in 2009.</li> <li>• Over the period 1990 – 2006, it is estimated that 50 kilotonnes of carbon (ktC) were sequestered by The National Forest. This is equivalent to the net removal of 182 million kg of CO<sub>2</sub> gas from the atmosphere.</li> <li>• Land used for agriculture has reduced from 74% to 61.5% between 1991 – 2007, while woodland cover has increased from 6% to 17.5%.</li> <li>• Since 1995, over 1,750ha of habitats have been created or brought back into management.</li> <li>• 92km (57.2 miles) of new hedgerows has been planted and 91 km (56.5 miles) of hedgerows have been brought back into management.</li> <li>• Habitat surveys have been undertaken across the Forest area by the County Ecological Record Centres and Wildlife Trusts to quantify the ecological resource</li> <li>• Between 1998 – 2006 there have been significant increases in woodland/ woodland edge birds*, including new arrivals (e.g. green woodpecker), increased breeding success (e.g. willow warbler) and several Red and Amber List species (UK birds of conservation concern).</li> <li>• Between 1994 – 2005 woodland bird populations in the East Midlands increased by 9%, but otherwise regional populations have declined</li> <li>• Since 1998, 155 redstart nest boxes have been installed and since 2004, 24 barn owl boxes, to help long-term species recovery</li> <li>• From 1995 to 2006 the National Forest Company and the Forestry Commission have supported 180 farm-based National Forest Tender Schemes. These have diversified 3,359ha of farmland to Forest-related uses, covering 6.7% of the Forest area</li> </ul>
	<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>• 175,000 people have participated in Forest-related events over the last 15 years.</li> <li>• Nearly 8,000 people have been involved in Plant a Tree events since 2001.</li> <li>• 345,000 children have participated in the environmental education sessions at Rosliston Forestry Centre since 1997 and Conkers from 2001.</li> <li>• Over 45 new sport and recreation facilities have been created</li> </ul>

	<p>including fishing, mountain biking, orienteering, carriage driving, cross country horseriding and sledging.</p> <ul style="list-style-type: none"><li>• 86km of new cycleways have been created, including 60km of Sustrans routes.</li><li>• The net benefit of the Forest since 1991 is calculated at £140m.</li><li>• Since 1995, £164m has been invested in Forest-related and regeneration projects and programmes.</li><li>• The National Forest Company has invested a total of c£51m through Forest creation grant schemes and land acquisitions.</li><li>• Tourism is now worth £287m pa (2008 - latest figure).</li><li>• There were 8 million visitors to The National Forest in 2008 (an increase of well over a million since 2003) and 4,400 tourism related jobs.</li><li>• Day visitors to The National Forest on average spent around £29 per day, whilst staying visitors spent £104 in serviced accommodation, and £43 in non serviced accommodation</li><li>• Over 20 new tourism attractions have opened, including the £16m Conkers which opened in 2001.</li><li>• The overall number of visitor days to The National Forest has increased by 17% from 2003 to 2008</li><li>• There have been six woodfuel installations in the Forest area with a further six committed or at an advanced planning stage.</li><li>• WEBS awarded grants of £166,000 to 39 projects. This supported the creation of 5 new businesses, helped to create or safeguard 24.5 jobs, provided training for 78 candidates and provided a total of 23 wood fuel feasibility studies.</li><li>• 55.5 new jobs were created and 12 jobs safeguarded between 2003/4 and 2009/10.</li><li>• Since 1990/1, a total of 333 jobs have been created/safeguarded directly related to the Forest's creation. This represents an increase of 25.2% since in 2004</li></ul>
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PROJECT FICHE (N°7)		
<b>PLBALTBOGS PROJECT</b>		
<i>“CONSERVATION OF BALTIC RAISED BOGS IN POMERANIA, POLAND”</i>		
<b>BASIC INFORMATION</b>	<b>Location (spatial scale)</b>	Pomerania, Poland (local/regional)
	<b>Relevant sector(s)</b>	Nature protection (water, forestry)
	<b>Project setting</b>	Rural
	<b>Duration/state of implementation</b>	2 Nov 2003 - 30 Sept 2007
	<b>Website</b>	<a href="http://kp.org.pl/plbaltbogs/">http://kp.org.pl/plbaltbogs/</a>
<b>OBJECTIVES AND RELEVANT POLICIES</b>	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Water quality and supply</li> <li>• Biodiversity conservation</li> </ul>
	<b>Project summary</b>	<p>The project targeted 23 of the 80 Baltic raised bogs have been recorded in northern Poland. Its overall objective was to maintain or restore active raised bogs and pine/birch bog forests in these sites in Pomerania, Poland. The project aimed to:</p> <ul style="list-style-type: none"> <li>• Halt the process of drainage and subsequent water loss of peat bogs through the building of sluices and dams and through the filling of ditches.</li> <li>• Eliminate local threats to biodiversity, such as the extension of birch, pine trees and spruce.</li> <li>• Increase the knowledge of the natural values, ecology and hydrology of each raised bog and adapt management plans on the basis of knowledge gained.</li> <li>• Disseminate active raised bogs conservation, including innovative management techniques tested by the project.</li> <li>• Increase public awareness of Baltic raised bogs and their conservation needs, especially among the most influential stakeholders groups, but also among local communities and the general public.</li> </ul>
	<b>Relevant strategy/policy</b>	<p>This project is part of the creation of the Natura 2000 network, falling under Directive 92/43/EEC -"Conservation of natural habitats and of wild fauna and flora" (21.05.92).</p> <p>Regarding the political situation and its impact on project implementation, the project's final report provides the following description: <i>There were some problems with implementation due to changing legislative environment in Poland (Polish government policy for Natura 2000 practically stop the process of proper Natura 2000 network creating in Poland for almost one year during the project lifetime. But finally, in September 2006, most of the project sites were officially submitted by Polish government to the Natura 2000 network. As a final result, all project sites with one exception are officially submitted by Poland to the Natura 2000 network. Sites submitted in 2004 were formally adopted by the Commission in November 2007, the rest of sites are expected to be adopted by the Commission in October 2008.</i></p>

DESCRIPTION	<b>Beneficiaries</b>	Klub Przyrodników (Naturalists Club Poland)
	<b>Ecosystem/habitat covered</b>	Raised bogs, transition mires and quaking bogs, beech forests, bog woodland, alluvial forests, dystrophic lakes and ponds, European dry heaths, Northern Atlantic Wet Heaths
	<b>Species covered</b>	Not relevant
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• Restoration zones</li> <li>• Protected areas</li> </ul>
	<b>General actions/measures</b>	<ul style="list-style-type: none"> <li>• Identification/mapping/spatial planning</li> <li>• Conservation</li> <li>• Restoration</li> <li>• Increasing public awareness</li> <li>• Research/analysis</li> </ul>
	<b>Specific project activities and initiatives</b>	<ul style="list-style-type: none"> <li>• Sites assessment, management plans preparation, habitat Action Plan preparation</li> <li>• Blocking draining ditches by building sluices and dams or filling the ditches</li> <li>• Invasive birch and pine tree removal to decrease evapotranspiration and to improve the water balance</li> <li>• Removal of spruce (alien species here) invading the bogs</li> <li>• Experimental removal of dry peat earth and Sphagnum transplantation</li> <li>• Work with local communities and influential stakeholders to build awareness of bogs value</li> <li>• Arrangement of a series of workshop and study tours to Estonia (natural bogs) and Scotland (restoring degraded bogs)</li> <li>• Publication of "Handbook of Bogs Conservation"</li> <li>• Construction of public access infrastructure on 3 selected bogs</li> <li>• Presentation and propagation of results</li> </ul>
	<b>Stakeholders involved</b>	<ul style="list-style-type: none"> <li>• Klub Przyrodników (Nature conservation NGO – Beneficiary)</li> <li>• Pomorski Urząd Wojewódzki (PUW) – Wydział Ochrony Środowiska I Rolnictwa (public body responsible for nature conservation in Pomerania Region)</li> <li>• Zachodniopomorski Urząd Wojewódzki (ZUW) (public body responsible for nature conservation in Western Pomerania Region)</li> <li>• Nadleśnictwo Kliniska &amp; Nadleśnictwo Szczecinek (State Forests – 2 forest districts)</li> </ul>

<b>COSTS /BUDGET</b>	<b>Source(s) of funding</b>	LIFE+ and sources listed below																																
		<b>Position in the Project</b>	<b>Name</b>	<b>Contribution</b>																														
				<b>foreseen</b>																														
				<b>real</b>																														
		<b>Beneficiary</b>	Naturalists Club	10386	10000,00																													
	<b>Partners</b>	Pomorski Urząd Wojewódzki	69077	64079,83																														
		Zachodniopomorski Urząd Wojewódzki	23924	18389,79																														
		Nadleśnictwo Szczecinek	11 880	9426,90																														
		Nadleśnictwo Kliniska	6900	9174,14																														
	<b>Cofinacers</b>	GEF	34394	41353,40																														
		EkoFundusz	130696	148872,98																														
	<b>Overall budget</b>	968,337 EUR; EC contribution: 681,080€																																
	<b>Financial costs</b>	<p><u>Final budget breakdown:</u></p> <table border="1"> <thead> <tr> <th>Categories of expenditure</th> <th>Foreseen</th> <th>Final</th> </tr> </thead> <tbody> <tr> <td>1. Personnel</td> <td>175124,00</td> <td>192232,10</td> </tr> <tr> <td>2. Travel</td> <td>26910,00</td> <td>28792,29</td> </tr> <tr> <td>3. External assistance</td> <td>511711,00</td> <td>544966,90</td> </tr> <tr> <td>4. Durable goods</td> <td>35797,00</td> <td>41636,28</td> </tr> <tr> <td>5. Land/rightspurchase/lease</td> <td>0,00</td> <td>0,00</td> </tr> <tr> <td>6. Consumable material</td> <td>123466,00</td> <td>116280,46</td> </tr> <tr> <td>7. Other Costs</td> <td>34000,00</td> <td>33829,74</td> </tr> <tr> <td>8. Overheads</td> <td>61329,00</td> <td>12832,48</td> </tr> <tr> <td>TOTAL</td> <td>968337,00</td> <td>970570,25</td> </tr> </tbody> </table> <p><u>Clarification:</u> <u>Other costs</u></p> <p>This category contains:</p> <ul style="list-style-type: none"> <li>- bank guarantee costs;</li> <li>- administration costs related with land owner identification;</li> <li>- administration fees related with water and building permits;</li> <li>- bank charges related to project account;</li> <li>- delivery service costs;</li> <li>- costs of formal, geodesic maps necessary for planning purposes;</li> <li>- etc.</li> </ul>			Categories of expenditure	Foreseen	Final	1. Personnel	175124,00	192232,10	2. Travel	26910,00	28792,29	3. External assistance	511711,00	544966,90	4. Durable goods	35797,00	41636,28	5. Land/rightspurchase/lease	0,00	0,00	6. Consumable material	123466,00	116280,46	7. Other Costs	34000,00	33829,74	8. Overheads	61329,00	12832,48	TOTAL	968337,00	970570,25
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	<b>Opportunity costs</b>	N/A																																

BENEFITS	<b>GI provision</b>	N/A
	<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>• Improved ecosystem services</li> <li>• Removal of local threats for biodiversity, created by species expansive as a result of desiccation</li> <li>• Halting of draining processes following desiccation of the peatbogs</li> </ul>
	<b>Socio-economic effects</b>	<ul style="list-style-type: none"> <li>• Creating of public access infrastructure for selected bogs create small, but important benefit for tourism development.</li> <li>• Local communities in northern part of Poland are looking for new sources of income. Tourism based on natural values is often recognized as one such potential source. From this point of view, each action creating new tourist attractions will be perceived as benefit for local communities. The project met this expectation. We identified additional needs and possibilities to develop more public access facilities to the project sites and their use for environmental education.</li> <li>• We fail in preventing unemployment effect. After the EU accession and huge temporal emigration, in project region unemployment exists only in official statistics, not in the practice. In practice, there are difficulties in finding employees ready to work, especially for simple works as ditches filling and trees removing.</li> <li>• The project was very important for building public awareness of bog's values and necessity of its conservation. For this, especially important were project presentation via media to general public:             <ul style="list-style-type: none"> <li>○ the project was presented in radio TOK FM broadcast;</li> <li>○ the project was presented in a fragment of TV film prepared by Regional TV in Gdańsk;</li> <li>○ the project was presented in article published in regional newspaper "Dziennik Bałtycki";</li> <li>○ the nature trails organised in scope of project were presented in local radio broadcast</li> </ul> </li> </ul>

PROJECT FICHE (N°8)		
<b>KENNET AND AVON CANAL RESTORATION</b> <i>“RESTORATION AND REGENERATION OF A WATERWAY”</i>		
<b>BASIC INFORMATION</b>	<b>Location (spatial scale)</b>	Local
	<b>Relevant sector(s)</b>	Built environment; water
	<b>Project setting</b>	Urban
	<b>Duration/state of implementation</b>	Completed (ongoing since 1960s but major efforts during 1997 and 2002 to complete the restoration efforts)
	<b>Website</b>	-
<b>OBJECTIVES AND RELEVANT POLICIES</b>	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Improved water quality and supply;</li> <li>• Human health and well-being</li> </ul>
	<b>Project summary</b>	<p>In the early 1950s a stretch of the Kennet &amp; Avon Canal was closed when some of the locks fell into dangerous condition, and, through disuse, severe deterioration of the remainder locks followed. Eventually the Kennet &amp; Avon Canal became un-navigable and its future was threatened by legal closure.</p> <p>The restoration of the waterway was prompted by a campaign by the Kennet and Avon Canal Trust, who successfully petitioned against the closure of the canal in 1956. The lengthy restoration of the derelict canal began in 1964 with support from British Waterways and local authorities.</p> <p>The first phase of this great restoration project ended in August 1990 when Her Majesty the Queen declared the 87-mile (140 kilometres) canal open to navigation. However, further improvements were needed, both structurally and to the water supply, as was the development of further visitor facilities and services in order to complete the canal's full restoration.</p> <p>In October 1995, a grant application was made to the Heritage Lottery Fund to complete the canal's full restoration. In 1996 awarded the largest ever grant to the five-year project. The long-term restoration effort has involved £38.9 million since 1997 (£25 million from HLF). Ongoing projects have improved access, interpretation, nature conservation, heritage and landscape along the 87-mile canal.</p>
	<b>Relevant strategy/policy</b>	<p>The restoration of the Kennet and Avon Canal sits within a clear policy and strategic context. The canal's role and the importance of its restoration is explicitly set out within the West Wiltshire Local Development Framework's Leisure and Recreation Development Plan. Sitting under the provision of water-based recreation, Policy WR2 on the Kennet and Avon Canal development aims to promote the use of the canal for leisure purposes by identifying sites for improved access and environmental improvements.</p> <p>The West Berkshire District Council Written Statement also explicitly includes a policy on the Kennet and Avon Canal under its policy regarding recreation and leisure (Policy RL5) which recognizes that the canal is an important recreation and leisure resource. It is based on policy KA7 from the 1993 District Local Plan. Extensions. The Council's</p>

		<p>Policy E10 of the Structure Plan is concerned with protecting the character and setting of rivers, canals and streams which calls for particular attention to be paid to safeguarding the environment of the Kennet and Avon Canal due to development. As a consequence, the Local Plan sets out the criteria to be used in considering proposals for boating and moorings development along the Canal.</p> <p>On the wider policy level, the canal's restoration is also encompassed within the commitment of Reading Borough Council to achieving the aims of the Urban Renaissance, namely that 'Urban neighbourhoods must become places where people of all ages and circumstances want to live'. It is also relevant to the Sustainable Communities Plan which seeks to 'improve the local environment of all communities, including cleaner streets, improved parks and better public spaces'.</p> <p>Moreover, Policy Q2 of the Regional Planning Guidance for the South East (RPG9) seeks to raise the quality of life in urban areas by achieving significant improvements to the urban environment. Policy EN1 of the adopted Berkshire Structure Plan (BSP) and Policy DP5 of the Deposit Berkshire Structure Plan (DBSP) seek to enhance the quality of the urban environment in order to achieve more sustainable communities. Along with the BSP, the adopted Reading Borough Local Plan (1998) (RBLP) provides the statutory policy platform. In particular, but not exclusively, policies CUD 14 (Standards of Design in Development), TRN 6 (Pedestrians), and WAT 9 (Waterway Design Objectives) provide the policy context for the canal's restoration.</p>
DESCRIPTION	<p><b>Beneficiaries</b></p>	<p>Communities and businesses using the canal; <i>to be further specified</i></p>
	<p><b>Ecosystem/habitat covered</b></p>	<p>Urban green space; habitats around waterways Several Sites of Special Scientific Interest (SSSI) are found along and close to the Kennet &amp; Avon Canal. The most important are the Aldermaston Gravel Pits, Woolhampton and Thatcham Reed Beds and Freemans Marsh, Hungerford. There are also many non-statutory nature reserves throughout the length of the canal.</p>
	<p><b>Species covered</b></p>	<p>The canal forms one of the most important habitats for the threatened Water Vole. It is also particularly rich in the range of species of Odonata (dragonflies and damselflies). It provides important habitats for birdlife (over 100 species recorded), including kingfishers, herons, sand martins, waterfowl and reed buntings. Small vertebrate and invertebrate species are prevalent</p>
	<p><b>GI elements addressed</b></p>	<ul style="list-style-type: none"> <li>• Green urban areas</li> <li>• Natural connectivity features</li> <li>• Multifunctional zones</li> </ul>
	<p><b>General actions/measures</b></p>	<ul style="list-style-type: none"> <li>• Spatial planning</li> <li>• Restoration</li> <li>• Maintaining/Protecting (e.g. to preserve and create water vole habitat)</li> </ul>
	<p><b>Specific project activities and initiatives</b></p>	<p>N/A</p>
	<p><b>Stakeholders involved</b></p>	<ul style="list-style-type: none"> <li>• British Waterways</li> <li>• Local Councils</li> <li>• Kennet and Avon Canal Trust</li> <li>• The Association of Canal Enterprises</li> </ul>

<b>COSTS /BUDGET</b>	<b>Source(s) of funding</b>	Heritage Lottery Fund grant and financial assistance from local authorities along the canal
	<b>Overall budget</b>	£38.9 million since 1997 (£25 million from HLF)
	<b>Financial costs</b>	N/A
	<b>Opportunity costs</b>	N/A
<b>BENEFITS</b>	<b>GI provision</b>	87-mile long canal restored
	<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>• Habitats for threatened wildlife such as the water vole have been created and safeguarded.</li> <li>• Improved waste management facilities have been installed for the increased numbers of visitor and canal boat users.</li> </ul>
	<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>• Direct and indirect employment created by the project totalled 150-210 FTE jobs between 1997 and 2002. The total number of jobs created and safeguarded by the project is estimated at 1,198-1,353 FTEs.</li> <li>• The net economic impact of the programme was estimated at £82 million to 2003. This included £29 million of direct expenditure on restoration and an additional £53 million of further investment in tourism, leisure and commercial development.</li> <li>• Visitor numbers increased by 15% between 1995 and 2001. 81% of survey respondents believe the restoration has improved access and 80% believe it has encouraged visitors to the area.</li> </ul>

PROJECT FICHE (N°9)		
GREEN ROOF BUILDING REGULATIONS		
BASIC INFORMATION	<b>Location (spatial scale)</b>	Basel, Switzerland (local/regional)
	<b>Relevant sector(s)</b>	Energy, built environment, urban and regional planning, health
	<b>Project setting</b>	Urban
	<b>Duration/state of implementation</b>	1996-1997; building regulations implemented in 2002; 2005-2006
	<b>Website</b>	<a href="http://www.unr.ch">www.unr.ch</a> ; <a href="http://www.naturdach.ch/">http://www.naturdach.ch/</a>
OBJECTIVES AND RELEVANT POLICIES	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Climate change adaptation and mitigation</li> <li>• Biodiversity conservation</li> <li>• Human health/quality of life/well-being</li> </ul>
	<b>Project summary</b>	<p>The city of Basel in Switzerland has the highest area of green roofs per capita in the world. The use of green roofs has been stimulated by a combination of financial incentives and building regulations. Building regulations have required the use of vegetation on roofs since their implementation in 2002. Initiatives aiming to increase the provision of green roofs in Basel were initially driven by energy-saving programmes, and subsequently by biodiversity conservation. The focus on green roofs was promoted by the researchers from the Zurich University of Applied Sciences (ZHAW) in Wädenswil, Switzerland, who worked to influence decision-makers in Basel to amend the building regulations and offer financial incentives to increase green roof coverage.</p>
	<b>Relevant strategy/policy</b>	<p>In the early 1990's the City of Basel implemented a law to support energy saving measures. According to this law, which was the only one of its type in Switzerland, 5% of all customers' energy bills are put into an Energy Saving Fund, which is then used to fund energy saving campaigns and measures. The national Department of Environment and Energy decided to pursue and promote green roofs using this source of funds. Green roofs were funded by the City of Basel for a two-year period in the mid-1990s to stimulate interest and awareness.</p> <p>The City of Basel has promoted green roofs via:</p> <ul style="list-style-type: none"> <li>• Investment in incentive programmes, which provided subsidies for green roof installation. The first incentive programme ran between 1996 and 1997, and was funded from the Energy Saving Fund. This focused on the insulating characteristics of green roofs and their capacity to reduce energy consumption. This was followed by another incentive programme ran between 2005 and 2006, which incorporated design specifications into the green roof guidelines.</li> <li>• In 2002, following the first incentive programme, and incorporating the outcomes of the research into biodiversity value of green roofs, an amendment to the City of Basel's Building and Construction Law, was passed (paragraph 72). It reads that all new and renovated flat roofs must be greened (5) and also stipulates associated design guidelines.</li> </ul>

<b>DESCRIPTION</b>	<b>Beneficiaries</b>	<ul style="list-style-type: none"> <li>• Zurich University of Applied Sciences (funding for PhD research into potential of different designs of green roofs to provide valuable habitat for invertebrate species and birds)</li> <li>• Those receiving incentives through the 2 programs</li> </ul>
	<b>Ecosystem/habitat covered</b>	Urban landscapes
	<b>Species covered</b>	Not applicable.
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• Natural connectivity features</li> <li>• Green urban areas</li> </ul>
	<b>General actions/measures</b>	<ul style="list-style-type: none"> <li>• Connecting habitats and features</li> <li>• Creating new GI components</li> <li>• Increasing public awareness</li> </ul>
	<b>Specific project activities and initiatives</b>	N/A
	<b>Stakeholders involved</b>	<ul style="list-style-type: none"> <li>• City of Basel; the local business association,</li> <li>• the horticultural association,</li> <li>• the green roof association,</li> <li>• the Pro Natura Basel environmental organization,</li> <li>• the Department of Parks and Cemeteries in the City of Basel,</li> <li>• the National Department of Environment, Forest and Landscapes</li> </ul>
<b>COSTS/ BUDGET</b>	<b>Source(s) of funding</b>	City of Basel (1 million Swiss Francs for 1996-1997 green roof incentive program; 1 million more CHF for 2005-2006 incentive program)
	<b>Overall budget</b>	N/A
	<b>Financial costs</b>	N/A
	<b>Opportunity costs</b>	N/A
<b>BENEFITS</b>	<b>GI provision</b>	N/A
	<b>Environmental benefits/ecosystem services</b>	<ul style="list-style-type: none"> <li>• 700,000 m2 of green roof habitat created</li> <li>• Protection of endangered invertebrate species</li> <li>• 4 giga watt-hours savings/yr across Basel (1st incentive program) and 3.1/yr in 2nd program</li> </ul>
	<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>• Local business profits from sale of materials and supplies relating to installation of green roofs</li> <li>• Energy savings for business owners</li> <li>• Worldwide recognition of Basel for achievements</li> </ul>

PROJECT FICHE (N°10)		
PROTECTION OF BIODIVERSITY OF THE SAVA RIVER BASINS FLOODPLAINS		
BASIC INFORMATION	<b>Location (spatial scale)</b>	Slovenia, Croatia, Serbia, Bosnia-Herzegovina (transnational)
	<b>Relevant sector(s)</b>	Nature protection (tourism, water, agriculture, forestry)
	<b>Project setting</b>	Rural
	<b>Duration/state of implementation</b>	Jan 2007 - June 2008, implemented
	<b>Website</b>	<a href="http://www.savariver.com">www.savariver.com</a>
OBJECTIVES AND RELEVANT POLICIES	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Life/well-being</li> <li>• Sustainable management</li> <li>• Water quality and supply</li> <li>• Biodiversity conservation</li> </ul>
	<b>Project summary</b>	The overall objective is to protect and manage the unique landscape and biodiversity along the Sava River through supporting Croatia and Bosnia-Herzegovina to: a) identify, protect and manage floodplain areas of importance for the landscape and biodiversity applying the criteria of the Birds and Habitats Directive, b) design a coherent transboundary ecological network of the core areas, buffer zones and corridors, c) identify floodplain areas capable of storing floods d) building capacities in the implementation of the Birds and Habitats Directive d) introducing land use practices that support the protection of the landscape and biodiversity e) support the development of rural tourism and f) raise awareness on the need to protect and manage the unique landscape and biodiversity along the Sava through transboundary co-operation. To achieve transboundary coherence the project will involve experts from Serbia and Slovenia.
	<b>Relevant strategy/policy</b>	This project falls under the Birds and Habitats Directive and involves sites that are part of the Natura 2000 network.
DESCRIPTION	<b>Beneficiaries</b>	International Union for the Conservation of Nature (IUCN)
	<b>Ecosystem/habitat covered</b>	River basin floodplains
	<b>Species covered</b>	Not applicable
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• Protected areas</li> <li>• Sustainable use areas</li> <li>• Natural connectivity features</li> <li>• Multifunctional zones</li> </ul>
	<b>General actions/measures</b>	<ul style="list-style-type: none"> <li>• Conservation</li> <li>• Connecting habitats and features</li> <li>• Increasing public awareness</li> <li>• Identification/mapping</li> </ul>
	<b>Specific project</b>	<ul style="list-style-type: none"> <li>• Carry out the Inception phase, incl. consolidating and increasing</li> </ul>

COSTS 7 BUDGET	activities and initiatives	<p>commitment of the Sava countries to designate and manage an ecological network along the Sava River.</p> <ul style="list-style-type: none"> <li>• Task B Assess and Protect biodiversity, where actions will concentrate on assessing the biodiversity and threat factors, proposing an ecological network with focus on Natura 2000 habitat types and species, and developing action plans to establish and maintain the network and securing favourable conservation status for the Natura 2000 habitat types and species.</li> <li>• Task C Maintain and improve land use practices with actions dedicated to identify land use practices and their relevance for the landscape and biodiversity, develop action plans for extensive land use and close-to-nature forestry practices, and develop innovative land use practices to support protection of floodplain landscape and biodiversity.</li> <li>• Task D Establish GIS with emphasis on harmonising database structures and procedures in accordance with the EU Birds and Habitats Directives and Water Framework Directive, and supporting establishment of GIS databases.</li> <li>• Task E Awareness Raising where the actions will focus on carrying out an awareness raising campaign.</li> <li>• Task F Project Management and reporting.</li> <li>• Task G Dissemination of lessons learned and experiences gained in order to publish and translate the produced strategies and action plans into three languages and also for the international society to spread the information and know-how gathered.</li> <li>• (Specific time schedule of implementation of activities can be found in the mid-term report)</li> </ul>																																							
	Stakeholders involved	<ul style="list-style-type: none"> <li>• IUCN</li> <li>• Wageningen International</li> <li>• Center for Ecology and Natural Resources of the Faculty of Science in Sarajevo (CEPRES), BiH</li> <li>• Agricultural Institute of the Republic of Srpska</li> <li>• Institute for Nature Conservation of Serbia</li> <li>• State Institute for Nature Protection of Croatia</li> </ul>																																							
	Source(s) of funding	LIFE+ Swiss Agency for Development and Cooperation																																							
	Overall budget	€863.940; EC contribution: €601.210																																							
	Financial costs	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Breakdown by category</th> <th style="text-align: right;">Total costs in €</th> <th style="text-align: right;">Eligible costs in €</th> </tr> </thead> <tbody> <tr> <td>Personnel</td> <td style="text-align: right;">496,758</td> <td style="text-align: right;">496,758</td> </tr> <tr> <td>Travel and subsistence expenses</td> <td style="text-align: right;">80,872</td> <td style="text-align: right;">80,872</td> </tr> <tr> <td>External assistance</td> <td style="text-align: right;">129,722</td> <td style="text-align: right;">129,722</td> </tr> <tr> <td>Durable goods</td> <td></td> <td></td> </tr> <tr> <td>Infrastructure</td> <td style="text-align: right;">-</td> <td style="text-align: right;">-</td> </tr> <tr> <td>Equipment</td> <td style="text-align: right;">-</td> <td style="text-align: right;">-</td> </tr> <tr> <td>Prototypes</td> <td style="text-align: right;">-</td> <td style="text-align: right;">-</td> </tr> <tr> <td>Land/rights purchase</td> <td style="text-align: right;">-</td> <td style="text-align: right;">-</td> </tr> <tr> <td>Consumables</td> <td style="text-align: right;">38,403</td> <td style="text-align: right;">38,403</td> </tr> <tr> <td>Other costs</td> <td style="text-align: right;">11,659</td> <td style="text-align: right;">11,659</td> </tr> <tr> <td>Overheads</td> <td style="text-align: right;">53,018</td> <td style="text-align: right;">53,018</td> </tr> <tr> <td><b>TOTAL</b></td> <td style="text-align: right;"><b>810,432</b></td> <td style="text-align: right;"><b>810,432</b></td> </tr> </tbody> </table>	Breakdown by category	Total costs in €	Eligible costs in €	Personnel	496,758	496,758	Travel and subsistence expenses	80,872	80,872	External assistance	129,722	129,722	Durable goods			Infrastructure	-	-	Equipment	-	-	Prototypes	-	-	Land/rights purchase	-	-	Consumables	38,403	38,403	Other costs	11,659	11,659	Overheads	53,018	53,018	<b>TOTAL</b>	<b>810,432</b>	<b>810,432</b>
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Opportunity costs	N/A																																								

<b>BENEFITS</b>	<b>GI provision</b>	N/A
	<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>• Improved ES</li> <li>• Protection of globally significant biodiversity</li> </ul>
	<b>Socio-economic benefits</b>	<ul style="list-style-type: none"> <li>• Local economic growth (increased tourism)</li> <li>• Support of rural development through stimulating sustainable land use practices and rural tourism</li> </ul>

PROJECT FICHE (N°11)		
<b>LAKE PAPE</b>		
<i>“CONSERVATION, PRESERVATION AND EVOLUTION”</i>		
<b>BASIC INFORMATION</b>	<b>Location (spatial scale)</b>	Lake Pape, Lativa (local/regional)
	<b>Relevant sector(s)</b>	Agriculture, water, nature protection, tourism
	<b>Project setting</b>	Rural
	<b>Duration/state of implementation</b>	1 Oct 2003 to 4 Oct 2007
	<b>Website</b>	-
<b>OBJECTIVES AND RELEVANT POLICIES</b>	<b>Overall objectives</b>	<ul style="list-style-type: none"> <li>• Biodiversity conservation</li> <li>• Sustainable management</li> <li>• Water quality and supply</li> <li>• Climate change adaptation and mitigation</li> </ul>
	<b>Project summary</b>	<p>The project set out to tackle the main threats to the Lake Pape region in a coordinated way and to create a sustainable long-term institutional framework for managing Lake Pape Nature Park. The threats included: the overgrowing of Lake Pape by reeds and merging of reed beds; extraction of peat outside of the strong protection zone potentially endangers active raised bog habitat; loss of wetland and meadow habitats required by protected species; threats by unregulated visitor/tourist use of the area for recreational purposes; a lack of capacity of municipalities and government institutions to enforce nature regime rules and laws.</p> <p>It aimed to work in partnership with the two municipal authorities to develop a preservation regime for defined priority habitats such as coastal lagoons and natural raised bogs, and introduce grassland management to maintain habitat for endangered wetland birds. It sought to create a long-term management structure, which would include management plans acceptable to other stakeholders and a monitoring system to police new regulations preventing illegal fishing and hunting and providing protection for sensitive dunes and wetlands. This would look to maintain and extend the project's gains. Water-management assessment would be made and work carried out to improve exchange of water between lake, sea and source rivers. It was also a specific objective to minimize destructive visitor impact by producing public information and introducing systems such as nature trails and signs.</p>
	<b>Relevant strategy/policy</b>	This project relates to the Natura 2000 network, as well as Commission Regulation 1257/1999 EC, Recommendation 2002/413 EC and Directives 79/409/EEC -"Conservation of wild birds" and 92/43/EEC - "Conservation of natural habitats and of wild fauna and flora".
	<b>Beneficiaries</b>	WWF Latvia (Pasauls dabas fonds)
<b>DESCRIPTION</b>	<b>Ecosystem/habitat covered</b>	<ul style="list-style-type: none"> <li>• Active raised bogs</li> <li>• Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i></li> </ul>

		<ul style="list-style-type: none"> <li>• Coastal lagoons</li> <li>• Boreal Baltic coastal meadows</li> <li>• Fixed coastal dunes with herbaceous vegetation ("grey dunes")</li> <li>• Hard oligo-mesotrophic waters with benthic vegetation of Chara spp</li> </ul>
	<b>Species covered</b>	Not applicable.
	<b>GI elements addressed</b>	<ul style="list-style-type: none"> <li>• Protected areas</li> <li>• Sustainable use areas</li> <li>• Multifunctional use zones</li> </ul>
	<b>General actions/ measures</b>	<ul style="list-style-type: none"> <li>• Identification/mapping/spatial planning</li> <li>• Conservation</li> <li>• Restoration</li> <li>• Increasing public awareness</li> </ul>
	<b>Specific project activities and initiatives</b>	<ul style="list-style-type: none"> <li>• Inventory of flora, fauna and habitats, a hydrology study and a feasibility study for calcareous meadows</li> <li>• Building of a bird-watching tower in 2006</li> <li>• Removal of 7,748 m of illegal fishing nets</li> <li>• Fencing of 421 ha of land and introduction of 6 horses and 23 cattle (resulting in 54 cattle and 31 horses grazing this land in total)</li> <li>• Production of information, including leaflets, a video and a website</li> <li>• Installation of dams in the bog areas to prevent drying-out and cutting-down of 100 ha of reeds each year</li> </ul>
	<b>Stakeholders involved</b>	<ul style="list-style-type: none"> <li>• WWF Latvia (Pasaules dabas fonds)</li> <li>• Spilas Ltd. Latvia</li> <li>• Flaxfield Nature Consultancy, Netherlands</li> <li>• State Joint Stock Company 'Latvian State Forests' Lare Herbivore Foundation (LHF), The Netherlands</li> <li>• Wildlife and Environmental Film Production, Latvia</li> </ul>
<b>COSTS /BUDGET</b>	<b>Source(s) of funding</b>	LIFE+
	<b>Overall budget</b>	911,744.00 € ; EU contribution: 683,808.00 €
	<b>Financial costs</b>	N/A
	<b>Opportunity costs</b>	N/A
<b>BENEFITS</b>	<b>GI provision</b>	N/A
	<b>Environmental benefits/ ecosystem services</b>	<ul style="list-style-type: none"> <li>• Improved water exchange</li> <li>• Prevented overgrowth of the lake</li> <li>• Improved habitat for wildlife</li> </ul>
	<b>Socio-economic benefits</b>	N/A