

## What is Green Infrastructure?

Green Infrastructure “is a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings.” Linked together, these strategically planned networks of green elements are able to provide multiple benefits in the form of supporting a green economy, improving quality of life, protecting biodiversity and enhancing the ability of ecosystems to deliver services such as disaster risk reduction, water purification, air quality, space for recreation and climate change mitigation and adaptation.

## The European Green Infrastructure Strategy

The Green Infrastructure Strategy proposed by the European Commission, promotes the development of Green Infrastructure across the EU delivering economic, social and ecological benefits and contributing to sustainable growth. It guides the implementation of Green Infrastructure at EU, regional, national and local levels. A main feature of the Green Infrastructure Strategy is its integration into relevant policies through: ecosystem-based adaptation into climate change policies; nature-based solutions into research and innovation policies; natural water retention measures into water policies; and through its focus on delivering multiple ecosystem services and their underlying factor - a rich biodiversity - into nature policies. The Natura

2000 network in particular plays a major role in protecting many of the core areas with healthy ecosystems.

As Green Infrastructure can make a significant contribution to many sectors and EU policy objectives, Green Infrastructure is being integrated into many funding streams including Structural Funds (the European Regional Development Fund (ERDF); European Social Fund (ESF)), the Cohesion Fund (CF), the European Maritime and Fisheries Fund (EMFF), the European Agricultural Fund for Rural Development (EAFRD), LIFE+ and Horizon 2020 project funds and the Natural Capital Financing Facility (NCF) of the European Investment Bank (EIB).

## Costs & benefits of Green Infrastructure

Green Infrastructure can often provide more benefits at less cost than single-purpose grey infrastructure. A growing body of research and experience demonstrates Green Infrastructure’s high potential due to its multi-functionality, i.e., its ability to perform several functions and to provide several benefits in the same spatial area. These functions can be social (providing healthy environment or green space for leisure and sports), environmental (conserving biodiversity or adapting to climate change and related water issues), and economic (supplying jobs, raising property prices and reducing damage recovery costs). These benefits will however only be fully delivered if Green Infrastructure elements are functional: they need to be big enough, at the right place and well connected. At the same time, these multiple benefits need to be weighed against the costs of establishing and maintaining Green Infrastructure, ideally over the expected life cycle.

## Green Infrastructure and the European Semester

Green Infrastructure can play a role in the European Semester, for instance through natural flood prevention or job creation. Floods are among the most common and most costly natural disasters in Europe, and flooding events are likely to become more frequent with climate change. Benefiting from nature’s own capacity to absorb large quantities of excess water is cost-effective and can play a major role in sustainable flood risk management. Investing in Green Infrastructure for flood protection typically yields benefits 6-8 times the costs. Investments in Green Infrastructure can help boost new markets in services, such as planning, implementing and monitoring Green Infrastructure.

## Green Infrastructure in Germany

Germany is a federal state in which the authority on nature conservation matters – and also planning and implementing of Green Infrastructure – largely lies with the 16 Federal Länder. The German Federal Länder each have their specific policies and activities on Green Infrastructure and nature conservation. However, the federal government can decide on overarching policy and planning programmes, whilst always respecting the shared responsibilities at the federal and regional levels.

## Policy setting & ongoing implementation

A national Green Infrastructure concept will be published in 2016. All relevant federal nature conservation strategies, objectives and concepts will be brought together in a single document to improve the integration of nature conservation policy in all federal activities, e.g., flood protection, federal transport infrastructure and energy networks.

Germany's National Natural Heritage scheme covers outstanding natural and cultural landscapes of national conservation interest. According to the coalition agreements adopted in 2005, 2009 and 2013, about 155,000 ha should be transferred to Länder, agencies, nature conservation organisations or foundations to be conserved in perpetuity. More than 70% of the area of the first two transferred tranches includes former military training grounds. The future aim in the transferred forests is wilderness.



In 2012, the German government adopted the Federal Defragmentation Programme (Bundesprogramm Wiedervernetzung) to maintain and restore Green Infrastructure across the national German road network. The programme aims to reconnect habitat corridors for flora and fauna that have been disconnected by the national road network by constructing crossing aids for wildlife (in particular green bridges). It focuses primarily on the existing road network, but also on new planned federal roads, nature conservation and landscape management as well as integrated spatial planning to facilitate the reconnection of a national biotope network. Results of research by the Federal Agency for Nature Conservation on habitat corridors in Germany (available since 2009) provide the scientific basis for the Federal Defragmentation Programme. Four indicative maps were compiled: the dry biotope habitat network, the wet biotope habitat network, the habitat network of valuable forest biotopes and the corridor system for larger mammals. Combined, these four maps represent the network of habitat corridors in Germany. The implementation of the programme by the various Federal Länder is currently at different stages.

Action 5 of the EU Biodiversity Strategy to 2020 calls Member States to work on the "Mapping and Assessment of the state of Ecosystems and their Services" (MAES). Germany is currently in the process of assessing national ecosystem services, covering several ecosystems ranging from forest to coastal areas, urban areas, grassland, etc., across the whole country from lowland to mountain areas.



In 2009, Germany presented a Status Report on German Floodplains, which documented the dramatic decline in floodplains. In a new approach to help solve this problem, the German Government is preparing a Federal Blue Ecological Network Programme (Bundesprogramme Blaues Band) for 2016, which will deal with the restoration of rivers and floodplains in Germany. The ecological status of federal waterways and their associated floodplains shall be enhanced, in particular in these sections that are no longer needed for shipping (length of about 2,800 km). The idea behind the Blue Ecological Network was inspired by the (now) European Green Belt initiative. The German stretch of the Green Belt, previously the border between East and West Germany, is part of the national natural heritage and has since become a valuable biotope network running through the country. Like the land in the former border area, Germany's rivers and their banks are also suitable for establishing a national biotope network.

An important initiative for Green Infrastructure in urban areas started in June 2015 with the "Green in Cities - for a liveable future" conference at which a "green paper" was presented outlining the importance and multiple functions of urban green infrastructure as well as current challenges and perspectives related to it. A planned "white paper" will recommend actions to be taken to improve Green Infrastructure in the German urban areas.

## Good practices in Germany

### Green Infrastructure in Leipzig

After German unification, there was an economic decline and a population shrinkage in Leipzig. The city reacted by enhancing the urban liveability, developing not only pocket parks but also identifying sites for detached houses in a green environment where the large and empty building blocks were demolished. This was part of the up-valuation of urban areas, in order to deal with and counter urban shrinkage. There were also other investments in urban green. In Paunsdorf, in the Eastern part of the city, a "Green Arc" (a chain of green spaces surrounding a large high density housing area) was developed as part of the Green Infrastructure of the city, and water buffaloes now contribute to a landscape of ponds and swamps which visitors can enjoy. The wild animals are valued by the inhabitants of the adjacent housing area. These interventions can be seen in a wider context of other relevant projects around Leipzig including green corridors, the "Green Ring" and the "Parthe Floodplain". All of these strategies contribute to the Green Infrastructure in the Leipzig Halle Region.

### Storm water management in the Emscher region

Storm water management through Green Infrastructure has been successful in the Emscher region. Years ago, confronted with widespread occurrences of land subsidence due to mining, the Emschergenossenschaft, one of the largest public water boards in Germany, straightened, deepened and embanked the Emscher River and canalised its tributaries. The coal crisis of 1957 led to a transition away from heavy mining industry in the region to a post-industrial economy based on high-tech and service industries. This transition also sparked a large-scale project to restore the Emscher River, which began in the early 1990s. Redirecting wastewater to treatment plants through a new subsurface sewer system has helped re-naturalise the surface hydrology of the Emscher catchment and its tributaries, converting many former industrial sites to green spaces in the process. The size and costs of the new sewer system were kept as low as possible by reducing the storm water input to the system through the widespread and concerted use of Green Infrastructure.



Floodplain Restoration

### Floodplain restoration in Lenzener Elbtalau

Floodplains perform a variety of ecosystem functions and services, more than many other ecosystems. According to the 2009 status report on German floodplains, only around 30% of the original floodplains of the country's major rivers remain. Along the lower Middle Elbe, dykes disconnect 80-90% of the floodplains from the hydrological regime of the river. In Lenzen, dyke relocation provided 420 ha of hydrologically rehabilitated floodplain. Scattered plantations of autochthonous woody species provided additional alluvial forest. This "Large Scale Conservation Project" was funded by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, the federal state of Brandenburg and the "Trägerverband Lenzen". It perfectly matches the requirements of the European Water Framework Directive and the EU Habitats and Birds Directives as well as addressing the flood risk management of the river Elbe. The combination of nature conservation objectives and flood protection goals make this project an example for an efficient and integrated approach for implementing Green Infrastructure. A second dyke relocation project, "Mittlere Elbe", close to the city of Dessau, is still under construction; it will provide 600 ha of reconnected floodplain.

### MoorFutures in Mecklenburg-Vorpommern

BLiving, intact moorlands store large amounts of carbon and water and offer habitats and refuge areas to many endangered species. They are valuable core elements of Green Infrastructure, delivering a range of ecosystem services such as climate regulation through carbon sequestration and water

regulation by water filtration and retention. Today, however, 95% of all large moors in Germany are drained for agriculture, forestry and peat extraction, releasing large amounts of greenhouse gases. For the dehydrated peat soils in Mecklenburg-Vorpommern, this currently amounts to 6.2 million tonnes of CO<sub>2</sub> equivalent per year. The Ministry of Agriculture, Environment and Consumer Protection of Mecklenburg-Vorpommern aims to shift to land use that works at higher water levels. Since 2011, MoorFutures is the financial mechanism that supports this transition. In Polder Kieve, 55 ha were re-wetted in 2012 with financing from MoorFutures.

Social benefits are estimated at EUR 1 million per year for each area of 10,000 acres converted to a wet, more extensive management regime. There are many climate benefits as well as biodiversity and leisure benefits.



## Challenges and opportunities

- Integration of Green Infrastructure planning and finance in urbanisation schemes.
- Integration of Green Infrastructure into agricultural schemes.
- There are many pilots and good practices in Germany. A next step would be to accelerate implementation and to bring Green Infrastructure solutions to a larger scale.
- Highlighting Green Infrastructure's economic and monetary benefits will encourage further uptake of Green Infrastructure.

### References

- Damm, C., 2013. Ecological restoration and dike relocation on the river Elbe, Germany. *Scientific Annals of the Danube Delta Institute* 19, 79-86.
- Darla Nickel, Wenke Schoenfelder, Dale Medearis, David P. Dolowitz, Melissa Keeley & William Shuster (2014) German experience in managing stormwater with green infrastructure, *Journal of Environmental Planning and Management*, 57:3, 403-423  
[http://www.bfn.de/0318\\_teeb-de.html](http://www.bfn.de/0318_teeb-de.html)  
<http://www.bfn.de/11930.html>  
[http://www.bundestag.de/presse/hib/2015\\_01/-/354424](http://www.bundestag.de/presse/hib/2015_01/-/354424)  
<http://www.hamburg.de/contentblob/3908156/data/erlaeuterungen-freiraumver-engl.pdf>  
<http://www.naturkapitalteeb.de/fallbeispiele/studien-und-fallbeispiele-mit-interaktiver-karte/kartenansicht.html>
- Promny, M., Hammer, M., Busch, N., 2014. Untersuchungen zur Wirkung der Deichrückverlegung Lenzen auf das Hochwasser vom Juni 2013 an der unteren Mittlere Elbe. *Korrespondenz Wasserwirtschaft* 7, 344-349.

Contract details: EC DG ENV, ENV.B.2/SER/2014/0012 "Supporting the implementation of the European Green Infrastructure Strategy"

Presented by: Trinomics, Alterra, Arcadis, Regional Environment Centre, Risk & Policy Analysis, Stella Consulting.

Disclaimer: The information and views set out in the factsheet are those of the author(s) and do not necessarily reflect the official opinion of the European Commission (EC). The EC does not guarantee the accuracy of the data included in this factsheet. Neither the EC nor any person acting on the EC's behalf be held responsible for the use, which may be made of the information contained therein.