



Document title	Background document on "Green infrastructure" / "Blue corridors"
Code	4-3
Category	INF
Agenda Item	4 - Ecosystem-based approach in MSP
Submission date	31.10.2017
Submitted by	HELCOM Secretariat
Reference	

Background

The work plan of the MSP WG includes the task 3.3 *Investigate the possible regional development of concepts such as green infrastructure, blue corridors etc.*

This document contains background information on "Green Infrastructure" / "Blue Corridors" as well as an overview of the currently available regional datasets of potential relevance to mapping them, including data on ecosystem components, Red listed species and habitats and biotopes, and MPAs.

Action requested

The Meeting is invited to take note of the information and make use of it when further planning the work on "Green Infrastructure" / "Blue Corridors", as appropriate.

Background information on “Green Infrastructure” / “Blue Corridors

Definitions of Green Infrastructure

In land use planning the concept of green infrastructure has commonly been described as a methodology to ensure the functioning of certain ecosystem services in constructed areas. These ecosystem services are often hydrology-related such as stormwater management – for example the United States Environmental Protection Agency (US EPA) defines green infrastructure as *“A cost-effective, resilient approach to managing wet weather impacts that provides many community benefits.”*

In the European Union (EU) the term green infrastructure has been used in a broader sense, extending to natural areas and including other ecosystem services. Under [the EU Strategy on Green Infrastructure](#) several definitions for green infrastructure can be found, such as *“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, green infrastructure is present in rural and urban settings.”* and *“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.”*

Even though *coastal resilience* (mitigation of climate change effects such as erosion caused by sea-level rise and stormwater surges on the coastline) has been described by US EPA as part of green infrastructure and coastal and marine areas are mentioned in the EU Strategy on Green Infrastructure, the focus has previously been mostly on terrestrial and fresh-water environments. As in ecosystem service related issues in general, until recently work on marine areas as part of the green infrastructure has so far been scarce compared to terrestrial areas.

The functions and features of green infrastructure

The DG Environment Science for Environmental Policy In-depth Report [The Multifunctionality of Green Infrastructure](#) describes the functions of green infrastructure in terms of four broad roles:

- Protecting ecosystems state and biodiversity
- Improving ecosystem functioning and promoting ecosystem services
- Promoting societal wellbeing and health
- Supporting the development of a green economy, and sustainable land and water management

The concept is easily translatable to the marine domain by amending the fourth role to *“Supporting the development of green and blue economy and sustainable land, water and marine management.”*

Green infrastructure is comprised of *features* that contribute to the four roles. These can include spatial features like nature-rich areas (functioning as core and hubs for green infrastructure, e.g. protected areas like Natura 2000 sites and Marine Protected Areas), other wildlife and natural areas, areas of high value for biodiversity and ecosystem health outside protected areas (e.g. EBSAs), ecological corridors (i.e. blue corridors) and ecological buffer zones, or actions such as restoration of landscape and ecosystems.

In practical implementation the green infrastructure features do not always fall into distinct categories. For example, protected areas are core areas but they can also include elements of ecological corridors and buffer zones.

Blue corridors in the green infrastructure

Other concepts such as Blue Corridors can also be linked to green infrastructure. The BALANCE project (2006) defined blue corridors as *“A route of particular importance for the population exchange between locations and of importance for the maintenance of biogeographical patterns of species and communities. Blue corridors are shaped by interplay between the biological characteristics of a species, the physical/chemical characteristics of an area, and the geographical location of habitats. Blue corridors can therefore either be concrete physical features or the preferred or realised route of spread of a species.”*. In this setting blue corridors is a concept meant for describing connectivity in marine habitats and ecosystems, and it's intended use the planning of a coherent MPA network for biodiversity conservation.

Using the green infrastructure framework, blue corridors can be described as features providing the functions of population exchange and maintenance of biogeographical patterns of species and communities by ensuring the connectivity between features like EBSAs and MPAs.

Green infrastructure in the Baltic Sea

Recently Sweden has come forward with the concept of green infrastructure in marine areas, to be used in MSP. It has been defined *“A coherent network of structures in the landscape, and the cultivation of the same, which ensure a long-term survival of habitats and species by safeguarding the connectivity potential, thus perpetuating the ability of ecosystems to provide important ecosystem services”*, and could be seen as expansion of the EU green infrastructure definition to marine areas.

The current HELCOM-VASAB MSP WG work plan paragraph 3.3 calls to *“Investigate the possible regional development of concepts such as green infrastructure, blue corridors etc.”*, with the aim of producing a draft regional concept of a green infrastructure by the end of 2019. The upcoming Pan Baltic SCOPE project will cover green infrastructure in an activity testing and further developing the concept in the Baltic Sea region.

Data needs, availability and gaps for green infrastructure work

In general the data needed for producing green infrastructure maps is very similar to other processes such as the defining of EBSAs, mapping and assessment of marine ecosystem services or the HELCOM Holistic Assessment. Ecosystem component maps as well as background data (bathymetry and coastline) in a relevant scale are needed for the work.

HELCOM hosts a variety of datasets to be used in the upcoming CBD Regional Workshop to Facilitate the Description of Ecologically or Biologically Significant Marine Areas (EBSA) in the Baltic Sea. Most relevant dataset collections are listed below with a short evaluation on data needs and gaps:

HELCOM HOLASII Ecosystem Components

Benthic species

- Five Important habitat forming species in presence/absence in 5x5 km raster resolution. Data is based on national mapping and made available to HELCOM via a specific data request.

Birds

- Special Protection Areas (SPAs) for wintering and breeding in 1x1 km grid

Broadscale habitats

- Broad-scale habitat maps for the Baltic Sea have been produced in the EUSeaMap project in 2016. For German and Estonian marine areas, national (more accurate) datasets were used. Polygon areas were converted to 1x1 km grid.

Fish

- Abundance and spawning areas for key species (cod, herring, sprat, perch, pikeperch) based on landings, modelling and expert opinion (depending on dataset). Resolution of map products is 1x1 km, although source data is coarser.

Mammals

- Distribution of seals and harbour porpoise based on expert opinion and survey data. Resolution of map products is 1x1 km.

Natura 2000 habitats

- Natura 2000 habitats (Habitat Directive Annex 1) distribution in 1x1 km grid.

Pelagic habitats

- Distribution of oxygen depleted areas and areas with high chlorophyll-a concentrations (representing high productivity) in 1x1 km grid.

HELCOM HOLASII update is underway and the updated Ecosystem Component datasets are expected to be acquired during November 2017. The Ecosystem Component maps will then be updated and used as the basis for Baltic Sea Impact Index calculations. The HOLASII update will be published in 2018 and the updated Ecosystem Component maps will be made available at the HELCOM Map and Data Service.

HELCOM REDLIST datasets

Benthic invertebrates

- Distribution and threat assessment of benthic species in 10x10 km grid, based on observations.

Birds

- Distribution and threat assessment of birds based on expert opinion.

Fish

- Distribution and threat assessment of fish on HELCOM subbasin level (old divisions used)

Marine mammals

- Distribution and threat assessment of marine mammals on HELCOM subbasin level (old divisions used)

Macrophytes

- Distribution and threat assessment of macrophytes in 10x10 km grid, based on observations.

Biotopes

- Distribution and threat assessment of biotopes in 100x100 km grid, based on observations.

Biotope complexes (Habitat directive Annex 1)

- o Distribution and threat assessment of biotope complexes in 100x100 km grid, based on observations.

Data availability, gaps, challenges and improvements for HELCOM HOLASII update*Benthic species*

- Obtaining species data requires resource-intensive mapping efforts. Current datasets have been gathered from national mapping programmes and research institutes, and their coverage is not even throughout the Baltic Sea region.
- For HOLASII update the contracting parties will provide most recent survey data available.

Birds

- Bird monitoring methods and efforts vary within the region, and more precise data is needed.

Habitats

- Habitat modelling is heavily dependent on data on presence/absence (requires resource-intensive field work), bathymetry and substrate (which are restricted in some countries). The EUSeaMap dataset is in a scale of 1:250 000, which works for region-wide assessments but is too coarse for green infrastructure work on national scale.
- The Natura 2000 habitats dataset coverage and methods used vary throughout the region. All HELCOM contracting parties are not EU member states so the dataset has not been produced for their marine area.

Pelagic habitats

- Oxygen data requires monitoring effort. Chl-a data can be obtained from recent earth observation datasets and is quite readily available.
- For HOLASII update the current oxygen dataset will be expanded with better coverage of the Gulf of Finland. The chl-a dataset will be updated using data from SENTINEL-3 satellite imagery.

Fish

- Using landing data is currently the only feasible way to assess abundance but a more accurate method should be developed. Mapping spawning areas is resource-intensive which results in non-uniform coverage throughout the region.

Marine mammals

- Marine mammal species are highly mobile so surveys are challenging and require moulting season observations or telemetric surveillance (for seals) or acoustic surveillance (for harbour porpoise).
- HOLASII update is working with the HELCOM SEAL Expert Group to produce more detailed distribution maps. Current distribution map for the harbour porpoise is based in the SAMBAH project and is the best available dataset so far.

In addition to the above mentioned spatial datasets, [the HELCOM MPA Database](#) contains information on which species/biotopes occurs or is protected within HELCOM MPA area, based on information reported by the Contracting Parties.

These kind of BSR scale datasets can be used in green infrastructure maps on a regional scale but for individual countries' MSP purposes datasets on a more precise scale are needed e.g. on coastal habitats and biotopes.

Detailed habitat and biotope distribution is dependent on field surveys and modelling, which needs precise substrate and bathymetric data as input. These are often hard to obtain or their publication is restricted, which is a common problem in e.g. assessment of marine ecosystem services.

There is also a need for detailed information on important areas for highly mobiles species (e.g. birds, fish, mammals), where species distribution can be described only in very coarse spatial scale due to mobile nature of the species. Important datasets for these kind of species would be e.g. haul-out sites for seals and reproduction and nursery areas of key fish species.

More on green infrastructure / blue corridors / HELCOM HOLASII / Marine Ecosystem Services:

BALANCE Interim report no. 4: [Literature review of the "Blue Corridors" concept and it's applicability to the Baltic Sea](#)

Boon et al 2015: [Mapping and assessment of marine ecosystem services and link to Good Environmental Status \(phase 1\) - Background document to the Roadmap for an integrated approach to a marine MAES](#)

DG Environment Science for Environmental Policy In-depth Report: [The Multifunctionality of Green Infrastructure](#)

Green infrastructure and MSP: [Document 4-2 of HELCOM-VASAB MSP WG 13-2016](#)

[HELCOM HOLASII](#)

Ivarsson et al 2017: [Ecosystem Services in MSP – Ecosystem services approach as a common Nordic understanding for MSP.](#)