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VOJVODINAŠUME

Land Habitat Corridor (WP 6)
Forest pattern, fragmentation and connectivity

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Riparian forests are vital habitats serving multiple functions for flora, fauna and humans.

In the past century, around 90% of the original Danube wetlands has been lost due to human intervention.

Deforestation is defined by a long term loss of canopy cover and area, notably a conversion to another nonforest use (which can be monitored effectively over timeat multiple scales effectively using remote sensing technologies).

In contrast, **forest degradation** is a more poorly understood process which involves partial canopy loss with no clear reduction in forest area, but a reduction in ecosystem services, more often described by a decrease in above ground biomass.

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The main drivers of forest degradation (and deforestation) are related to urban expansion and associated infrastructure, and accidental or deliberate fires for small-scale clearing.

Most remote sensing studies focusing on deforestation and forest degradation are driver specific and aim to detect canopy gaps and clearings through direct approaches such as spectral mixing, or indirect methods such as mapping roads or human settlements or fire monitoring.

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Fragmentation leads to the loss of connectivity among forested landscapes, which is important for biological conservation and biodiversity maintenance.

Restoration of fragmented landscapes is necessary to develop genetic linkages between organisms and biodiversity conservation. This can be achieved by developing connectivity/linkages between fragmented patches.

Habitat loss often leads to the fragmentation, which in turn results in division of large contagious forest to small-disconnected patches. Severity of forests fragmentation has been studied with respect to fragment size, edge effects and biotic pressures.

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Recent studies have shown that fragmentation is an increasing threat to global forests, which has major impacts on biodiversity and the important ecosystem services provided by forested landscapes.

Several tools have been developed to evaluate global patterns of fragmentation.

Deforestation and forest degradation are global problems, significantly altering ecosystems, the services they provide, while contributing to carbon emissions and affecting regulation of global climate and terrestrial carbon storage.

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Many protected areas (PAs) in the region are still surrounded by natural and near natural forests and hence it is possible to expand the PAs to restore the connectivity among the isolated patches (Anon., 2007a).

Developing structural linkages is a complicated task due to presence of different barriers i.e. major roads, railways, power distribution network, canal, large settlements, terrain, land use patterns, etc.

Fragmentation categories

- Intact forests
- Low fragmentation
- Moderate fragmentation
- High fragmentation

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Satellite remote sensing data provides most up-to-date status about the land use dynamics of the area under investigation, whereas, GIS provides the flexibility to store, retrieve and analyze relevant spatial information based on the criteria set by the investigator.

Structural component is mainly related to the spatial arrangement of habitats within a landscape, whereas behavioral component is based on the response of species to the physical arrangements of landscape.

The factor to be taken into account is the **structure** of the corridor. The ecological effectiveness of the corridor will depend on its location, plant composition and particularly its size.

Corridors must **link two ecological entities** that have the greatest diversity of habitats and species. A link with another corridor can be essential for species in the case of a catastrophic event such as a forest fire

The corridor must also have **vegetation suitable** for the target species (in terms of providing food and cover) and must not be subject to excessive pressure from *human activities* (roads, hunting, etc.).

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Remote sensing solutions analyze remotely sensed data to ensure proper assessment and management of food and timber production areas.

These analyses include health and stress detection, change detection for land use dynamics, monitoring of logging and pest activities, and fire danger zone mapping.

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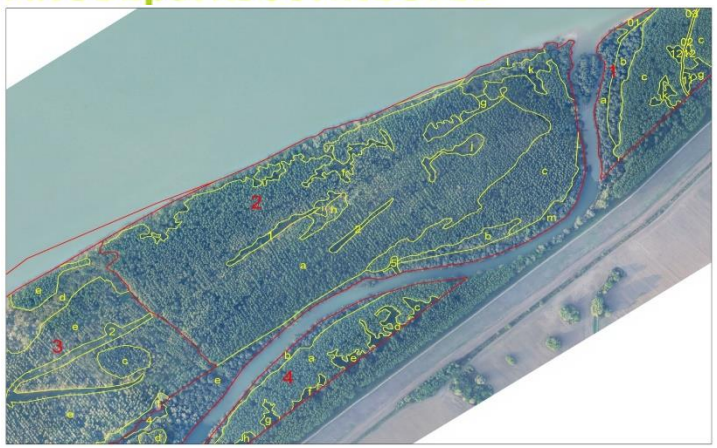

Stand delineation

Damage caused by wind

Damage caused by climate change

Damage caused by recent fires

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Copernicus
Europe's eyes on Earth

Data Access

Copernicus is a European Union Programme aimed at developing European information services based on satellite Earth Observation and in situ (non-space) data.

The Programme is coordinated and managed by the European Commission. It is implemented in partnership with the Member States, the European Space Agency (ESA), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), the European Centre for Medium-Range Weather Forecasts (ECMWF), EU Agencies and Mercator Océan.

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The Earth observation satellites which provide the data exploited by the Copernicus services are split into two groups of missions:

- The Sentinels, which are currently being developed for the specific needs of the Copernicus programme. Sentinel-1, -2, -3, -5P and -6 are dedicated satellites, while Sentinel-4 and 5 are instruments onboard EUMETSAT's weather satellites;
- The Contributing Missions, which are operated by National, European or International organisations and already provide a wealth of data for Copernicus services.

Families of satellites
dedicated to Copernicus
"The Sentinels"

Contributing missions
from National, European
or International organisations

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Pan-European

Image mosaics

The CORINE Land Cover (CLC)

High Resolution Layers

Forests

Grasslands

Wetlands

Permanent water bodies

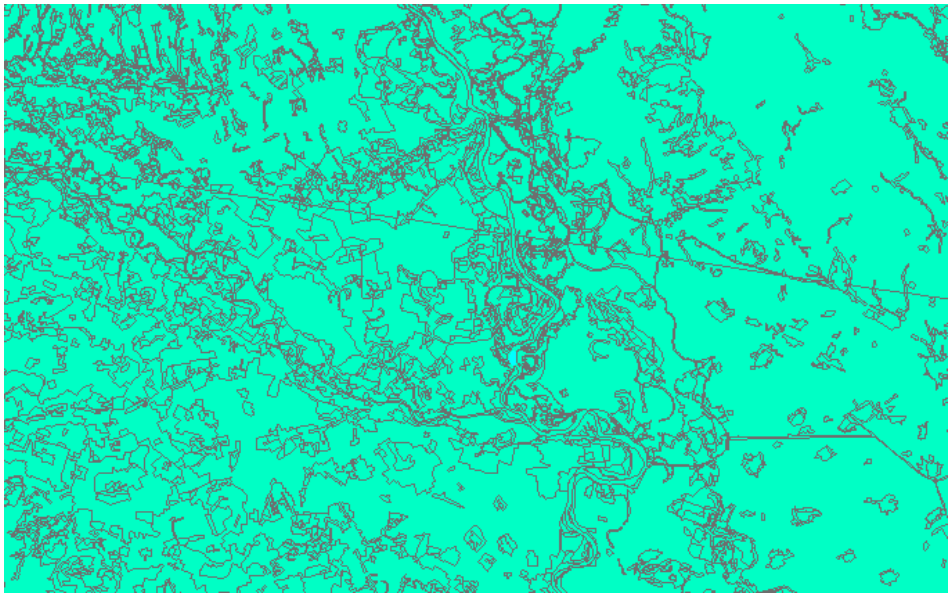
Reference data

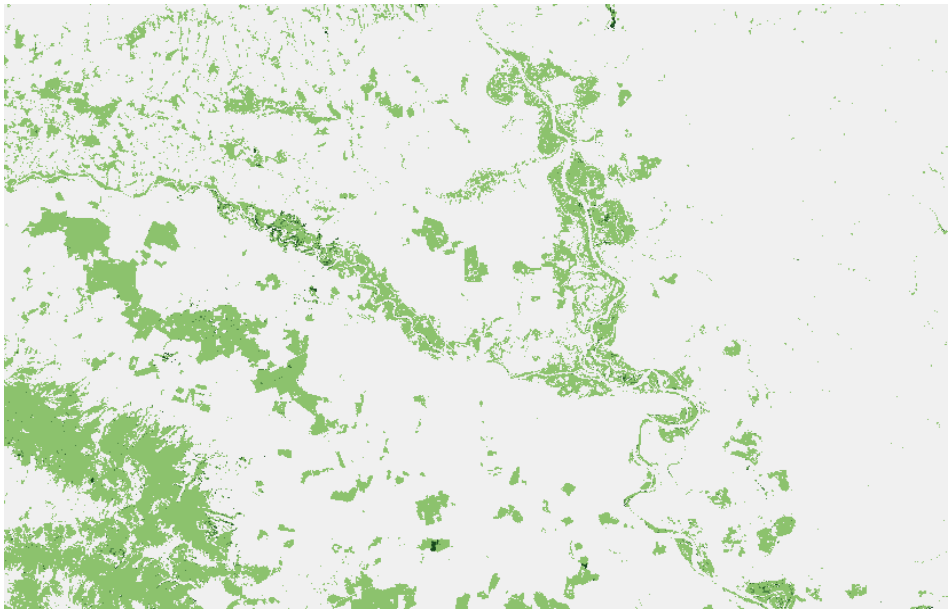
EU-Hydro

EU-DEM

Related Pan-European products

European Settlement Map





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GRID_CODE	CLC_CODE	LABEL1	LABEL2	LABEL3
1	111	Artificial surfaces	Urban fabric	Continuous urban fabric
2	112	Artificial surfaces	Urban fabric	Discontinuous urban fabric
3	121	Artificial surfaces	Industrial, commercial and transport units	Industrial or commercial units
4	122	Artificial surfaces	Industrial, commercial and transport units	Road and rail networks and associated land
5	123	Artificial surfaces	Industrial, commercial and transport units	Port areas
6	124	Artificial surfaces	Industrial, commercial and transport units	Airports
7	131	Artificial surfaces	Mine, dump and construction sites	Mineral extraction sites
8	132	Artificial surfaces	Mine, dump and construction sites	Dump sites
9	133	Artificial surfaces	Mine, dump and construction sites	Construction sites
10	141	Artificial surfaces	Artificial, non-agricultural vegetated areas	Green urban areas
11	142	Artificial surfaces	Artificial, non-agricultural vegetated areas	Sport and leisure facilities
12	211	Agricultural areas	Arable land	Non-irrigated arable land
13	212	Agricultural areas	Arable land	Permanently irrigated land
14	213	Agricultural areas	Arable land	Rice fields
15	221	Agricultural areas	Permanent crops	Vineyards
16	222	Agricultural areas	Permanent crops	Fruit trees and berry plantations
17	223	Agricultural areas	Permanent crops	Olive groves
18	231	Agricultural areas	Pastures	Pastures
19	241	Agricultural areas	Heterogeneous agricultural areas	Annual crops associated with permanent crops
20	242	Agricultural areas	Heterogeneous agricultural areas	Complex cultivation patterns
21	243	Agricultural areas	Heterogeneous agricultural areas	Land principally occupied by agriculture, with significant areas of natural vegetation
22	244	Agricultural areas	Heterogeneous agricultural areas	Agro-forestry areas
23	311	Forest and semi natural areas	Forests	Broad-leaved forest
24	312	Forest and semi natural areas	Forests	Coniferous forest
25	313	Forest and semi natural areas	Forests	Mixed forest
26	321	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Natural grasslands
27	322	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Moors and heathland
28	323	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Sclerophyllous vegetation
29	324	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Transitional woodland-shrub
30	331	Forest and semi natural areas	Open spaces with little or no vegetation	Beaches, dunes, sands
31	332	Forest and semi natural areas	Open spaces with little or no vegetation	Bare rocks
32	333	Forest and semi natural areas	Open spaces with little or no vegetation	Sparsely vegetated areas
33	334	Forest and semi natural areas	Open spaces with little or no vegetation	Burnt areas
34	335	Forest and semi natural areas	Open spaces with little or no vegetation	Glaciers and perpetual snow
35	411	Wetlands	Inland wetlands	Inland marshes
36	412	Wetlands	Inland wetlands	Peat bogs
37	421	Wetlands	Maritime wetlands	Salt marshes
38	422	Wetlands	Maritime wetlands	Salines
39	423	Wetlands	Maritime wetlands	Intertidal flats
40	511	Water bodies	Inland waters	Water courses
41	512	Water bodies	Inland waters	Water bodies
42	521	Water bodies	Marine waters	Coastal lagoons
43	522	Water bodies	Marine waters	Estuaries
44	523	Water bodies	Marine waters	Sea and ocean
48	999	NODATA	NODATA	NODATA
49	990	UNCLASSIFIED	UNCLASSIFIED LAND SURFACE	UNCLASSIFIED LAND SURFACE
50	995	UNCLASSIFIED	UNCLASSIFIED WATER BODIES	UNCLASSIFIED WATER BODIES
255	990	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED

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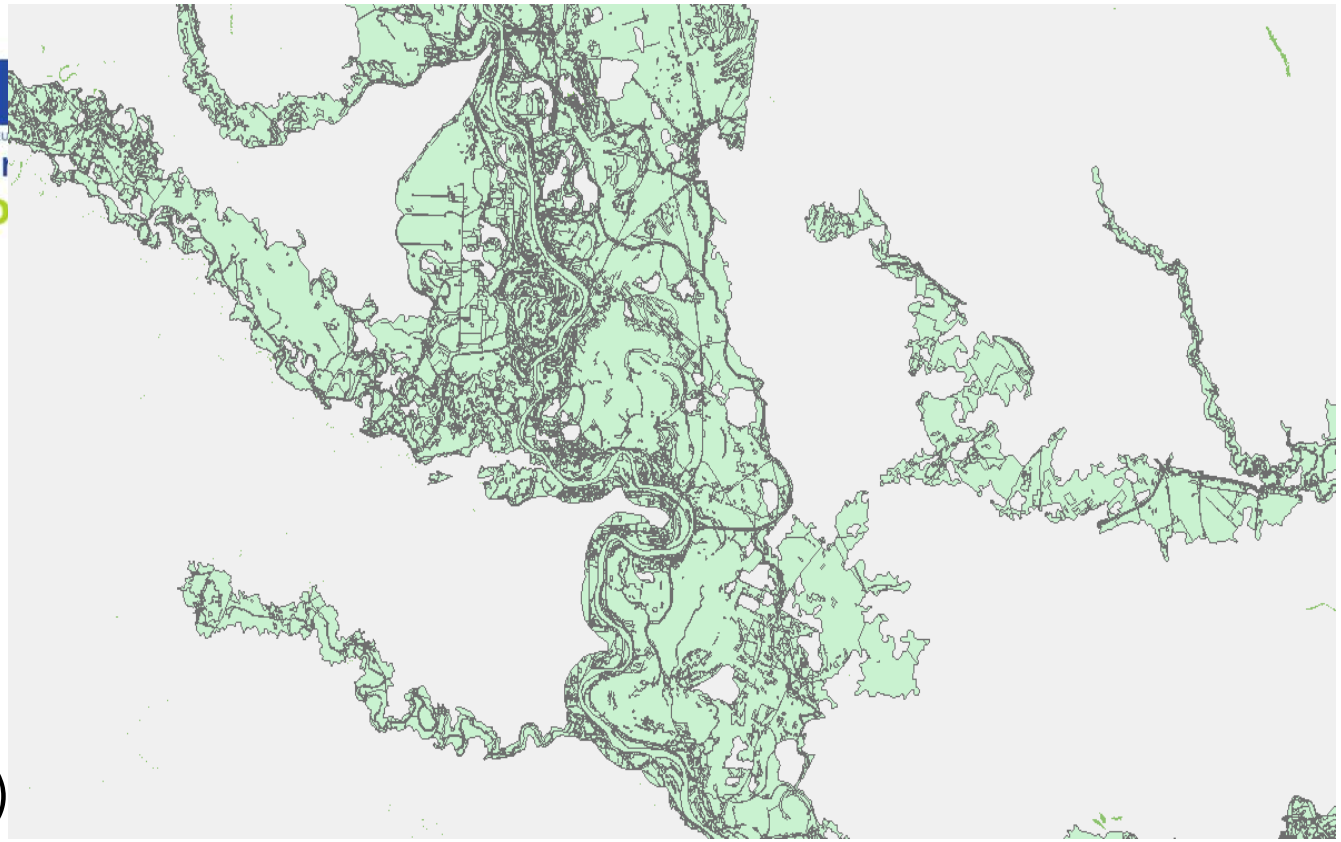

Local

Urban atlas

Urban atlas 2006

Urban atlas 2012

Change 2006 – 2012

Street tree layer (STL)

Population estimates by urban atlas polygons

Delineation of Riparian Zones

Green Linear Elements

Natura 2000 (N2K)

N2K 2006

N2K 2012

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Workflow

- Definition of „Fittness“ with all participants (Danube riparian forest fittness check)
- Preparation: identificaion of available basic data sets (types see below + more)
- Collection of these (making use of own data, and accessible data from other authorities (INSPIRE), and of COPERNICUS (images, image mosais e,g, VHR layer, HR layer , thematic maps)

Establishment of a first sound data base of existing data including description

- Forest layer (GIO & local)
- Forest type data (local, what is there, e.g. from FMP, in Germany, Federal state of Ba-WÜ from public forest e.g. all FMP data are available on a portal)
- Forest age data (local, what is there)
- Ownership, Proction type, Habitat status from H2020 mapping etc. ,
- Information on threads (Habitat status from H2020 mapping, H2020 management plans, knowlege of recent known threads (fire, barkbeatles, ash decies ...)
- Information on flooding and other special infos of riparian area.
- DTM from Lidar where available??
- Copernicus VHR image layer, Copernicus HR image layer, recent S2 images

- Analysis of existing data
  - completeness ,
  - first thematic fittness analysis

- Complementatin of existing data addressing identified data deficits using remote sensing (utlising airial photoography, Copernicus VHR image layer, Copernicus HR image layer, recent S2 images ...) eventually with additional field work
- thematic fittness analysis based on improved & (more) complete data

Erdas Imagine software

Erdas Imagine is an image processing software package that allows users to process both geospatial and other imagery as well as vector data.

Erdas can also handle hyperspectral imagery and LiDAR from various sensors.

Erdas also offers a 3D viewing module (VirtualGIS) and a vector module for modeling. The native programming language is EML (Erdas Macro Language).

Erdas is integrated within other GIS and remote sensing applications and the storage format for the imagery can be read in many other applications (*.img files).

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Monitoring concept addressing possible threats / fittness

- Periodic elements (aerial photography, VHR copernicus data set [might be easier accessible in many countries compared to aerial photographs from survey, both is worth a try / a check])
- Field sampling
- S2 based monitoring during the vegetation season (annual OR mulit annual)

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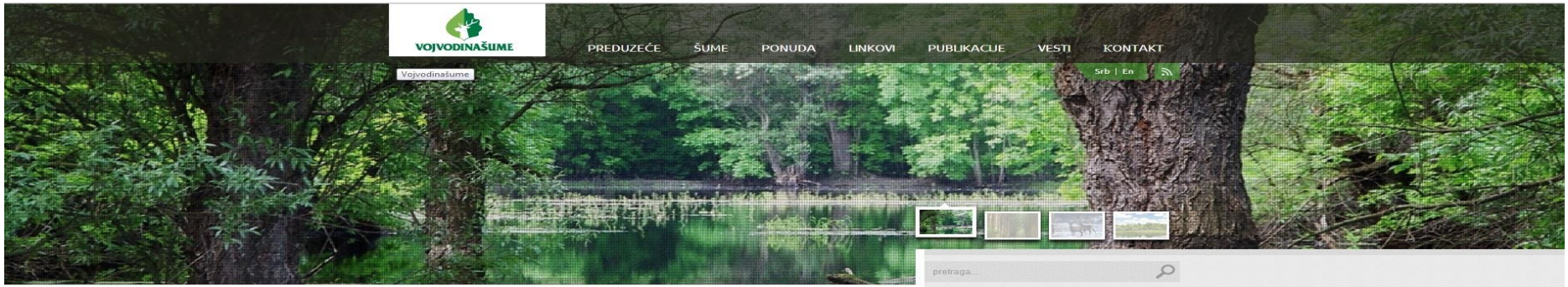

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