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PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT umweltbundesamt

Project outputs presentation

Standardized methodology for assessing functionality of ecological corridors & Application Toolbox

Florian Danzinger, Environment Agency Austria

SaveGREEN Final Conference, 7th December 2022

Project co-funded by European Union funds (ERDF)

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Structural connectivity vs. Functional connectivity

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A particular interest of SaveGREEN is the interplay of different aspects of corridors:

- On a landscape-scale, the structural connectivity describes the permeability of the landscape due to land-cover and land-use characteristics, while the
- functional connectivity relates to the interactions of animals with the landscape and its structures due to their needs.

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Structural connectivity vs. Functional connectivity

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Step 1 - Structural connectivity: assessment by using GIS techniques based on data mostly derived from remote sensing and relevant geodata sets. Detection of bottleneck situations along the corridors.

Step 2 - Functional connectivity (the “species perspective”): for each of the 8 pilot areas field survey data was collected at identified bottleneck locations. This was obtained for a set of different species groups like large carnivores, large herbivores, medium-sized mammals and others.

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Structural connectivity vs. Functional connectivity

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The aim of the developed monitoring procedure is to determine

- mitigation measures and
- minimum habitat requirements

based on the evaluation results and the analysis of ecological corridor segments with functional and non functional connectivity.

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Structural connectivity vs. Functional connectivity

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Starting point:

- Most of the existing ecological corridor designations are more or less based on the concept of structural connectivity

➔ Further development of designated corridors by starting from the viewpoint of structural connectivity to the functional connectivity perspective

Structural connectivity vs. Functional connectivity

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The monitoring concept developed within WP1 is therefore designed as a two-stage process:

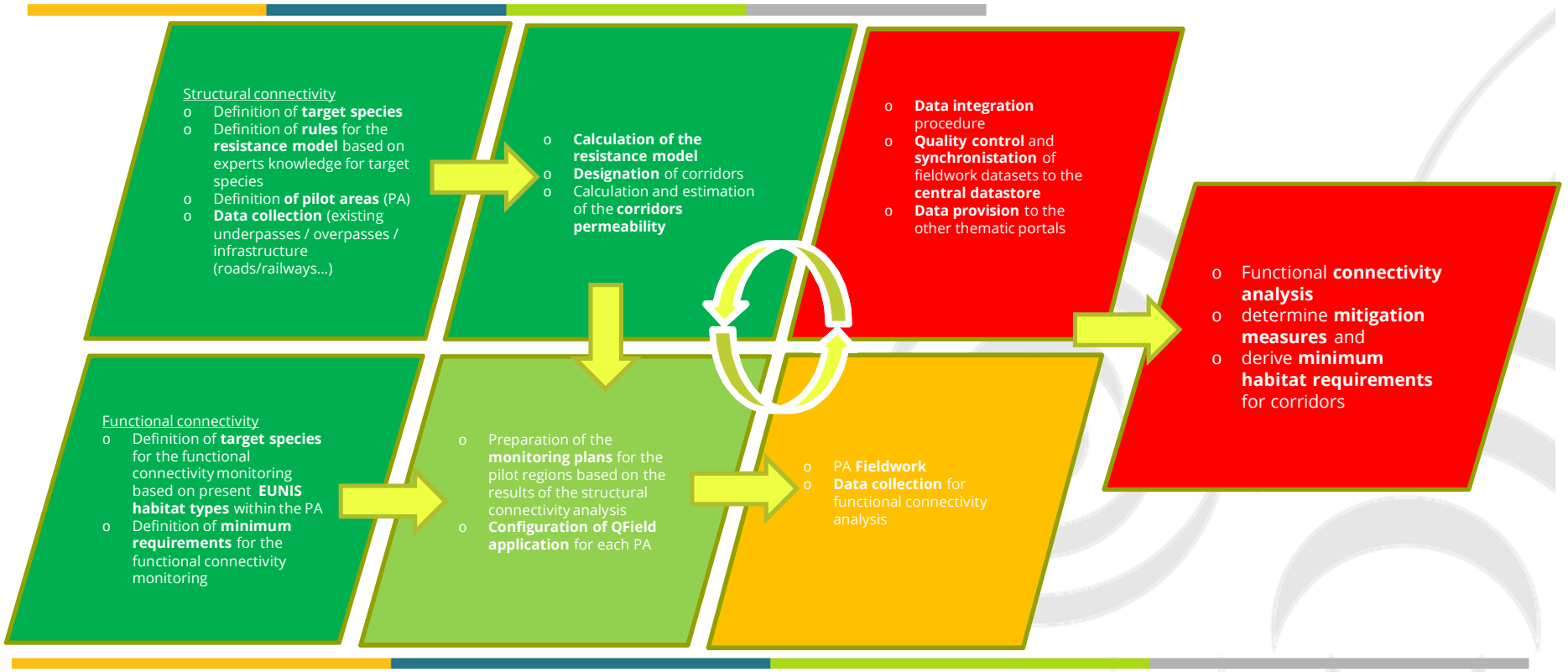
Step 1 - Structural connectivity:

- designation of ecological corridors and
- classification of the permeability of segments within the ecological corridors based on the structural connectivity

Step 2 - Functional connectivity

- field based collection of all required parameters for the evaluation of functional connectivity

Monitoring Process Diagram



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Example PA Pöttsching (AT)

Step 1 - Structural connectivity

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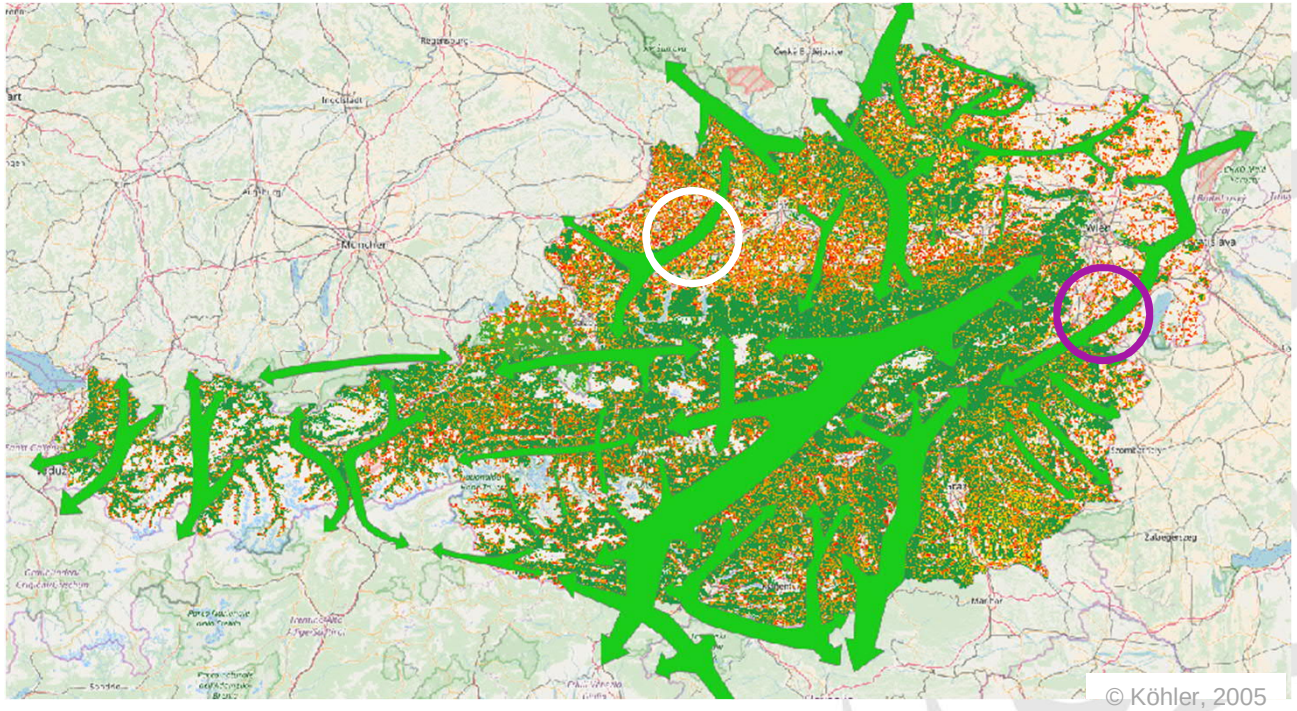
Development of spatially explicit model to identify bottleneck situations along corridors for functional monitoring.



© Köhler, 2005

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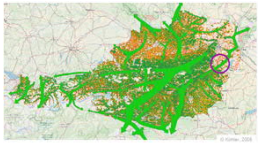
Pilot area Pöttsching



Step 1 - Structural connectivity

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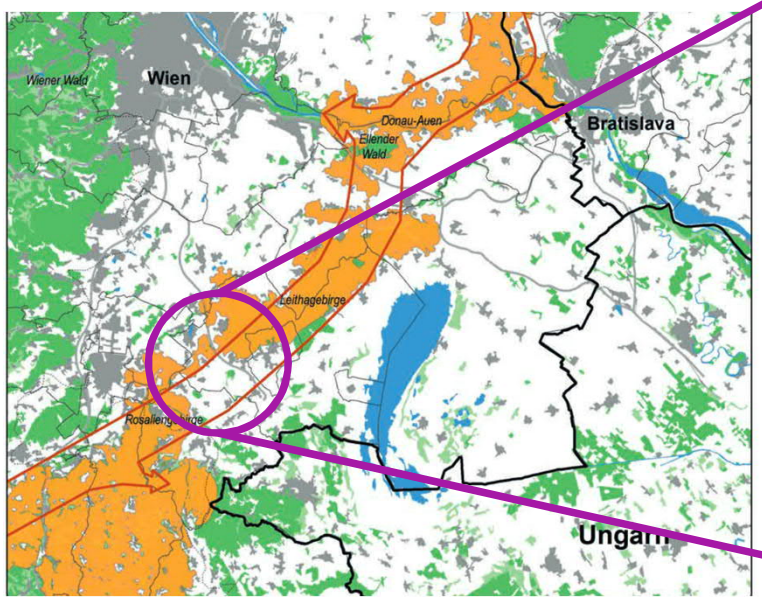
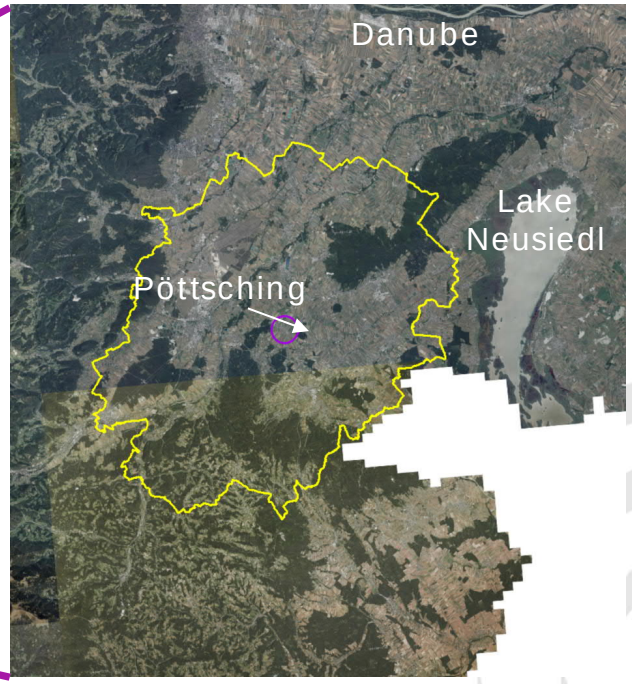
Part of Alpine-Carpathian Corridor



© Suppan (2012)



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Input data & model framework

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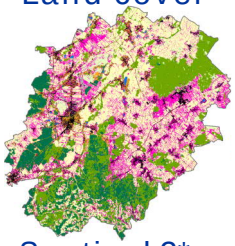
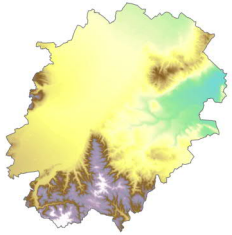
Step 1 - Structural connectivity

Land cover



Sentinel 2*

Altitude, Slope



EU-DEM*

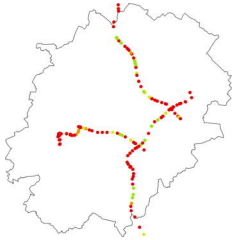
RESOLUTION:

10x10 meters

Rivers

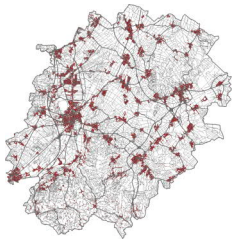
EU-HYDRO*

Over- and Underpasses



ASFINAG

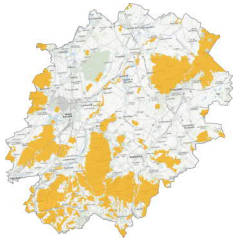
Buildings, Road, Rail



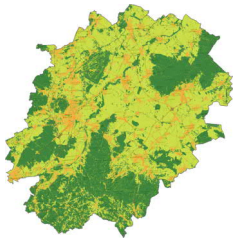
OSM*

RULES

Core areas & (Large) stepping stones

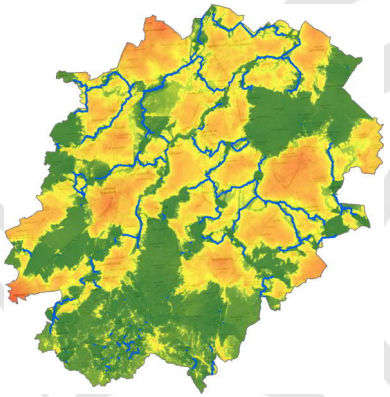


Resistance surface



LM**

Corridors



* available for most of the pilot areas

** Linkage Mapper

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Estimation of permeability

Step 1 - Structural connectivity

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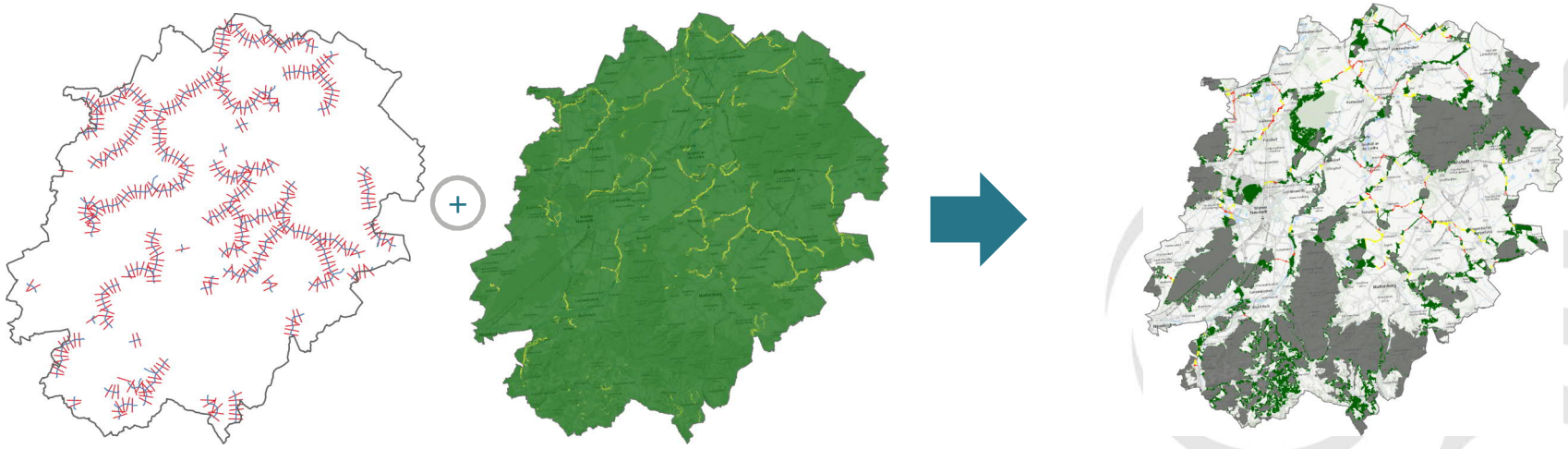
Segmentation of corridors

Bottleneck situations*

Permeability of corridor segments



* Pinchpoint Mapper

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Preparation of monitoring plans

Step 2 - Functional connectivity

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- Monitoring plans are based on the results of structural monitoring approach
- Condensed methodology of the functional monitoring
- Consideration of local characteristics regarding landscape and ecological conditions
- Definition of moderate minimum requirements for the functional monitoring for all project partners

Preparation of monitoring plans

Step 2 - Functional connectivity

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Minimum requirements for each pilot area:

- Target Species: Red deer / wild boar / large carnivores
- Monitoring methods: Photo traps / tracks / other activity signs
- Quantity

  - 10 monitoring sites
  - minimum 1 over- and 1 underpass
  - minimum 3 corridor sites
  - results of structural monitoring approach should be considered for the selection of monitoring sites

Monitoring Approach

Step 2: FUNCTIONAL CONNECTIVITY ANALYSIS

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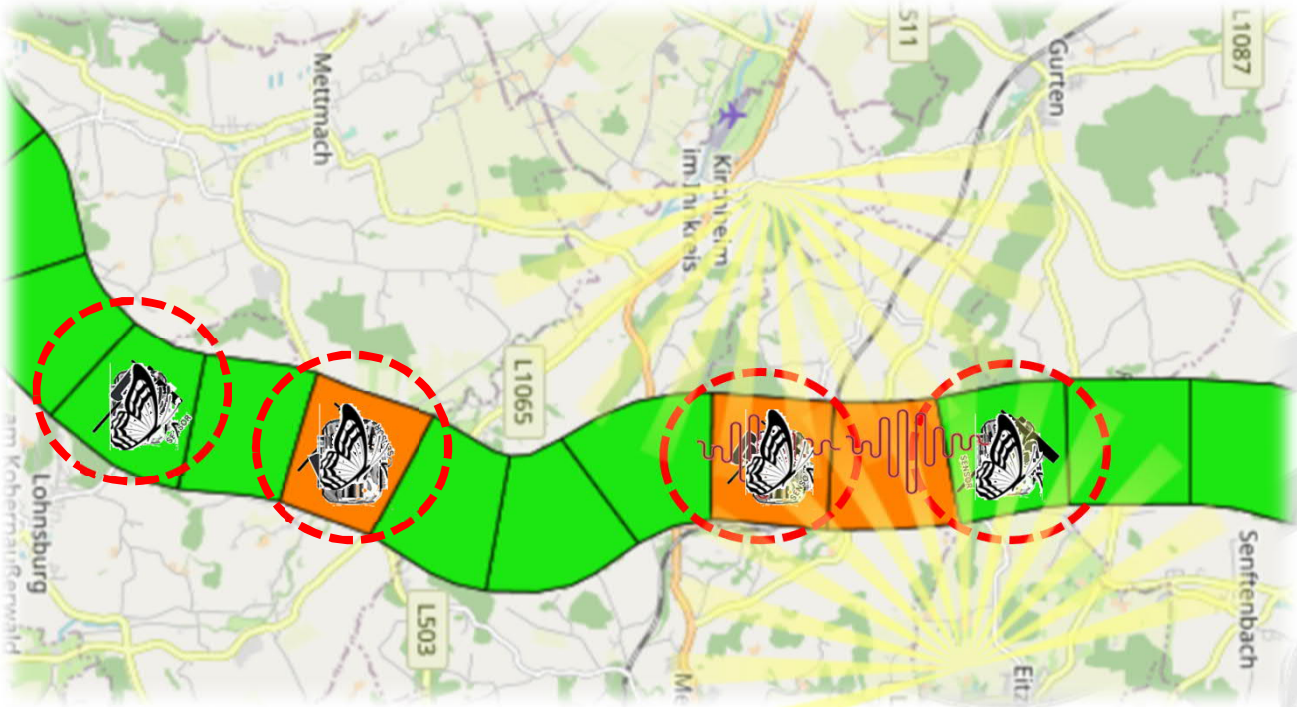

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Monitoring Approach

Step 2: FUNCTIONAL CONNECTIVITY ANALYSIS

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Footprints and other activity signs are collected along the whole length of the corridor

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Monitoring Approach

Step 2: FUNCTIONAL CONNECTIVITY ANALYSIS – APPLICATION TOOLBOX

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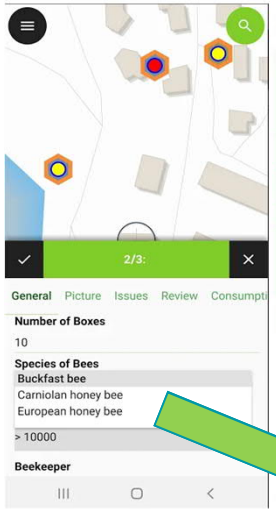
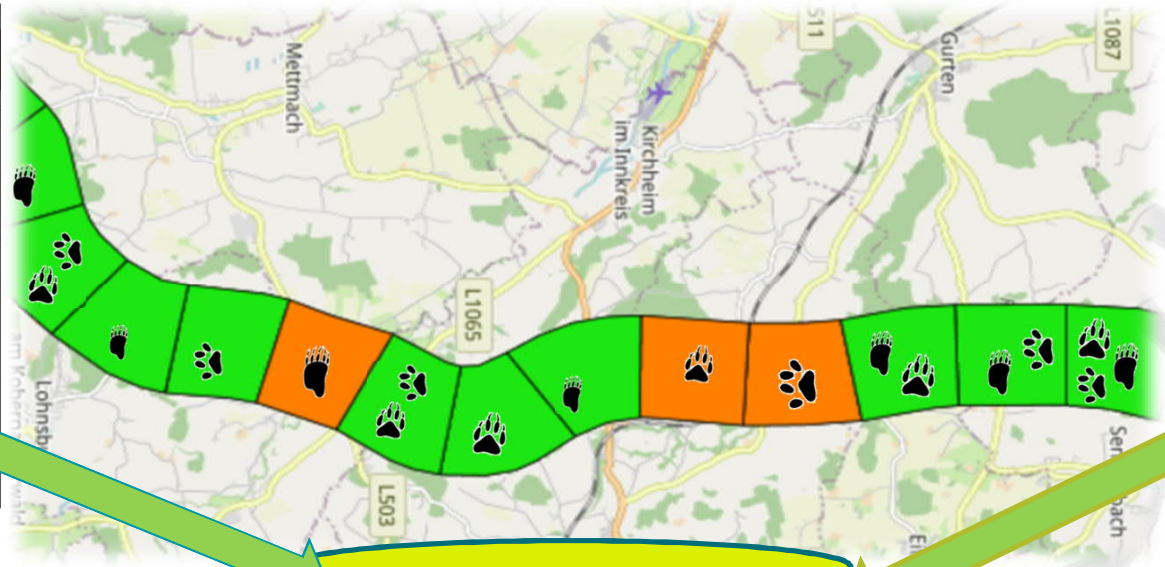
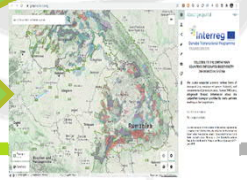




Data synchronization procedure
Harmonized Data Model



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Electronic application toolbox

Step 2 - Functional connectivity

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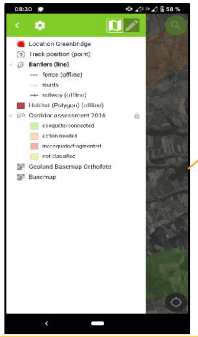
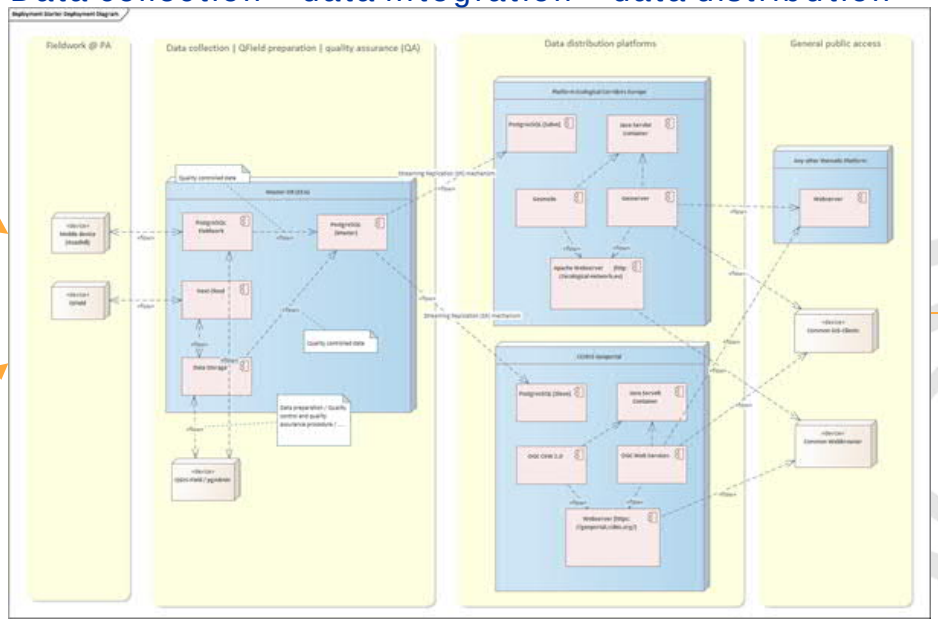
Roadkill

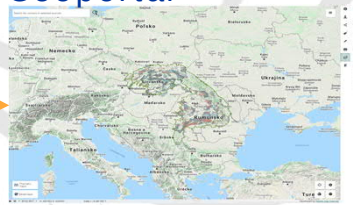
QField



Data collection → data integration → data distribution → general public access



e.g. CCIBIS Geoportal



CARPATHIAN COUNTRIES INTEGRATED BIODIVERSITY INFORMATION SYSTEM

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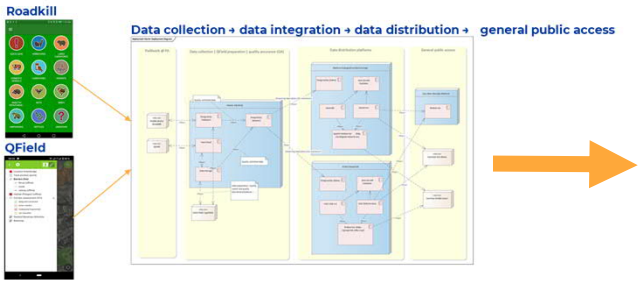
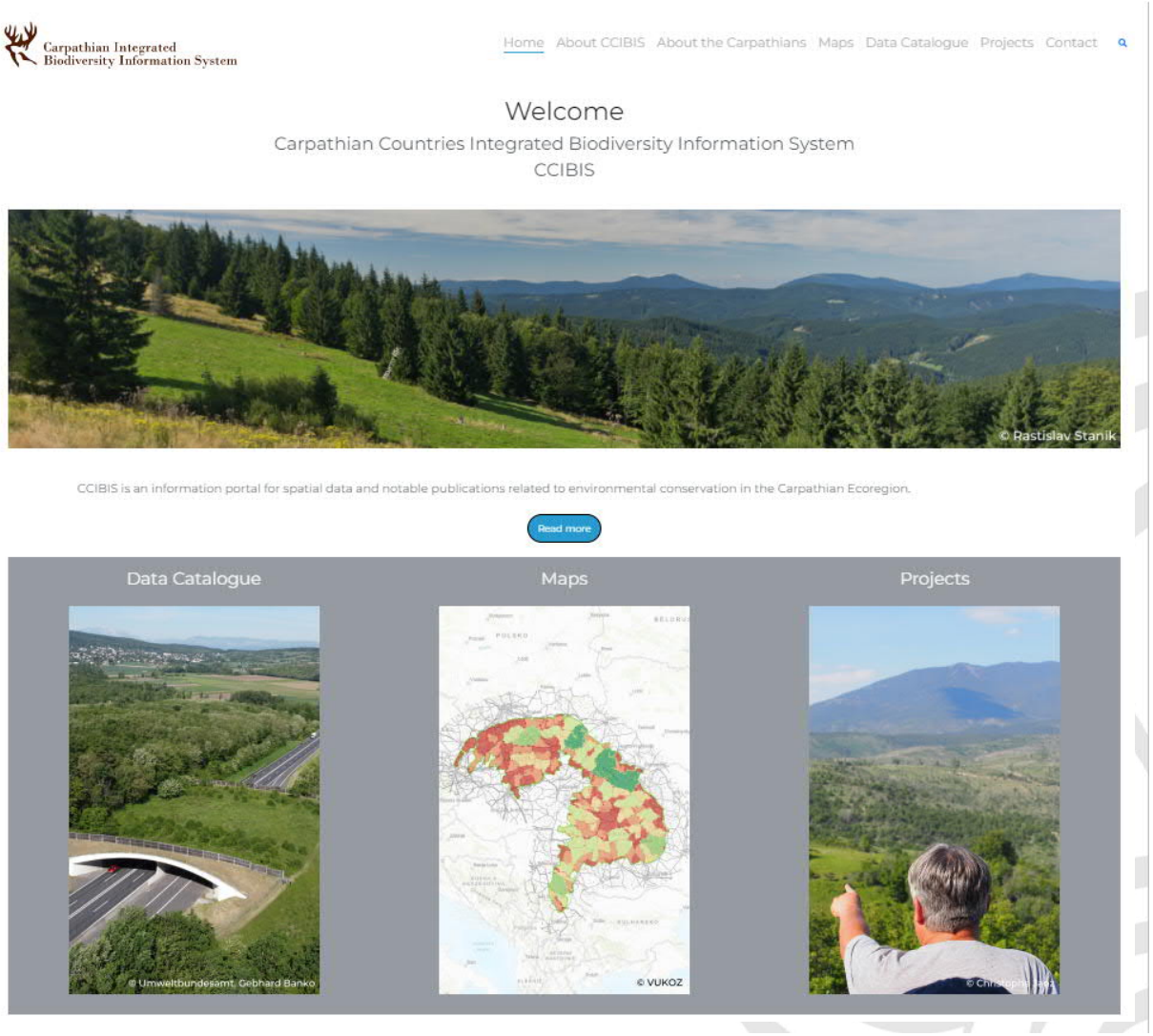
CCIBIS Geoportal



www.ccibis.org



Preparation of monitoring plans

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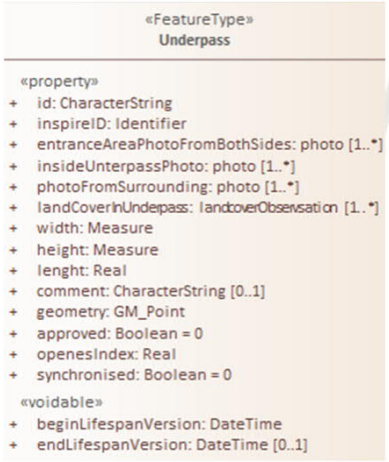
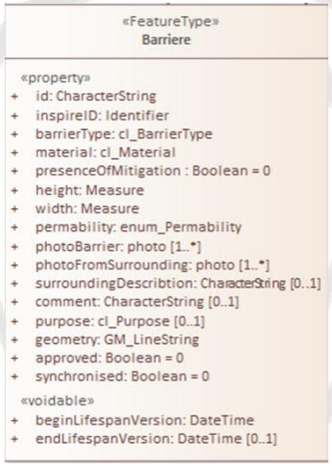
- Other objects surveyed as part of the monitoring process for the whole length of the grey corridors within the pilot areas

Overpasses

Underpasses



Barriers



Preparation of monitoring plans

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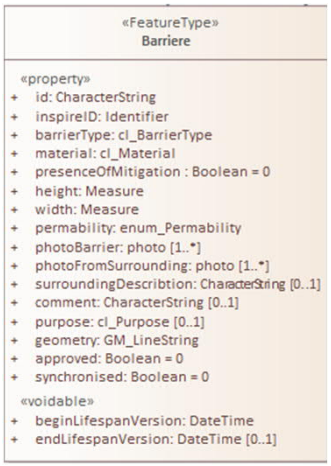
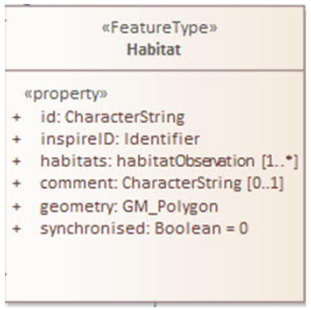
- Other objects surveyed as part of the monitoring process for the whole length of the green corridors within the pilot areas

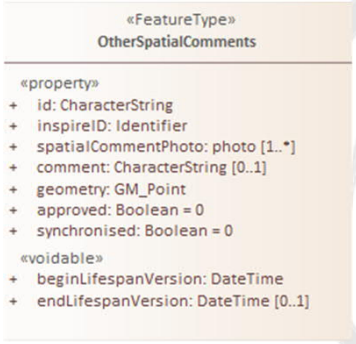
Barriers



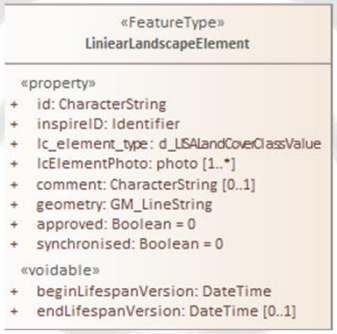
Habitats

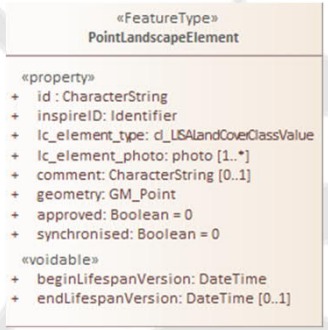


Spatial comments



Landscape elements





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Preparation of monitoring plans

Pilot area Pöttsching (AT)

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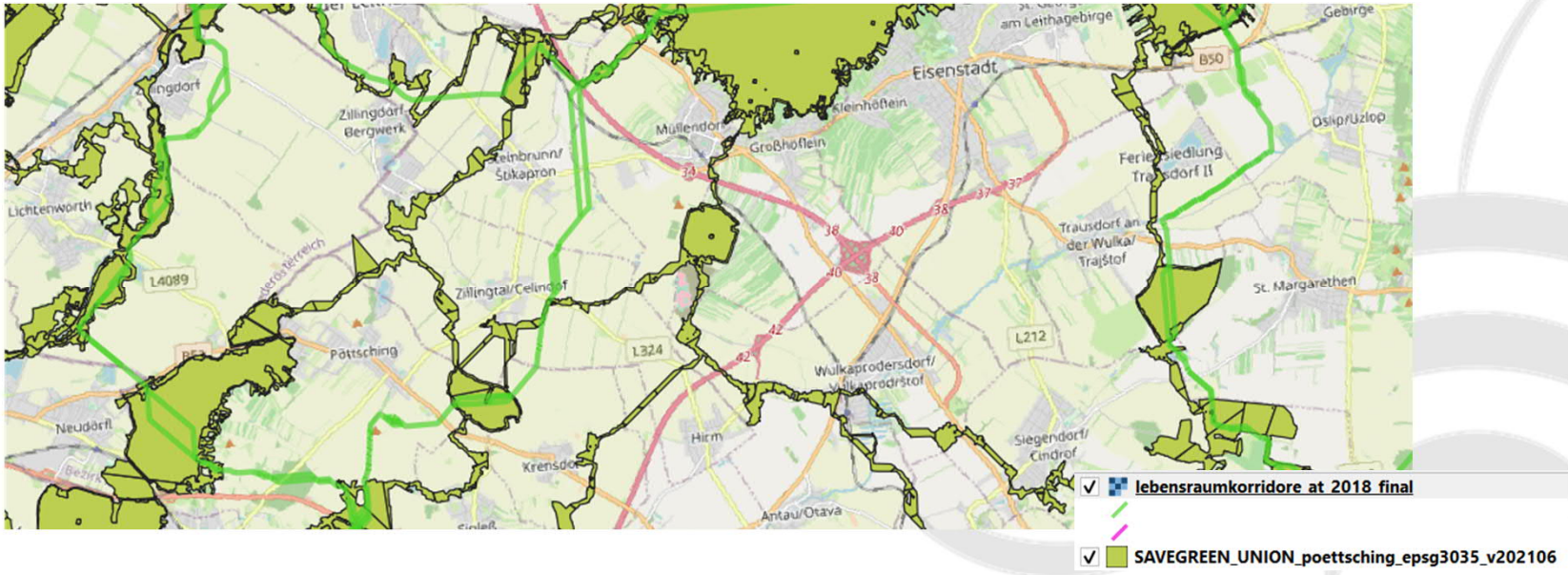
- Evaluation of designated corridors from the monitoring of structural connectivity



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Preparation of monitoring plans

Pilot area Pöttsching (AT)

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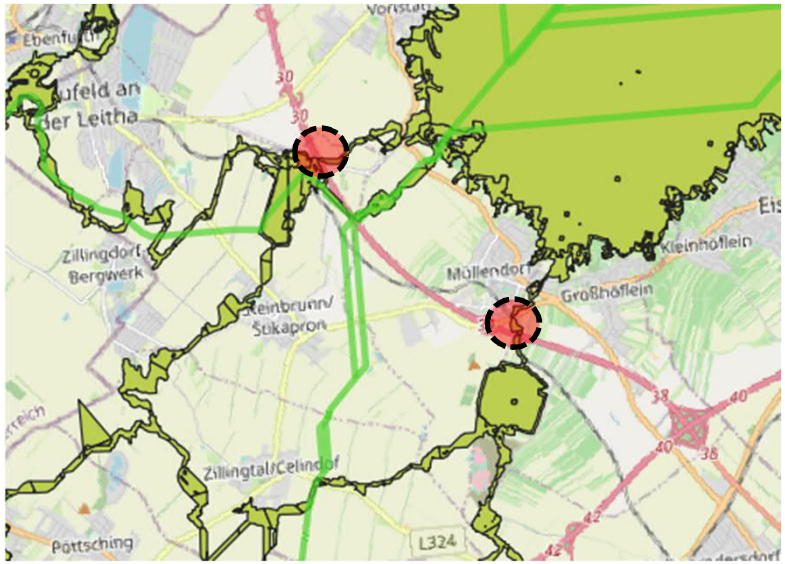
- Evaluation of critical corridor areas (high resistance values) or under- and overpasses (and other anthropogenic structures) with unknown permeability



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Preparation of monitoring plans

Pilot area Pöttsching (AT)

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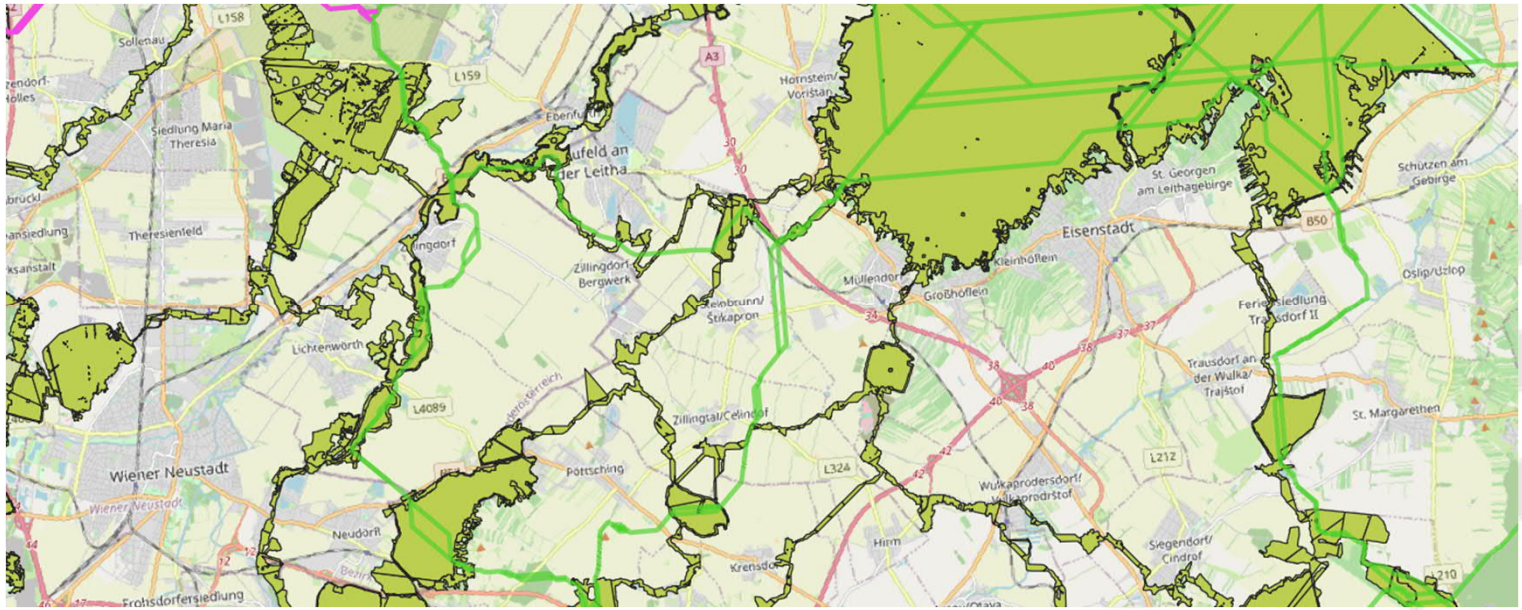
- Prioritization of corridors for functional monitoring



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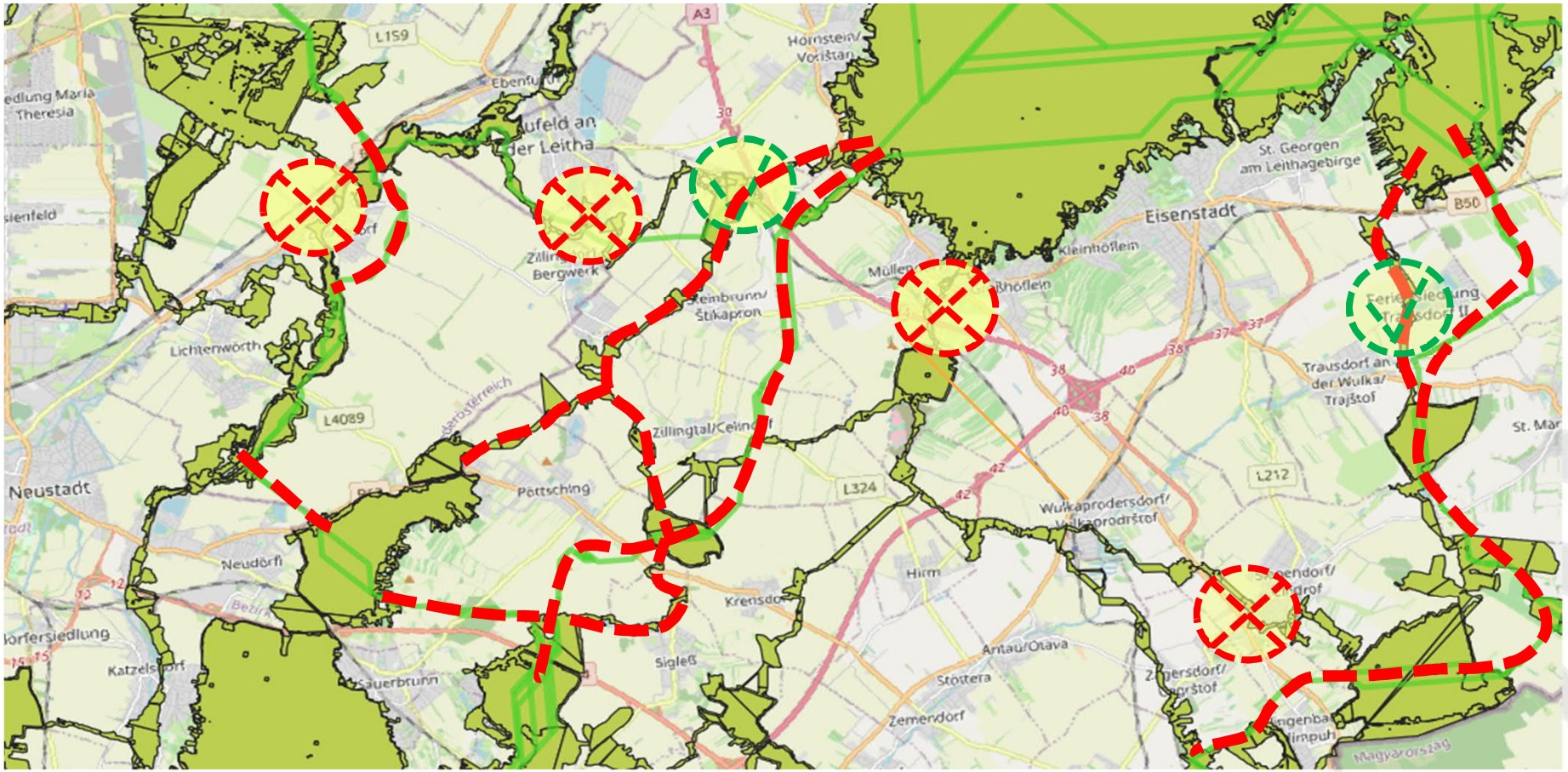

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Preparation of monitoring plans

Pilot area Pöttsching (AT)

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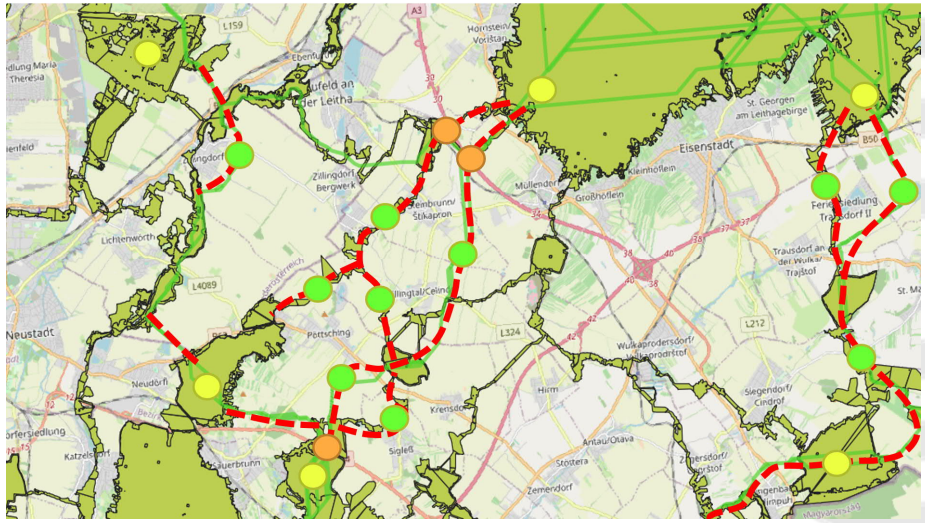
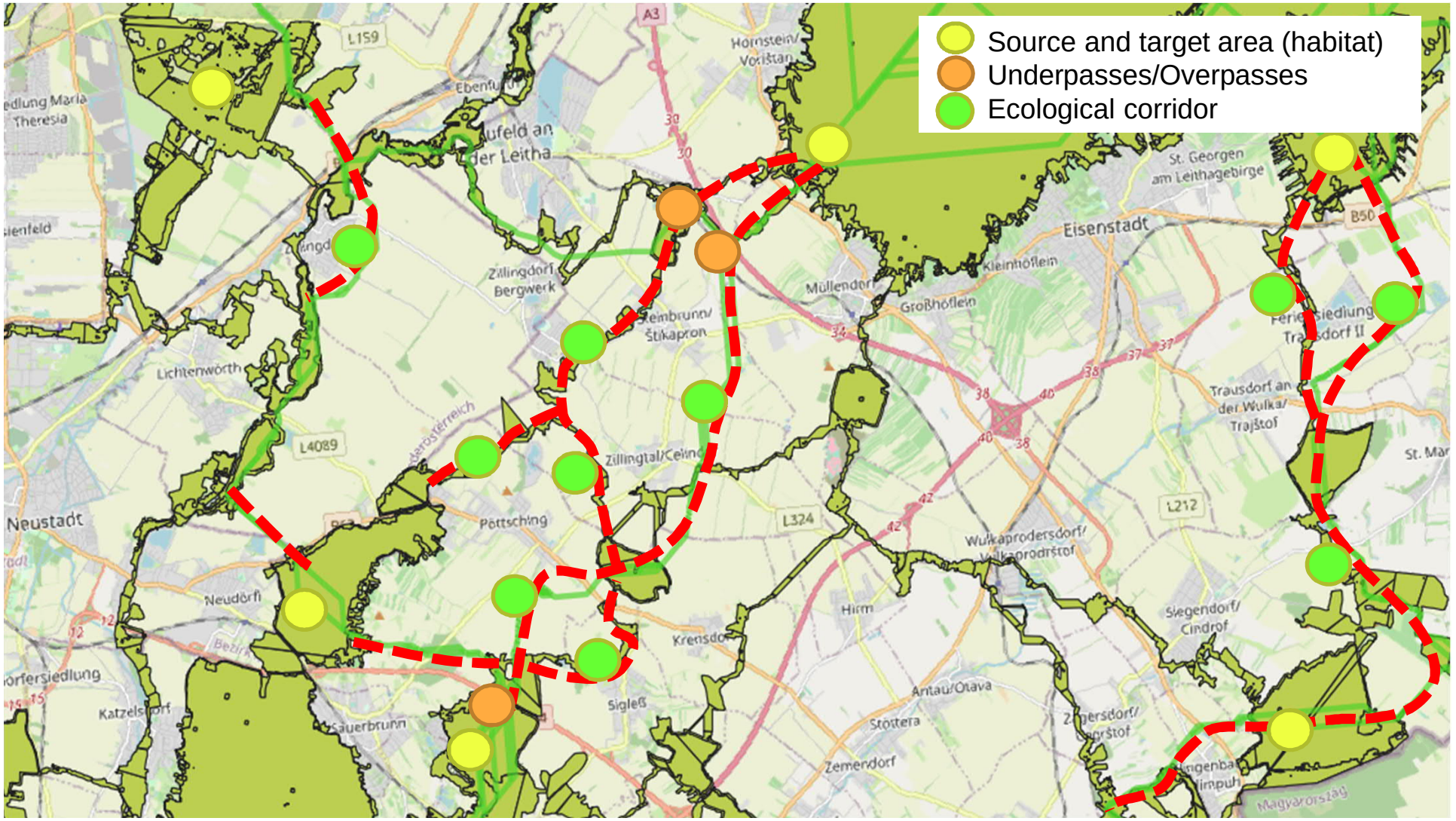
- Determination of the monitoring sites for the first monitoring season based on the prioritized corridors for the pilot areas




Source and target area (habitat)
Underpasses/Overpasses
Ecological corridor
Eisenstadt
Zillingdorf
Bergwerk
Müllendorf
Großhöflein
Kleinhöflein
Lichtenwörth
Neustadt
Pöttsching
Zillingtal/Celin
Trausdorf an
der Wulka/
Trajštof
Wulkaprodersdorf/
Hirm
Siegendorf/
Cindrof
Antau/Otava
Stotzera
Zemendorf
Siglß
Neudörfl
Katzelsdorf
Sauerbrunn
Krensdo
Hornstein/
Voxistan
St. Georgen
am Leithagebirge
Magyarország
L159
L4089
L324
L212
B50
A3

Monitoring of animal activities

Step 2 - Functional connectivity

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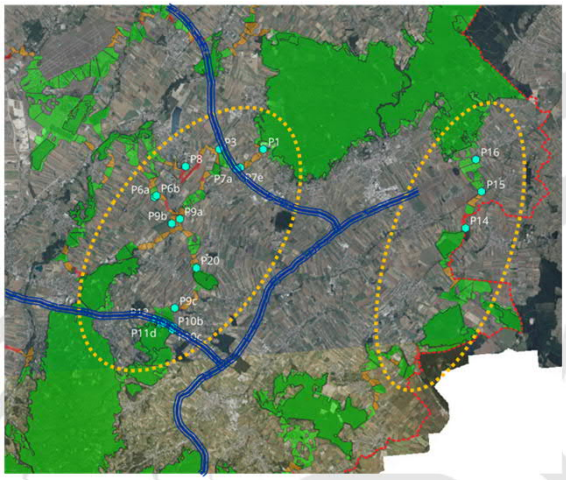
Stationary monitoring devices

- Camera traps
- Light sensors
- Sound sensors

Field mapping

- Direct species observation
- Tracks
- Other activity signs
- Roadkills
- Over- & Underpasses
- Landscape Elements (linear/punctiform)
- Barriers



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Monitoring of animal activities

Step 2 - Functional connectivity

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Stationary monitoring devices

- Camera traps
  - 26 monitoring sites
  - 04.12.2021 - 29.05.2022 ff.
  - Day and night
  - 12,252 specific sightings (and countless additional recordings)
  - Evaluable data after identification run:
    - Date and Time
    - Category of Activity (Animal species/Human activities)
    - Abundance
    - Localization
    - Direction of movement

Monitoring of (animal) activities

Step 2 - Functional connectivity

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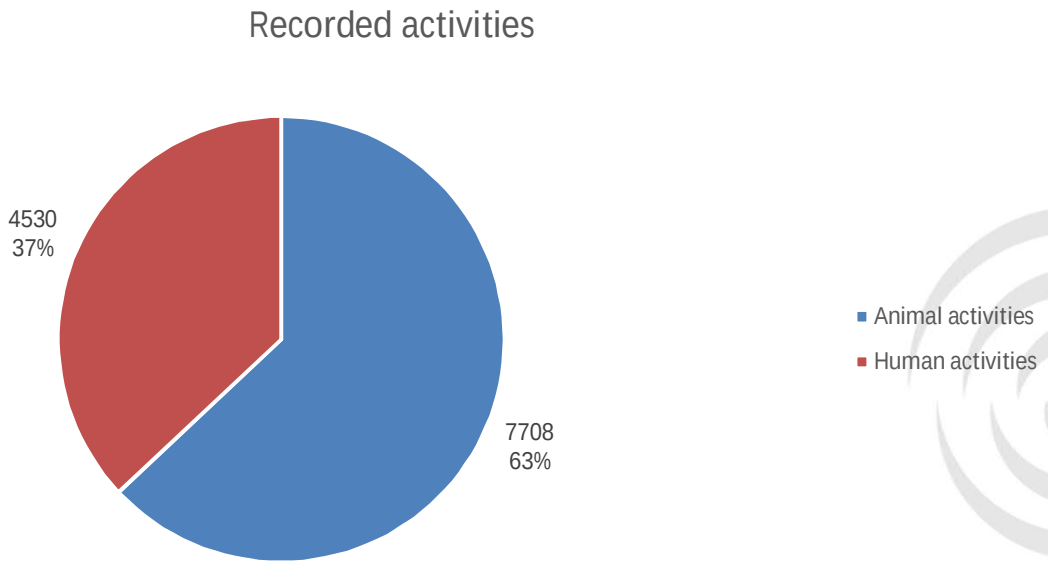
PA Pötsching aggregated

Preliminary results: Camera Traps



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Monitoring of (animal) activities

Step 2 - Functional connectivity

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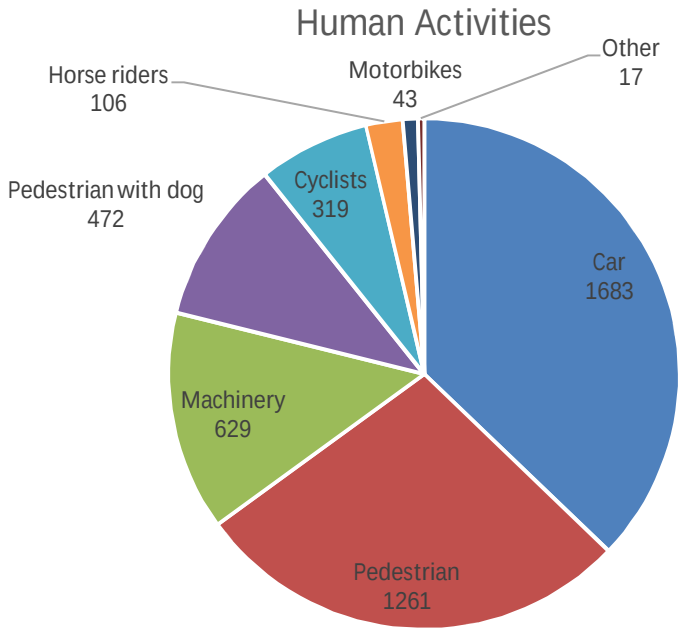

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Monitoring of animal activities

Step 2 - Functional connectivity

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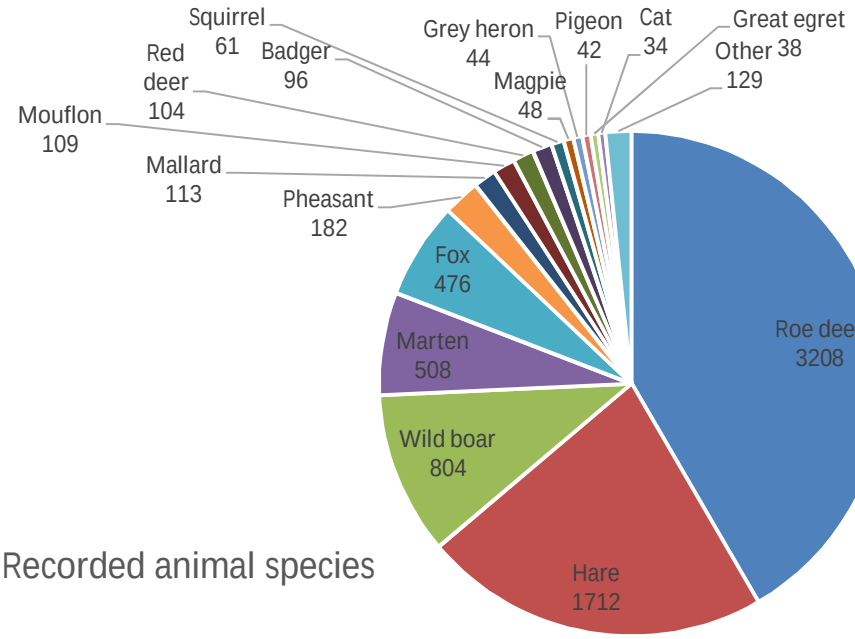
PA Pötsching aggregated

Preliminary results: Camera Traps



Recorded animal species

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Monitoring of animal activities

Step 2 - Functional connectivity

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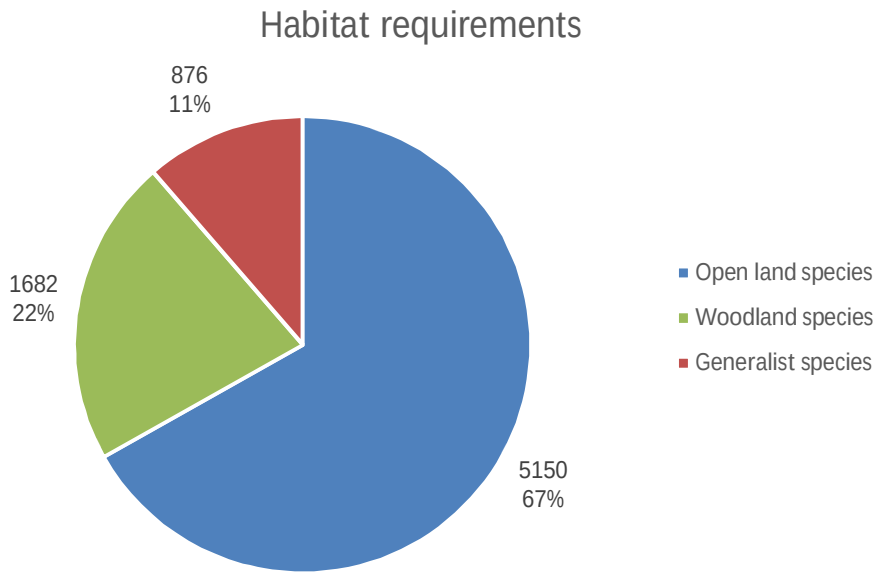
Preliminary results: Camera Traps

PA Pötsching aggregated



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Monitoring of (animal) activities

Step 2 - Functional connectivity

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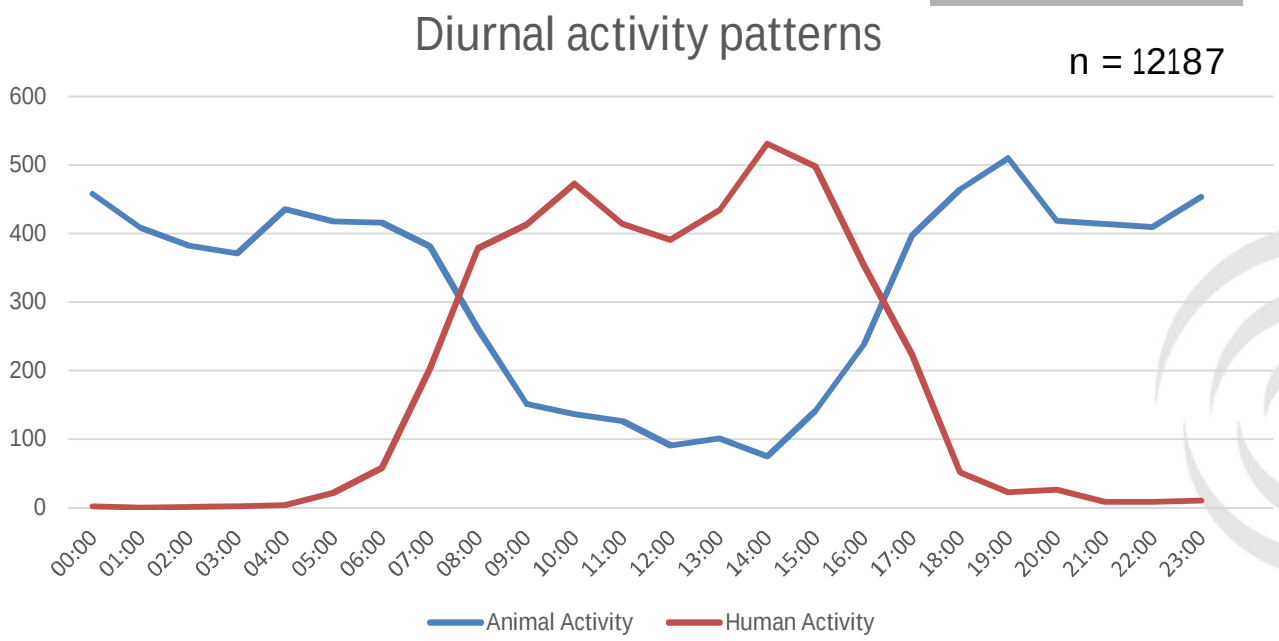
Preliminary results: Camera Traps

PA Pötsching aggregated



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Monitoring of (animal) activities

Step 2 - Functional connectivity

Spatially explicit

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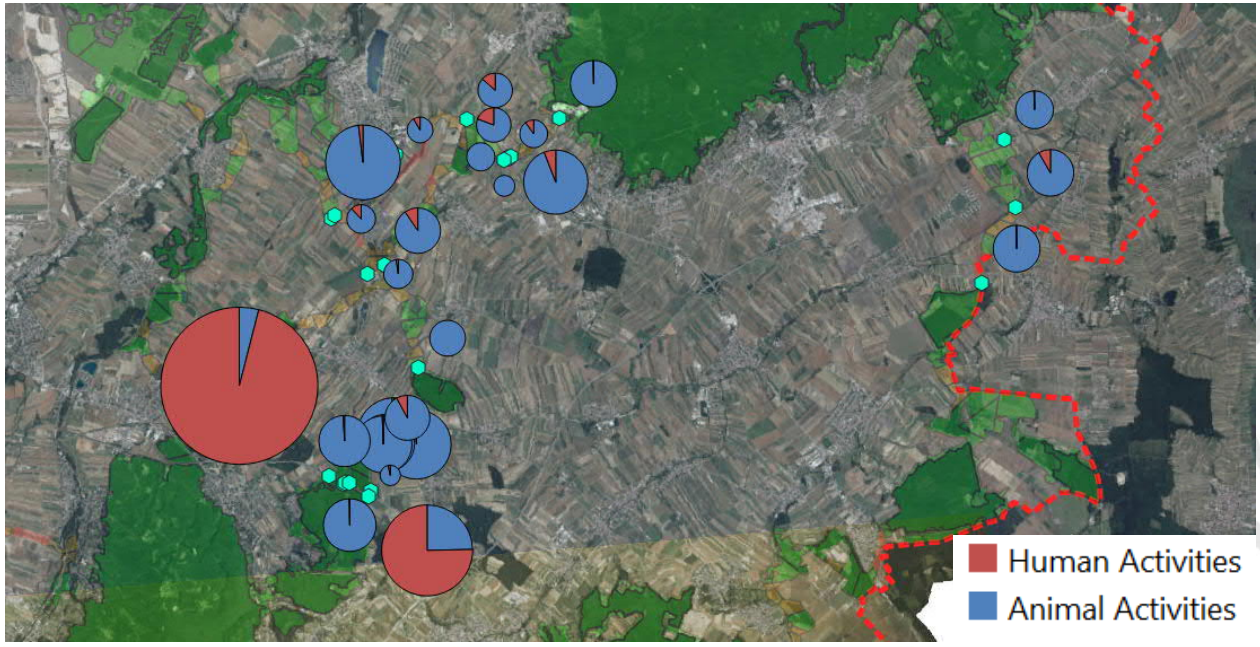
Preliminary results: Camera Traps



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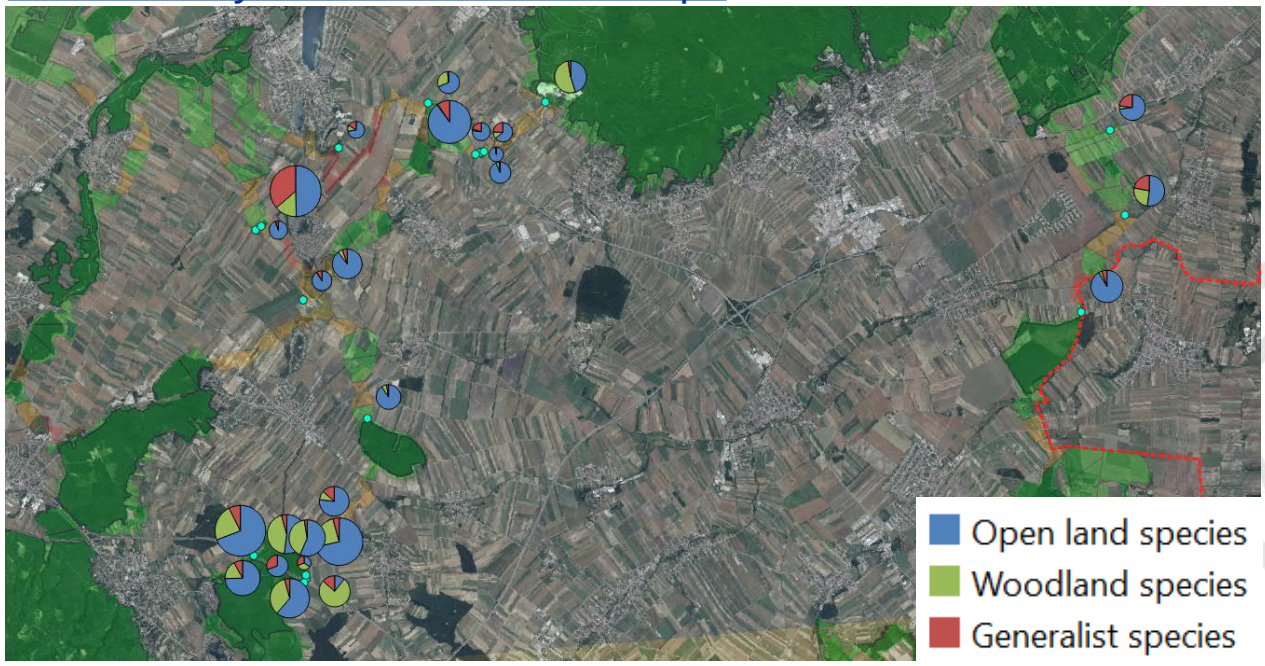

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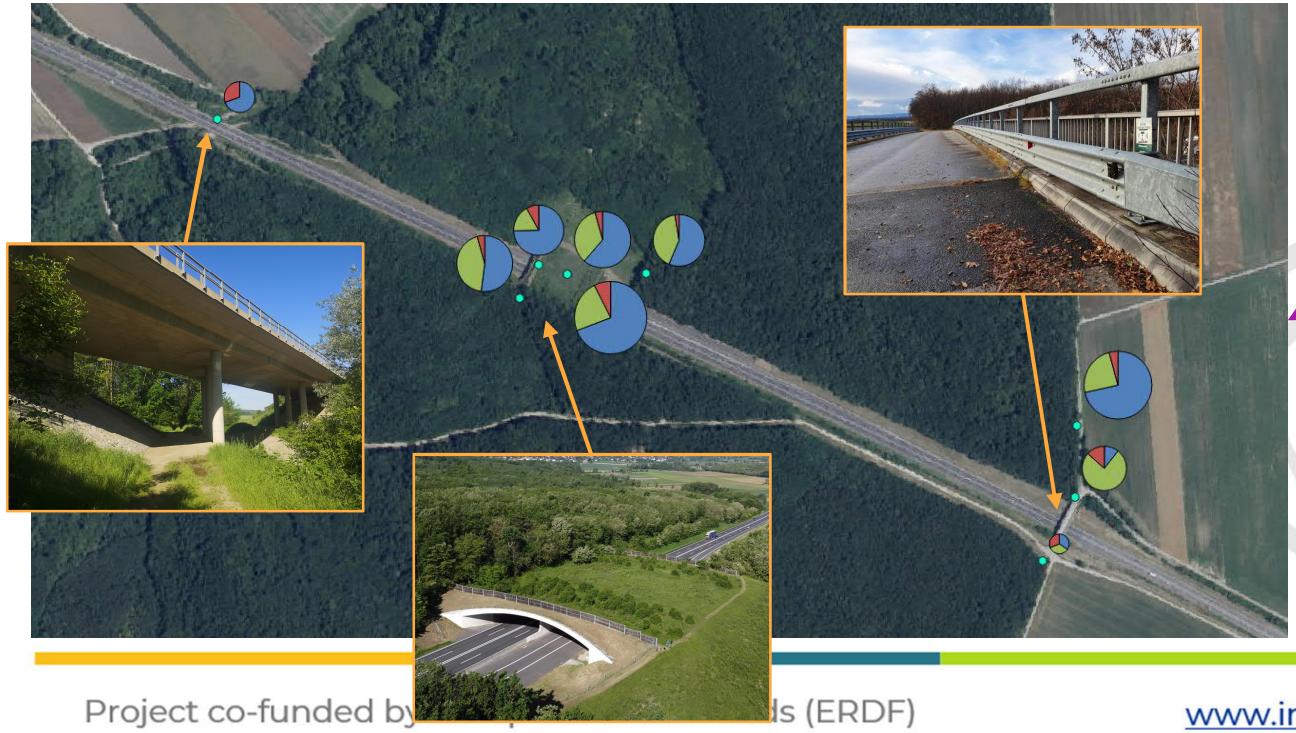

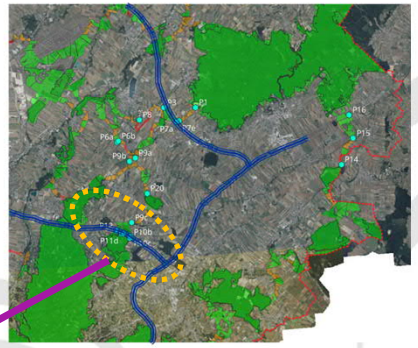

Open land species
Woodland species
Generalist species

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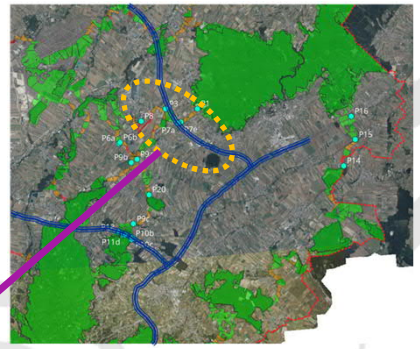

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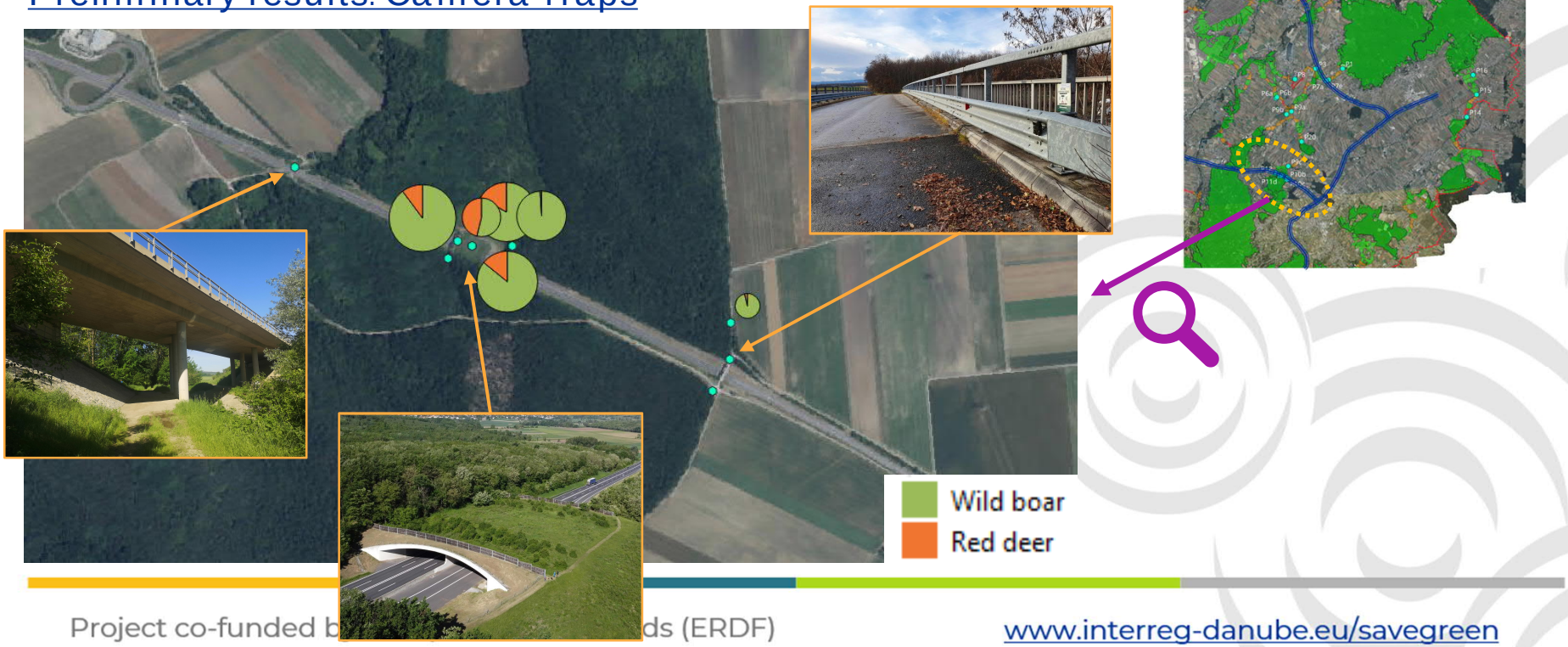

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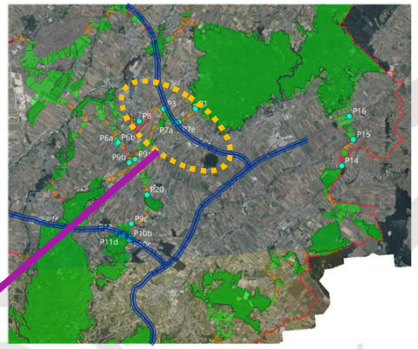

Wild boar
Red deer

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Monitoring of (animal) activities

Step 2 - Functional connectivity

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Field mapping

- Direct species observation
- Tracks
- Other activity signs
- Roadkills
- Over- & Underpasses
- Landscape Elements (linear/punctiform)
- Barriers

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Monitoring of animal activities

Step 2 - Functional connectivity

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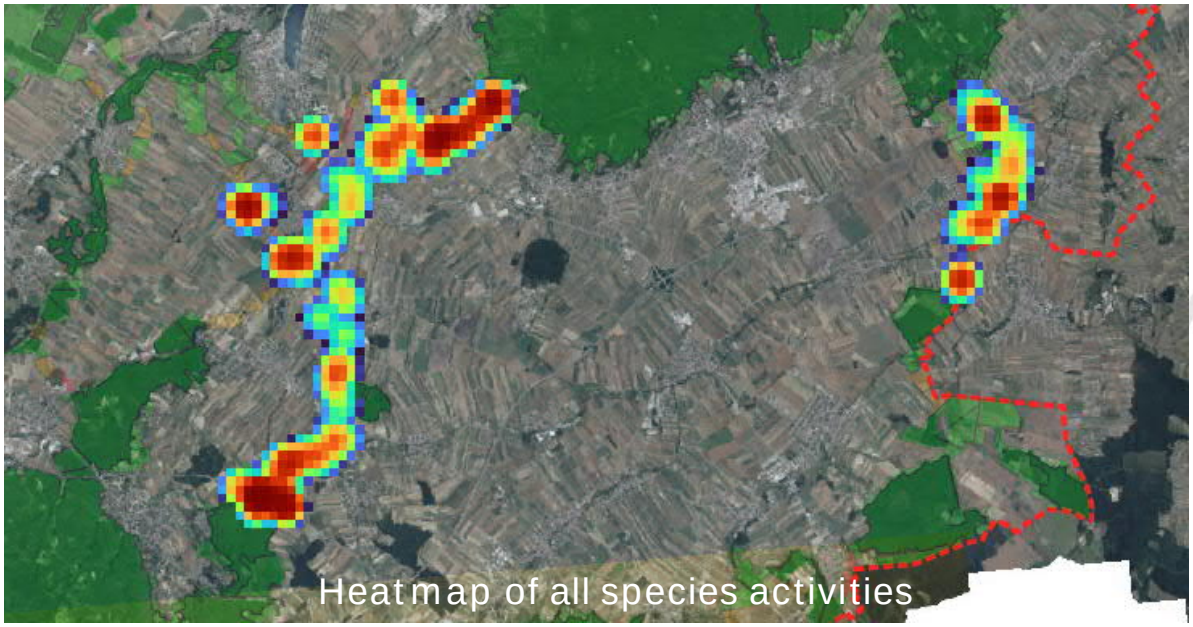
Preliminary results: Field mapping



Heatmap of all species activities

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Monitoring of animal activities

Step 2 - Functional connectivity

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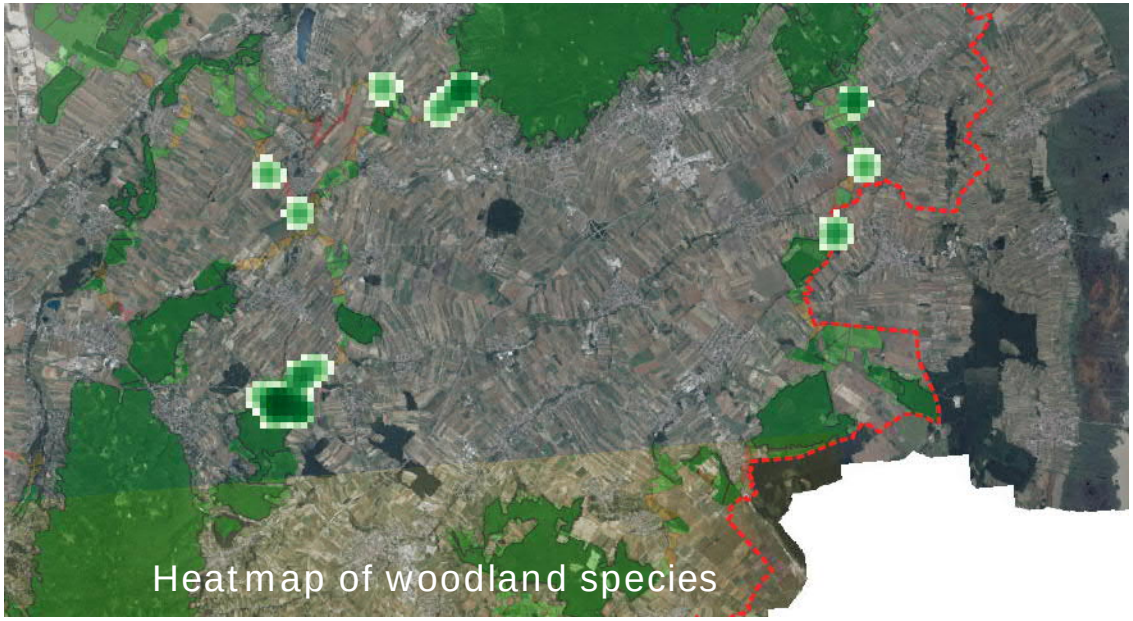
Preliminary results: Field mapping



Heatmap of woodland species

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Conclusions

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- Even the best data-based modeling results require validation using real world data obtained in the field
- The green bridges studied are located at suitable sites in the bottleneck area
- They clearly have structural and functional connectivity to support animal migration
- However, the surrounding landscape, which integrates the bridge into the larger biotope network or corridor in the first place, does not support the structural and functional connectivity or even has a barrier effect, especially for forest-bound species.
- Also the most advanced green bridges in the ideal locations need efficient “feeder/supply roads” = well structured environment with landscape elements as guiding features and stepping stones

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Conclusions

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- Even the best **data-based modeling** results **require validation** using **real world data** obtained in the field
- The **green bridges** studied are **located at suitable sites** in the bottleneck area
- T
- H
- Also the most advanced **green bridges** in the ideal locations **need efficient** "**feeder/supply roads**" = well structured environment with landscape elements as guiding features and stepping stones

→ Targeted restoration of degraded landscapes over the entire bottleneck situation and especially in the feeder area of green bridges is urgently needed!

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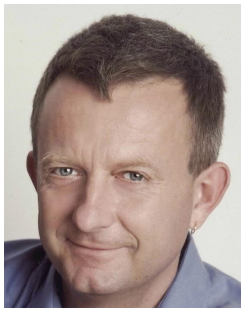
PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT umweltbundesamt

Contact information



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