Habitat classification & connectivity analysis along the European Green Belt using high-resolution satellite imagery

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The European Green Belt
➢ 12,500km length
➢ Traverses 8 biogeographical regions in 24 countries
➢ Includes
  - Wilderness areas
  - Cultural landscapes
  - Aquatic ecosystems and coasts
  - Endangered animal and plant species
➢ Contributes substantially to the diversity of European nature
  ➢ and to the Europe-wide ecological network
➢ Incorporates over 1100 protected areas within a corridor of 10m width along the former Iron Curtain
➢ Unique European memorial, that connects nature and history

Results of the habitat classification in the 4 pilot regions
Using all (mostly) cloudfree Sentinel-2 scenes for each pilot region from 2017/18

Habitat classification via machine learning
➢ “Supervised learning” by the Random Forest Classifier
➢ Remote sensing data as feature for the differentiation of classes:
  ➢ Sentinel-2 time series (spectral bands and derived products)
  ➢ Terrain information from the Copernicus EU-DEM
➢ Model is trained with data from existing biotope mappings
Random Forest Classifier is able to recognize important properties as well as define correlations between them
➢ For each 1 m pixel, a decision will be made based on the spectral signature of the Sentinel-2 time series
➢ Extensive automated applicability
➢ Result: Habitat map with 10m spatial resolution
➢ Application in 4 pilot regions (100x100km area)

Connectivity analysis
➢ Definition of Green Infrastructure (GI) dependent on the target of (co)connectivity – e.g.:
  ➢ GI = forests, grasslands, waterbodies, bogs, etc.
  ➢ Non-GO = built-up areas, landfills, farmland, etc.
➢ Application of GUIDOS Toolbox (EU Science Hub) for raster analyses:
  ➢ Morphological Spatial Pattern Analysis (MSPA)
  ➢ Euclidean Distance
➢ Habitat map as basis for the analysis with GUIDOS
  ➢ Combination of Euclidean distance map and MSPA allows conclusions on geometry, connectivity and intactness of Green infrastructure
➢ Important corridors between core areas of GI can be derived from the results

Ecosystem services analysis
➢ Linking of Broader Habitat Types (BHT) with a capacity matrix of provided ecosystem services
➢ Matrix consists of 30 single ESS, cumulated in 5 main categories (regulation, habitat, production, information & carrier function) and the total value of all ESS – the “Total Function Value”
➢ Assessment of BHTs from “very high” (5) to “no capacity” (0)
➢ Depiction of functional valuable regions and habitats

Connectivity-Functionality Index (CFI)
➢ Combination of indices from the Connectivity- and ESS-analyses
➢ Shows potential corridors with:
  ➢ High functional value ➢ qualitative habitat types
➢ An important role as connecting landscape element
➢ Definition of 3 Areas of Action: Maintain ➢ Safeguard ➢ Restore

Comparison of the Sentinel-2 habitat classification (above) and CORINE Landcover 2018 (below).