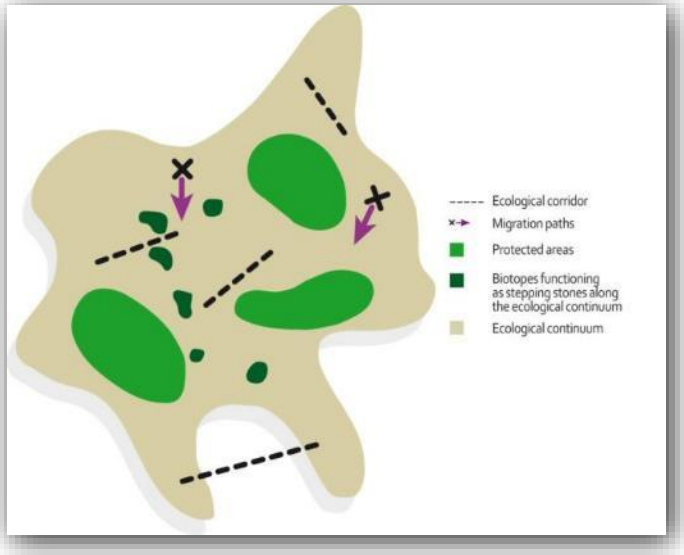
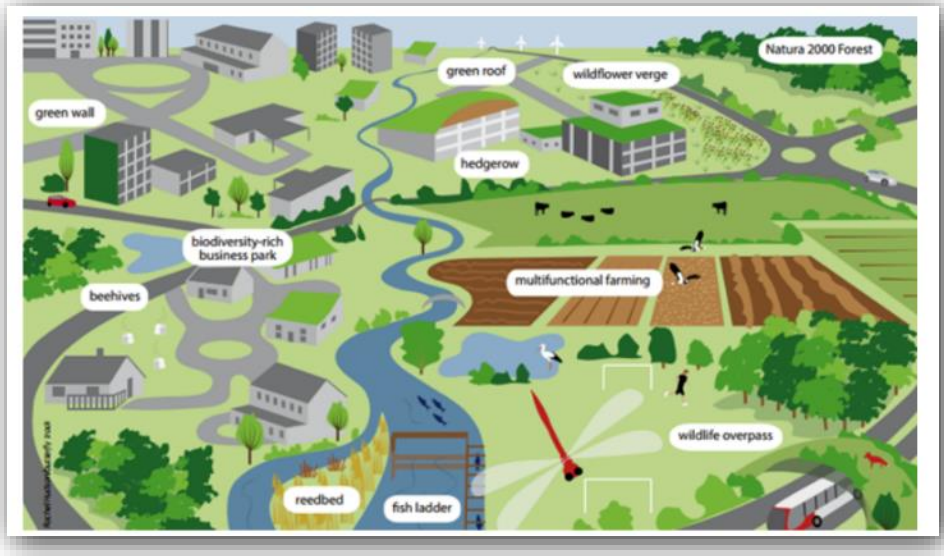
A search for ecological connectivity in the in the Alps

Ruedi Haller
Head Research and Geoinformation, Swiss National Park

parc naziunal svizzer

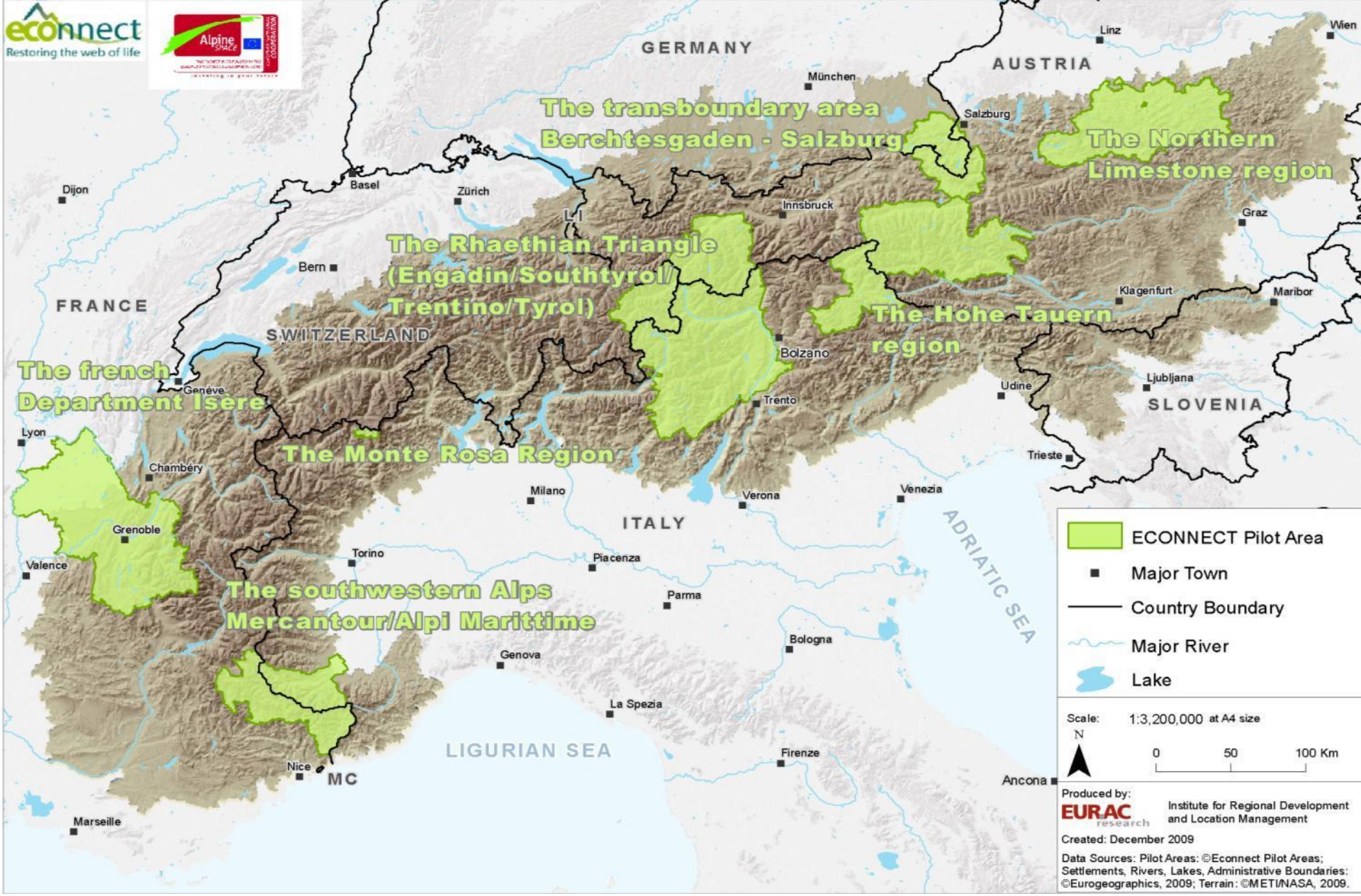
Green infrastructure





http://www.alpine-ecological-network.org

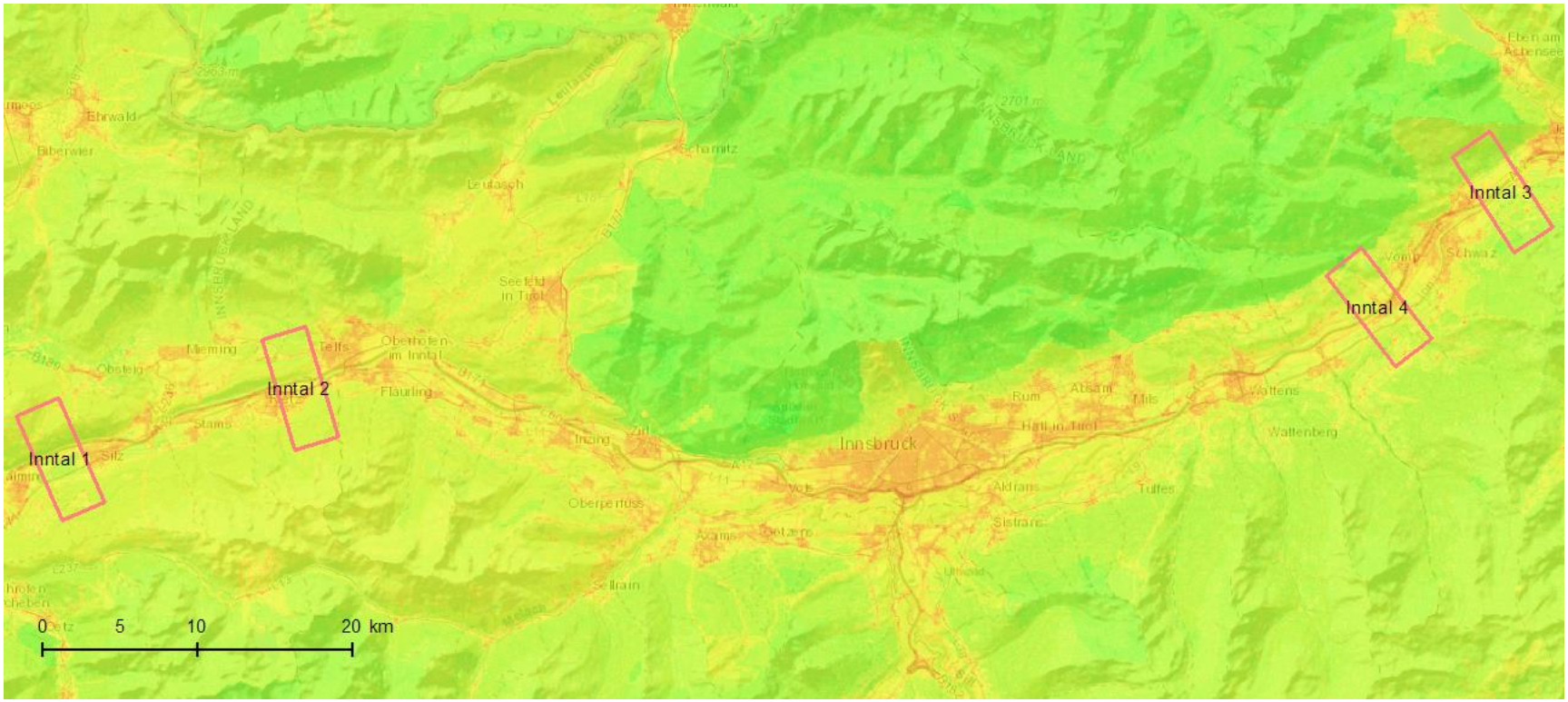
GI-elements according to EU strategy


econnect
Restoring the web of life
Alpine Space
The transboundary area Berchtesgaden - Salzburg
The Northern Limestone region
The Rhaethian Triangle (Engadin/Southtyrol/ Trentino/Tyrol)
The Hohe Tauern region
The french Department Isere
The Monte Rosa Region
The southwestern Alps Mercantour/Alpi Marittime
GERMANY
AUSTRIA
SWITZERLAND
FRANCE
ITALY
SLOVENIA
LIGURIAN SEA
ADRIATIC SEA
München
Linz
Wien
Salzburg
Innsbruck
Graz
Basel
Zürich
Bern
Dijon
Klagenfurt
Maribor
Bolzano
Trento
Udine
Ljubljana
Trieste
Genève
Lyon
Chambéry
Grenoble
Valence
Milano
Verona
Venezia
Torino
Piacenza
Parma
Bologna
Genova
La Spezia
Firenze
Ancona
Nice
MC
Marseille
ECONNECT Pilot Area
Major Town
Country Boundary
Major River
Lake
Scale: 1:3,200,000 at A4 size
N
0 50 100 Km
Produced by:
EURAC research
Institute for Regional Development and Location Management
Created: December 2009
Data Sources: Pilot Areas: ©Econnect Pilot Areas; Settlements, Rivers, Lakes, Administrative Boundaries: ©Eurogeographics, 2009; Terrain: ©METI/NASA, 2009.

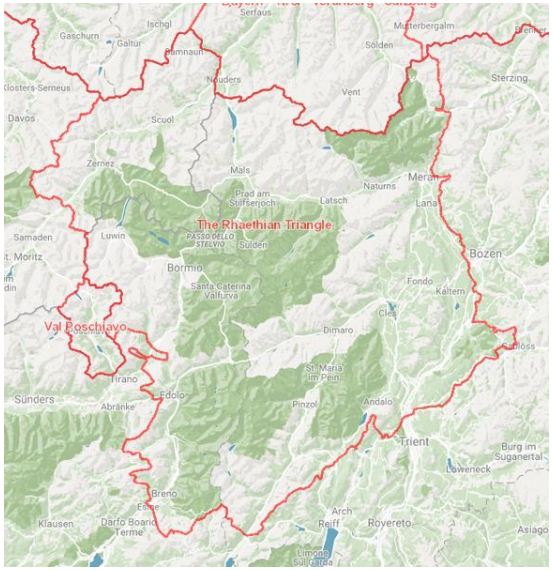





Where are the best zones to act across heavily used valleys?



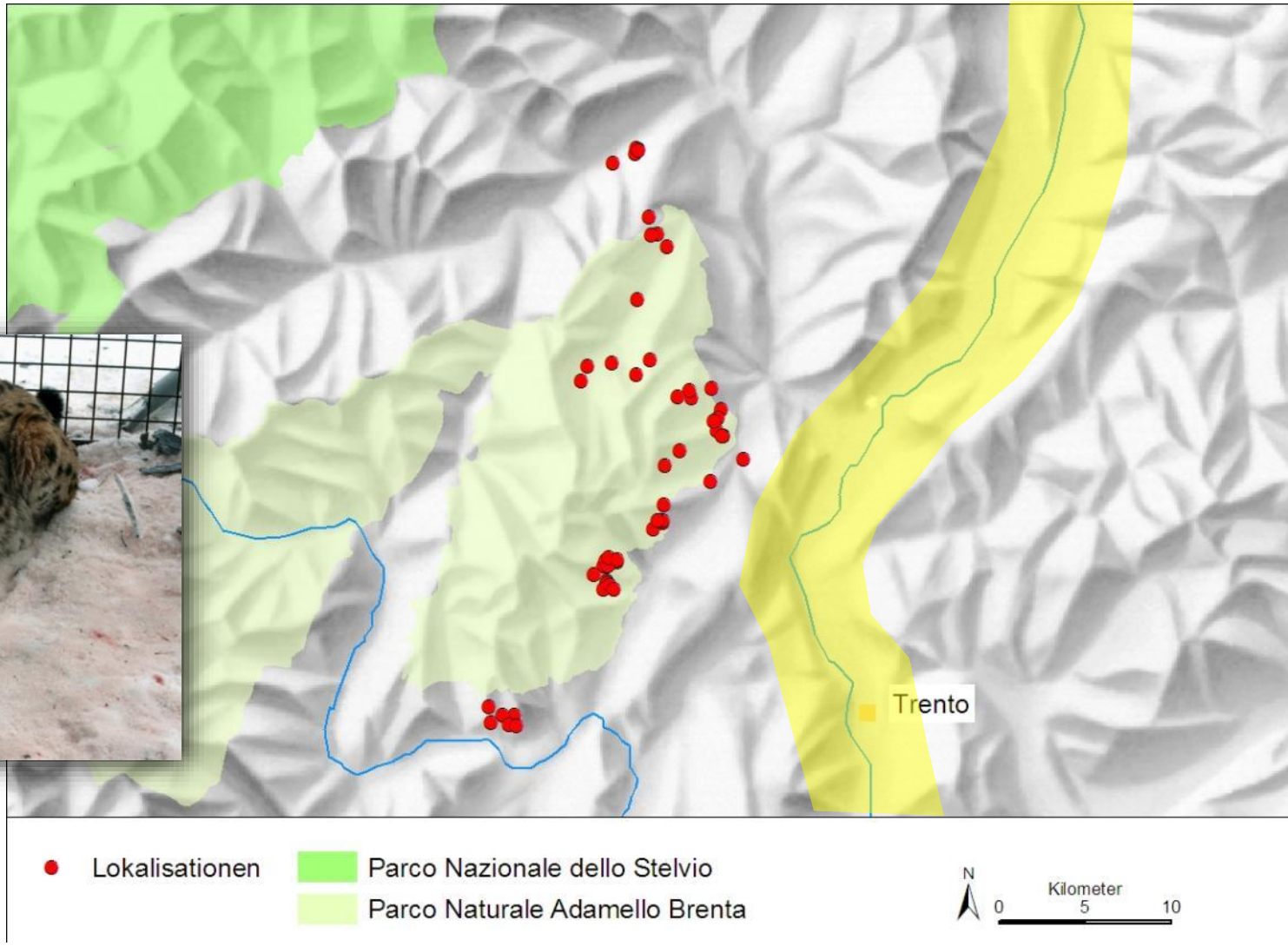
JECAMI 0.0



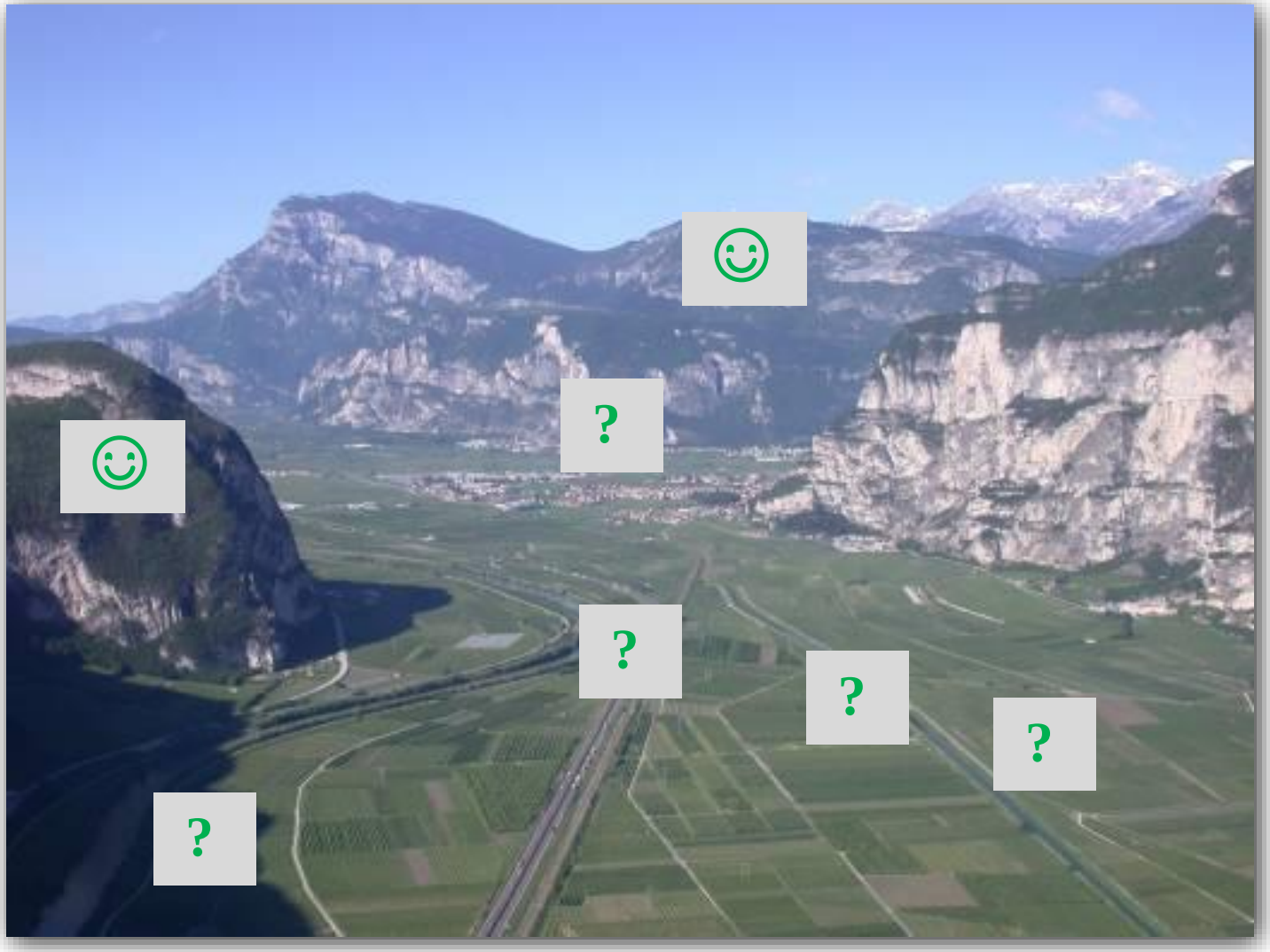
„Mapping relevant factors“

06.04.2017

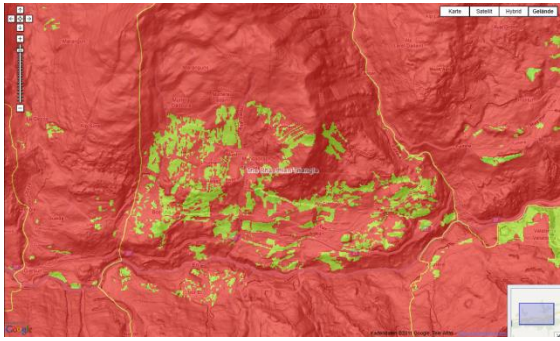
The “common” connectivity problem



The lynx connectivity problem



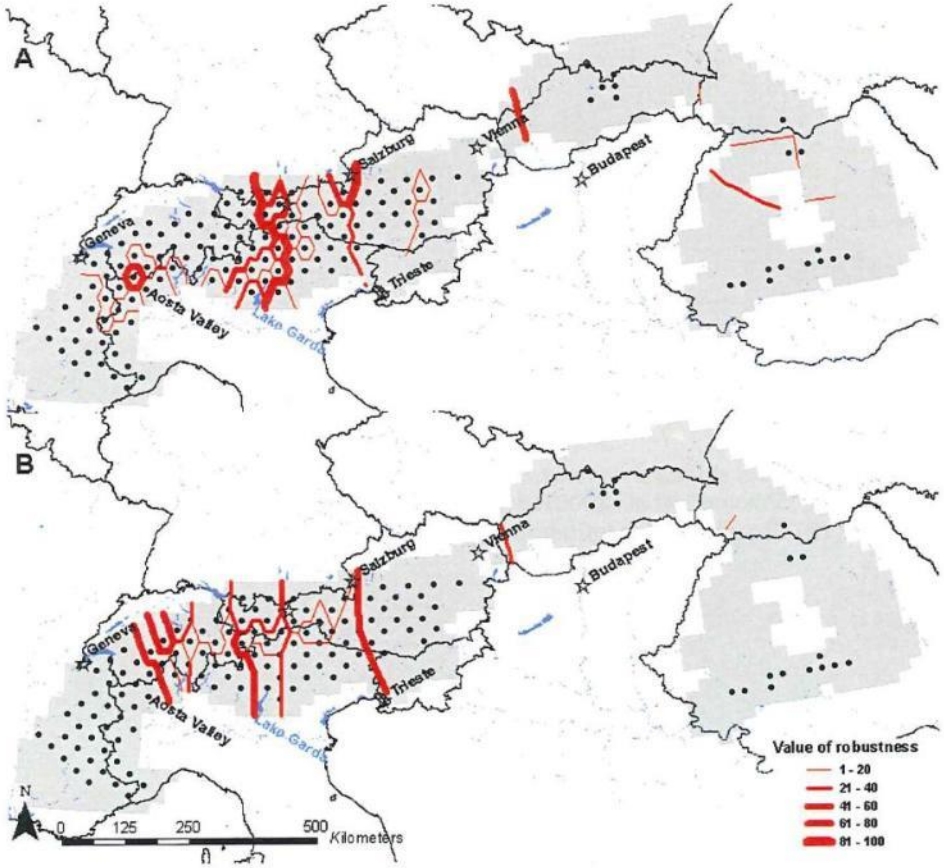
The small scall connectivity



Connectivity, biodiversity and climate change in the Alps

swisstopo 2011

Genetical differences in the Alps



Thiel-Egenter, 2007

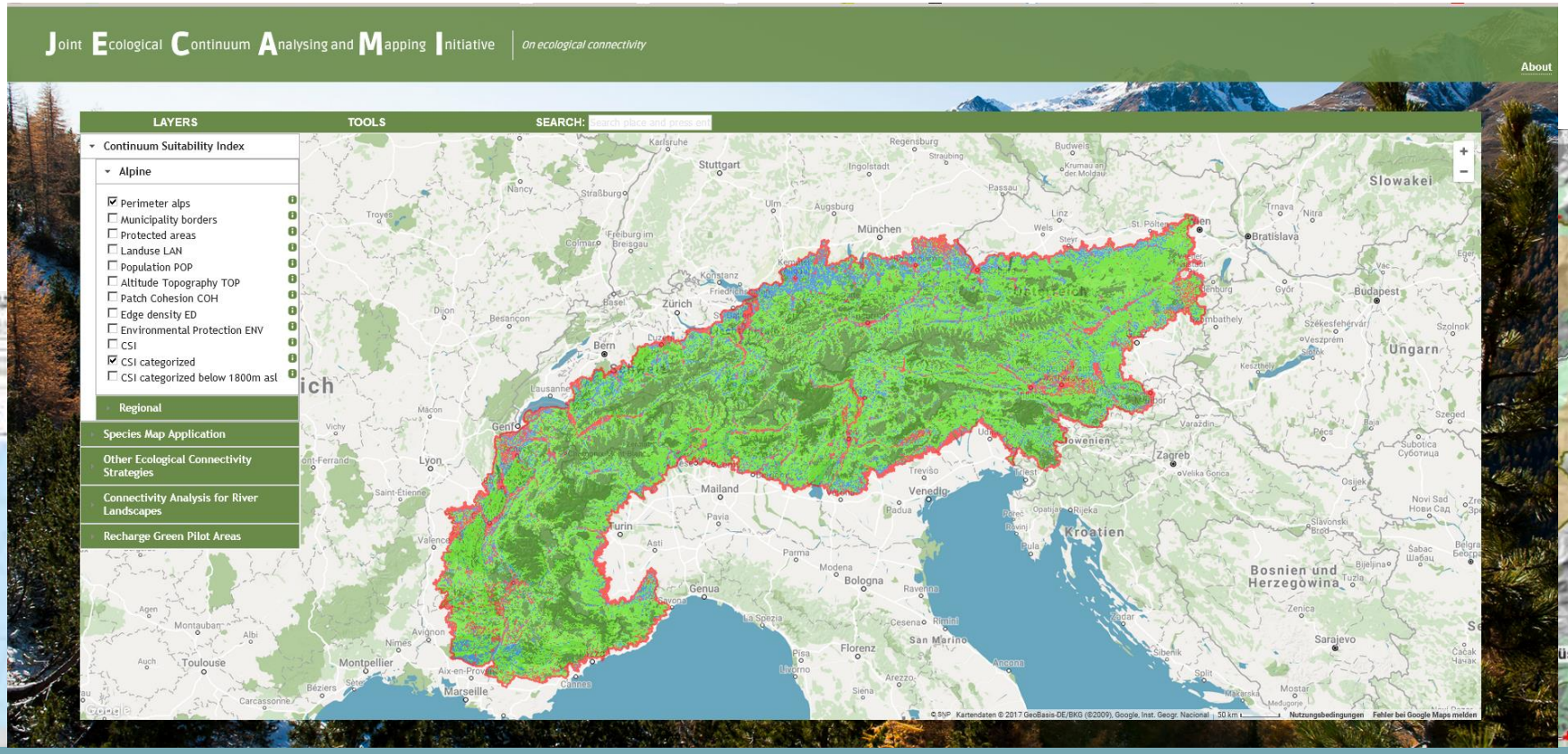
Protocol “Conservation of nature and the countryside” of the Alpine convention

Article 12

Ecological network

The Contracting Parties shall pursue the measures appropriate for creating a national and cross-border network of protected areas, biotopes and other environmental assets protected or acknowledge as worthy of protection. They shall undertake to harmonise the objectives and measures with the cross-border protected areas.

How to concatenate these spatial levels?



JECAMI

Joint Ecological Continuum Analysis and Mapping Initiative

A platform to analyse and visualize ecological connectivity in the Alps

„Mapping relevant factors“

CSI

„The landscape approach“

SMA

„The species approach“

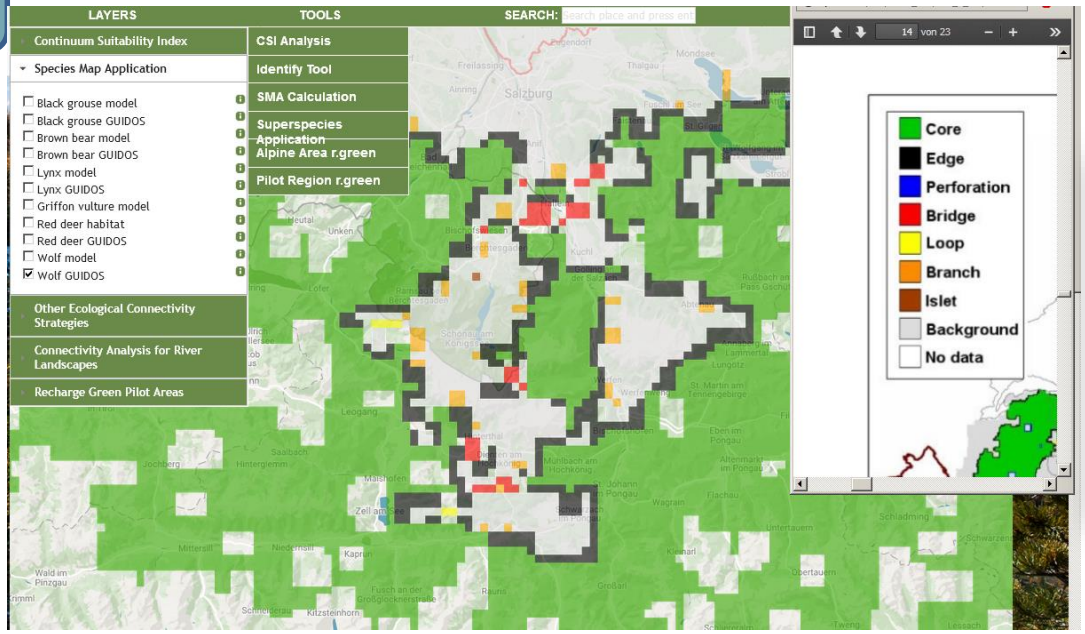
CARL

„Blue corridors“

Joint ecological connectivity analysis and mapping initiative

JECAMI – www.jecami.eu

SMA



Map of func. connectivity

Joint ecological connectivity analysis and mapping initiative

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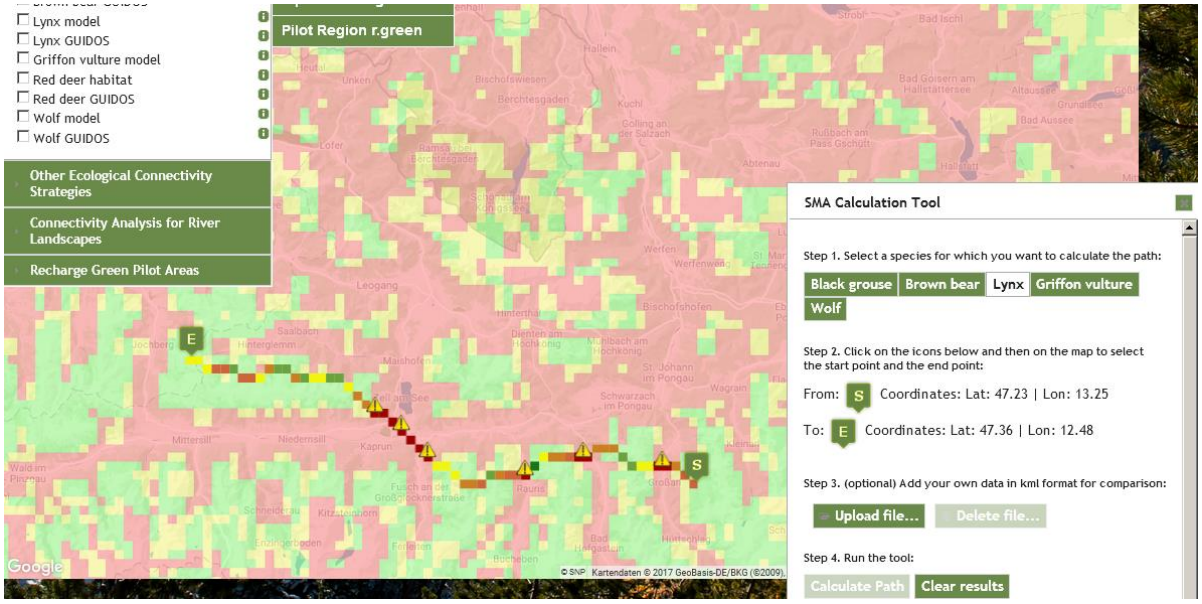
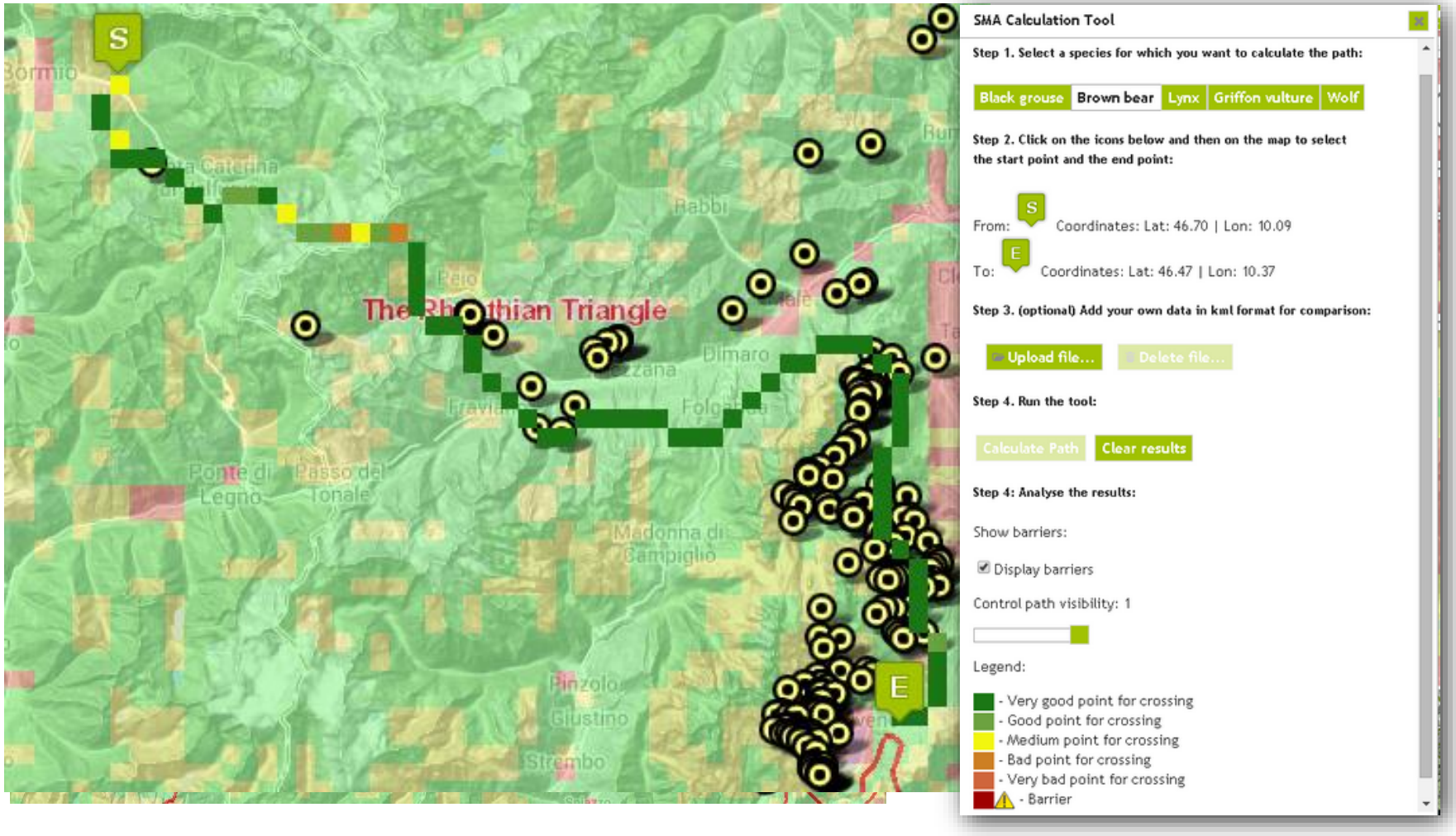
SMA



Path estimation

Compare with “real” wildlife data



„Mapping relevant factors“

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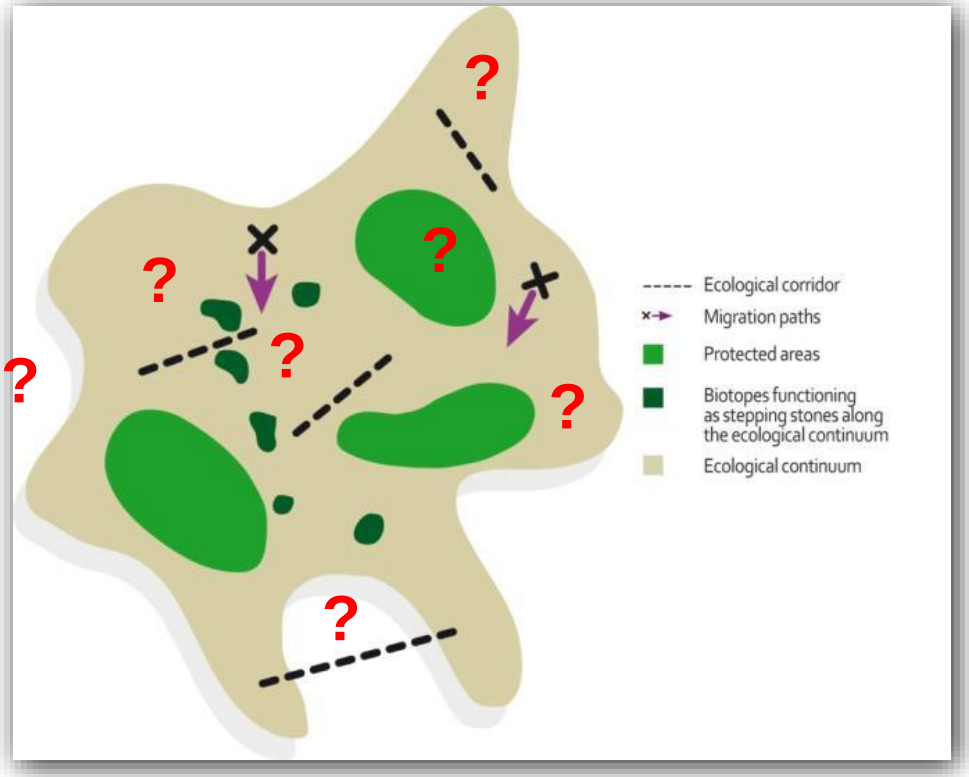
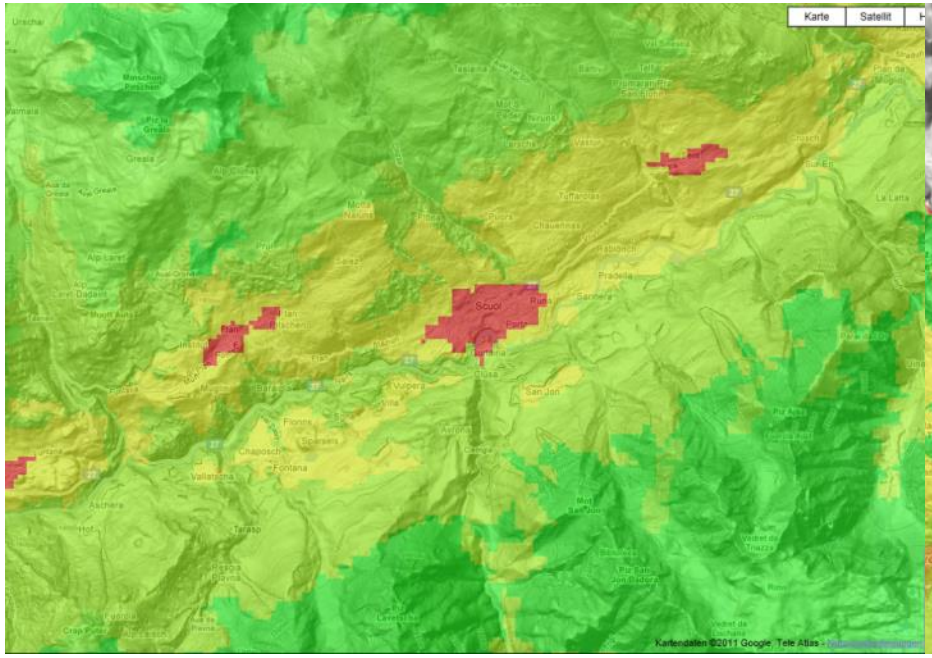
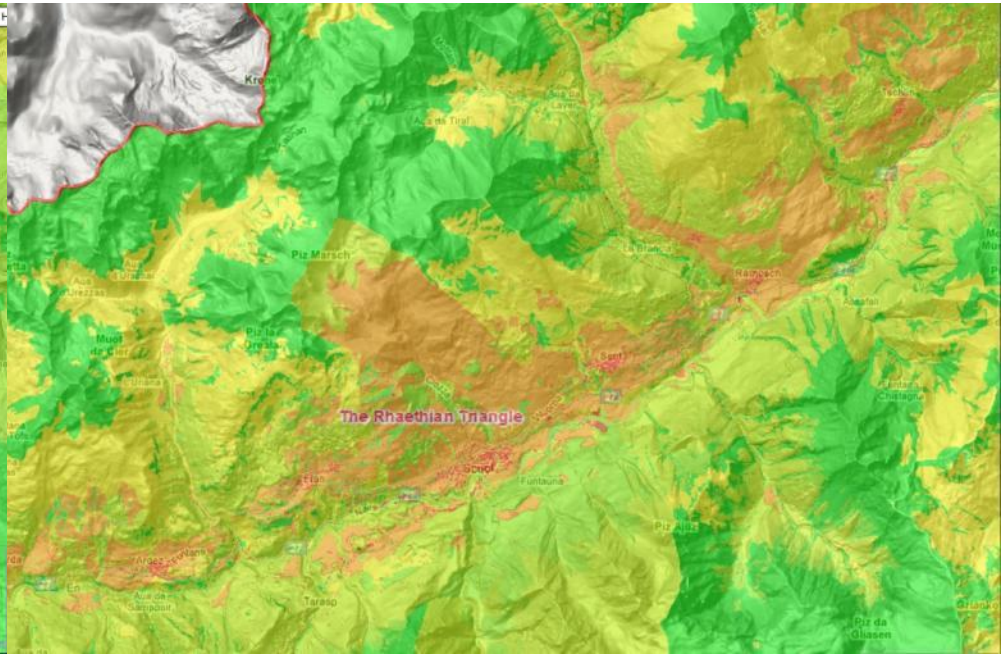
Ecological continuum



http://www.alpine-ecological-network.org

Local approach needs local data





Joint ecological connectivity analysis and mapping initiative

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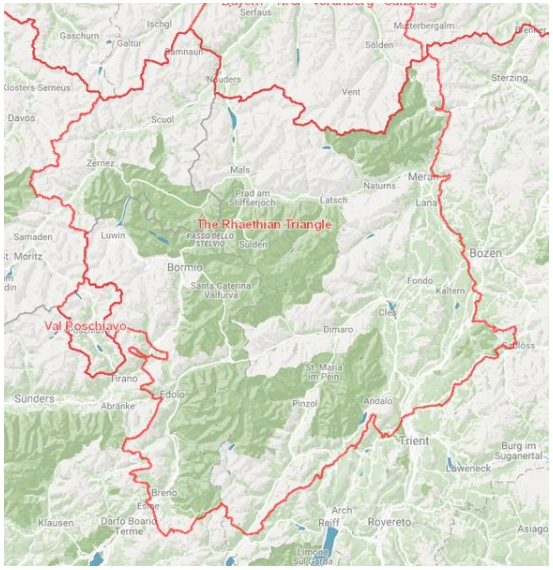
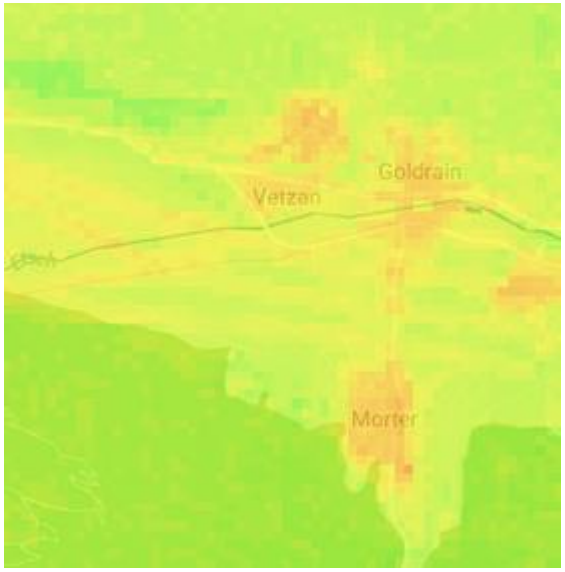
CSI





Local

Joint ecological connectivity analysis and mapping initiative

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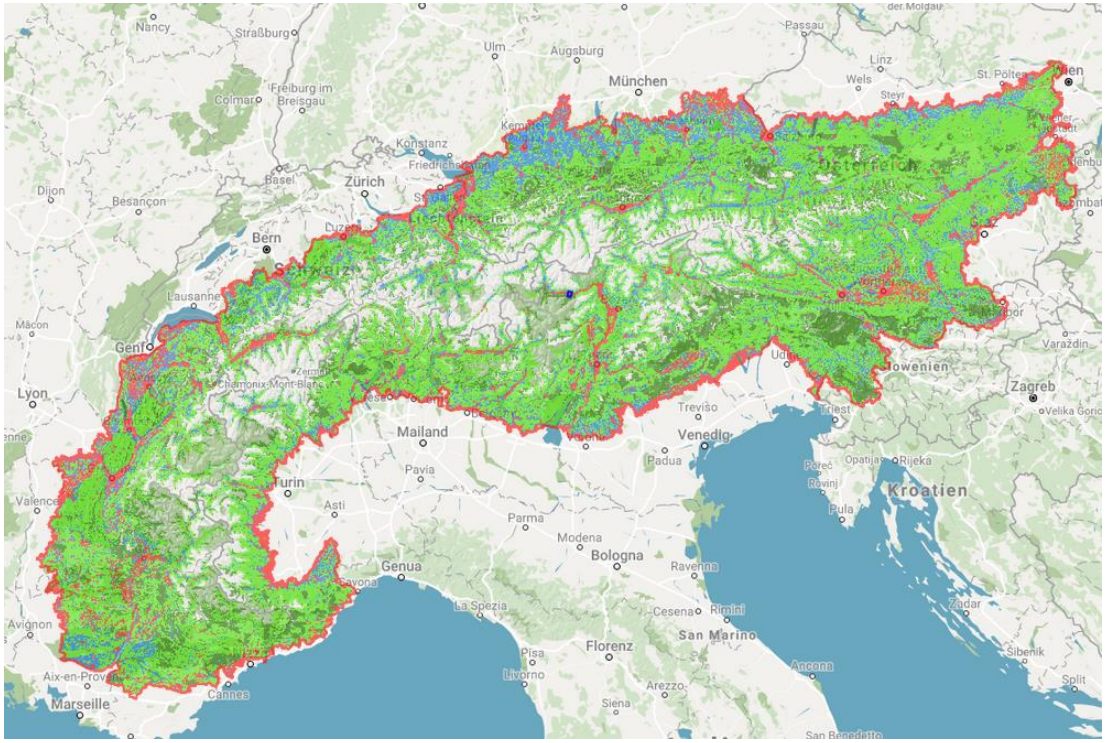
CSI



Alp wide

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CSI

Local analysis

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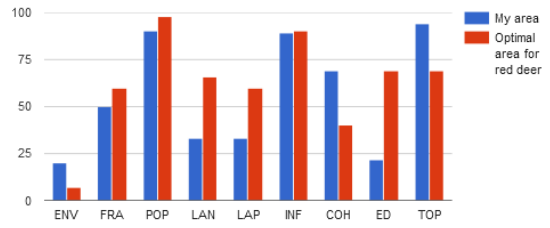
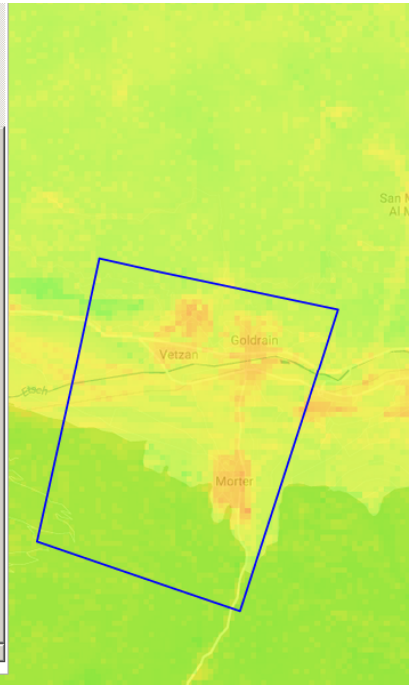
CSI

Step 4. Analyse the results:



Brown bear	Bearded vulture	Red deer	Wolf	Lynx	Grouse	No comparison

Index	Mean	Geometric Quality	Thematic Quality	Completeness Quality	Ac
ENV	20	49	67	100	
FRA	50	52	50	100	
POP	90	52	30	100	
LAN	33	95	31	100	
LAP	33	95	29	100	
INF	89	95	80	100	
COH	69	52	28	100	
ED	22	52	28	100	
TOP	94	91	75	100	
ECO	NaN	NaN	NaN	NaN	



Local results

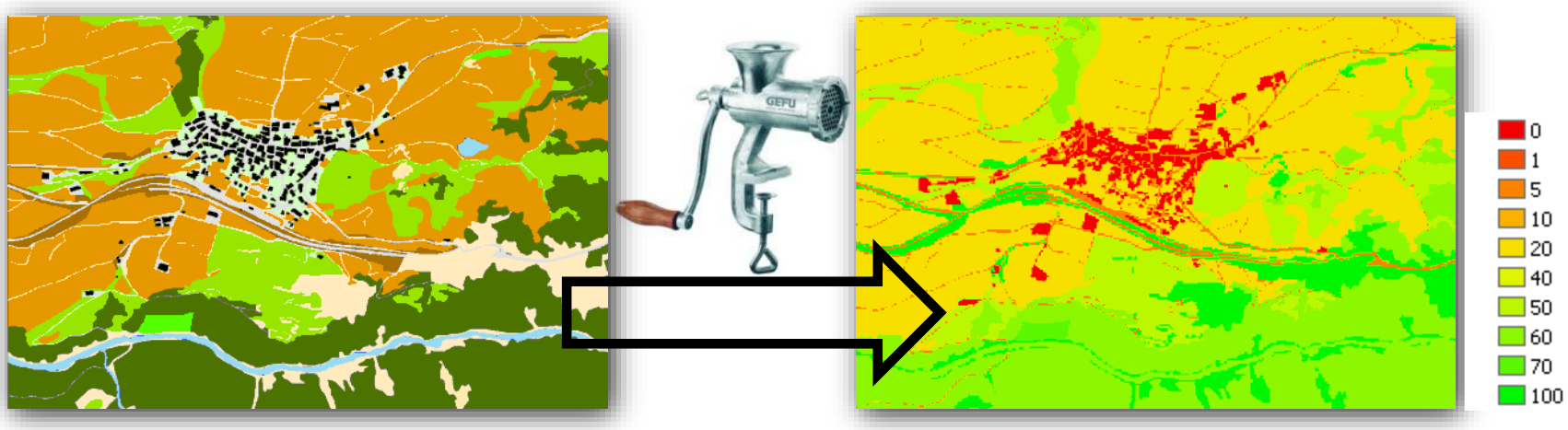
Joint ecological connectivity analysis and mapping initiative

CSI

Indicator	Description
Ecological measures	Planned or realized measures
Fragmentation	Degree of fragmentation by human infrastructure
Landscape heterogeneity	Capacity of stepstones for species migration
Environmental protection	Protected areas, based on legal status
Population	General human pressure, local people and tourists
Infrastructure	Impact of diverse infrastructure
Land use	Coherence of activities with landscape type
Land use planning	Future developments
Altitude and topography	Absolute altitude, energy and slope
Urbanisation	Pendular movements
Economical activity	Weight of economic activities by sectors
Public opinion and policy	Political and public will
Pollution	Level of disturbances, human impacts
Artificial light	Brightness per area

From data to CSI

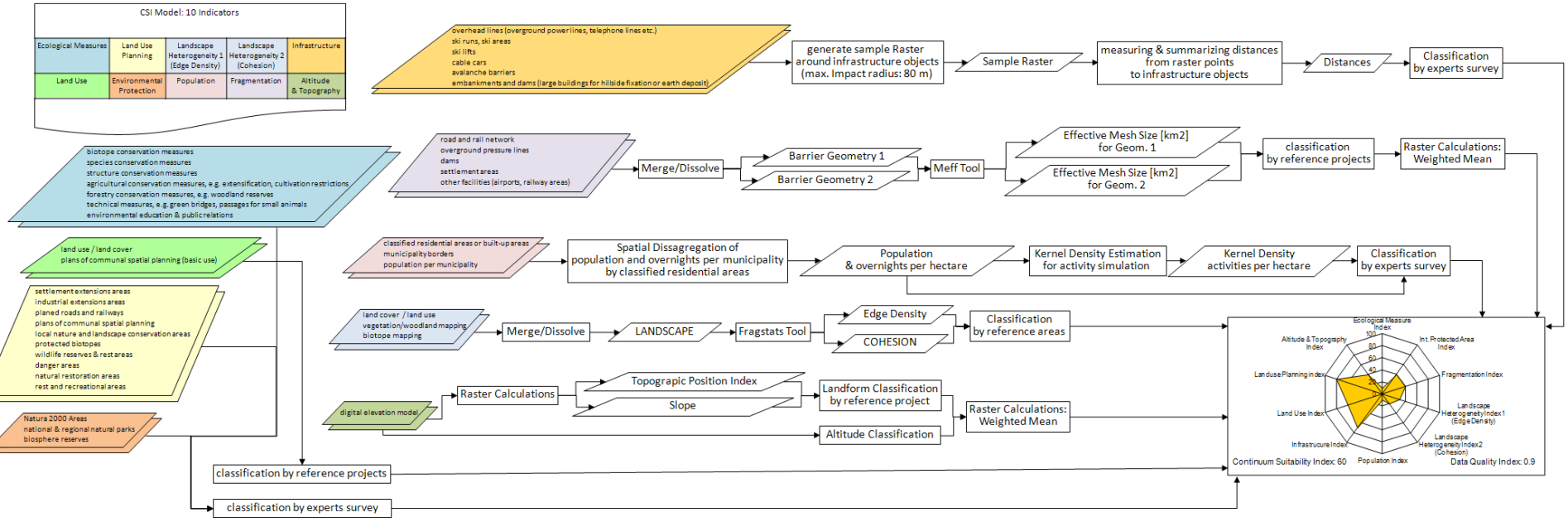
From data to CSI

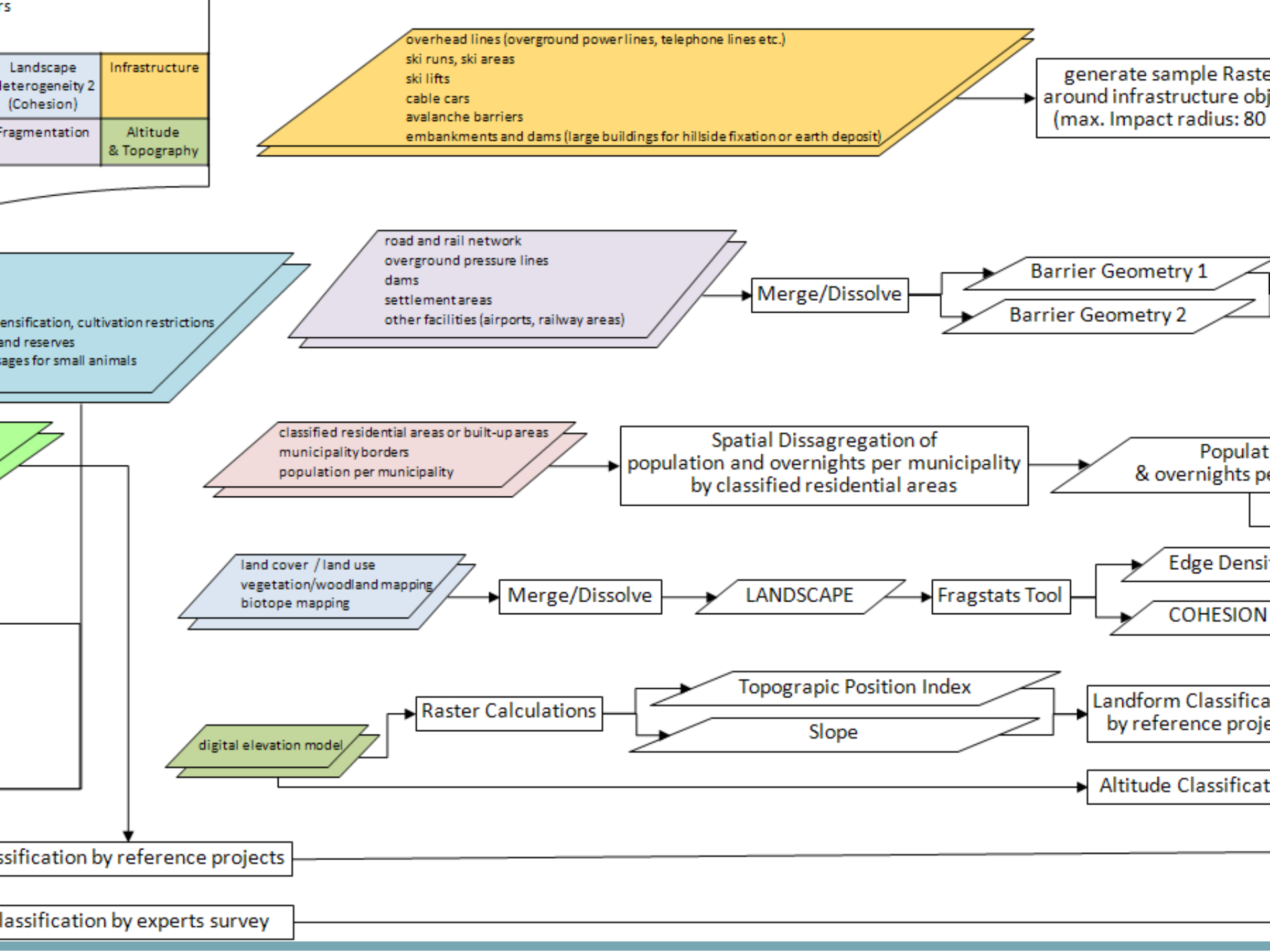


7 Pilot regions
Many Political regions
A few Coordinate systems
A bunch of Datasets

1 Coordinate system
10 Indicators (raster datasets)

Indicator model




Landscape
Heterogeneity 2
(Cohesion)
Infrastructure
Fragmentation
Altitude
& Topography
overhead lines (overground power lines, telephone lines etc.)
ski runs, ski areas
ski lifts
cable cars
avalanche barriers
embankments and dams (large buildings for hillside fixation or earth deposit)
generate sample Raste
around infrastructure obj
(max. Impact radius: 80
road and rail network
overground pressure lines
dams
settlement areas
other facilities (airports, railway areas)
Merge/Dissolve
Barrier Geometry 1
Barrier Geometry 2
classified residential areas or built-up areas
municipality borders
population per municipality
Spatial Dissagregation of
population and overnights per municipality
by classified residential areas
Populat
& overnights pe
land cover / land use
vegetation/woodland mapping
biotope mapping
Merge/Dissolve
LANDSCAPE
Fragstats Tool
Edge Densi
COHESION
digital elevation model
Raster Calculations
Topograpic Position Index
Slope
Landform Classifica
by reference proje
Altitude Classificat
ssification by reference projects
lassification by experts survey

„Mapping relevant factors“

CSI

„The landscape approach“

SMA

„The species approach“

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„Blue corridors“

Joint ecological connectivity analysis and mapping initiative

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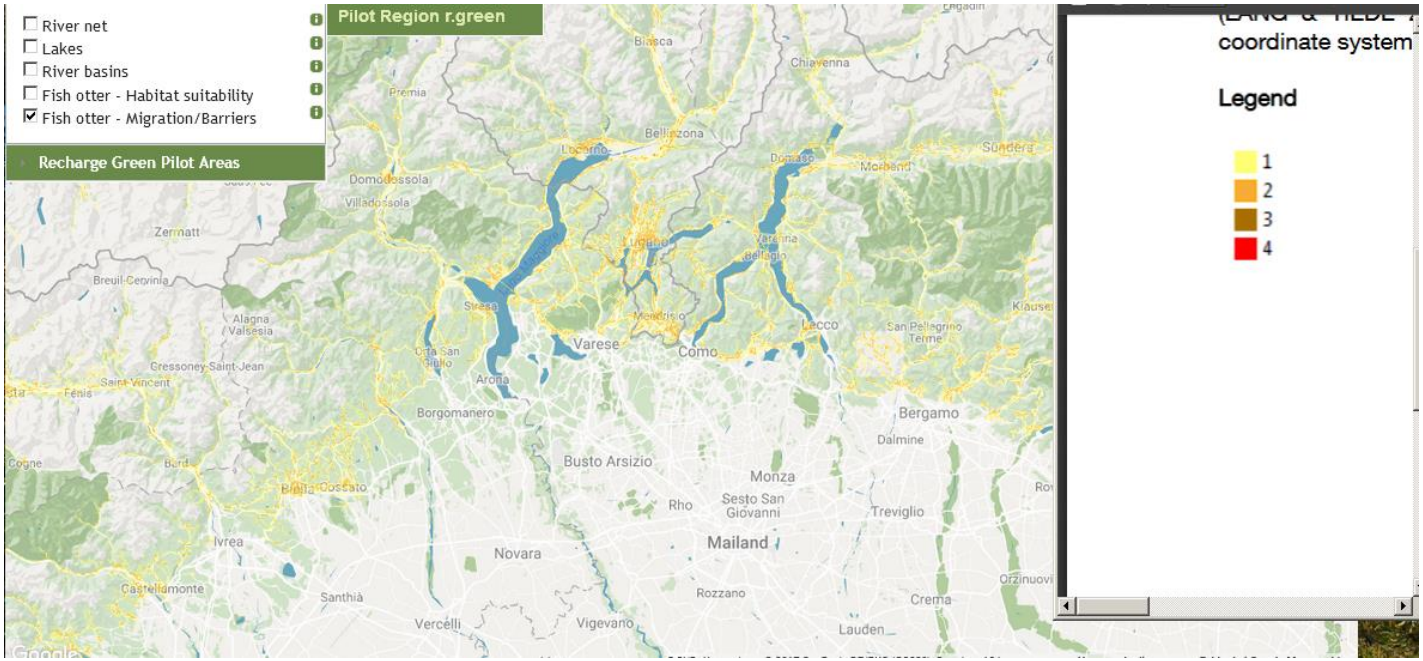
Blue corridors



Func. connectivity for fish otter

Joint ecological connectivity analysis and mapping initiative

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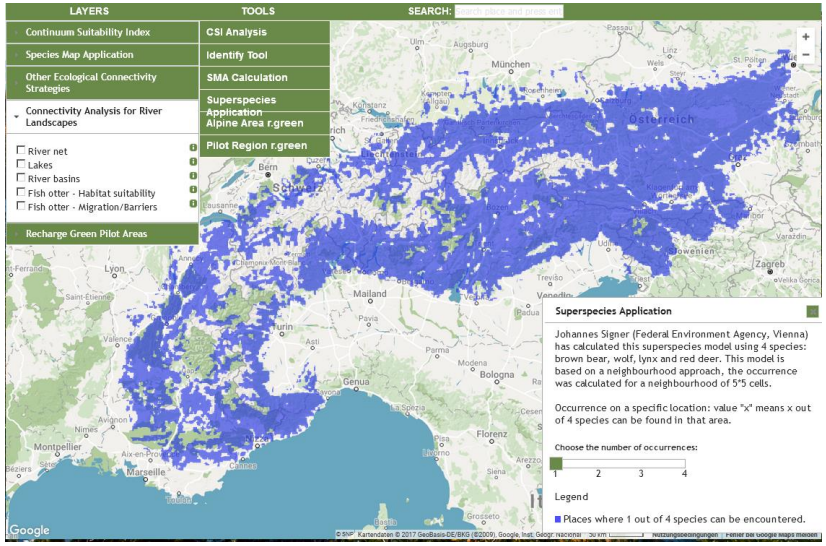
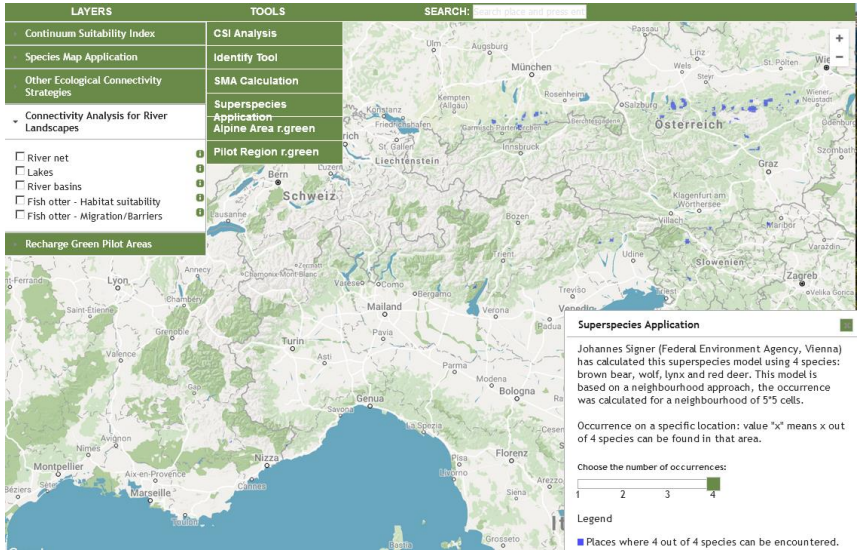
Super species





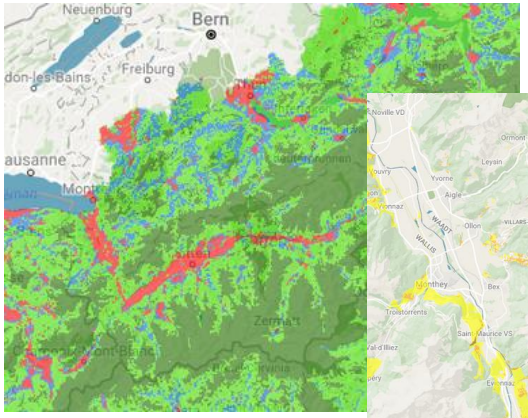
Super species tool

Joint ecological connectivity analysis and mapping initiative

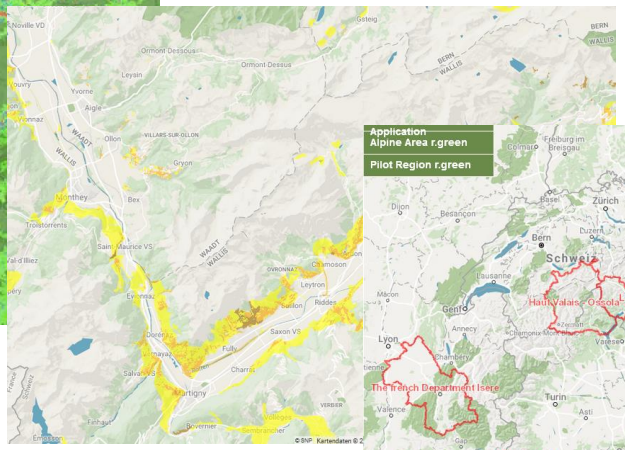
JECAMI – www.jecami.eu

Other GI

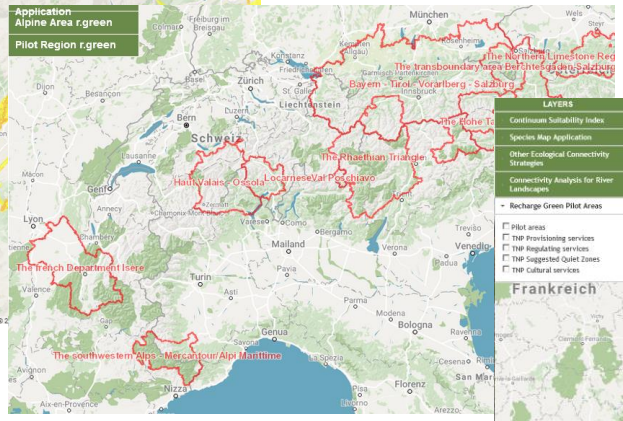
Recharge Green



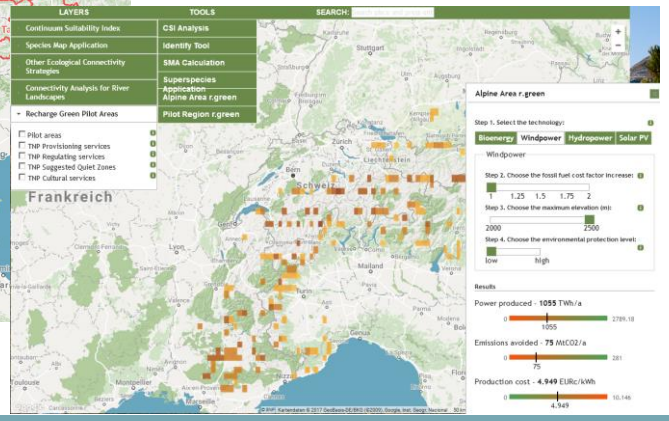
CSI categorized



REN CH



More regional data



Renewable energy potential

Joint ecological connectivity analysis and mapping initiative

JECAMI – www.jecami.eu

CSI	SMA	Blue corridors	Super-Species	Other GI	Renewable Energy

www.jecami.eu

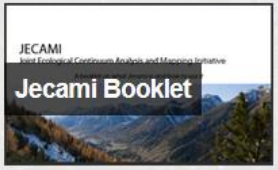
About Jecami - what is it?

JECAMI is an online application that facilitates the analysis of ecological connectivity in the European alpine region.

Zoom to your area of interest and discover the values of different connectivity indicators in the Layers menu. If you have a kml layer of your area, just upload it to the CSI Analysis Tool and get a mean of the indicator values for this region. The **Continuum Suitability Index** is a combined analysis of structural landscape connectivity and landscape permeability. The landscape is considered as a Matrix where each part or patch promotes more or less the ecological connectivity. The CSI-Tool is not thought as a planning tool, but it rather gives a first insight in the initial situation.

Have you asked yourself which areas are suitable for which species? The **Species Mapping Application** Tool can display the favourable areas for the black grouse, the brown bear, the lynx, the griffon vulture and the wolf. SMA shows which areas are suitable for different species. The SMA tool calculates an optimal path for a selected species and shows the barriers and corridors along the path.

Tutorials - how does it work?



At the moment, we are working on improving the online tools, so please report **here** any problems you might encounter.

Partners - who is behind the project?

Jecami was developed as part of the Econnect Project. The data used for the models come from various **sources**.

econnect
Restoring the web of life

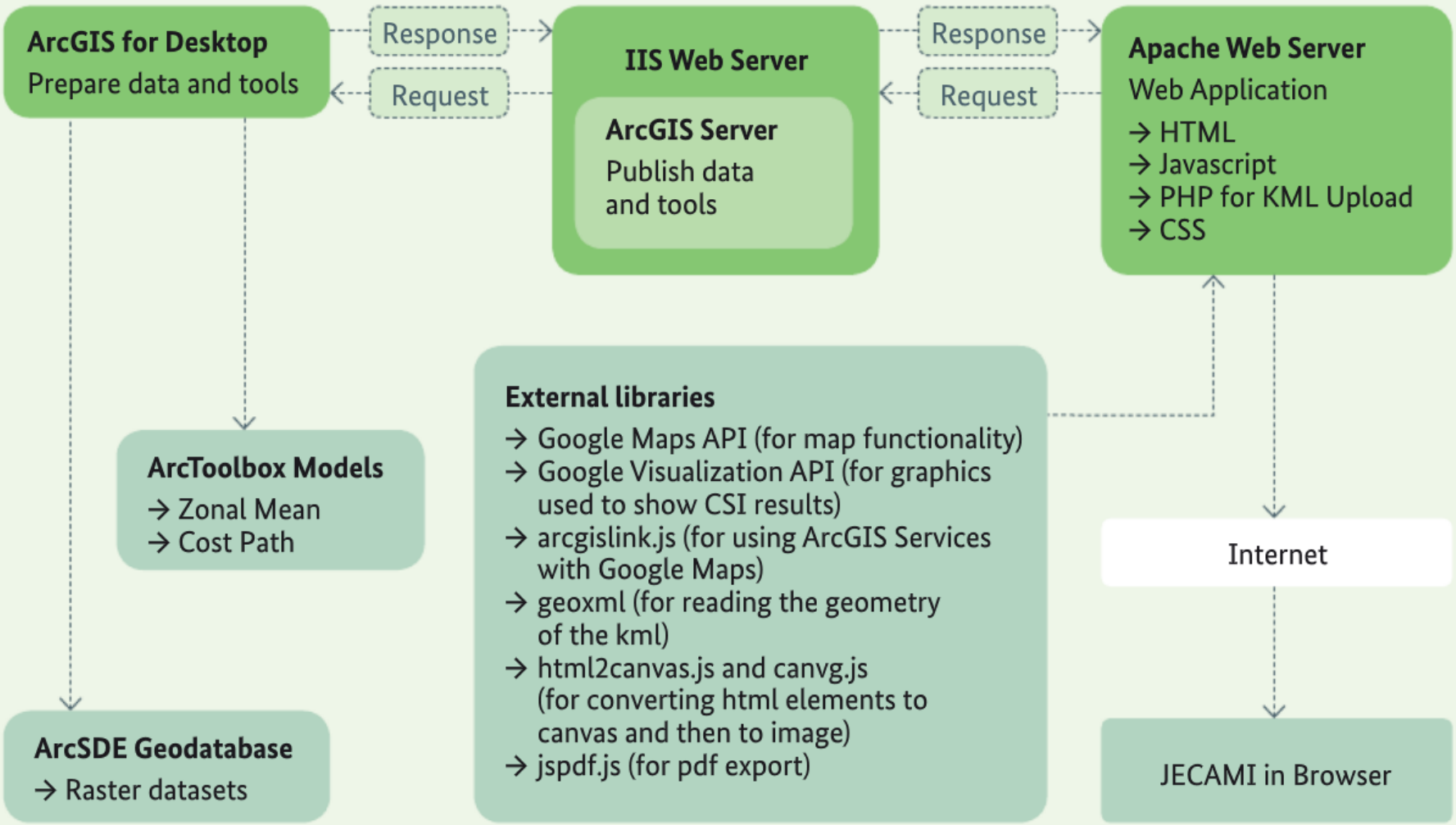
parc naziunal svizzer

Alpine Space

alpenkonvention · convention alpine
convenzione delle alpi · alpska konvencija

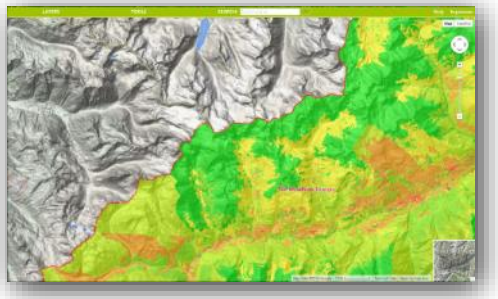
Platform Ecological Network

The technical framework of JECAMI

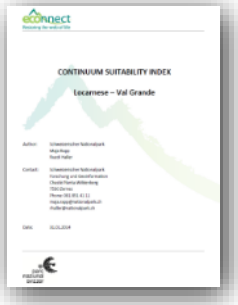


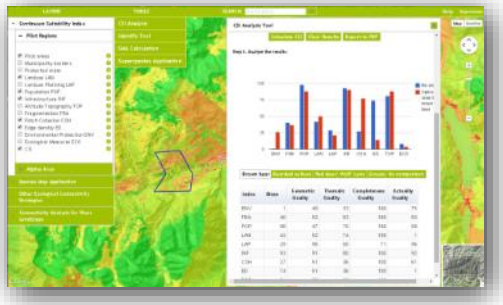
Benefits

JECAMI serves all interested stakeholders on all political levels by visualization of the connectivity potential to plan spatially meaningful actions

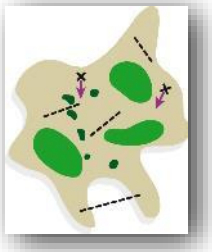


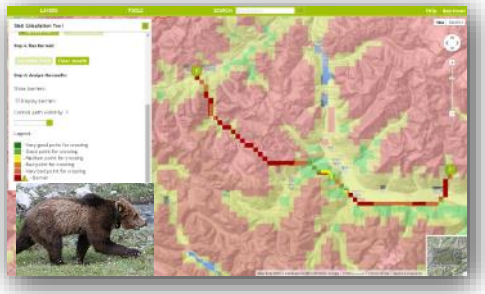
Measure dimensions on ecological connectivity of any area of the Alps, e.g. EC hotspots or action areas



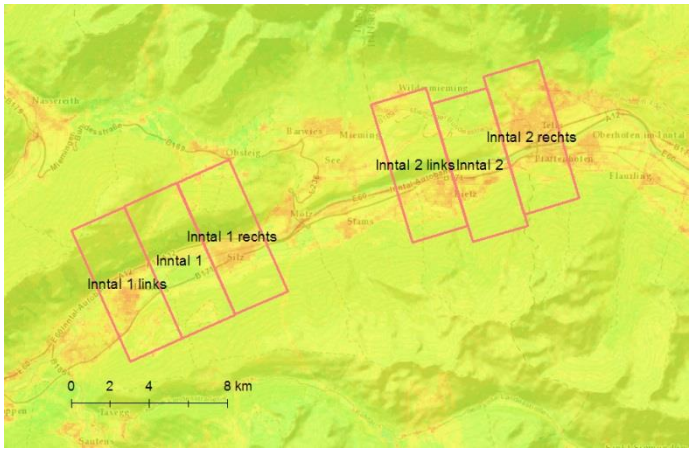


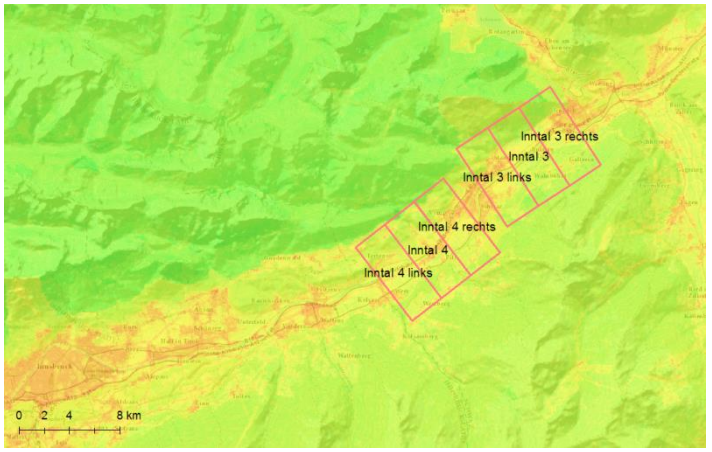
Analysis of spatial movements and identification of barriers , explain species occurrence on species level

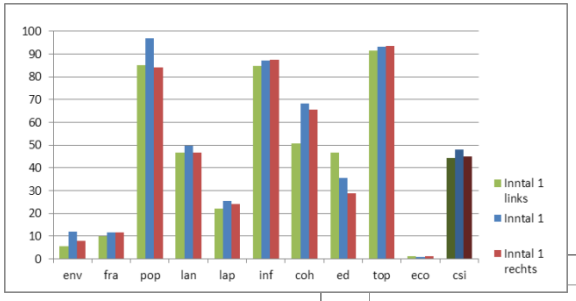


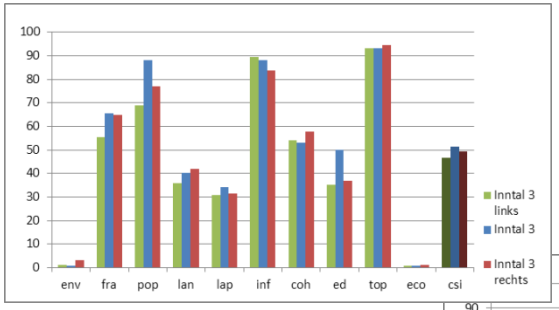


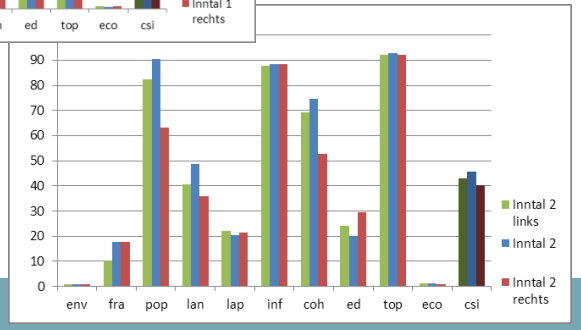
Where are the best zones to act across heavily used valleys?

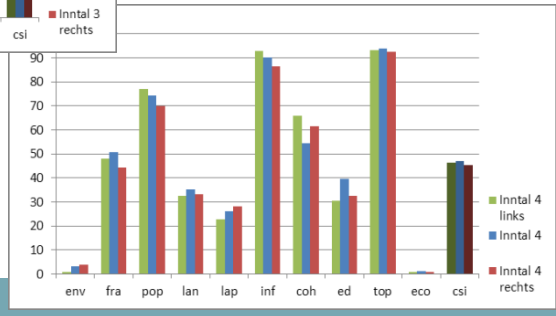












Restrictions of the JECAMI

- JECAMI is just a tool (out of others), it does not makes decisions on its on.
- All content and indicators are human made and therefore to be discussed and further assessed.
- JECAMI has been developed while an Interreg IV B project. It does not have an official legitimation nor is it’s further maintenance and development is assured.



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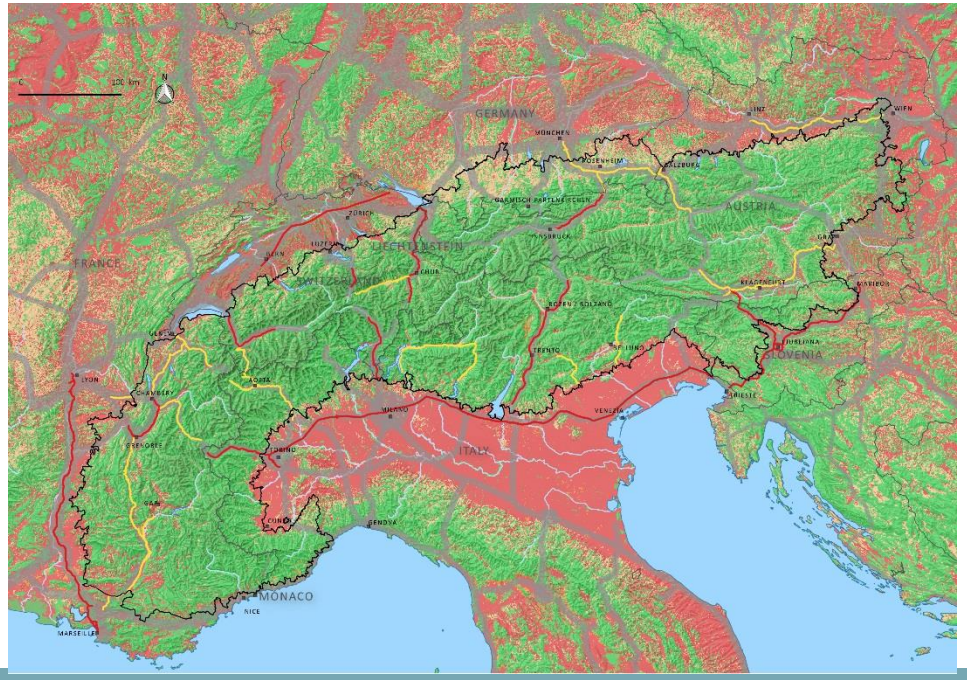
econnect
Restoring the web of life

www.econnectproject.eu
www.jecami.eu

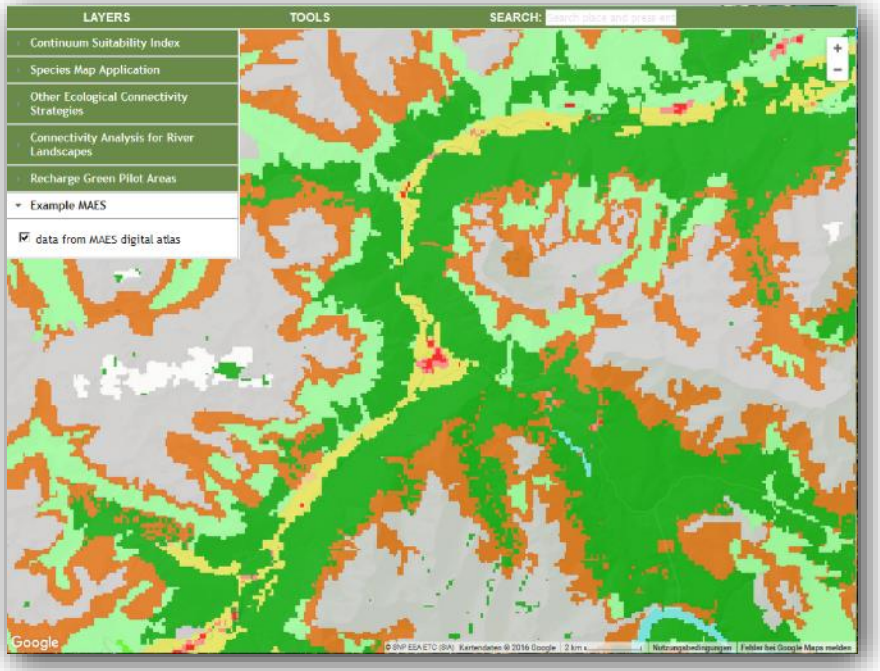
New ideas 2017 - 2019

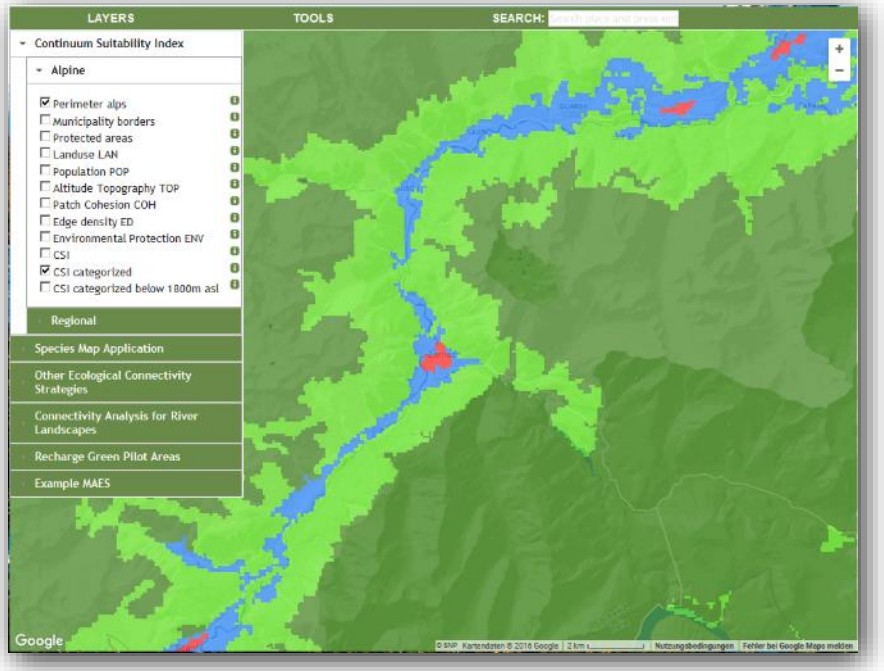
- Integrate a multi paths species analysis
- Integrate new (local) data
- Integrate user data and assumptions (e. g. a new infrastructures as barriers or potential GI to analyse the impact of a measure)
- Split the «grown» web service into the «public» and «specialist» versions
- …



Benefits

JECAMI can integrate different spatial data, provided by national and regional data providers or projects and allows comparisons between different GI-mapping approaches, e.g. MAES (maps of ecosystem types and ecosystem services)

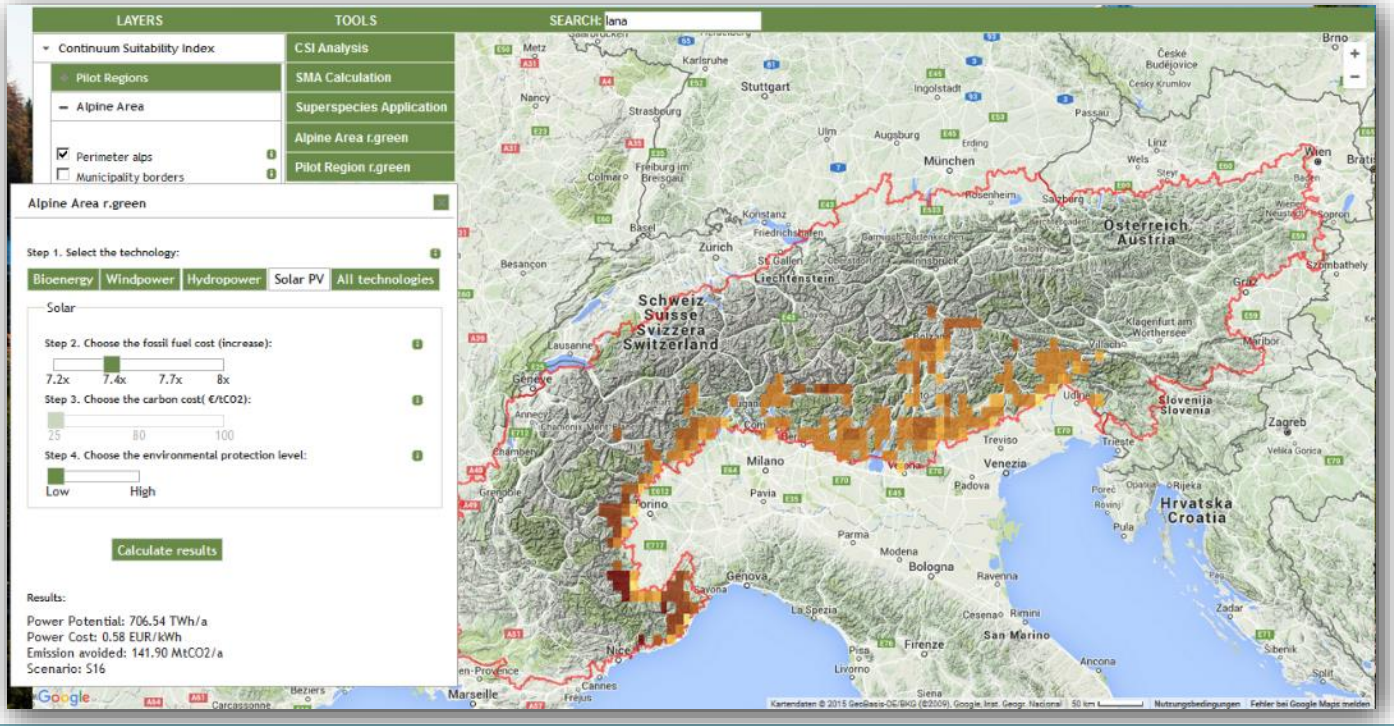




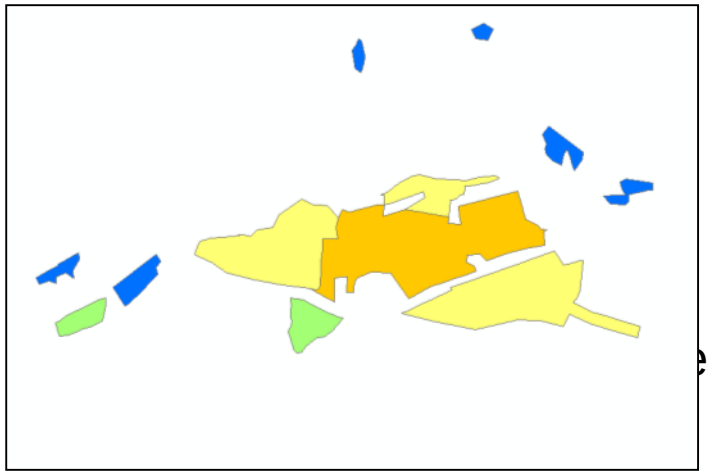
Source: http://biodiversity.europa.eu/maes/maes-digital-atlas

Benefits

JECAMI shows a part of the Alpine Ecosystem Service, e.g. the potential of renewable energy in the Alps (recharge.green)



Recharge.green



Klassifizierte Wohngebiete

+

COMM_NI	COMM	POP_91	POP_07	OVN_05
12001	Agra	342	405	0
12002	Albizzate	5089	5014	2344
12003	Angera	5384	5672	16324
12004	Arcisate	8946	9859	740
12005	Arsago Seprio	4121	4746	0
12006	Azzate	3720	4297	1512
12007	Azzio	646	755	154
12008	Barasso	1636	1728	0
12009	Bardello	1274	1512	0
12010	Bedero Valcuvia	504	625	0
12011	Besano	2154	2485	0
12012	Besnate	4[illegible]	[illegible]	0
12013	Besozzo	7639	8971	111
12014	Biandronno	3109	3233	17454
12015	Bisuschio	3[illegible]	[illegible]	[illegible]

Bevölkerung -und Tourismusdaten

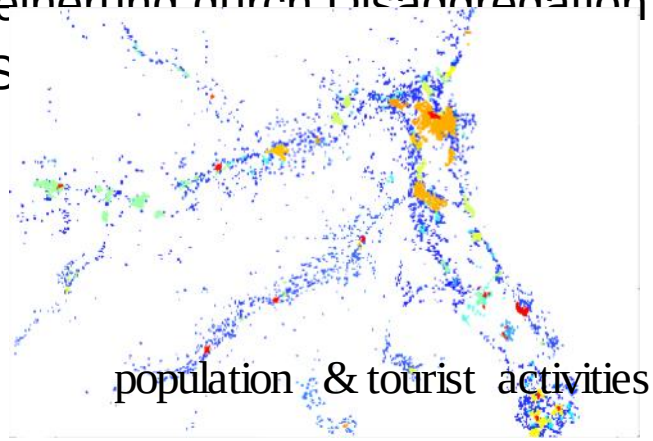
– [illegible]er Mensche auf die U[illegible]

$$k = \frac{population}{\sum_i A_i * site\_density_i}$$

– Räumliche Verfeinerung durch Disaggregation

– Bevölkerung x S[illegible]

– Indikator W[illegible]rt:



Bevölkerung und tour. Übernachtungen pro ha

$$population\ \&\ tourist\ activities = population + \frac{ovn \times ImpFct}{365}$$

$$pop.dens.per\ hectare = k * site\_density_i$$

Unfragmentiertes Gebiet

+

Barrieren-Geometrie

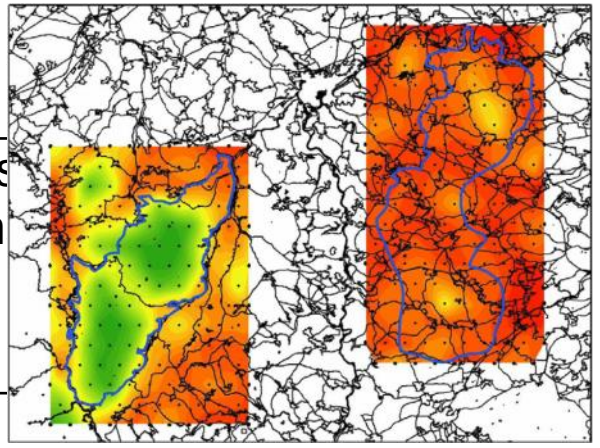
ragme … rnahen Bereichen

ert: Klassifizierung auf der Basis der Maschenweite“ (M_{eff})“

- Straßennetz – Siedlungs- und Industriegebiete
- Schienennetz – Weitere Infrastruktur (z. B. Flug
- Druckleitungen – Zäune
- (Stau)Dämme

M_{eff} berechnet für jede Zelle die Antreffenswahrs… Tieren. Diese ändert sich durch das Vorhanden… von Barrieren.

Berechnung einer interpolierten Oberfläche



Interpolierte Fragmentations-fläche

$$C = \sum_{i=1}^{n} \left(\frac{A_i}{A_g} \right)^2$$

$$m_{eff} = \frac{1}{A_g} \sum_{i=1}^{n} A_i$$

A_g: total area
A_i: subarea i
n: number of subareas