

Econnect - Restoring the web of Life



Developing a tool to analyze the potential ecological connectivity in the Alps -
The Joint Ecological Connectivity Analysis and Mapping Initiative (JECAMI) and the ECONNECT GeoPortal

Aim

“Where is the ecological continuum (the corridors and barriers) in the pilot areas and how can they be estimated and compared over all pilot regions?”

WP4 - Data Management (GIS platform)

WP5 - Barriers and corridors (Analysis of species and habitat types)

WP7 - Implementation in Pilot areas

- Connectivity mapping and landscape modeling
- Identification of connectivity potential

„Mapping relevant factors“



CSI

„The landscape approach“
Structural Connectivity



SMA

„The species approach“
Functional Connectivity



CARL

„The network approach“
Structural and functional c.

JECAMI: *Joint Ecological Continuum Analysis and Mapping Initiative*
A platform to analyze and visualize ecological connectivity in the Alps

Objectives of the landscape approach

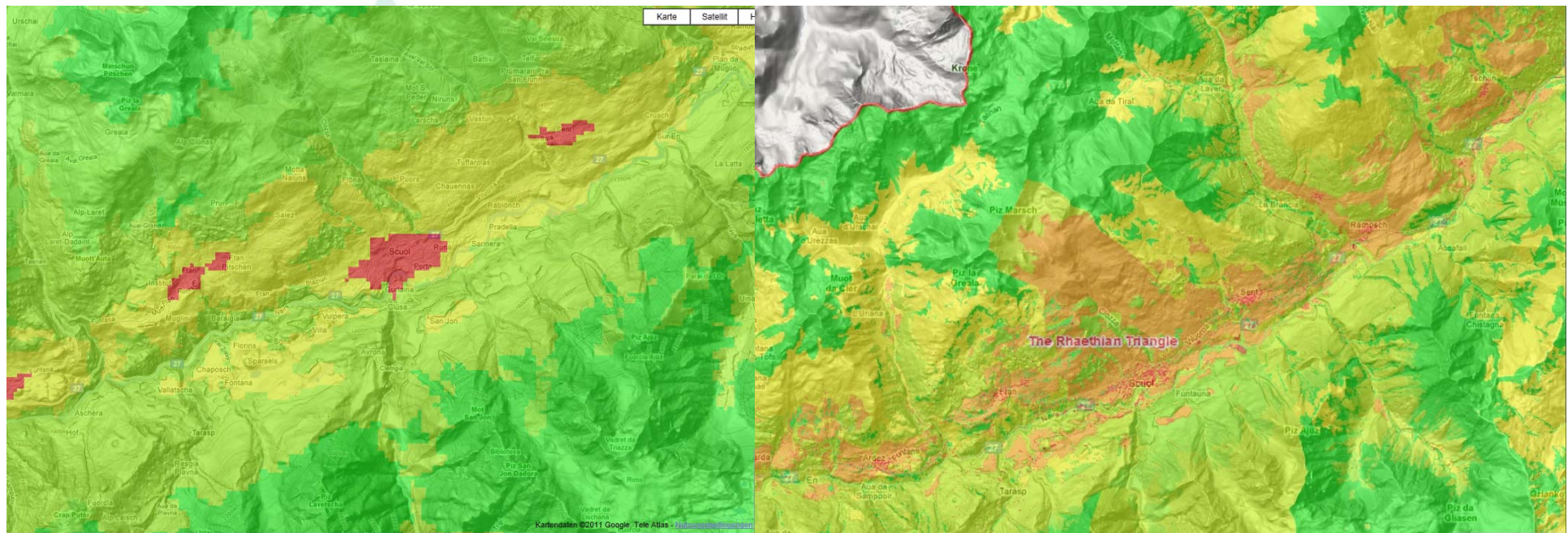
- General definition of the structure of an ecological continuum/ the connectivity
- Defining suitable criteria for an assessment of the space

- Definition of the scale: Provide **global**, alpine-wide analysis (>100 km²) as well as **local** analysis (<1 km²) in the municipalities

- high spatial precision and resolution of data is appreciated

- Mapping on the web - broad access for all interested parties without specific and expensive software

Locally high precision data needed



Webs of Life - Alpine Biodiversity needs ecological connectivity

10 Indicators

Population

Landuse

Landuse Planning

Altitude and Topography

Fragmentation

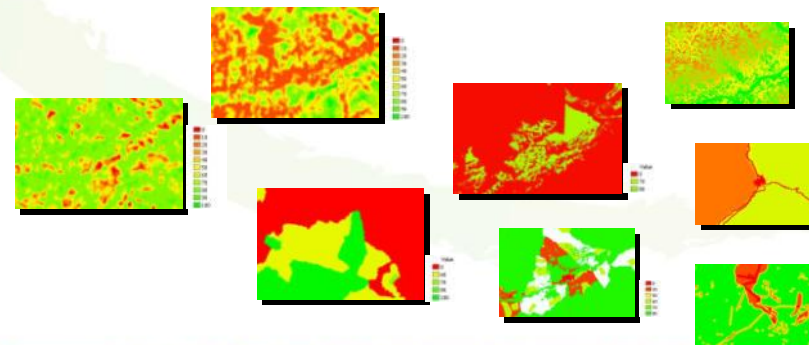
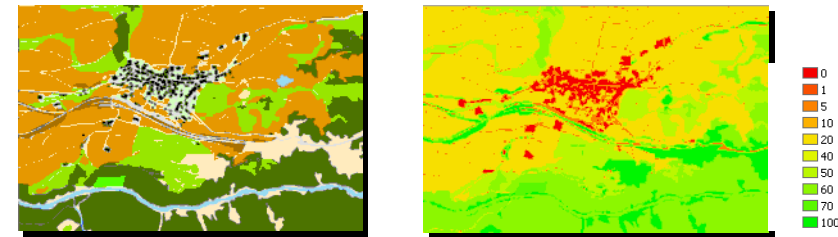
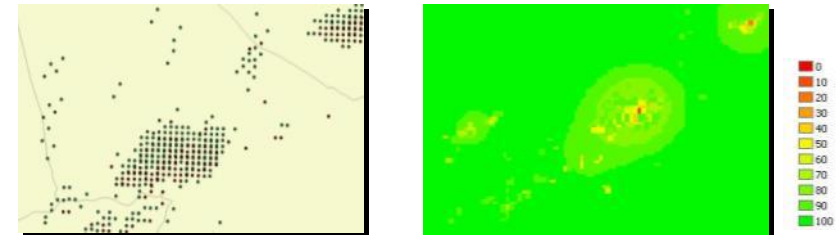
Infrastructure

Landscape Heterogeneity

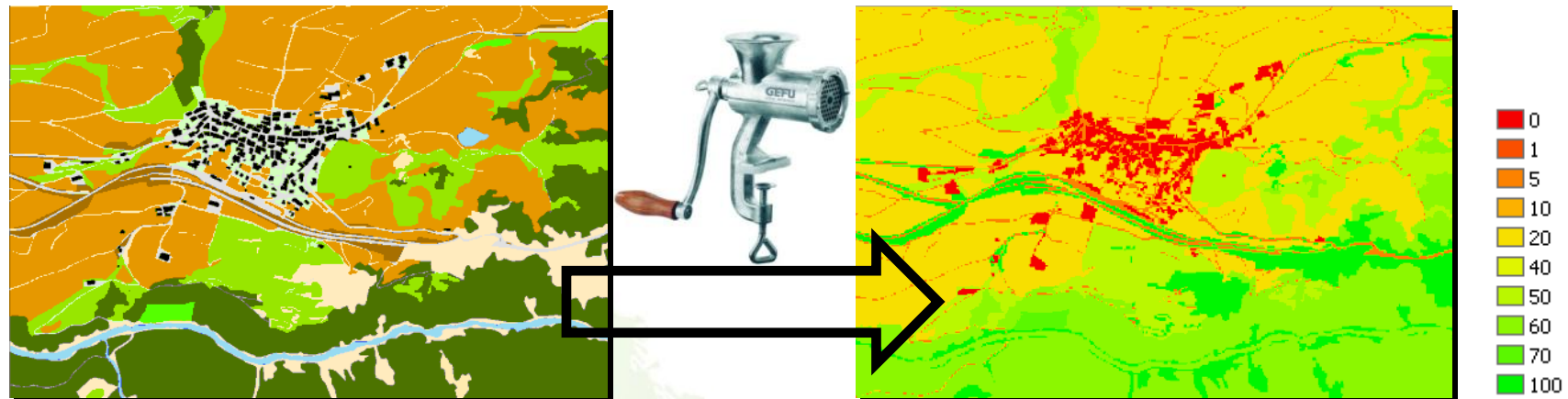
Edge density

International Protected Areas

Ecological Measures



Data processing



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

1 Coordinate system
 10 Indicators (raster datasets)

Data Management

GIS data collected included:

- Built-up areas, settlement areas
- Administrative boundaries
- Road and rail infrastructure (classified)
- Dams, weirs
- Terrain information
- Ski areas, cable cars, lifts, overhead power lines, fences, embankments

Data Management

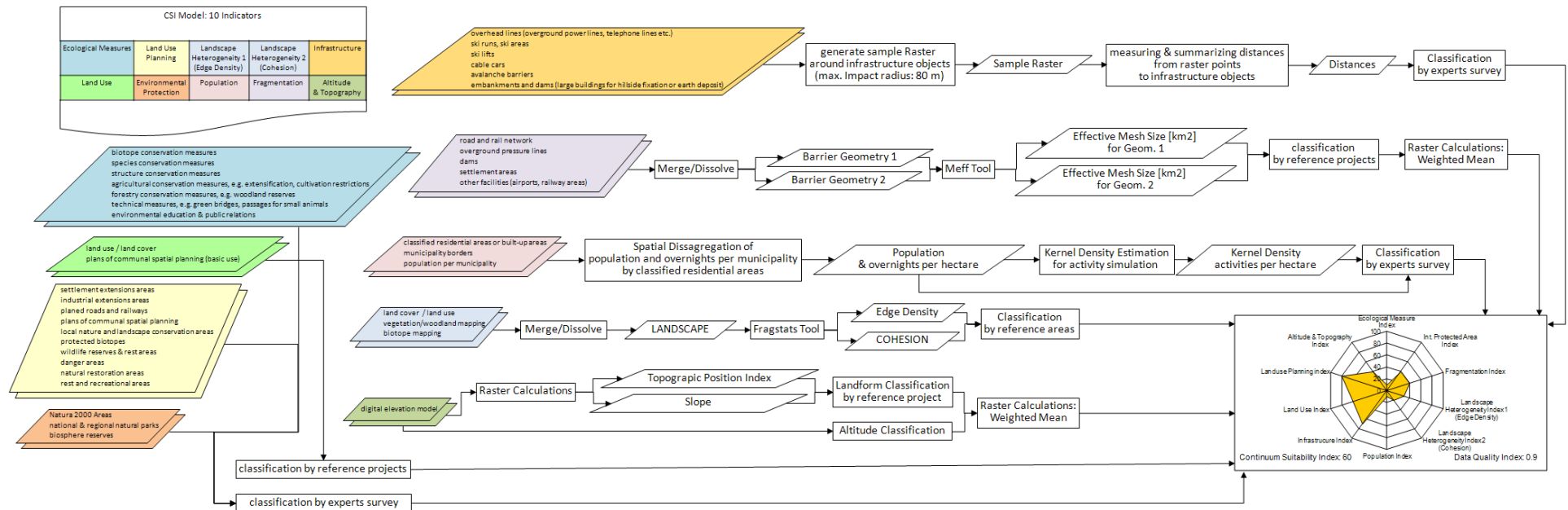
GIS data collected cont'd:

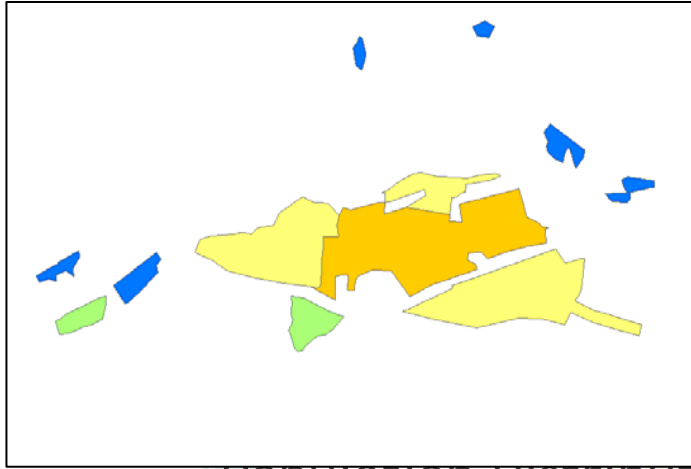
- Land Use/Land cover
- Land Use planning
- Forest Development Plan
- Protected areas (classified)
- River network, lakes, river morphology, embankments, hydro power stations, discharge, abstraction, watersheds,

Data Management

- Sources for each data set: five alpine countries, three languages, 18 regional Administrations
- Harmonised in language, classifications, coordinate systems
- Plenty of data - requires a data structure
- Metadata and license documentation
- Online GeoPortal set up for easily sharing data and having one central repository

Indicator model scheme



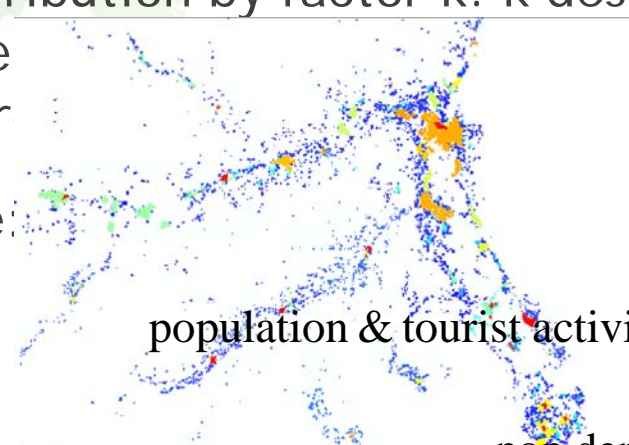


COMM_II	COMM	POP_91	POP_07	OVH_05
12001	Agra	342	405	0
12002	Albizzate	5089	5014	2344
12003	Angera	5384	5672	16324
12004	Arcisate	8946	9859	740
12005	Arsago Seprio	4121	4746	0
12006	Azzate	3720	4297	1512
12007	Azzio	646	755	154
12008	Barasso	1636	1728	0
12009	Bardello	1274	1512	0
12010	Bedero Valcuvia	594	625	0
12011	Besana	2154	2485	0
12012	Besnate	4538	5253	0
12013	Besozzo	7630	8971	111
12014	Biantrunno	3109	3233	17454
12015	Bisuschio	3760	4200	0

sure on environme
n spatial disaggreg

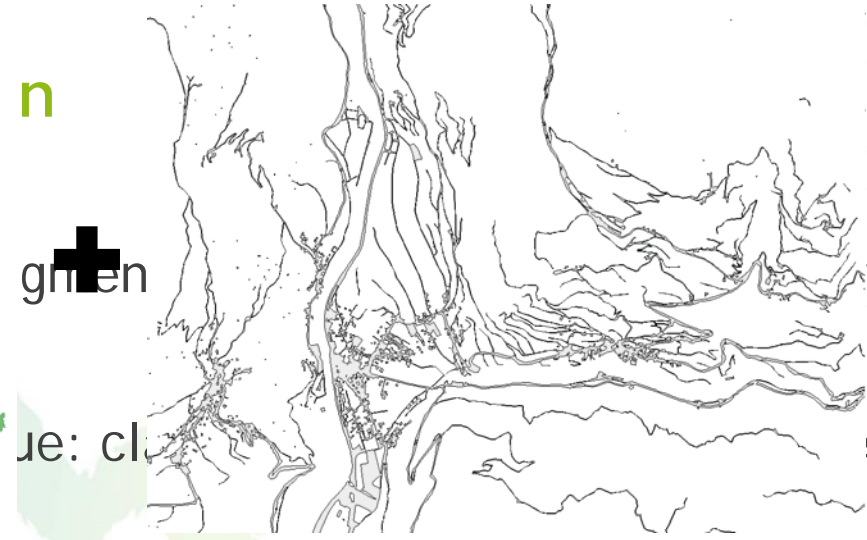
$$k = \sum_i A_i * \text{site_density}_i$$

Population Distribution by factor k. k describes the relation between site density depending on the ratio of Indicator value:



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

$$\text{pop.dens. per hectare} = k * \text{site_density}_i$$



n
green
natural spaces
mesh size

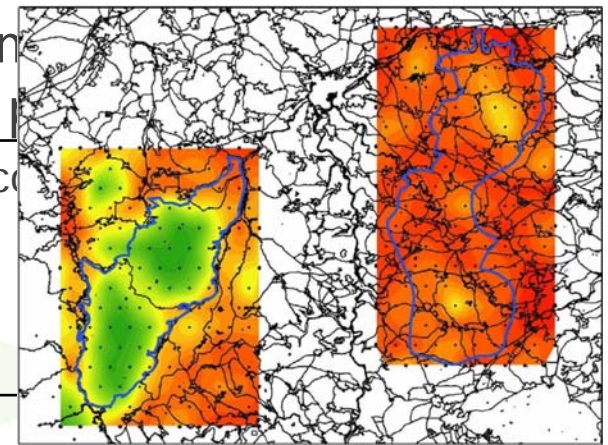
unfragmented Area
probability of animals calculated for each

- roads
- railway system
- pressure lines - fences and walls

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

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

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



interpolated surface

Fragmentation

References

Jaeger, J.A.: „Landscape division, splitting index, and effective mesh size: new measures of landscape fragmentation“. In: *Landscape Ecology*, 15(2) (2000), S. 115-130.

Lang, C., Schwarz, H.-G., Esswein, H.: „ArcGIS-Tool zur Analyse des Landschaftzerschneidungsgrades mit der Messgrösse ‘Effektive Maschenweite’“. Handbuch. Universität Stuttgart, 2008.

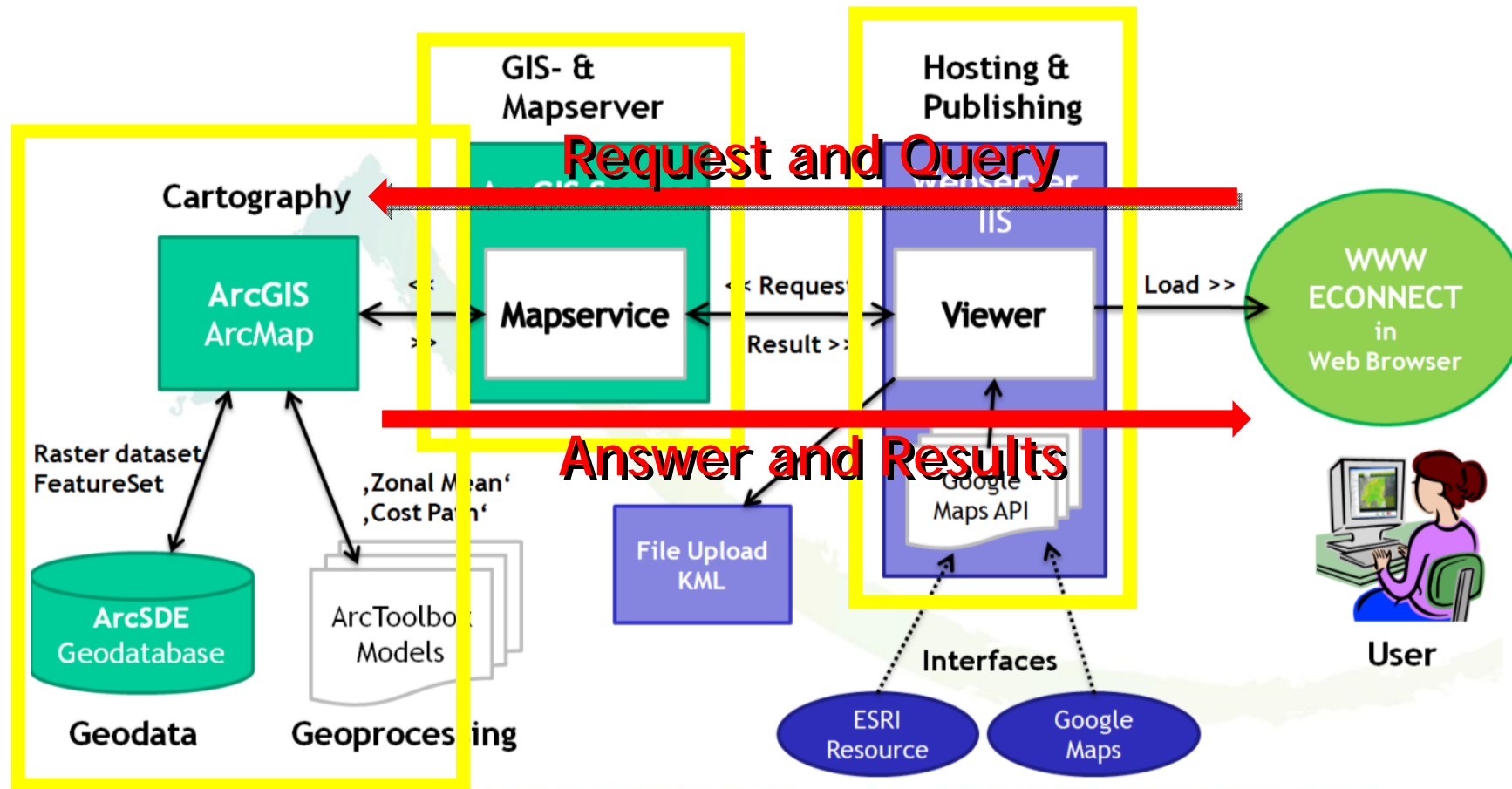
Bertiller, R., Schwick, C., Jaeger, J.: *Landschaftzerschneidung Schweiz. Zerschneidungsanalyse 1885 - 2002 und Folgerungen für die Verkehrs- und Raumplanung*. Bern: ASTRA, 2007.

Continuum Suitability Index

The screenshot displays the 'CSI Service' web interface. At the top, there is a navigation menu with links: HOME, ABOUT THE PROJECT, PILOT REGIONS, WORK PACKAGES, PARTNERS & OBSERVERS, NEWS & EVENTS, DOWNLOAD AREA, and LINKS. The main content area features a map of the Parco Nazionale dello Stelvio region, overlaid with a Continuum Suitability Index (CSI) map. The map uses a color scale from green (low suitability) to red (high suitability). A legend on the right side of the map lists various layers: Pilot areas, Municipality borders, Protected areas, Landuse (LAN), Landuse Planning (LAP), Population (POP), Infrastructure, Altitude (TOP), Freshwater, Patch Cohesion (COH), Edge density (ED), Environmental Protection (ENV), Ecological Measures (ECO), and Your uploaded KML-File. Below the legend is an 'Analyse Area' section with a search box and 'Durchsuchen...' button, and an 'Upload File' section with 'Upload File' and 'Clear' buttons. A 'Define manually' section includes 'Draw' and 'Clear' buttons. At the bottom of the interface, there is a progress bar with steps: 1 Search, 2 Select & Upload, 3 Calculation, Chart, Table, and Report. The footer contains the text: WWF Italia ONG-Orlus - Programma ApI P.I. IT 02121111005 alpi@wwf.it, Reserved Area, News RSS, XHTML, CSS, Requisites, Credits, and an 'Impressum' link.

Webs of Life - Alpine Biodiversity needs ecological connectivity

JECAMI web services - the technical background

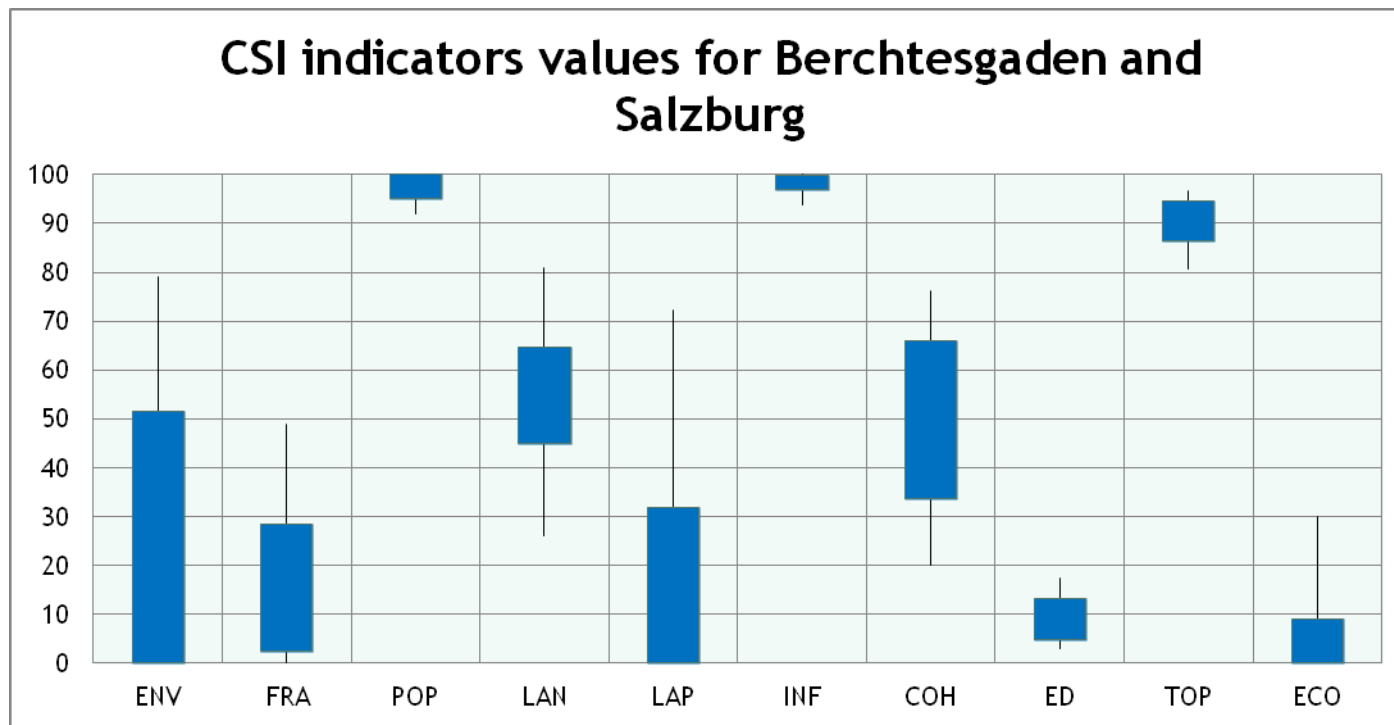


The screenshot displays the ECONNECT web application interface. At the top, the 'econnect' logo is visible. The main interface is divided into several sections:

- Map View (Left):** A topographic map of a mountainous region with a red polygon highlighting a specific area. Navigation controls and a 'Powered by Google' logo are present.
- Report Window (Center):** A window titled 'ECONNECT CSI-Report for CSI-drawing' showing an aerial view of the same area with the red polygon. Below the map is a 'Radar Chart' with three axes: LAP, ENV, and ECO. The chart shows values for each axis, with ENV being the highest.
- Legend and Controls (Right):** A panel titled 'CSI Service (v.8)' containing a legend with various layers like 'Pilot areas', 'Municipality borders', 'Protected areas', etc. There is also a 'Generate' button for the report.

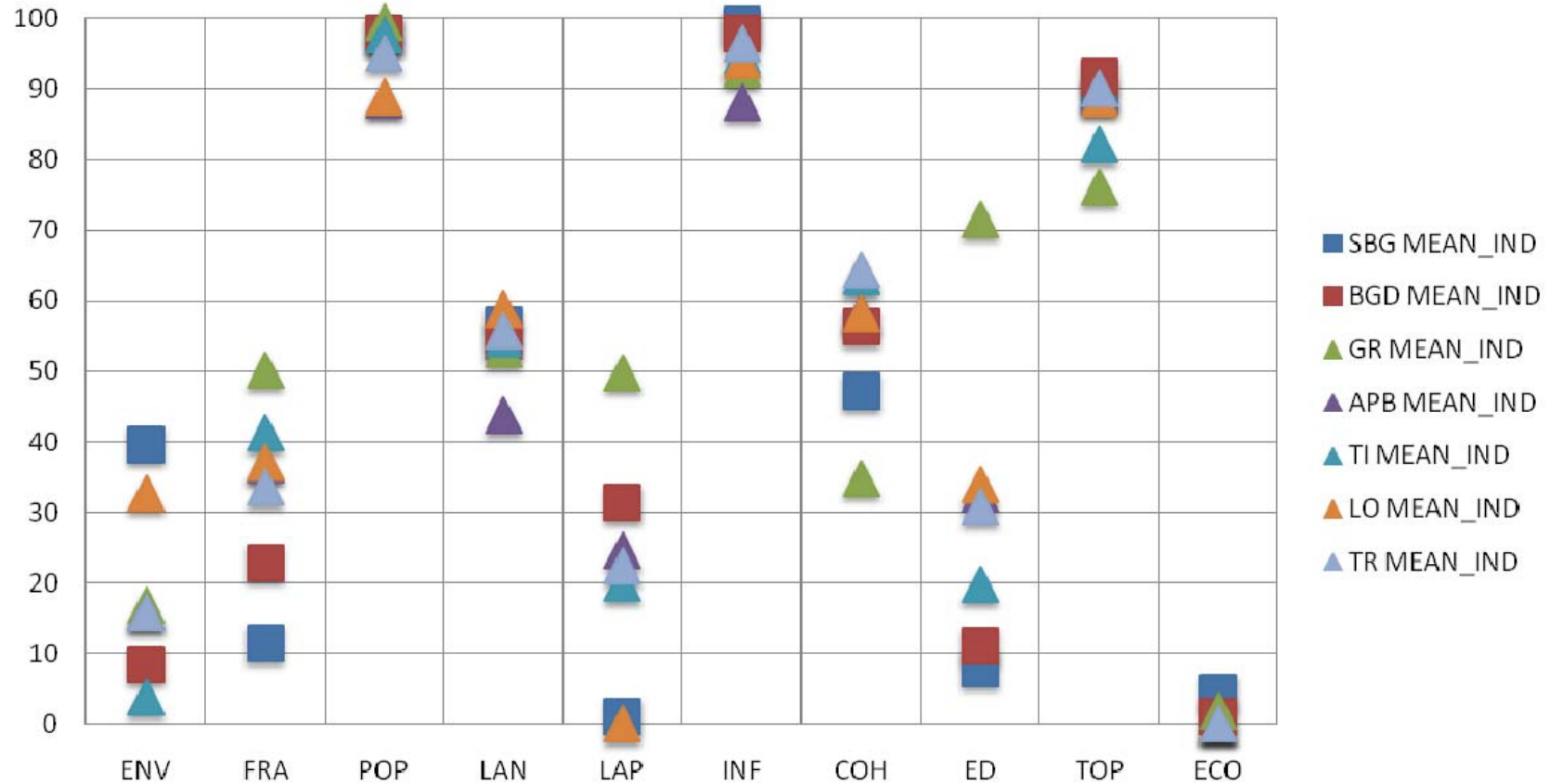
Webs of Life - Alpine Biodiversity needs ecological connectivity

Continuum Suitability Index



Community	ENV	FRA	POP	LAN	LAP	INF	COH	ED	TOP	ECO	MEAN CSI	
Ainring		7	0	95	47	1	99	21	3	93	1	37
Anger		2	5	99	53	1	100	43	4	81	1	39
Bad Reichenhall		23	5	92	52	1	99	41	5	91	1	41
Bayerisch Gmain		48	6	93	59	1	100	46	13	92	1	46
Berchtesgaden		61	12	97	53	1	98	32	4	93	1	45
Bischofswiesen		61	1	94	51	1	99	31	4	84	1	43
Bischofswiesen_Forst		67	10	100	63	1	100	70	11	87	1	51
Dienten am Hochköni		3	12	99	56	20	96	63	13	89	1	45
Eck		60	23	100	59	1	99	57	7	86	1	49
Forst Sankt Zeno		60	10	100	60	1	100	74	12	86	1	50
Golling_an_der_Salzach		31	39	98	81	28	99	61	11	95	1	54
Grossgmain		7	5	98	50	72	100	52	4	91	1	48
Grüdig		0	6	94	48	63	96	42	7	94	1	45
Inzell		17	8	98	57	1	99	53	7	86	15	44
Kuchl		7	28	97	43	23	99	40	9	93	1	44
Kuchl		7	27	97	62	23	99	39	9	95	1	46
Lofer		4	20	99	58	22	96	63	16	92	1	47
Möhlbach am Hochkö		1	26	98	56	21	94	51	9	86	1	44
Maria Alm am Steiner		1	36	99	56	21	94	61	17	86	1	47
Marktschellenberg		60	3	98	54	1	98	20	4	93	1	43
Piding		8	4	95	52	1	98	42	5	91	1	40
Ramsau_b_Berchtesgaden		60	34	99	65	1	99	62	16	94	1	53
Reit im Winkl		14	15	99	57	1	97	55	6	86	30	46
Ruhpolding		42	13	99	59	1	99	62	12	87	21	50
Saalfelden am Steine		3	24	97	47	25	99	50	11	93	1	45
Sankt Martin bei Lof		6	14	99	60	20	100	76	12	94	1	48
Schellenberger_Forst		79	10	100	67	1	100	63	15	94	1	53
Schneizreuth		55	17	100	60	1	99	61	9	89	1	49
Schönau_a_Königssee		60	49	98	62	1	99	47	11	95	1	52
Siegsdorf		3	2	97	49	1	99	33	5	83	6	38
Teisendorf		5	1	98	50	1	99	30	4	91	1	38
Unken		4	26	100	59	22	98	69	14	90	1	48
Unken		4	26	100	59	22	98	69	14	90	1	48
Wals_Siezenheim		0	0	92	26	39	99	22	5	97	1	38
Wals_Siezenheim		0	0	92	26	39	99	22	5	97	1	38
Weissbach bei Lofer		38	35	100	60	21	100	69	14	93	1	53

Mean indicators values from all pilot regions



SMA Service (v.8)

Legend

- Black grouse model
- Black grouse GUIDOS
- Brown bear model
- Brown bear GUIDOS
- Lynx model
- Lynx GUIDOS
- Griffon vulture model
- Red deer habitat
- Red deer GUIDOS
- Wolf model
- Wolf GUIDOS

Control data

Upload your own spatial distribution-data!
Choose a local datafile (Google Earth *.kml):
Durchsuchen...

Geometry-types that are provided: POLYGON and POINT.
Please enter a description:
Upload

Clear overlay

Impressum

1 Search 2 Select & Upload 3 Calculation Chart Table Report

Conclusion

Strengths +++

Scalability and flexibility

Access

Open technology

Extensibility

Weakness ---

Assessments (ecosystem value?) based on expert opinions

Just a few indicators, no time dynamic data

Data acquisition and data preparation is time-consuming

Wordwide connectivity?



The screenshot shows the econnect web application interface. At the top, there is a navigation menu with links: HOME, ABOUT THE PROJECT, PILOT REGIONS, WORK PACKAGES, PARTNERS & OBSERVERS, NEWS & EVENTS, DOWNLOAD AREA, and LINKS. The main content area features a world map with various data layers overlaid. A sidebar on the right contains a legend for the 'CSI Service (v.8)' and search options. The legend includes:

- Perimeter alps
- Municipality borders
- Protected areas
- Landuse LAN
- Population POP
- Altitude Topography TOP
- Patch Cohesion COH
- Edge density ED
- Environmental Protection ENV

 The search section includes:

- A search box for 'Search a municipality inside a pilot region:' with 'Execute Find' and 'Clear' buttons.
- A search box for 'Search pilot region:' with a dropdown menu set to 'Rhaethian Triangle' and an 'Execute Find' button.
- A search box for 'Search Place or Address:' with a 'Go!' button.

 At the bottom of the map interface, there is a progress bar with steps: 1 Search, 2 Select & Upload, 3 Calculation, Chart, Table, and Report.

Webs of Life - Alpine Biodiversity needs ecological connectivity



Kathrin Renner
European Academy of
Bolzano



Ruedi Haller
Swiss National Park

Christian Schmid, Dominik Affolter,
Angelika Abderhalden, Kathrin Sedy,
Johannes Signer, Andrea Bouvinals, Leo
Füreder, Katrin Renner

