econnect
Restoring the web of life

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

Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

Aim

"Where is the ecological continuum (the corridors and barriers) in the pilot aeas 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

Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

„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

Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

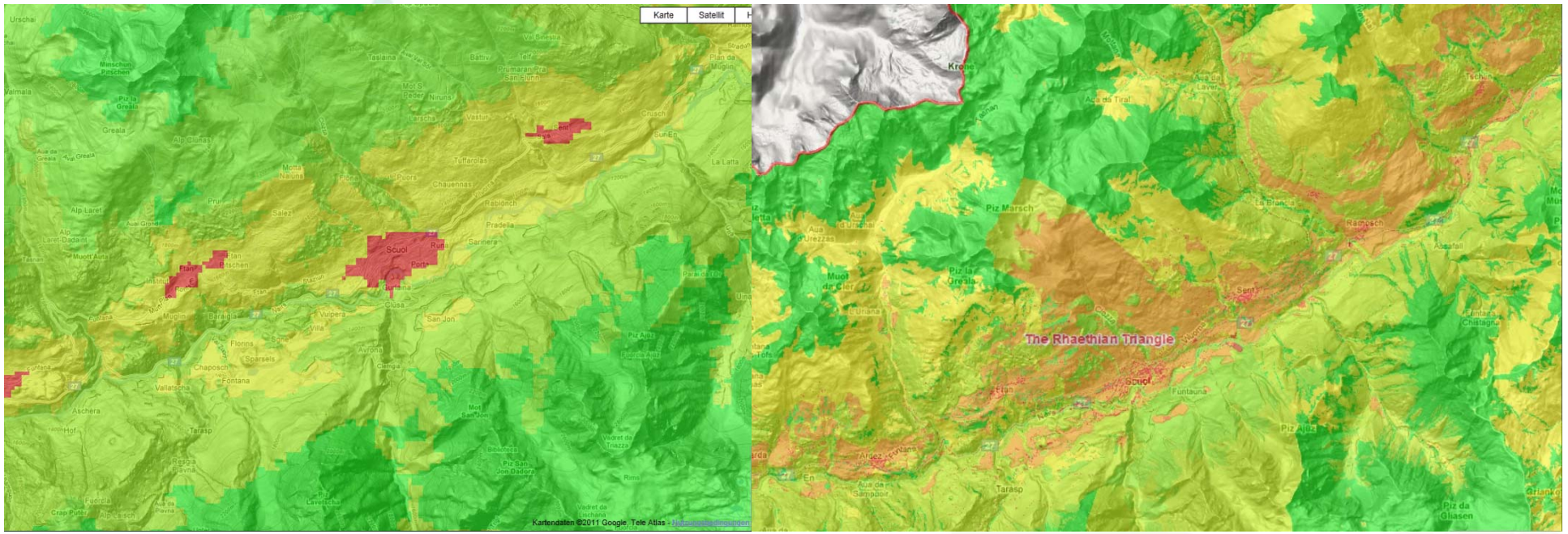
Objectives of the landscape approach

- 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 km^2) as well as **local** analysis(<1 km^2) 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

Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

Locally high precision data needed

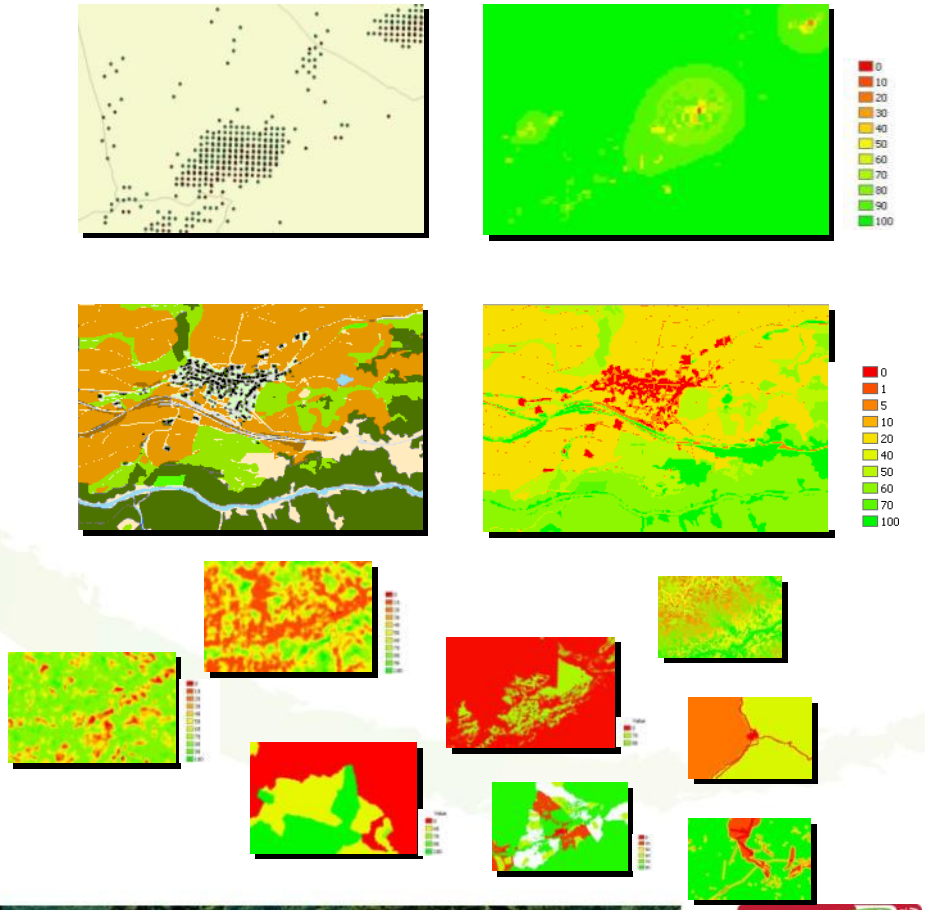


Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

10 Indicators

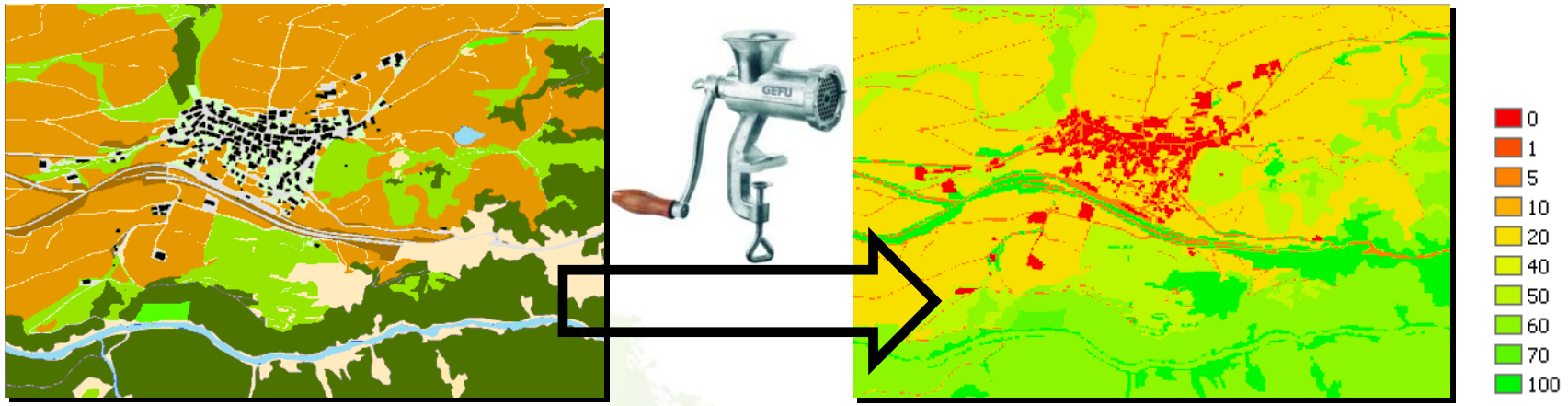
- Population
- Landuse
- Landuse Planning
- Altitude and Topography
- Fragmentation
- Infrastructure
- Landscape Heterogenity
- Edge density
- International Protected Areas
- Ecological Measures



Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

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,

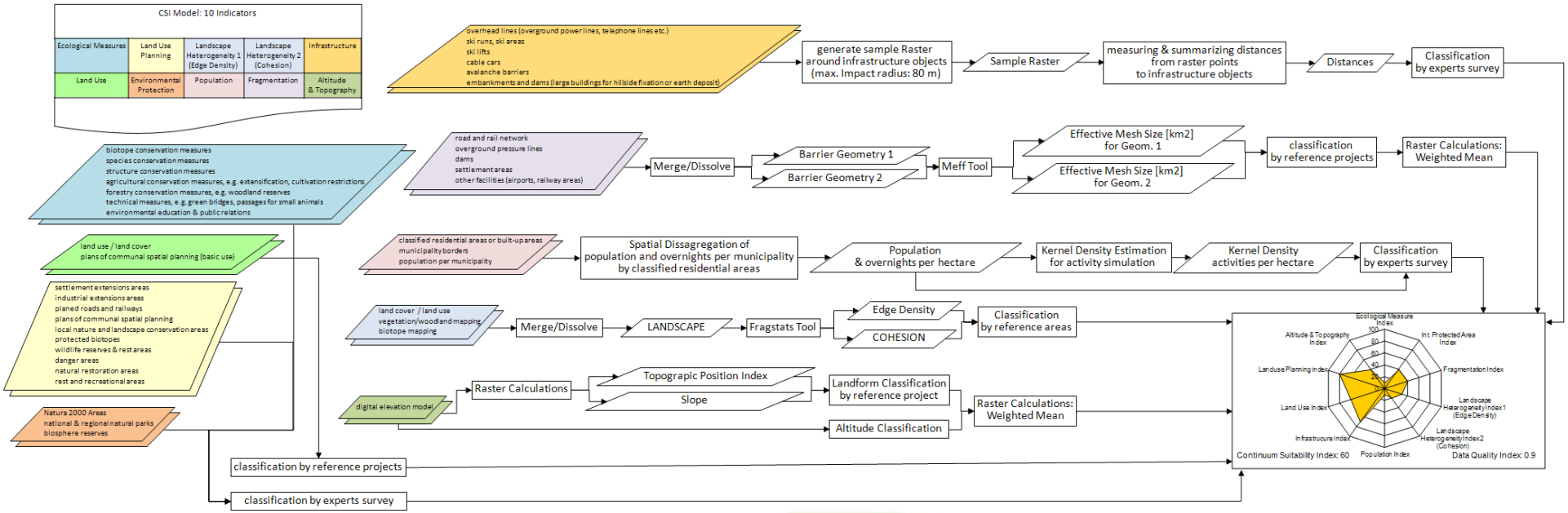
econnect
Restoring the web of life

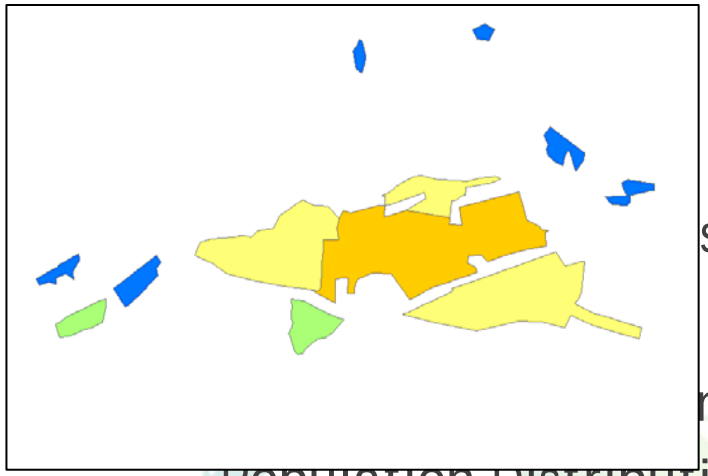
Data Management

- 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

Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

Indicator model scheme





classified residential areas

+

COMM_ID	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	564	625	0
12011	Besano	2154	2485	0
12012	Besnate	4638	5253	0
12013	Besozzo	7630	8971	111
12014	Biandronno	3109	3233	17454
12015	Bisuschio	3760	4200	0

population & tourist data

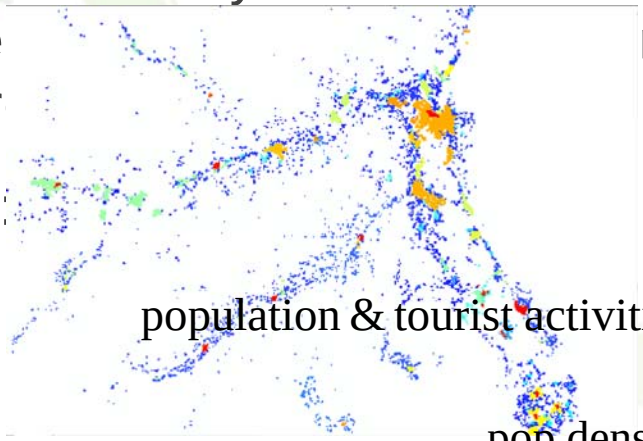
sure on environme

n spatial disaggreg

Population Distribution by factor k. k describes the relation between site nsity depending on the ratio of r

$$k = \frac{population}{\sum_i A_i * site_density_i}$$

Indicator value:



population & overnights per hectare

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

$$pop.dens.\ per\ hectare = k * site_density_i$$

n

gmen al spaces

ue: cl mesh size

barrier geometry

unfragmented Area

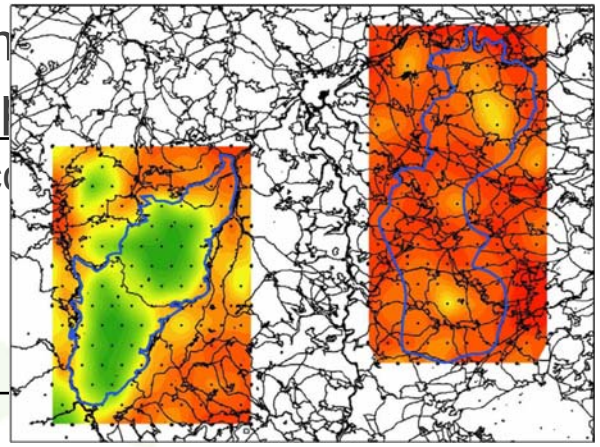
a of a regular grid of the same n

probability of animals calculated for each

natural living space of a fragmented area

- road system – settlement areas (gric industrial & c
- railway system – facilities (airports, railway a
- pressure lines – fences and walls
- dams

Calculation of an interpolated surface



interpolated surface

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

A_g: total area

A_i: subarea i

n: number of subareas

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.

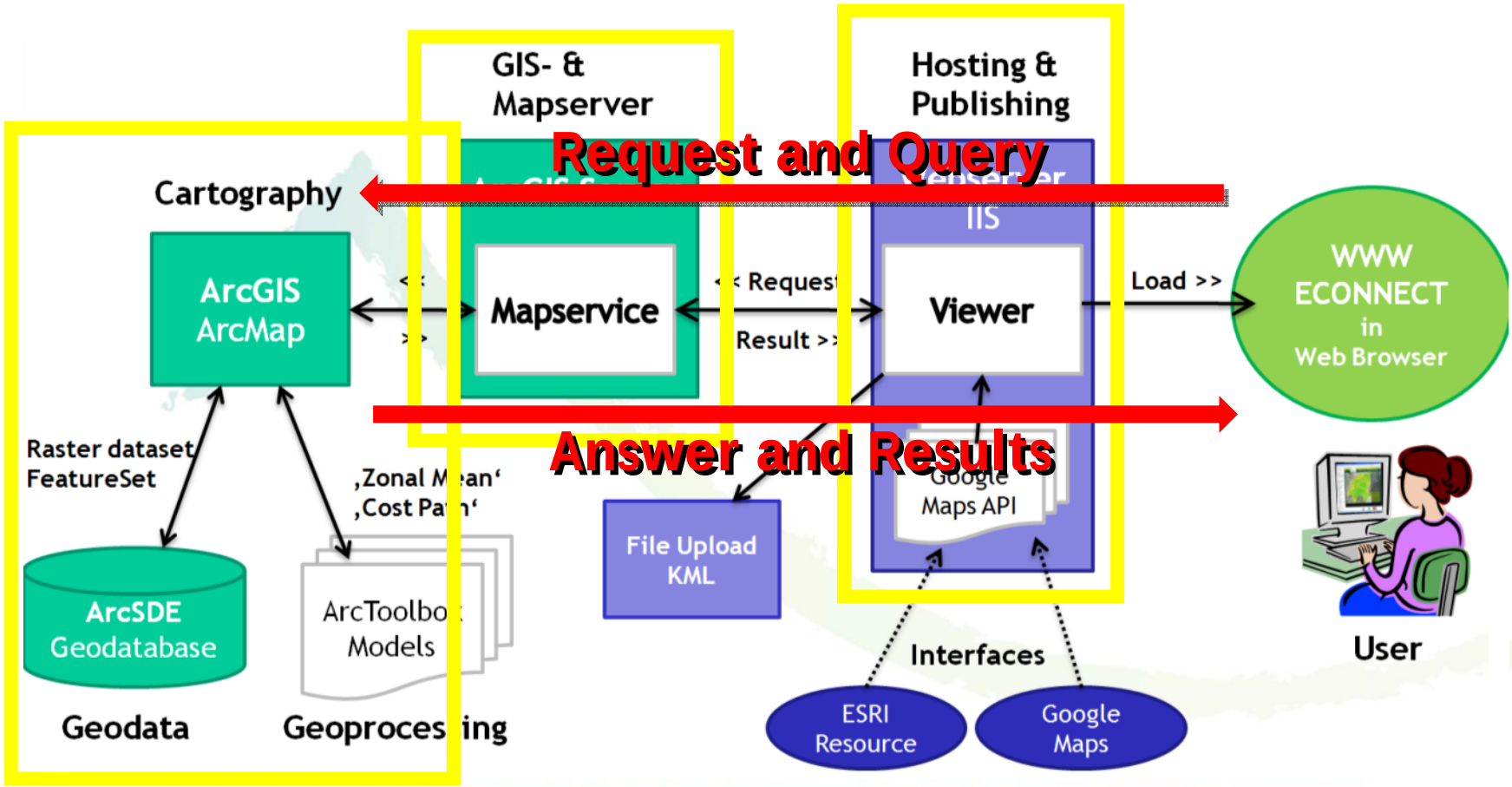
Bertiller, R., Schwick, C., Jaeger, J.: Landschaftszerschneidung Schweiz. Zerschneidungsanalyse 1885 – 2002 und Folgerungen für die Verkehrs- und Raumplanung. Bern: ASTRA, 2007.

Continuum Suitability Index

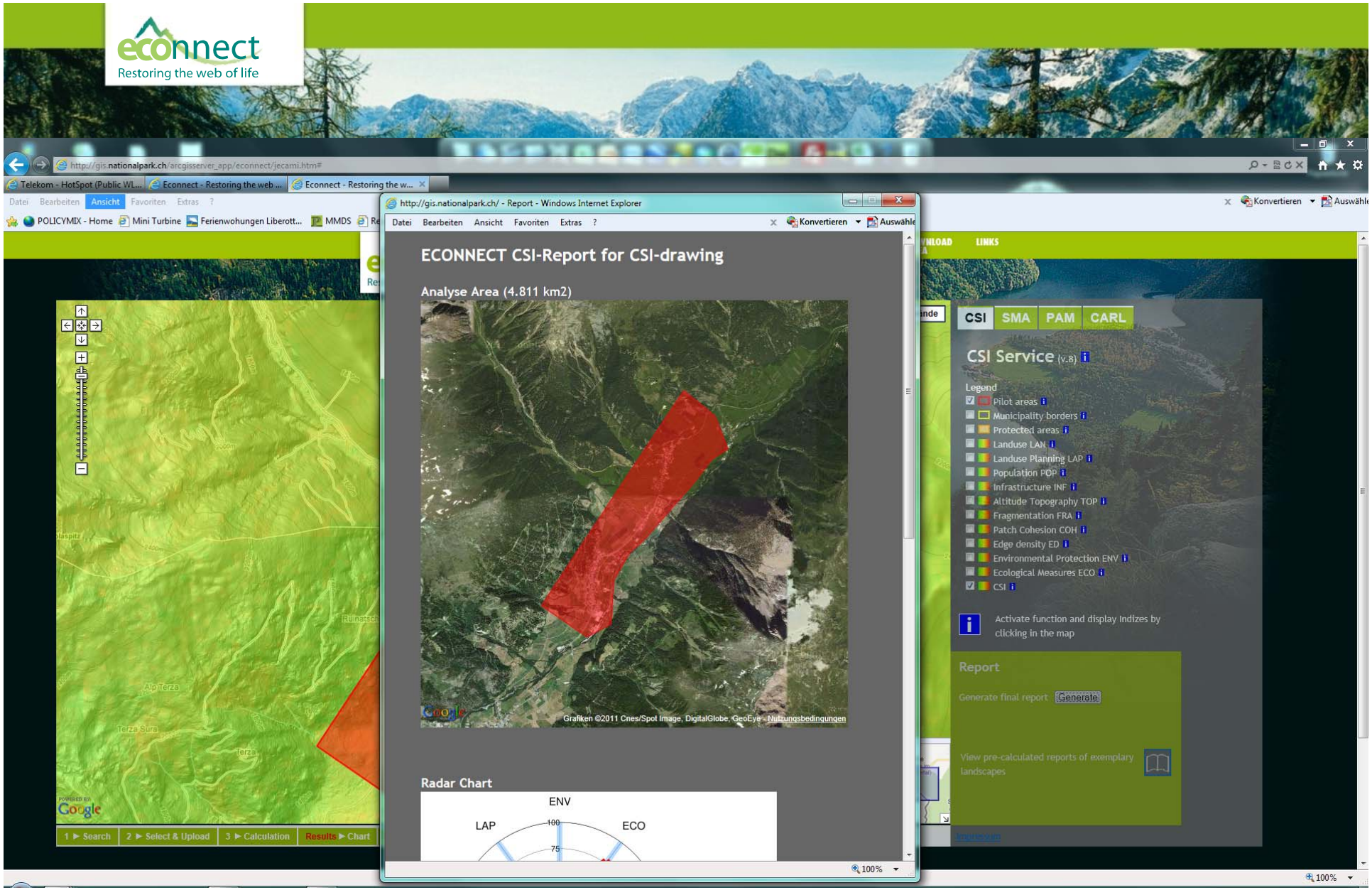
The CSI web service

econnect
Restoring the web of life

JECAMI web services – the technical background

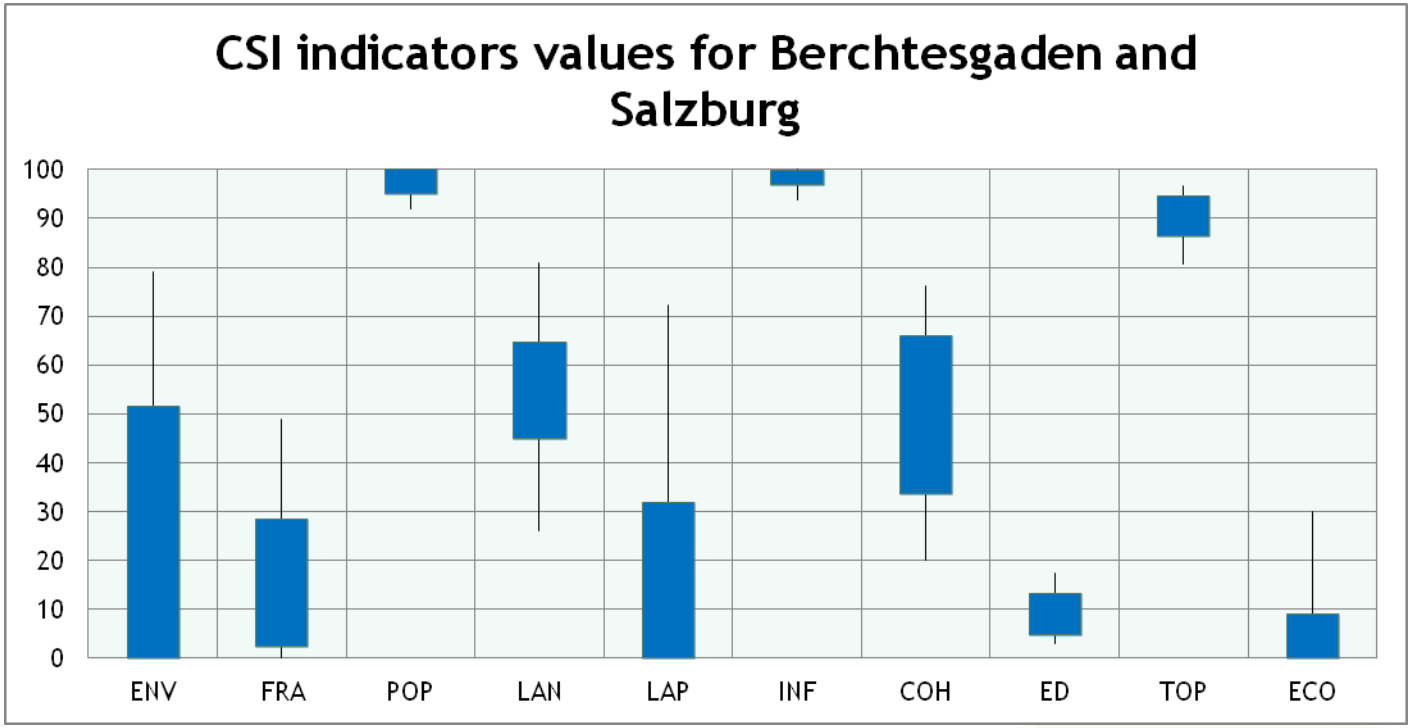


econnect
Restoring the web of life



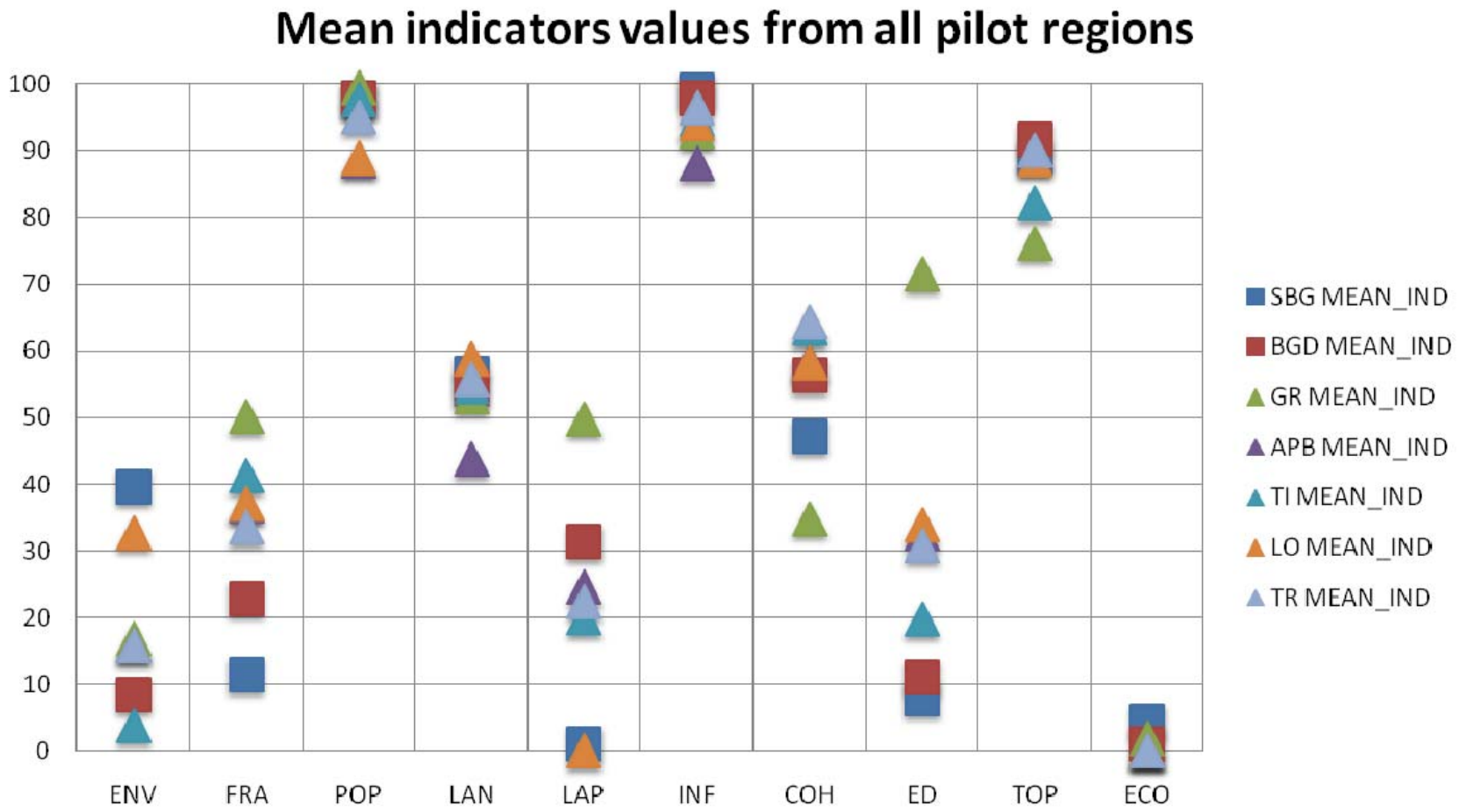
Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

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
Schneizlreuth	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

econnect
Restoring the web of life



Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

Webs of Life – Alpine Biodiversity needs ecological connectivity

Alpine Space
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

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

Alpine SPACE
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION

econnect
Restoring the web of life

Wordwide connectivity?

econnect
Restoring the web of life

EURAC research

Kathrin Renner
European Academy of Bolzano

parc naziunal svizzer

Ruedi Haller
Swiss National Park

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

econnect
Restoring the web of life

www.econnectproject.eu
www.nationalpark.ch

Alpine Space
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future
EUROPEAN TERRITORIAL COOPERATION