‘EEA Ecosystems assessments NFP-Eionet 7 June 2012’

Integrated Ecosystem Capital Accounts of Europe 2000-2010

Accounts in basics physical units and in ECU

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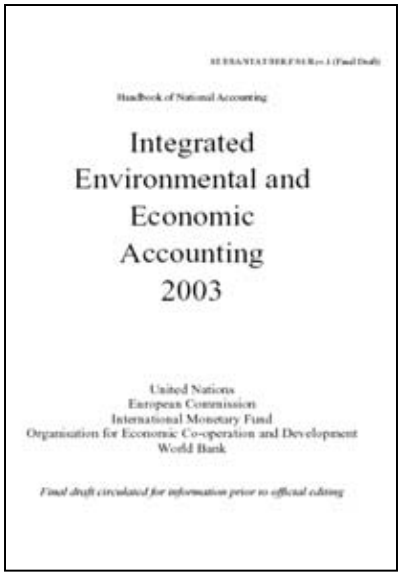
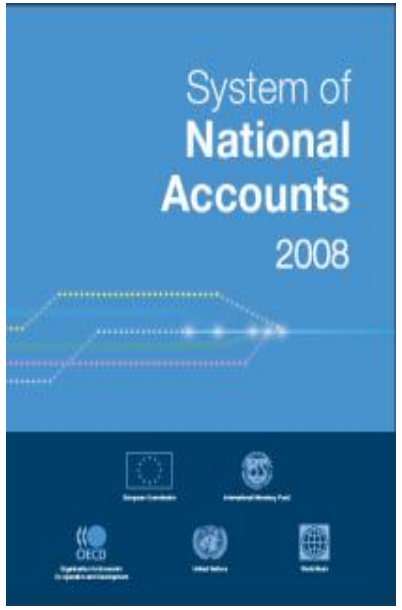
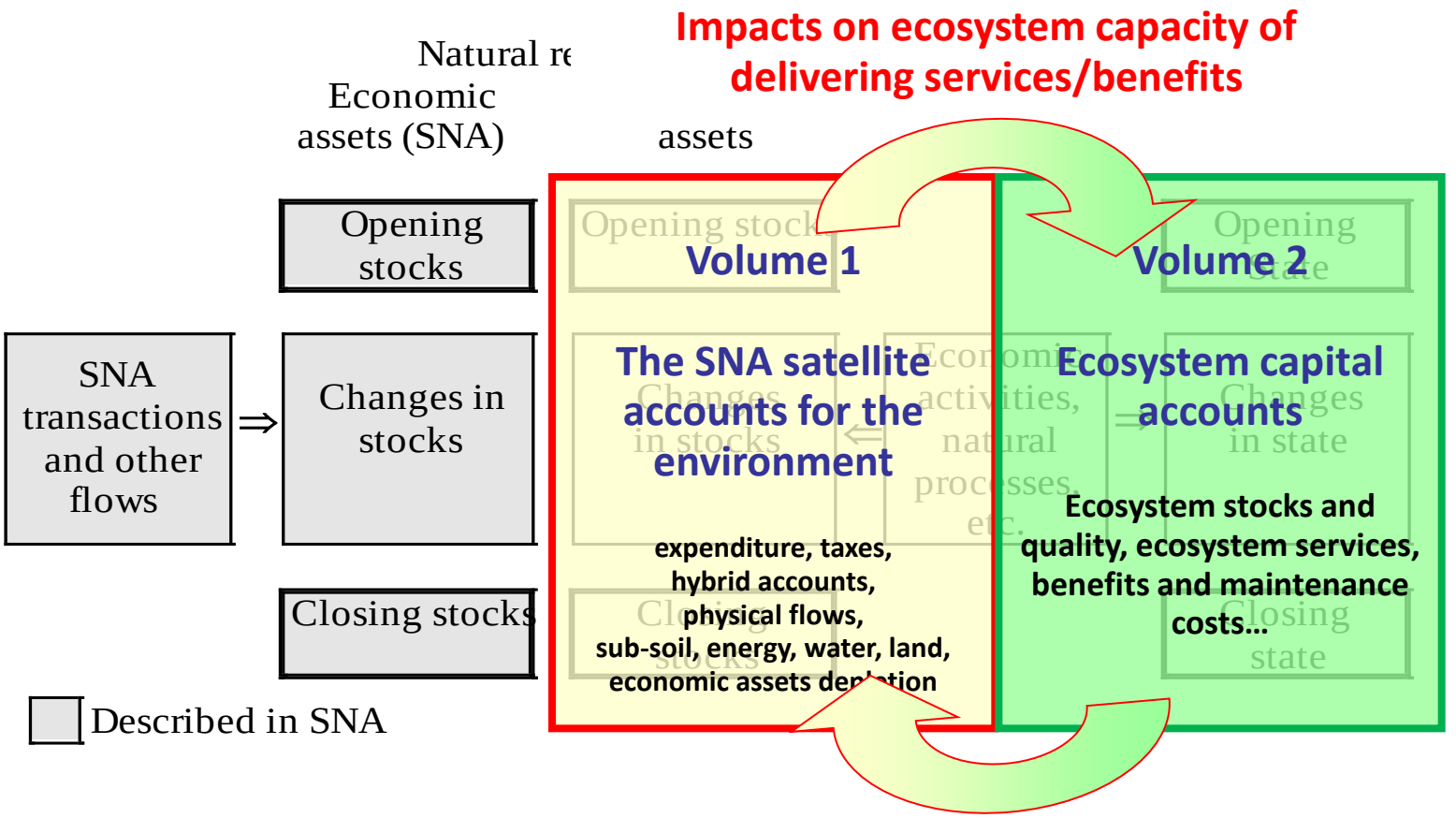
UN manual for environmental-economic accounting: **SEEA2003**

Enlargement of the System of National Accounts





Revision ➔ SEEA2012/13



RM HASSAN - UN The System of Environmental and Economic Accounting
RANESA Workshop June 12-16, 2005 Maputo

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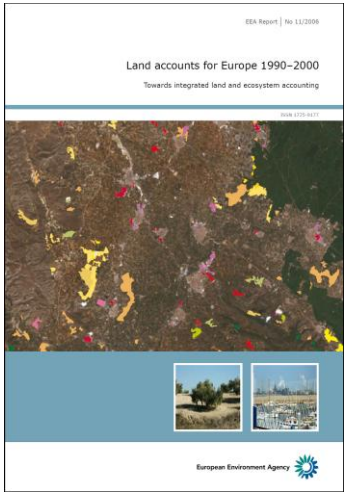

Land cover accounts for Europe 1990-2000 (26 countries), 2006

Update of year (34 countries), next update: for 2012

Ecosystem accounting and the cost of biodiversity losses — the case of coastal Mediterranean wetlands, 2010

An experimental framework for ecosystem capital accounting in Europe
EEA Technical report No 13/2011

http://www.eea.europa.eu/publications/an-experimental-framework-for-ecosystem

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Ecosystem capital accounting in Europe

- The objective of ecosystem capital accounts is to measure the ecosystem resources that are accessible without degradation, the actual intensity of use of this accessible resource and the change in the capability of ecosystems to deliver their services over time.
- These accounts are based on currently available data from nature observation collected by satellite or in situ and on socioeconomic statistics.
- They cover all ecosystems types (forests, wetlands, agricultural and urban systems, sea ...).
- The results are aggregated by watersheds or administrative regions, but most data are collected or disaggregated according to the European standard grid of 1 km x 1 km.
- Accounts are intended to be updated annually in order to match the policy process.
- Simplified accounts are firstly implemented top-down for the European Union 27 countries. Based on the model, national accounts are planned to be developed with more specific focuses.

Purpose of ecosystem capital accounting,
… measuring capital maintenance

- The degradation of ecosystems' capability to deliver ecosystem services such as biomass, freshwater and natural cycle's regulation or socio-cultural services is not recorded in companies' accounting books and national accounts.
- Therefore depreciation is not charged in the price of our consumption.
- Consuming ecosystem capital without paying is equivalent to create ecological debts that are transmitted to others, to our present and future generations or to those countries from which we import products produced under unsustainable conditions.
- Ecological debts (and credits in case of improvement) can be measured using a composite physical unit reflecting ecosystem productivity and condition and recorded in an appropriate balance sheets.
- Ecological debts measured in physical units can be converted into money on the basis of remediation costs of degradation; its is an estimation of ecosystem capital depreciation.

Purpose of ecosystem capital accounting, continued, … measuring ecosystem services

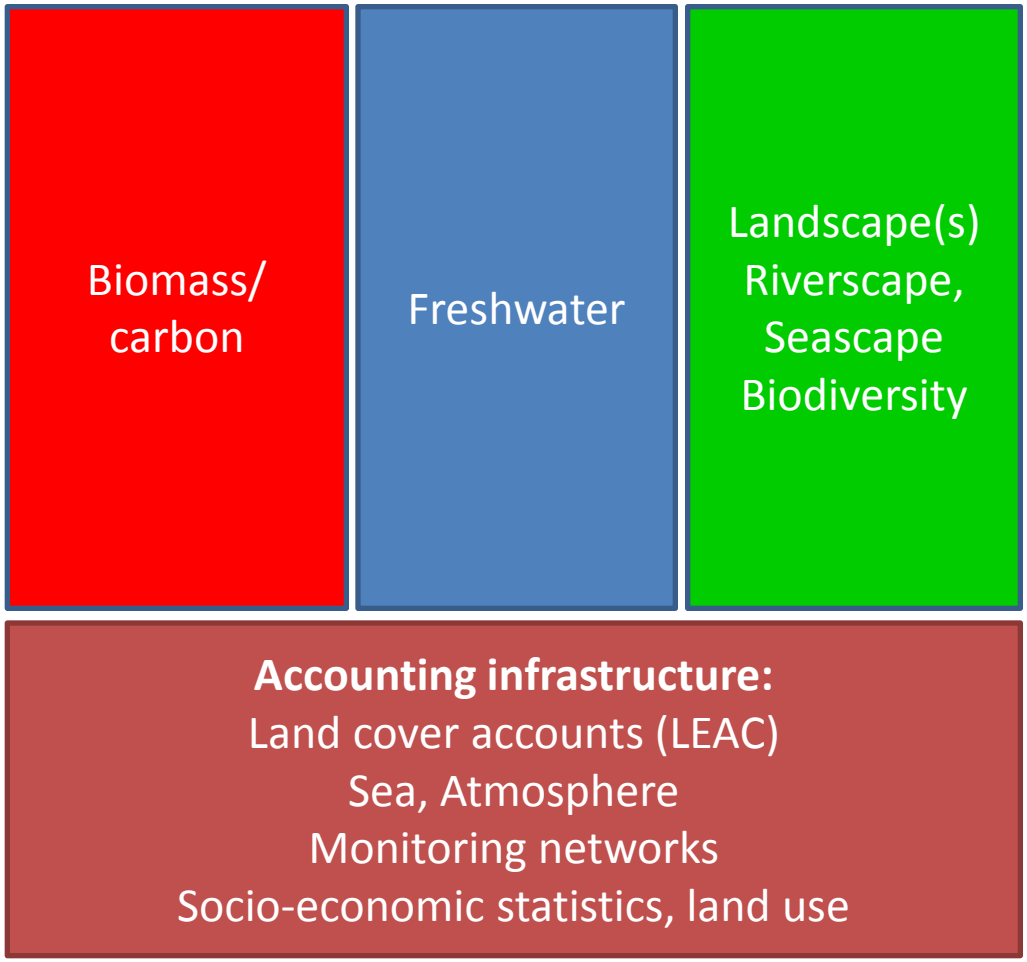
- Ecosystem services are measured in physical units for the purpose of assessing trade offs in the use of ecosystem's multiple functions and ecosystem intensity of use.
- Some ecosystem services which are input to production of commodities are given a value by the market. This value is in several aspects underestimated because of unpaid capital depreciation or because of inappropriate price used for the production of food and housing services for self account. Ecosystem capital accounts aim at putting these prices right.
- Other services of importance are part of market values but they are entangled into commodities and assets values. When useful and possible, their economic importance will be measured either as isolated rent component or regarding the total value added that they induce.

Experimental accounts 2000-2010

- Preliminary results in physical units, based on existing monitoring and statistics, annual, 2000 to 2010
- By ecosystem types, rivers basins, administrative regions…
- For each ecosystem 4 accounts:
  - Land cover
  - Biomass/carbon: stocks and flows, harvest and returns from artificial systems (manure, sludge…)
  - Water: accessible freshwater, quantity and quality
  - Landscape (nLEP) and rivers integrity, species biodiversity
- Basic resource accounts and ecosystem capability accounts

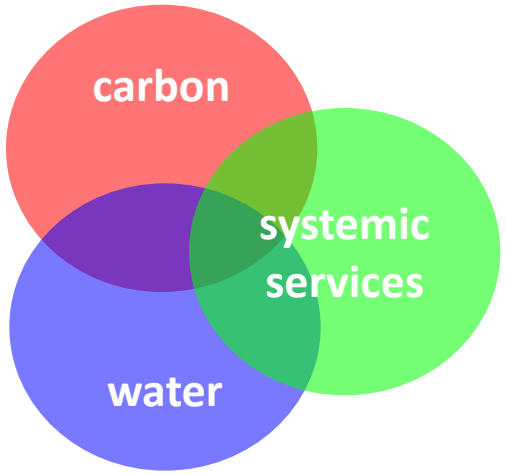
Sustainable capability: not flows, not stocks…

➔ flows and stocks accessible without degrading the ecosystem



The framework of Simplified Ecosystem Capital Accounts:

➔ **Ecosystem capital capability (& degradation)** can be measured by **combining the measurements of 3 broad ecosystem services:**
biomass/carbon, **freshwater** and **systemic services**



there is little or **no compensation or tradeoff between them; the use of one should not reduce the use of the others**
biomass/carbon, **freshwater** are firstly recorded as conventional balances
systemic services (regulating, socio-cultural…) are measured indirectly in relation to ecosystem integrity.

➔The simplified ecosystem capital accounting circuit

Calculating economic aggregate

Healthy ecosystem → benefit

Ecosystem capital depreciation
Ecological debts

Ecosystem degradation

Adapted from
Aoyama Yukiko, Oguro Michio, and Yano Tohru,
Tohoku University, Sendai, Japan, November 2011

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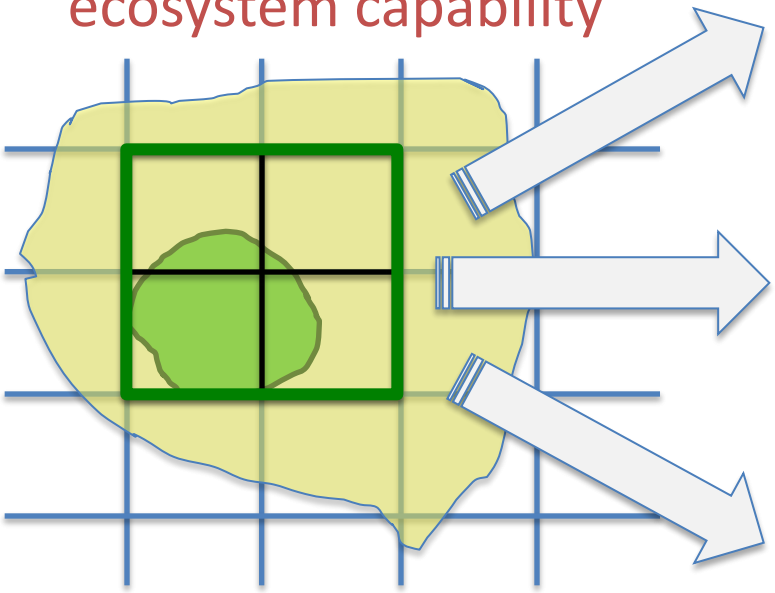
Land cover, landscape units, 1km^2 grids and calculation of ecosystem capability



6	5
10	8

Accessible Carbon

"+"

2	4
4	3

Accessible Water

"+"

4	1
6	4

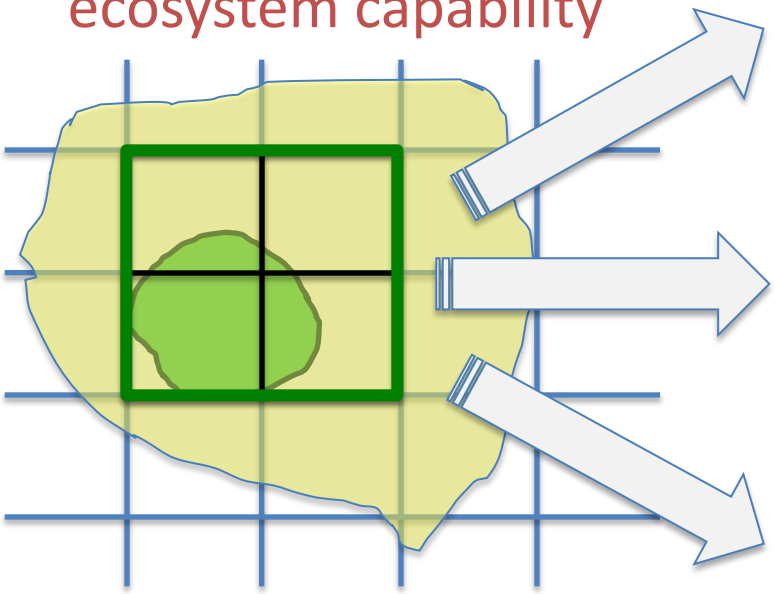
Landscape integrity, biodiversity

Adapted from

Aoyama Yukiko, Oguro Michio, and Yano Tohru, 2011

Tohoku University, Sendai, Japan, November 2011

Land cover, landscape units, 1km^2 grids and calculation of ecosystem capability



6	5
10	8

Accessible Carbon

"+"

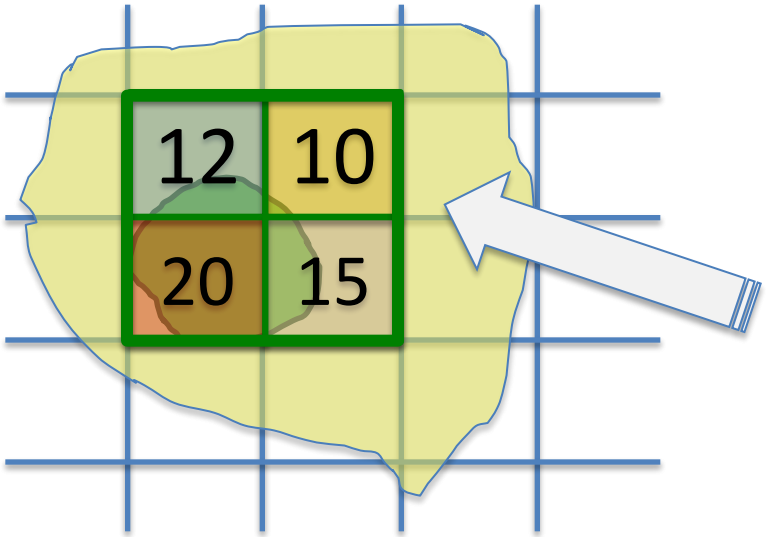
2	4
4	3

Accessible Water

"+"

4	1
6	4

Landscape integrity, biodiversity



"="

12	10
20	15

Total ecosystem capital capability (or potential)

Adapted from Aoyama Yukiko, Oguro Michio, and Yano Tohru, 2011 Tohoku University, Sendai, Japan, November 2011

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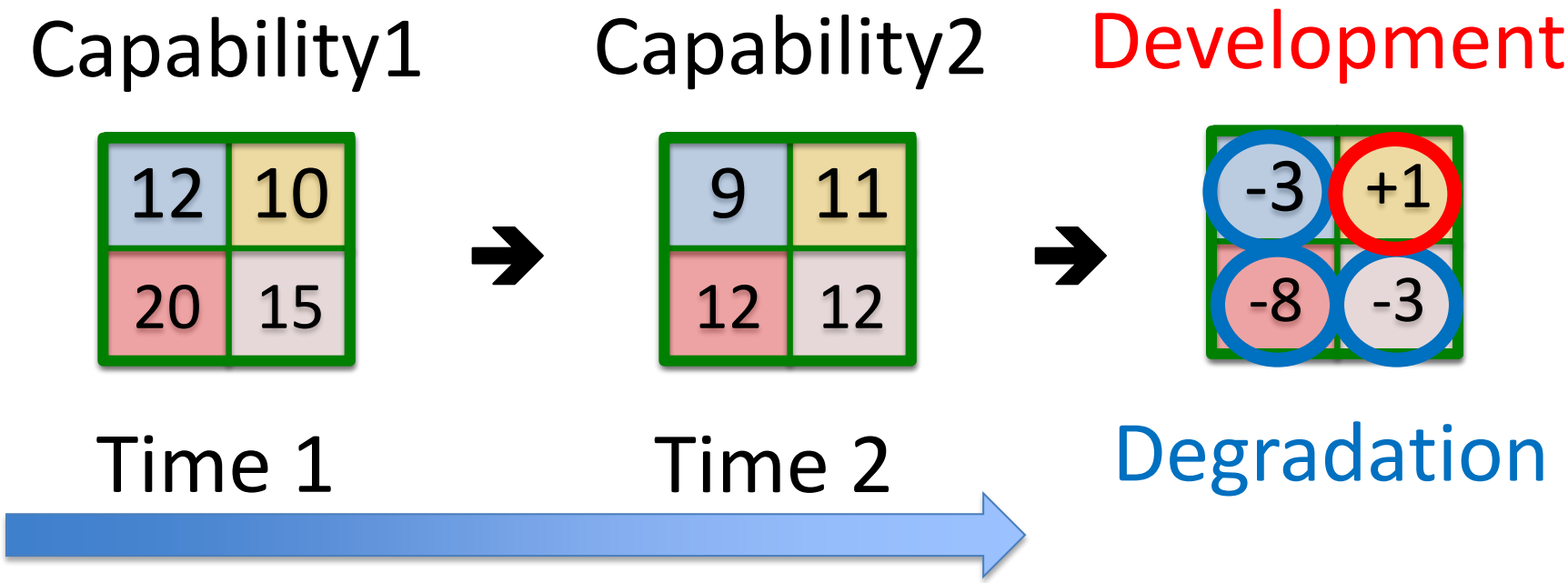

Capability2 – Capability1 = Change in capital

Adapted from

Aoyama Yukiko, Oguro Michio, and Yano Tohru

Tohoku University, Sendai, Japan, November 2011

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Need of a common accounting unit

- In physical accounts, measurements are made firstly in basic units (tons, joules, m^3 or ha)
- They are then converted to a special composite currency named ECU for 'Ecosystem Capability Unit'.
- Loss of ecosystem capability in ECU is a measurement of ecological debt. To territorial debt, it should be added the consumption of non-paid ecosystem capital that is embedded in international transactions.
- The ecological debt in ECU (and symmetrically credits when improvements are verified) could be incorporated into portfolios of financial instruments.

ECU: Ecosystem Capability Unit

1 ECU = 1 unit of accessible ecosystem service

The price of one physical unit (e.g. 1 ton of biomass) in ECU expresses at the same time the intensity of use of the resource in terms of maximum sustainable yield and the direct and indirect impacts on ecosystem condition (e.g. contamination or biodiversity loss).

François 1st (1515-1547), Ecu d'or au soleil du Dauphiné, Source : Münzen & Medaillen GmbH (DE)

A - Theoretical total resource: stocks and flows, in basic units (tons, joules, m^3, hectares…)
(the resource of an individual economic agent, not that of a community or a country)

B - Theoretical available resource: previous accumulation to stocks and net annual flows, in basic units *(the maximum sustainable yield paradigm)*

C – Limitations to resource use: timeliness, location, quality, in basic units

D - Real available resource in basic units

E - Resource use in basic units

F - Resource use intensity (Index: D/E)

G - Ecosystem condition (Index)

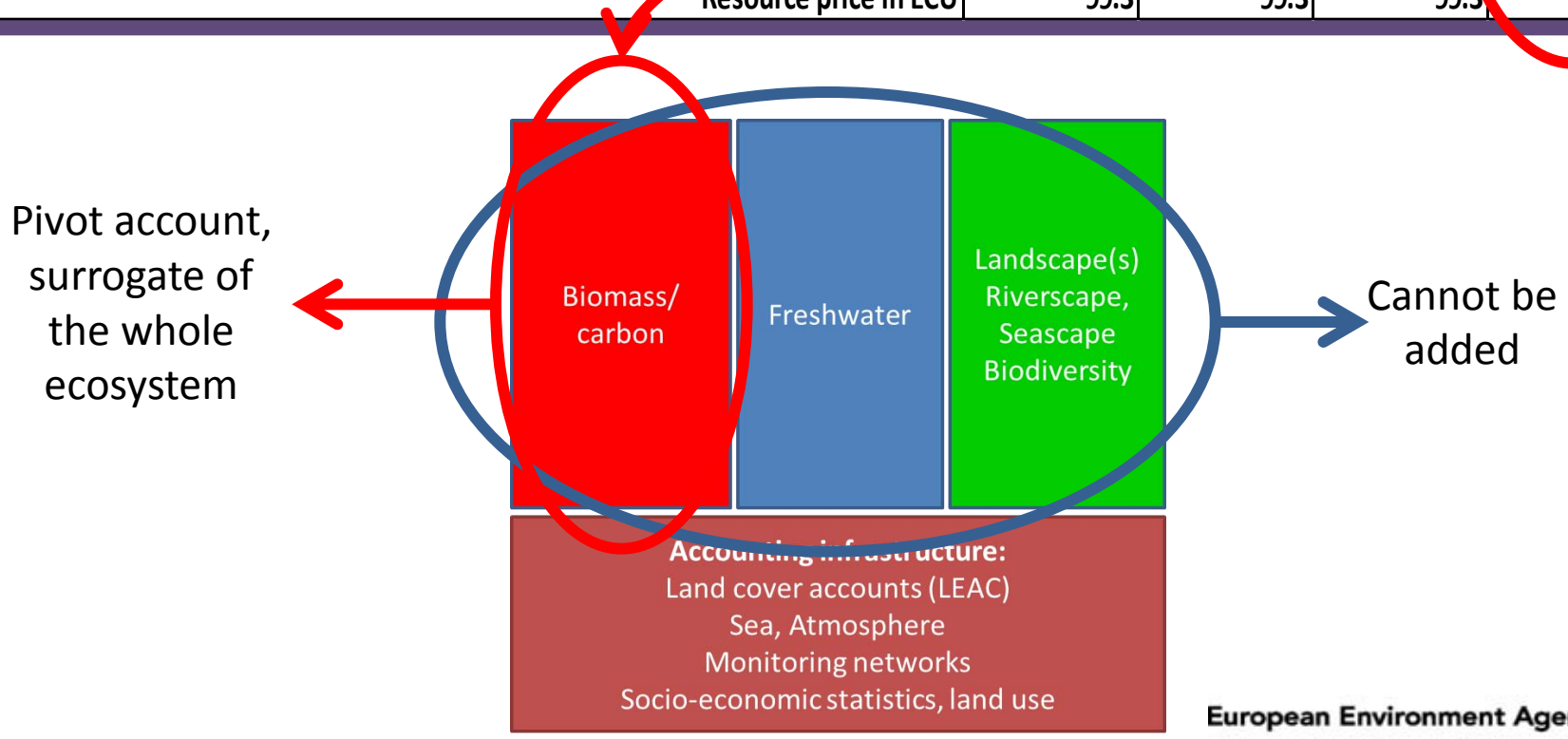
H - Overall ecological price, in ECU (F+G)

I - Accessible resource in ECU (B x H): Ecosystem Capability

Change in Ecosystem Capability: degradation or development

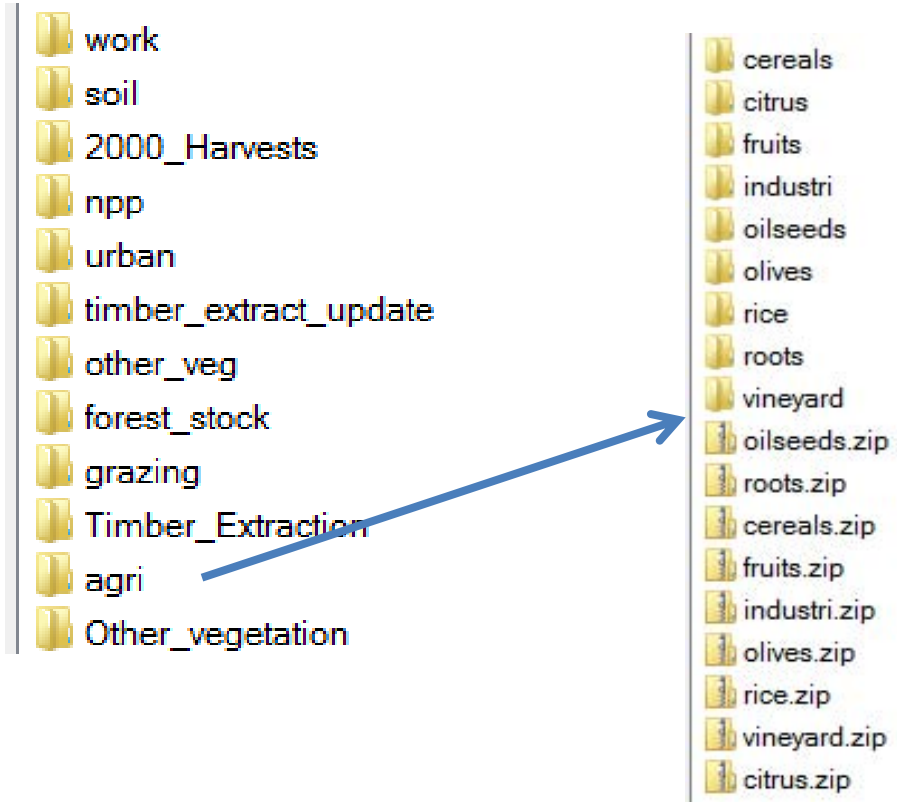
Calculating prices in ECU

Calculation of resource prices in Ecosystem Capability Units (ECU)	Ecosystem accounting unit: e.g. forest, agro-system…			
	Biomass/ carbon	Water	Landscape biodiversity	Total Ecosystem Capability
a - Indexes of resource use sustainability [IF<100, = overuse, dilapidation; IF>100, accumulation]	110	98	98	Non applicable
b - Indexes of ecosystem condition [IF<100, = impoverishment; IF>100, improvement]	100	95	97	Non applicable
Combined indexes of ecosystem distress (implicit prices = a+b-100) & mean overall price in ECU	110	93	95	**99.3**
Resource price in ECU	**99.3**	**99.3**	**99.3**	**99.3**

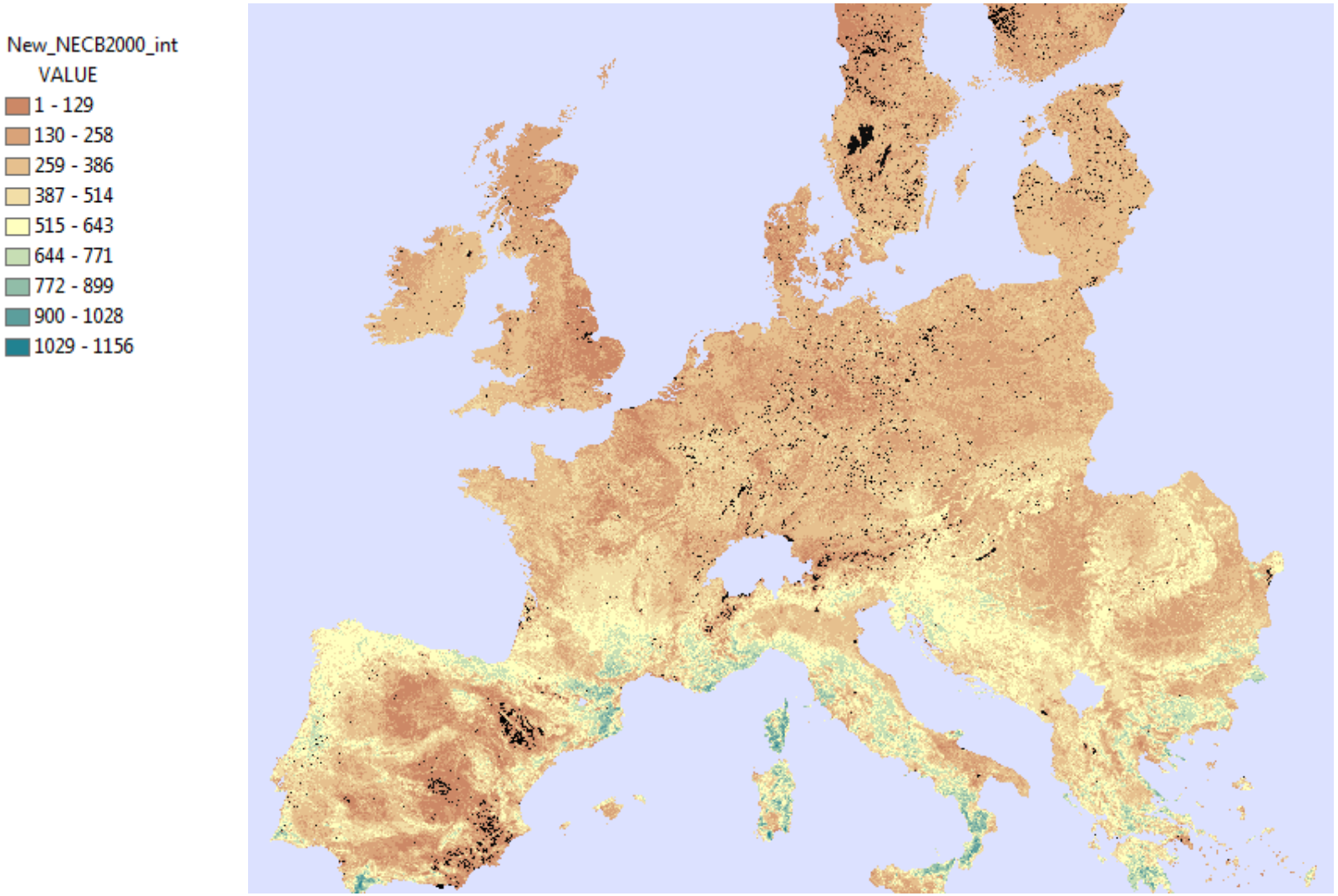


Progress in implementation by 7 June 2012

- Most datasets have been computed on the basis of the 1 x 1 standard EU/Inspire grid, for 2000-2010 (some, for 2011).
- It includes land cover and derived layers, some water variables, biodiversity monitoring data and socio-economic statistics



The Net Ecosystem Carbon Balance 2000 (provisional results – 5 June 2012)
Positive values



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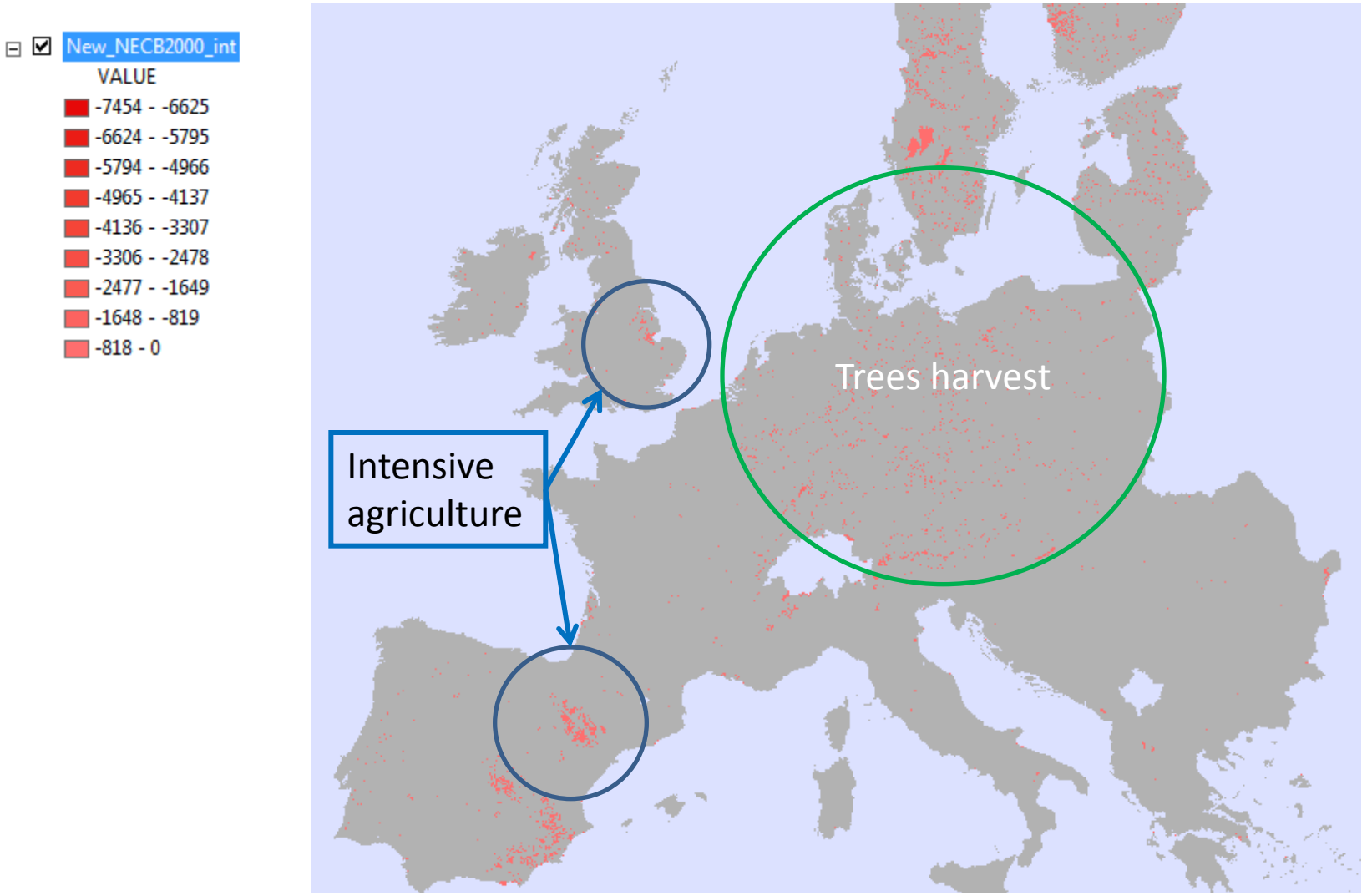
The Net Ecosystem Carbon Balance 2000 (provisional results – 5 June 2012)
Negative values



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Water Accessibility: taking into account limiting factors

Conventional water balances adjusted from various limiting factors ➔ calculation of resource accessibility and use intensity on the basis of what can be safely used without degrading the ecosystem

Water/ Rivers Stress Indexes

		Chemical status		Ecological status		Dry days					Change in River Green Ecotones 2000-2006
		Chemical Status Index		Ecological Status Index							
SB	level3	bad =("3"/tot)*5	good =("2"/tot)*5	bad =("4"+("5"*2))/tot	good =("1"+"2")/tot)	Mean number of dry days 2001-2010	Standard deviation	Dry days relative stress 2000 (2000/((mean+(STD/2)))	Dry days relative stress 2006 (2006/((mean+(STD/2)))	Dry days relative stress 2010 (2010/((mean+(STD/2)))	
WSB0000165	Guadalquivir main - Upper - Guadiana meno	100.00	105.00	98.70	100.33	214.6	35.8	0.83	0.97	0.64	0.64
WSB0000166	Guadiana coastal catchments	100.00	100.00	100.00	100.00	215.7	34.1	0.73	0.85	0.77	-0.30
WSB0000167	Guadiana main - Lower - Ardilla	100.00	100.00	100.00	100.00	217.1	31.4	0.77	0.88	0.74	-0.14
WSB0000168	Guadiana main - Medium - Zujar	99.60	100.84	99.97	100.37	219.5	34.2	0.82	0.94	0.71	-0.10
WSB0000169	Guadiana main - Upper - Zancara	100.00	105.00	98.61	100.00	192.8	32.0	0.85	0.97	0.67	-0.22
WSB0000170	Gulf of Finland coastal catchments and smal	100.00	100.00	100.00	100.00	93.1	16.3	0.79	1.13	0.94	-0.17
WSB0000172	Havel	99.90	100.00	99.99	100.00	135.1	17.5	0.84	1.05	0.76	0.02
WSB0000173	Henares	100.00	104.99	100.00	100.00	172.2	23.5	1.03	0.90	0.87	-0.04
WSB0000174	Humber	100.00	100.00	100.00	100.00	108.6	18.6	0.80	0.84	0.95	0.03
WSB0000176	Ialomita	100.00	100.00	100.00	100.00	160.1	23.0	0.95	1.05	0.86	0.04
WSB0000178	Iijoki coastal catchments	100.00	100.00	100.00	100.00	92.7	13.8	0.84	1.08	0.82	0.55
WSB0000179	Iijoki main - Lower	100.00	100.00	100.00	100.00	92.2	14.4	0.83	1.05	0.85	-0.03
WSB0000180	Iijoki main - Medium	100.00	100.00	100.00	100.00	82.1	14.3	0.85	1.04	0.89	0.05
WSB0000181	Iijoki main - Upper	100.00	100.00	100.00	100.00	69.0	14.0	0.93	1.06	0.92	0.03
WSB0000185	Indals main - Lower	95.24	100.00	99.05	100.00	109.1	29.7	0.44	0.98	0.63	0.05
WSB0000186	Indals main - Medium	100.00	100.00	100.00	100.00	87.9	34.2	0.34	1.02	0.49	0.03
WSB0000187	Indals main - Upper	100.00	100.00	100.00	100.00	44.4	17.0	0.27	1.07	0.50	0.04
WSB0000188	Inn	100.00	105.00	100.00	100.00	51.4	8.5	0.78	1.01	0.85	-0.05
WSB0000189	Internal Basins of Catalonia	100.00	104.98	99.99	100.72	186.9	31.8	0.87	1.03	0.74	-0.24
WSB0000191	Isere	95.00	100.00	99.95	100.00	83.4	14.4	0.71	0.99	0.85	-0.01

Fast track implementation of ecosystem capital accounts in Europe

Landscape/biodiversity capacity accounts

preliminary results 2000-2006-2010,
version 2

Jean-Louis Weber, Emil D. Ivanov,
Rania Syropoulou, Oscar G. Prieto

4 June 2012

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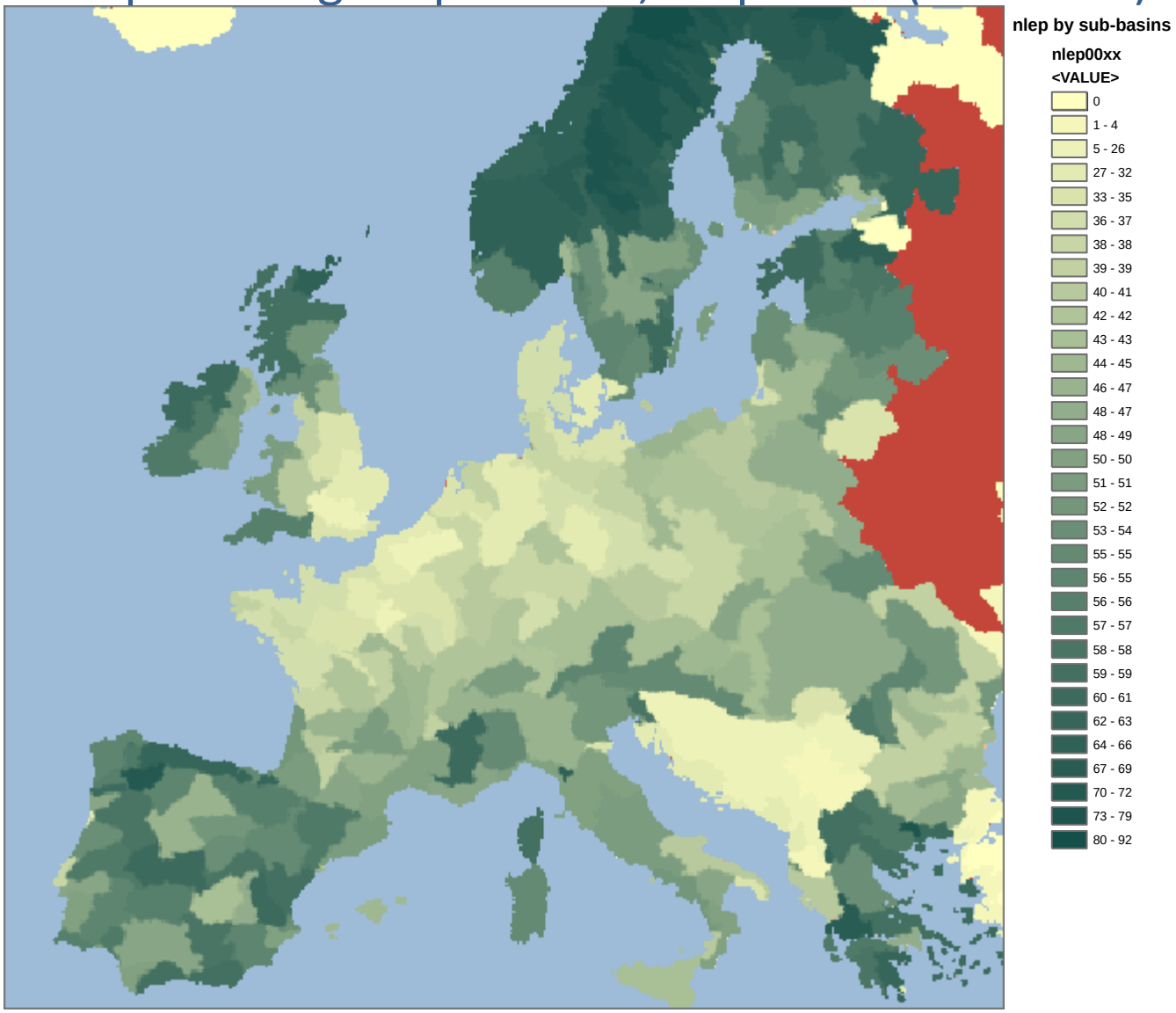
Net landscape ecological potential, nlep 2000 (observed)



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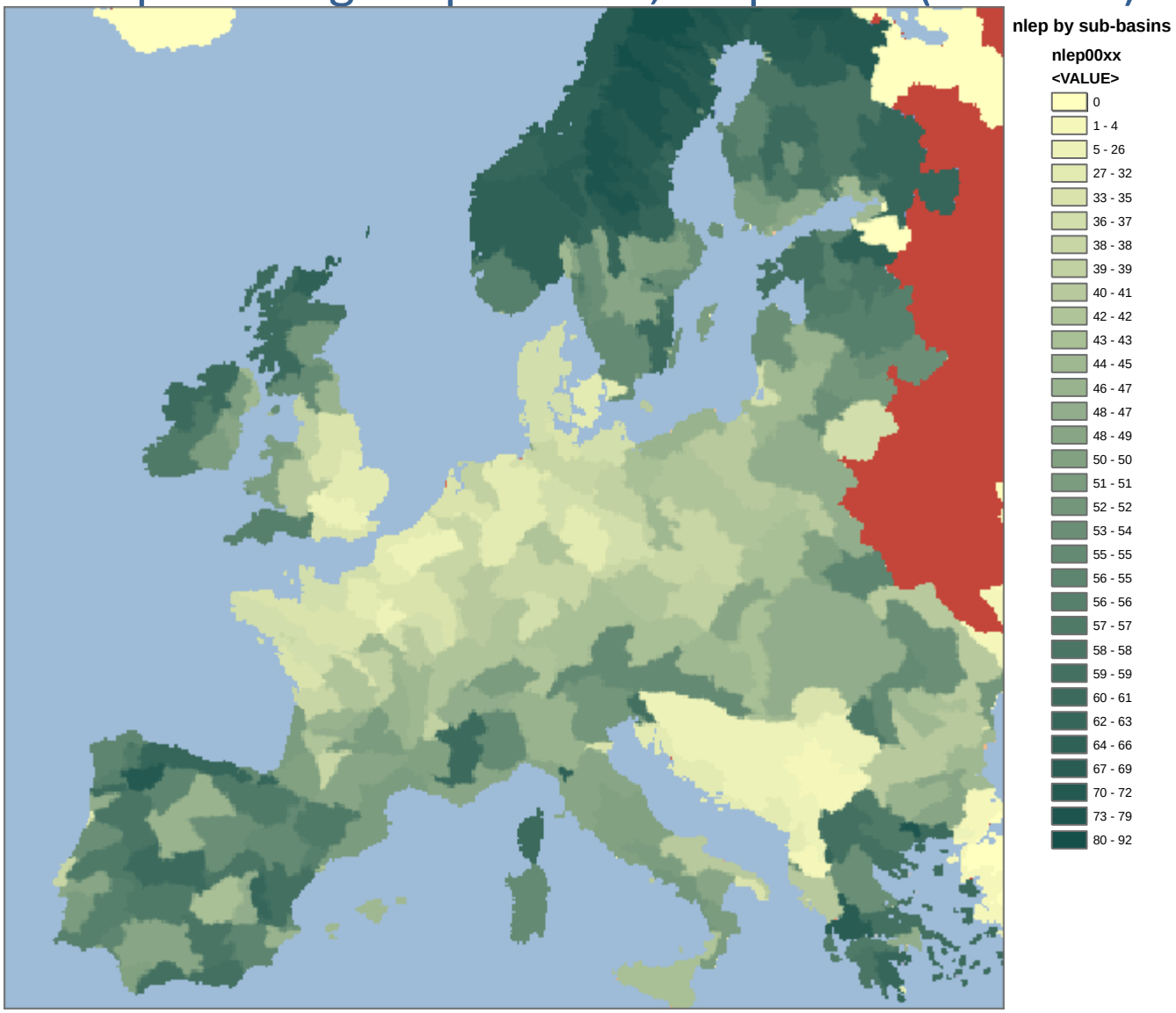
Net landscape ecological potential, nlep 2010 (nowcast)



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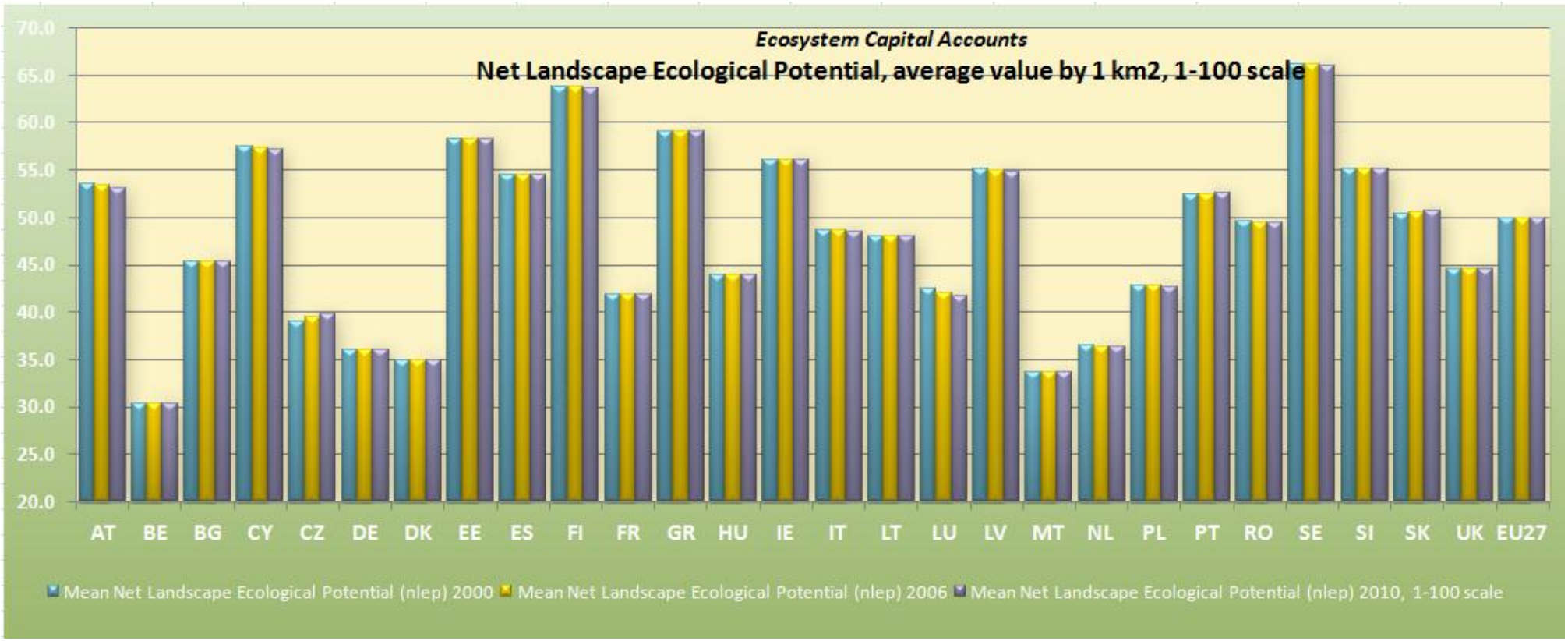
Ecosystem Capital Accounts: Landscape/Biodiversity Capacity Account



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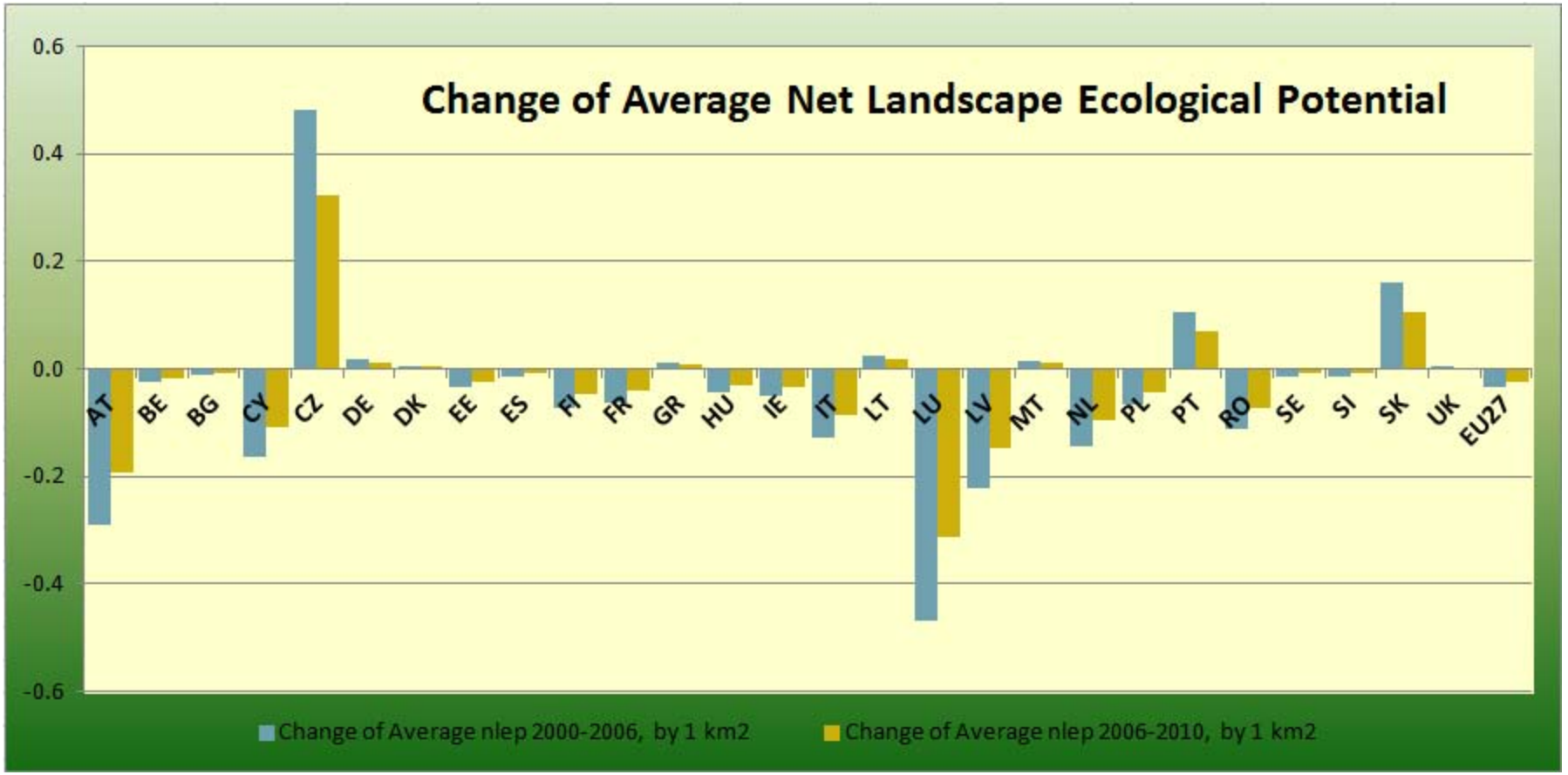
Ecosystem Capital Accounts: Landscape/Biodiversity Capacity Account



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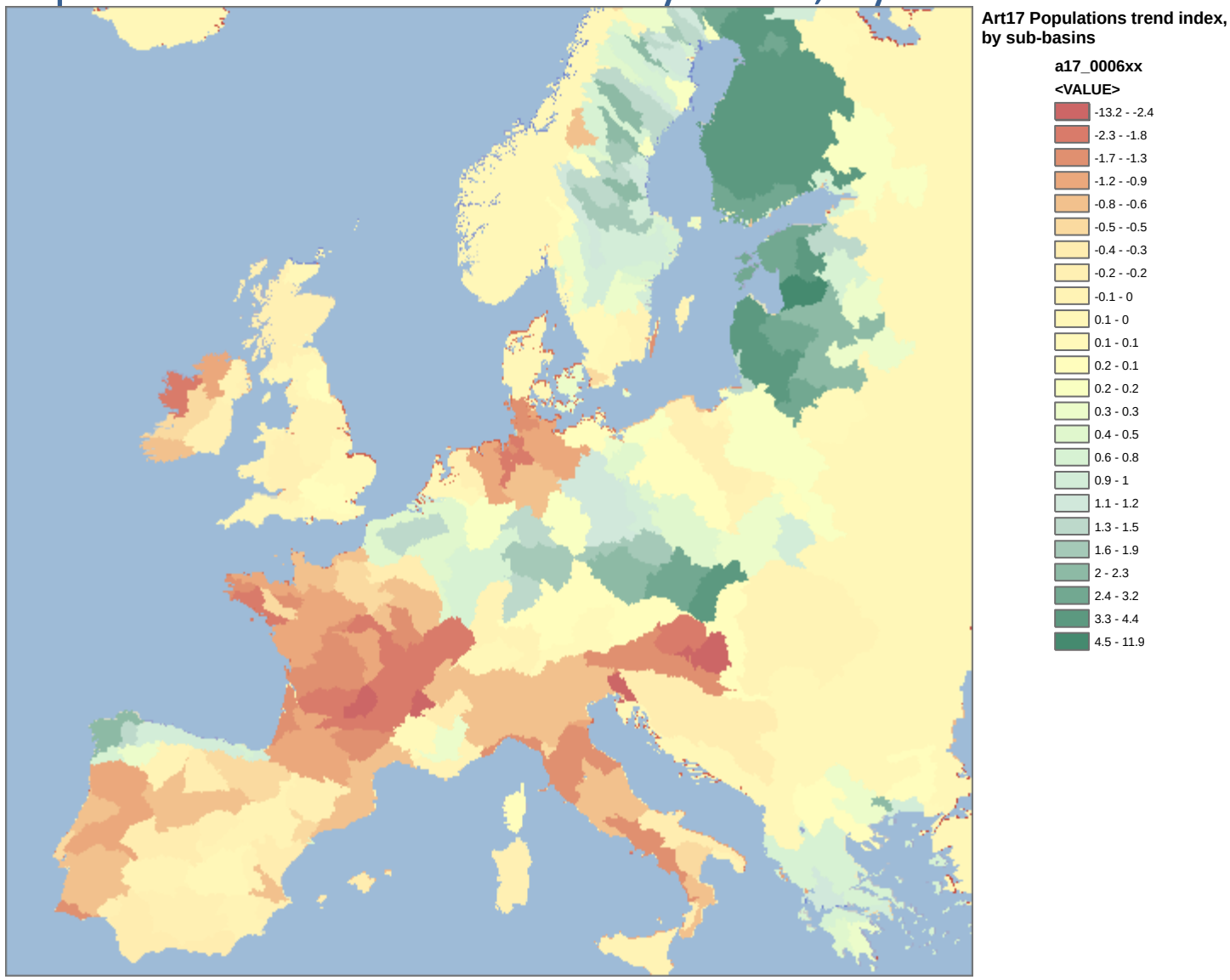
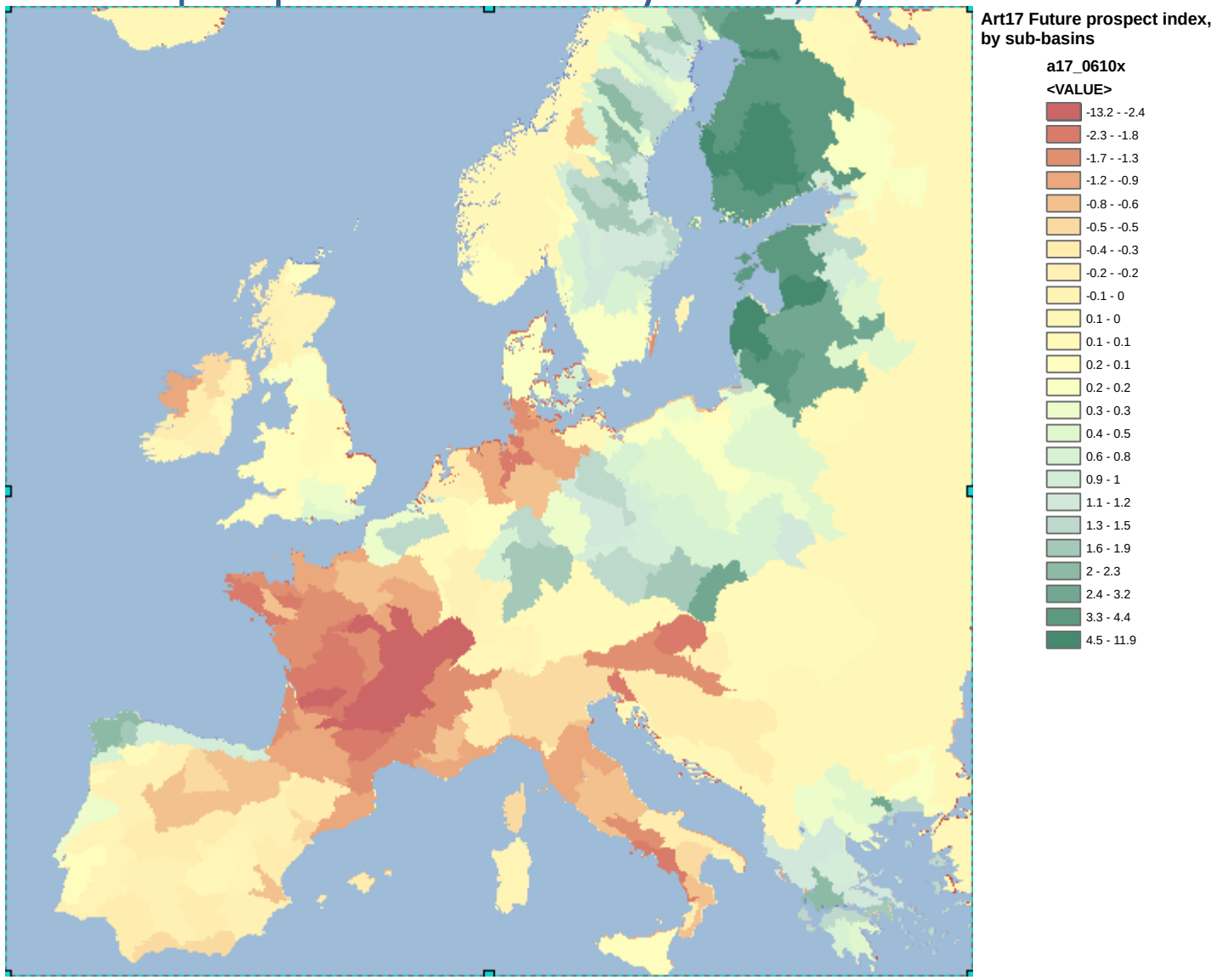
Art17 “Populations trend” biodiversity index, by sub-basins



European Environment Agency

Art17 “Future prospect” biodiversity index, by sub-basins



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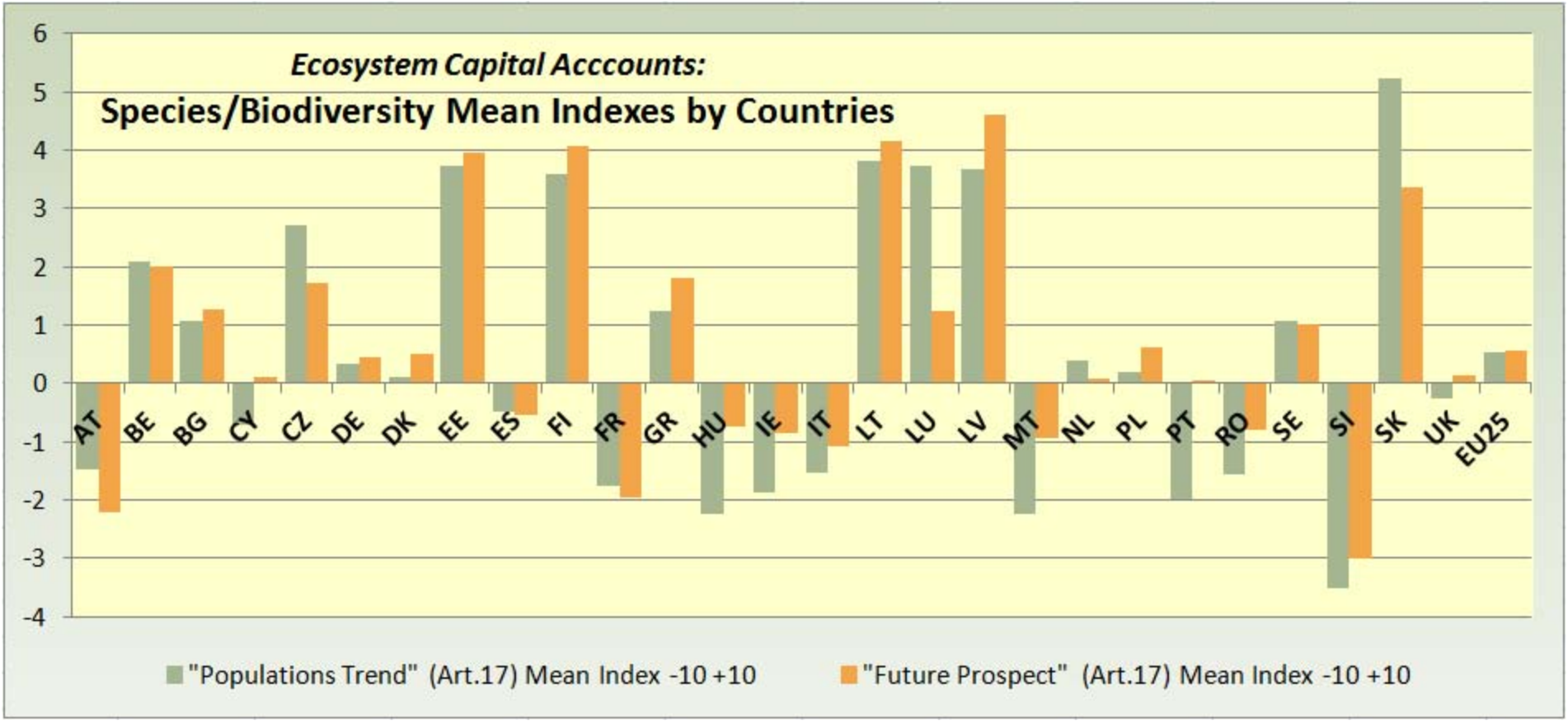
Ecosystem Capital Accounts: Landscape/Biodiversity Capacity Account



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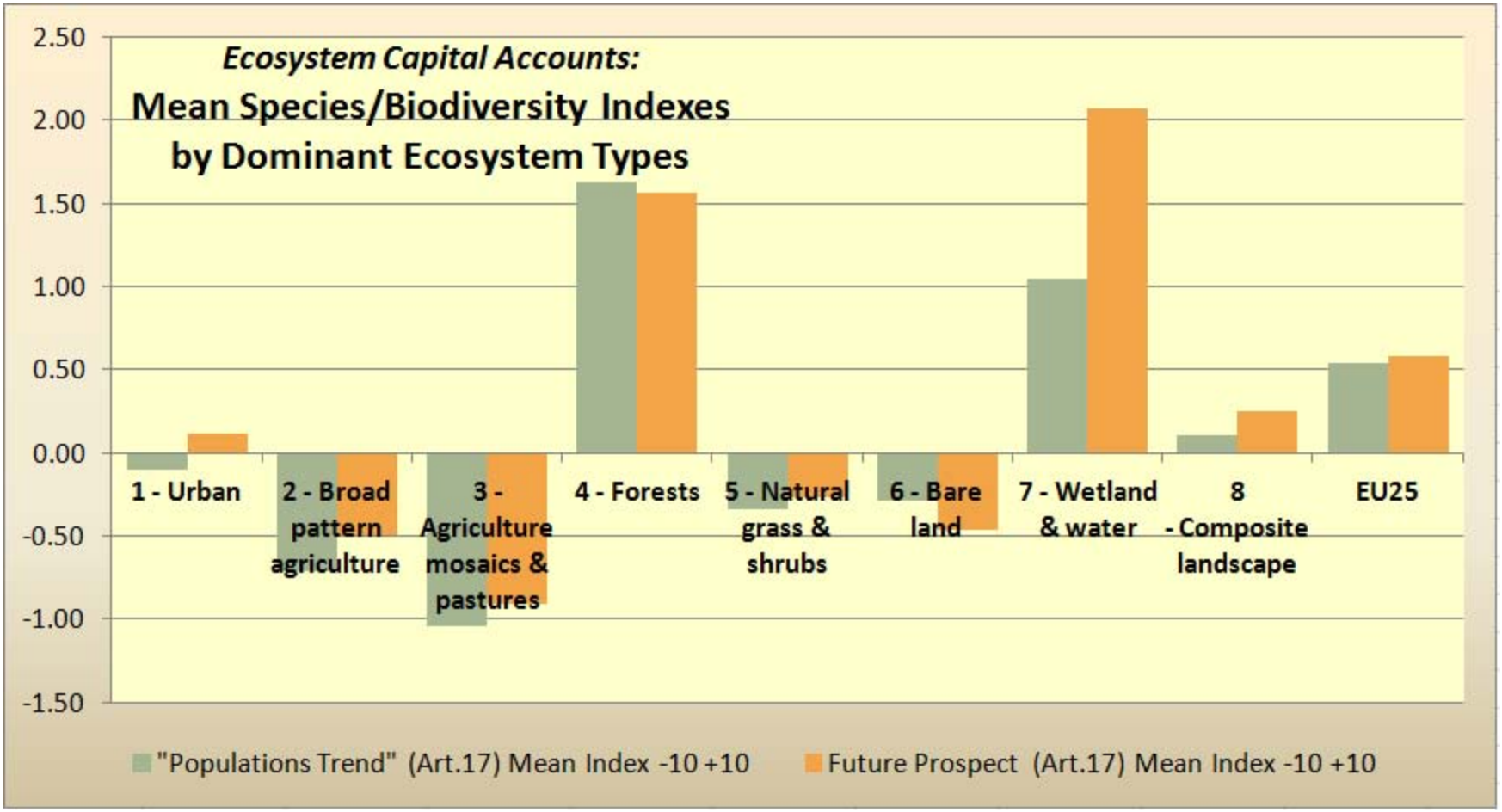
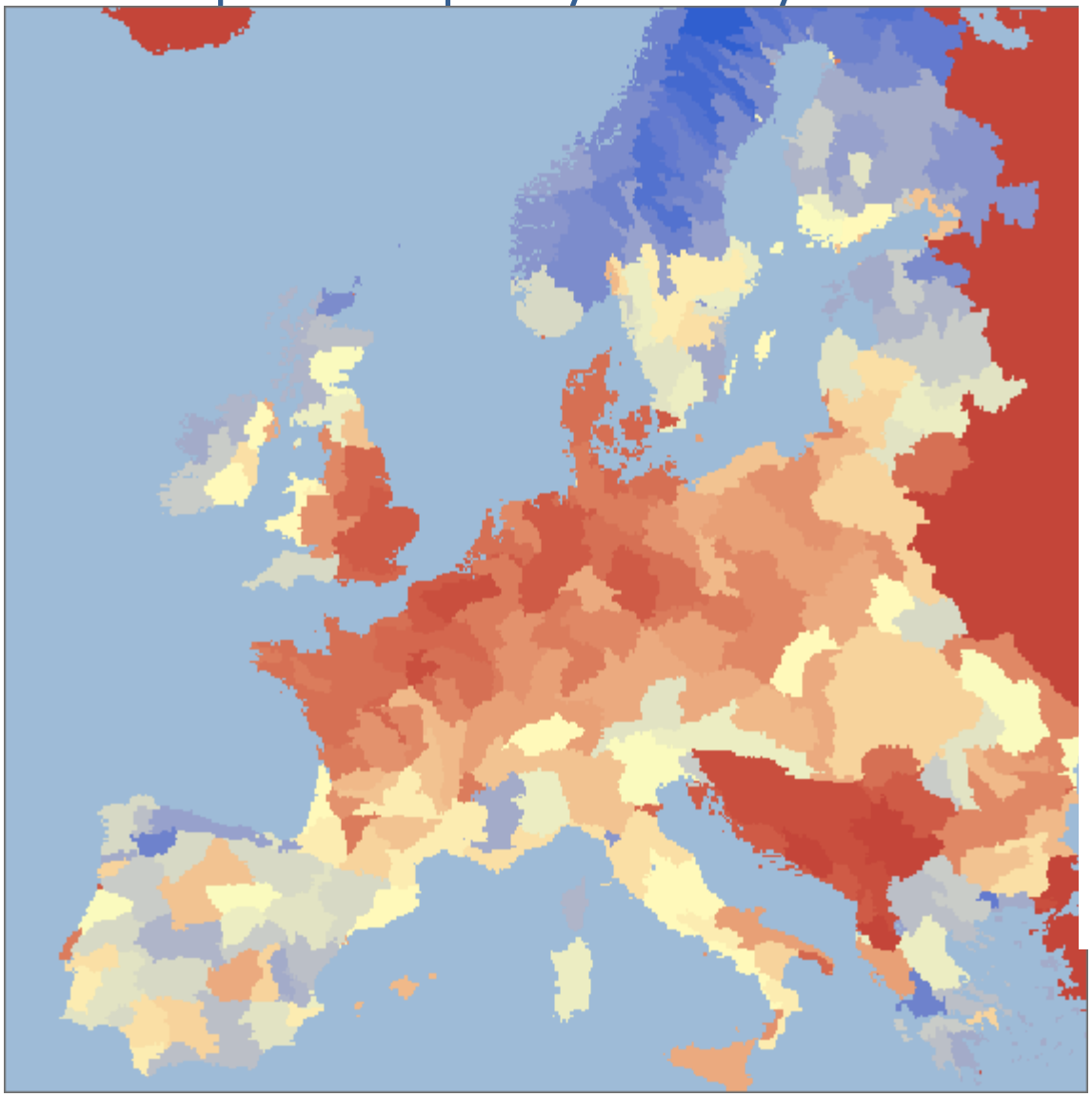
Ecosystem Capital Accounts: Landscape/Biodiversity Capacity Account



Landscape bio-capacity 2000 by sub-basins



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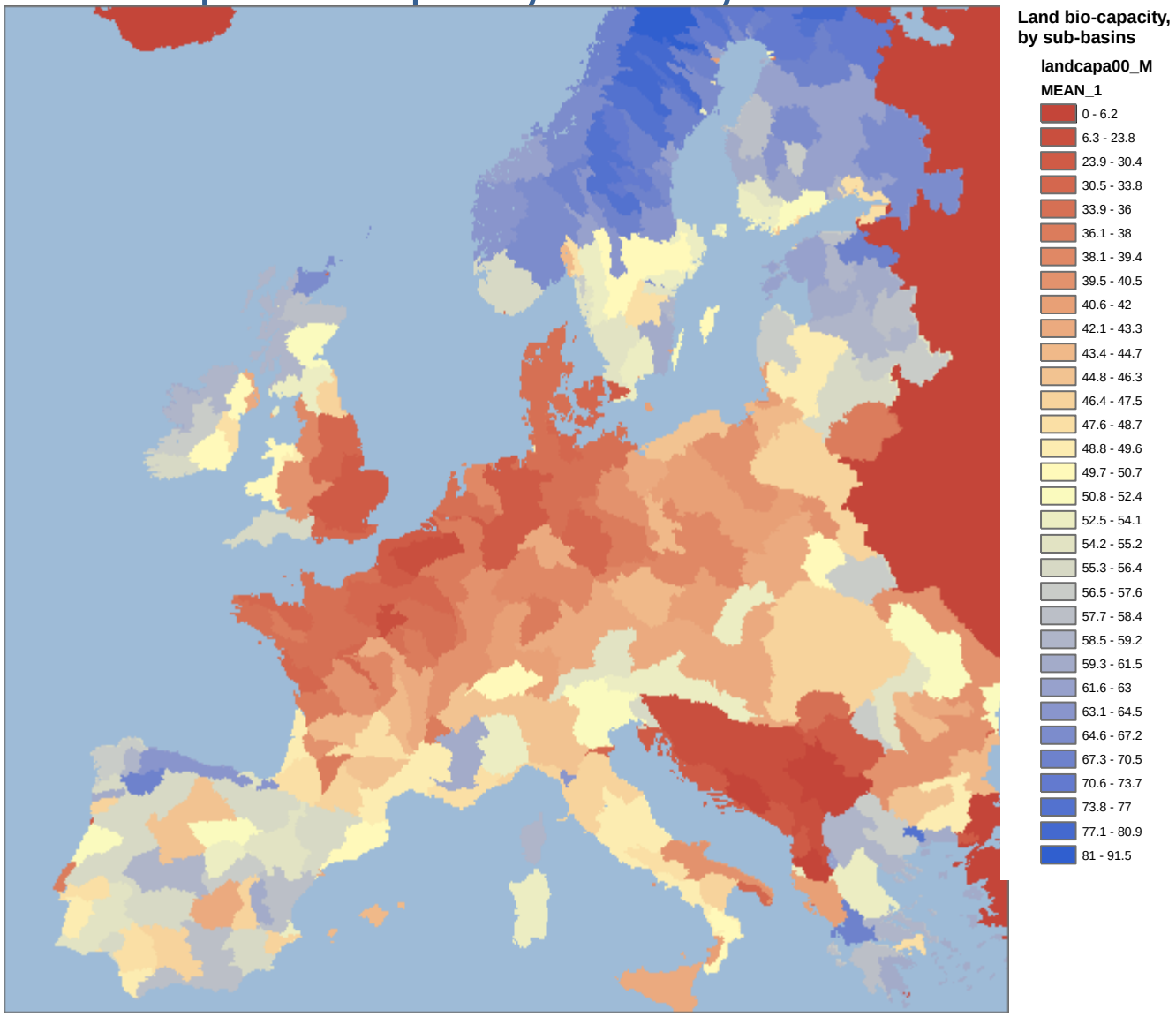
Landscape bio-capacity 2006 by sub-basins



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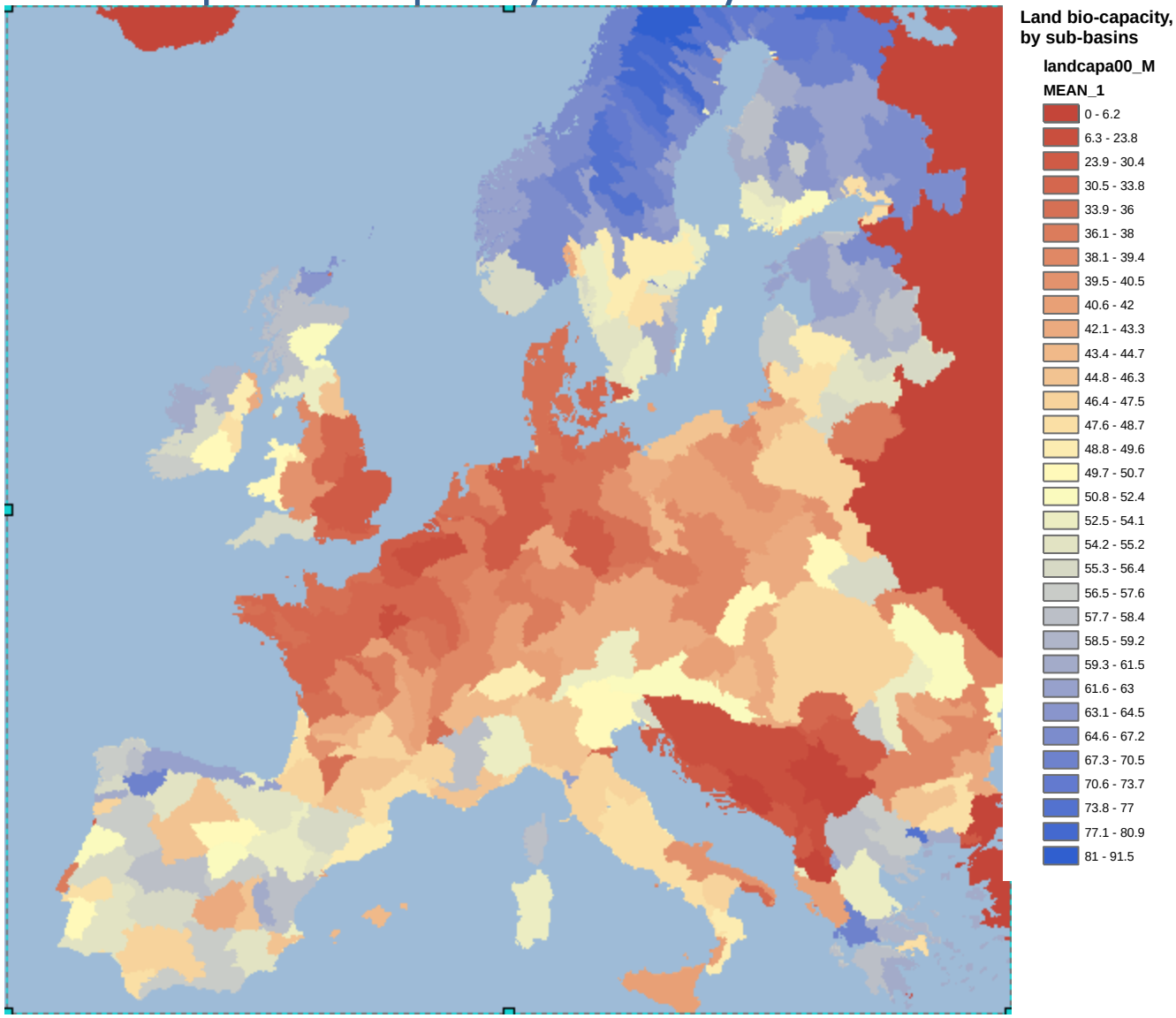
Landscape bio-capacity 2010 by sub-basins



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Ecosystem Capital Accounts: Landscape/Biodiversity Capacity Account

TABLE LBDV6: Landscape/Biodiversity Capacity 2000, 2006 & 2010, by Countries and River Basin Districts

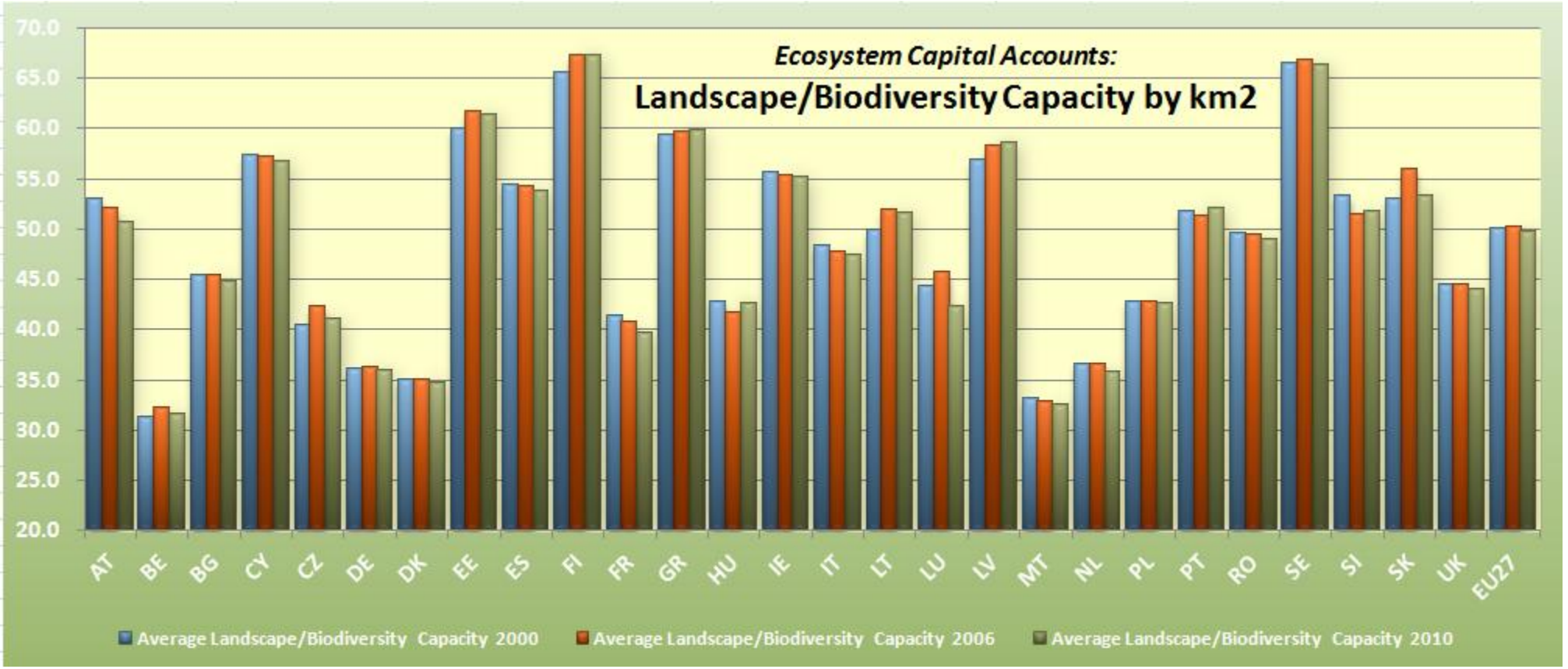
COUNTRY	RIVER BASIN DISTRICT (ECRINS Level 0)	Landscape /Biodiversity Capacity 2010 — *Dominant Ecosystem Type (as DLT51*)*								Total Landscape /Biodiversity Capacity 2010
		1 - Urban	2 - Broad pattern agricult.	3 - Agricult. mosaics & pastures	4 - Forests	5 - Natural grass & shrubs	6 - Bare land	7 - Wetland & water	8 - Composite landscape	
AT	Danube Region Basin District	1979	302111	289517	2005087	215553	318449	14231	905645	**4052572**
	Elbe			13988	15977				10771	**40736**
	Rhine	1		1350	49792	12149	10180	321	53326	**127119**
AT Total		1980	302111	304855	2070856	227702	328629	14552	969742	**4220427**
BE	Meuse	1278	26663	101209	189969	166		511	201926	**521722**
	Rhine			19090	9551				5127	**33768**
	Scheldt (Brussels Area)	5845	89742	105027	3913				208194	**412721**
	Seine			649	1345				2194	**4188**
BE Total		7123	116405	225975	204778	166		511	417441	**972399**
BG	Black Sea Basin District	123	204865		316847			3998	183388	**709221**
	Black sea coastal and small river basins				12529			101	74	**12704**
	Danube Region Basin District	567	737563	6953	598288	1520	221	745	567130	**1912987**
	East Aegean Region Basin District	1775	365119	4076	924463	13858			343576	**1652867**
	West Aegean Region Basin District	476	31705	1251	492336	15413	1155		165240	**707576**
BG Total		2941	1339252	12280	2344463	30791	1376	4844	1259408	**4995355**
CY	Cyprus	1241	109507	6308	112845	36020	4930	5180	249814	**525845**
CY Total		1241	109507	6308	112845	36020	4930	5180	249814	**525845**
CZ	Danube Region Basin District	355	320140	13830	283699				242307	**860331**
	Elbe	4605	643797	35047	640171	4538		478	713248	**2041884**

Ecosystem Capital Accounts: Landscape/Biodiversity Capacity Account

TABLE LBDV7: Landscape/Biodiversity Capacity 2000, 2006 & 2010, by Countries and River Sub-Basins

COUNTRY	RIVER SUB-BASIN (ECRINS Level 3)		Landscape /Biodiversity Capacity 2010 — *Dominant Ecosystem Type (as DLT51*)*								Total Landscape /Biodiversity Capacity 2010
			1 - Urban	2 - Broad pattern agricult.	3 - Agricult. mosaics & pastures	4 - Forests	5 - Natural grass & shrubs	6 - Bare land	7 - Wetland & water	8 - Composite landscape	
AT	WSB0000069	Danube main upper 1 - Altmuhl, Lech, Iller			762	25198	11929	11119		42265	91273
	WSB0000070	Danube main upper 2 - Naab, Regen, Isar				43051		9793		17342	70186
	WSB0000071	Danube main upper 3- Traun, Enns, Kamp	1277	155083	177549	653520	48135	12856		200844	1249264
	WSB0000101	Drau	509	5170	8674	756276	91036	82233		268854	1212752
	WSB0000188	Inn	77	2345	70631	348090	63552	202448		258231	945314
	WSB0000321	Morava		81671	5799	6020				21748	115238
	WSB0000411	Raab	116	57842	26102	172932	901		14231	96361	368485
	WSB0000417	Rhine main - Upper - Ill	1		1350	49792	12149	10180	321	53326	127119
	WSB0000571	Vltava			13988	15977				10771	40736
AT Total			1980	302111	304855	2070856	227702	328629	14552	969742	4220427
BE	WSB0000138	Escaut / Schelde	4131	57108	62229	3587				170961	298016
	WSB0000304	Meuse	1278	26663	101209	189969	166		511	201926	521722
	WSB0000322	Moselle			19090	9551				5127	33768
	WSB0000362	Oise			649	1345				2194	4188
	WSB0000445	Scheldt coastal castchments and small basins (Somme,	1714	32634	42798	326				37233	114705
BE Total			7123	116405	225975	204778	166		511	417441	972399
BG	WSB0000037	Black Sea Basin District	123	204865		316847			3998	183388	709221
	WSB0000038	Black sea coastal and small river basins				12529			101	74	12704
	WSB0000066	Danube main lower 1 - Ogosta, Iskar, Vit, Osum, Yantra,	562	460294	5988	502230	1520	221	745	440070	1411630
	WSB0000067	Danube main lower 2 - final	5	193499		19117				57506	270127
	WSB0000068	Danube main - Medium - Timok		83668	965	40155				45714	170502

Ecosystem Capital Accounts: Landscape/Biodiversity Capacity Account



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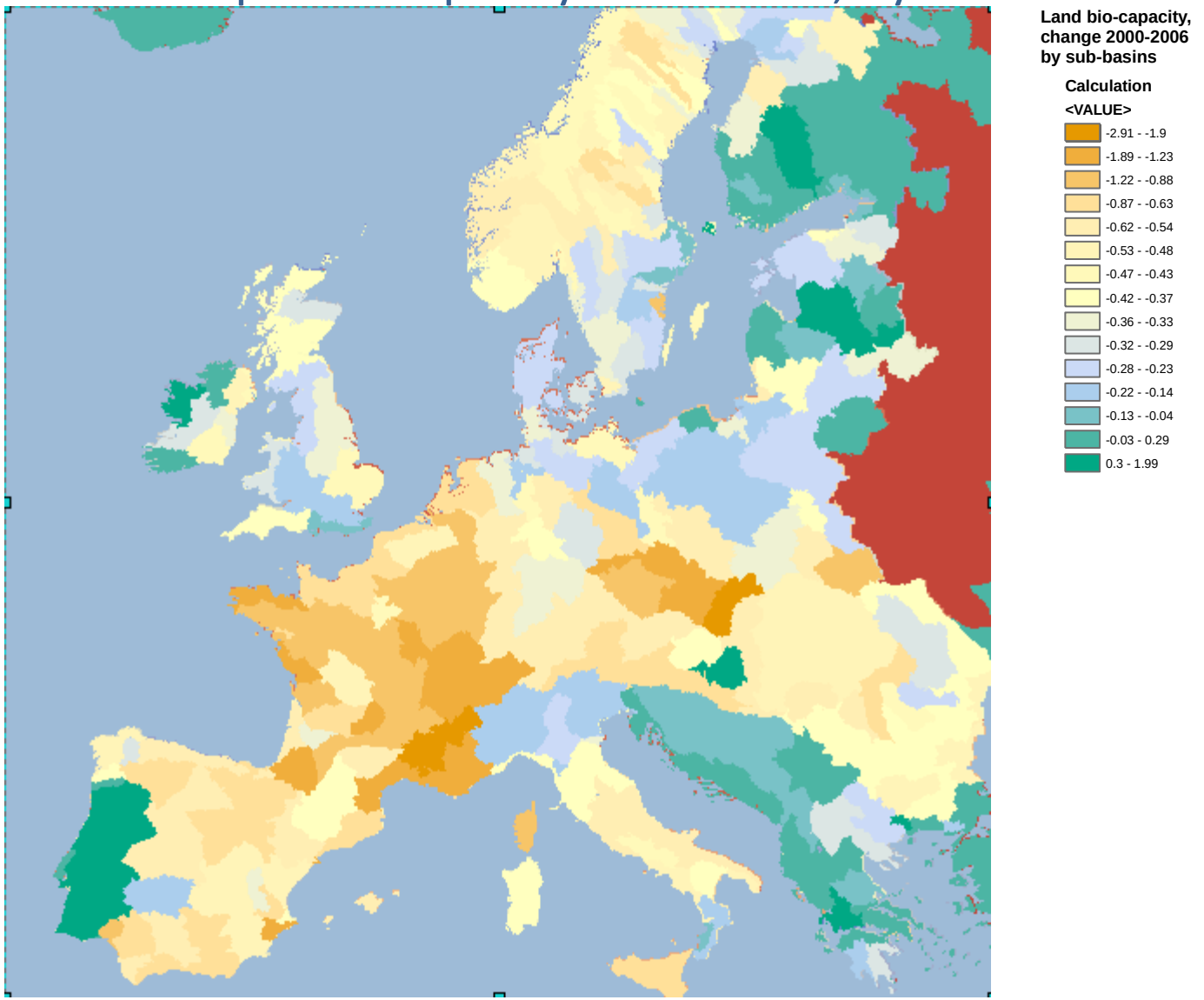
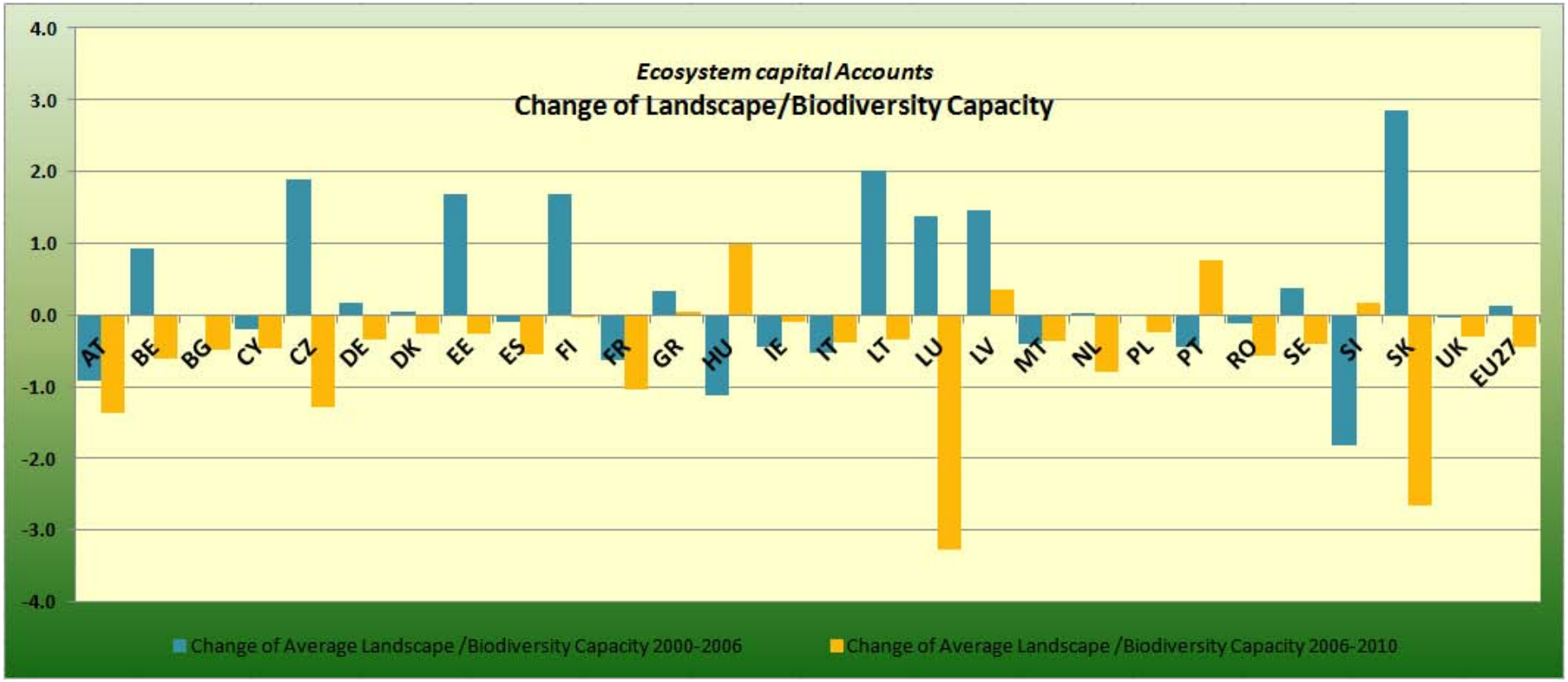
Change in landscape bio-capacity 2000-2006, by sub-basins



Ecosystem Capital Accounts: Landscape/Biodiversity Capacity Account



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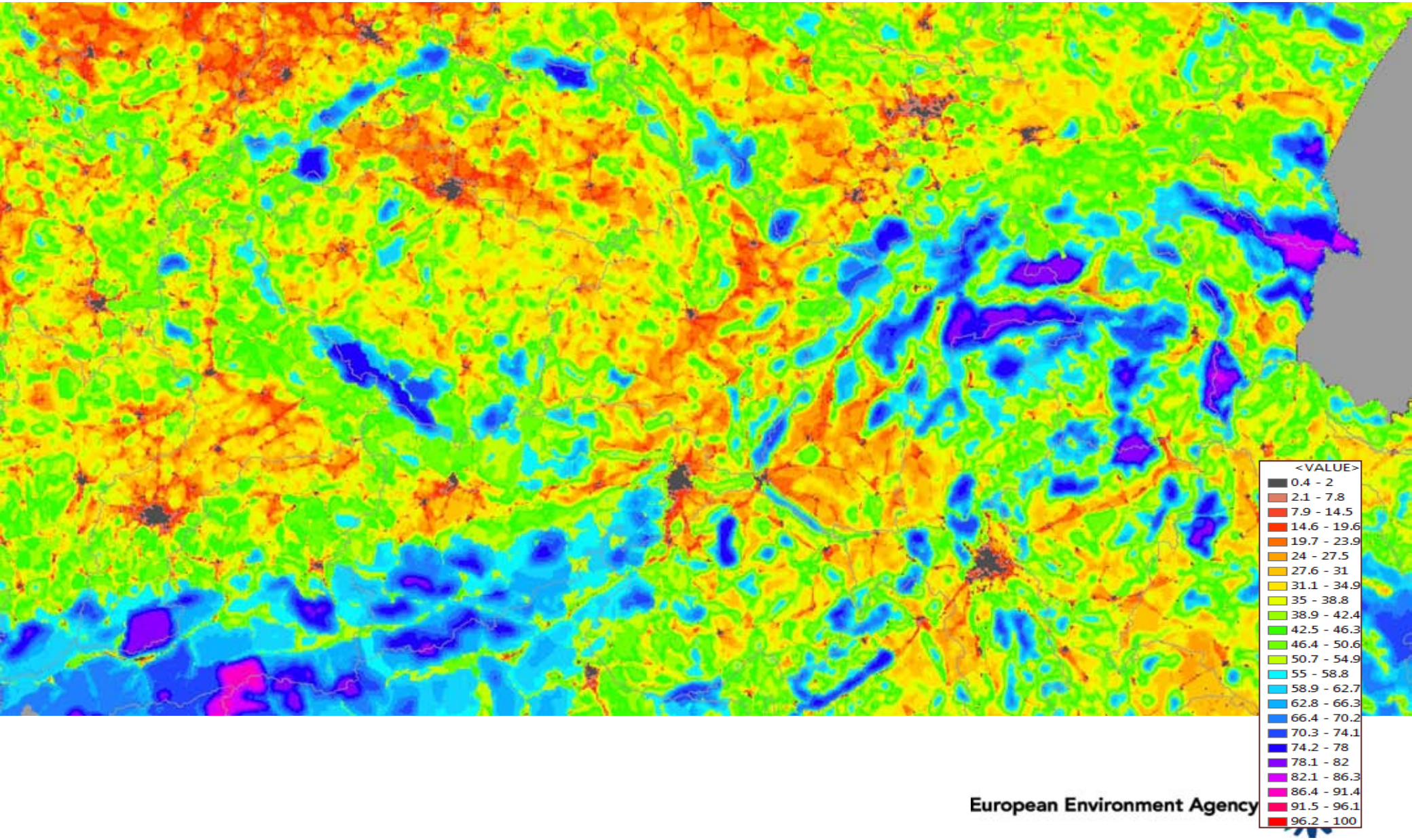
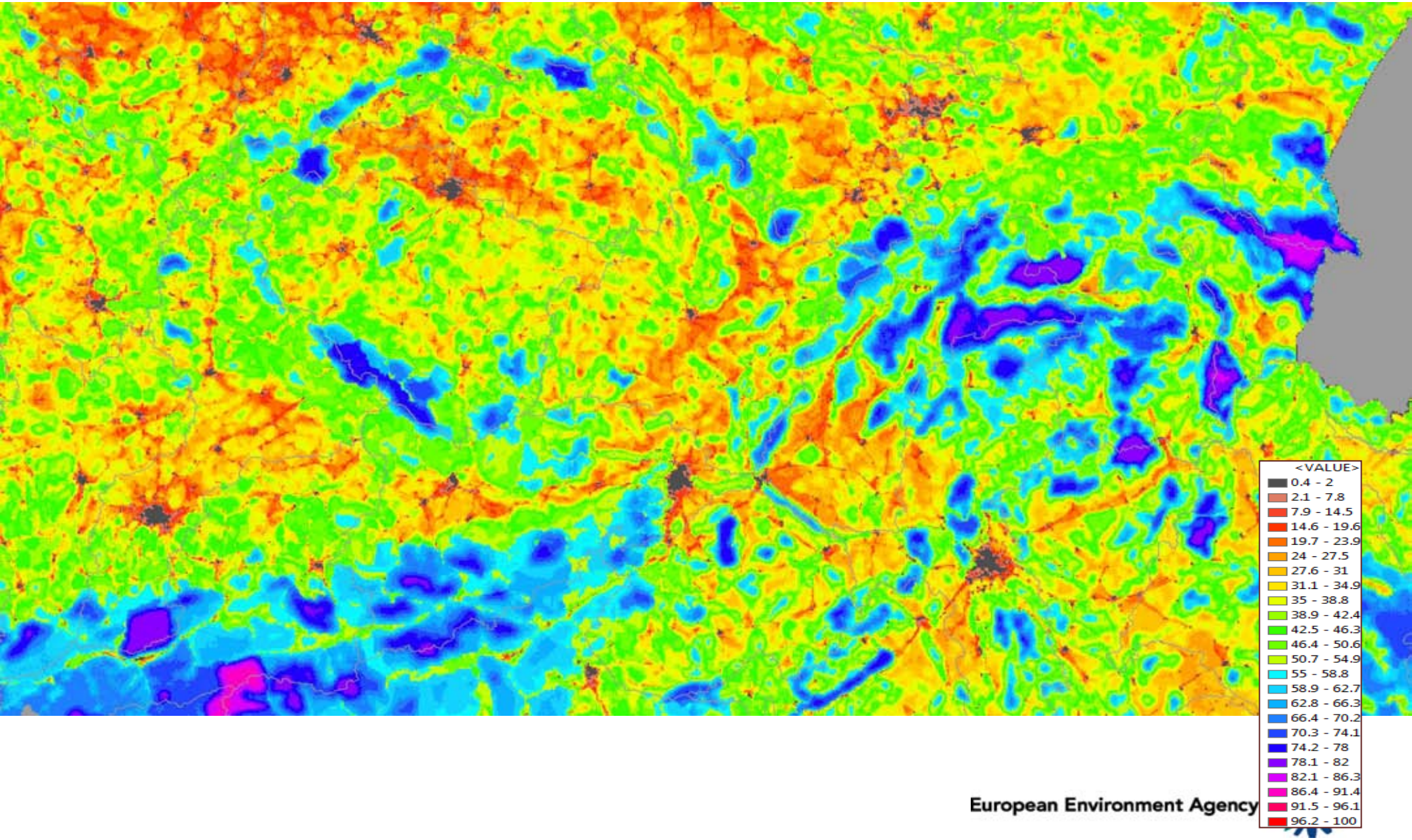
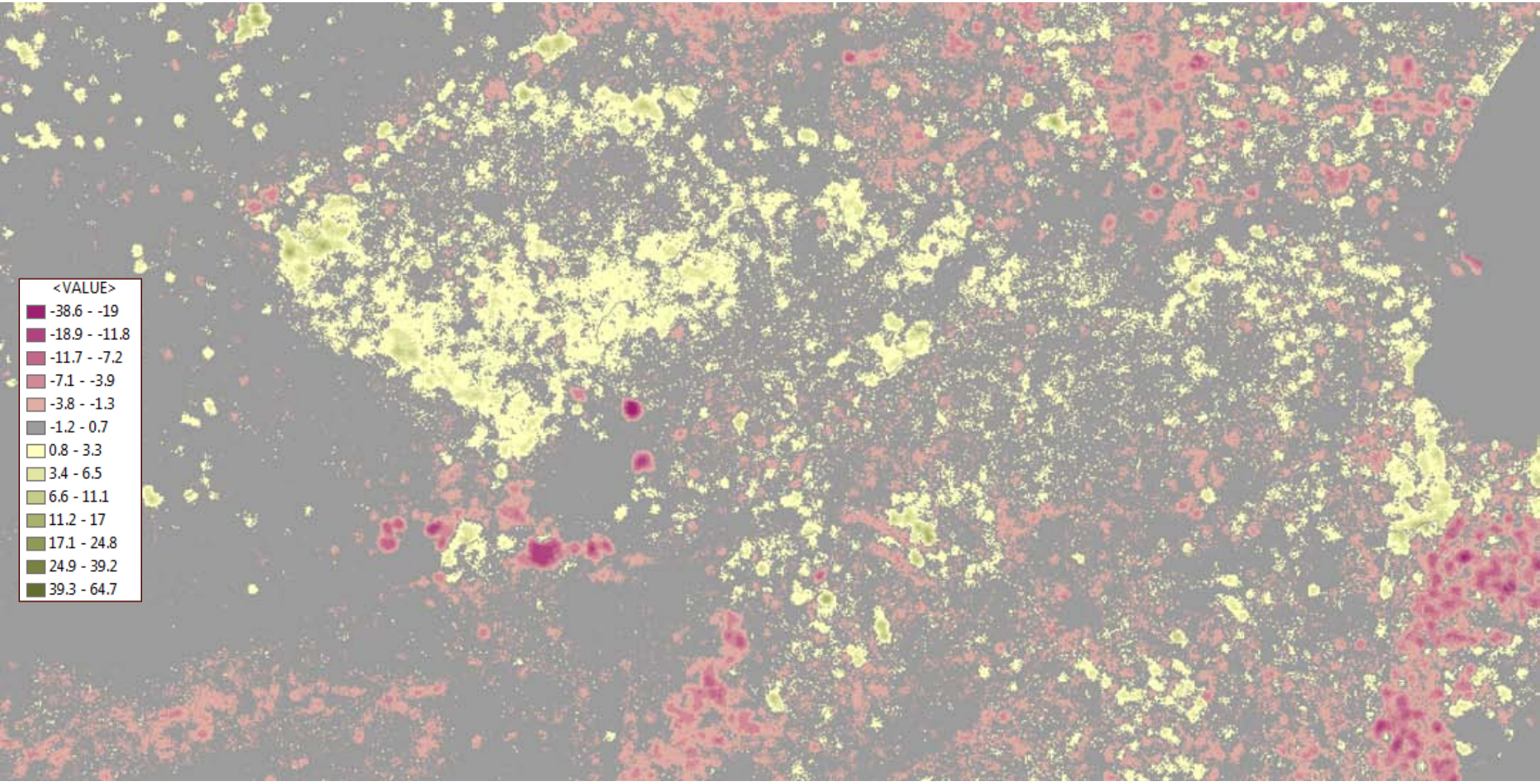
Landscape ecosystem potential (integrity): the EEA nlep indicator – 2000 (observed)



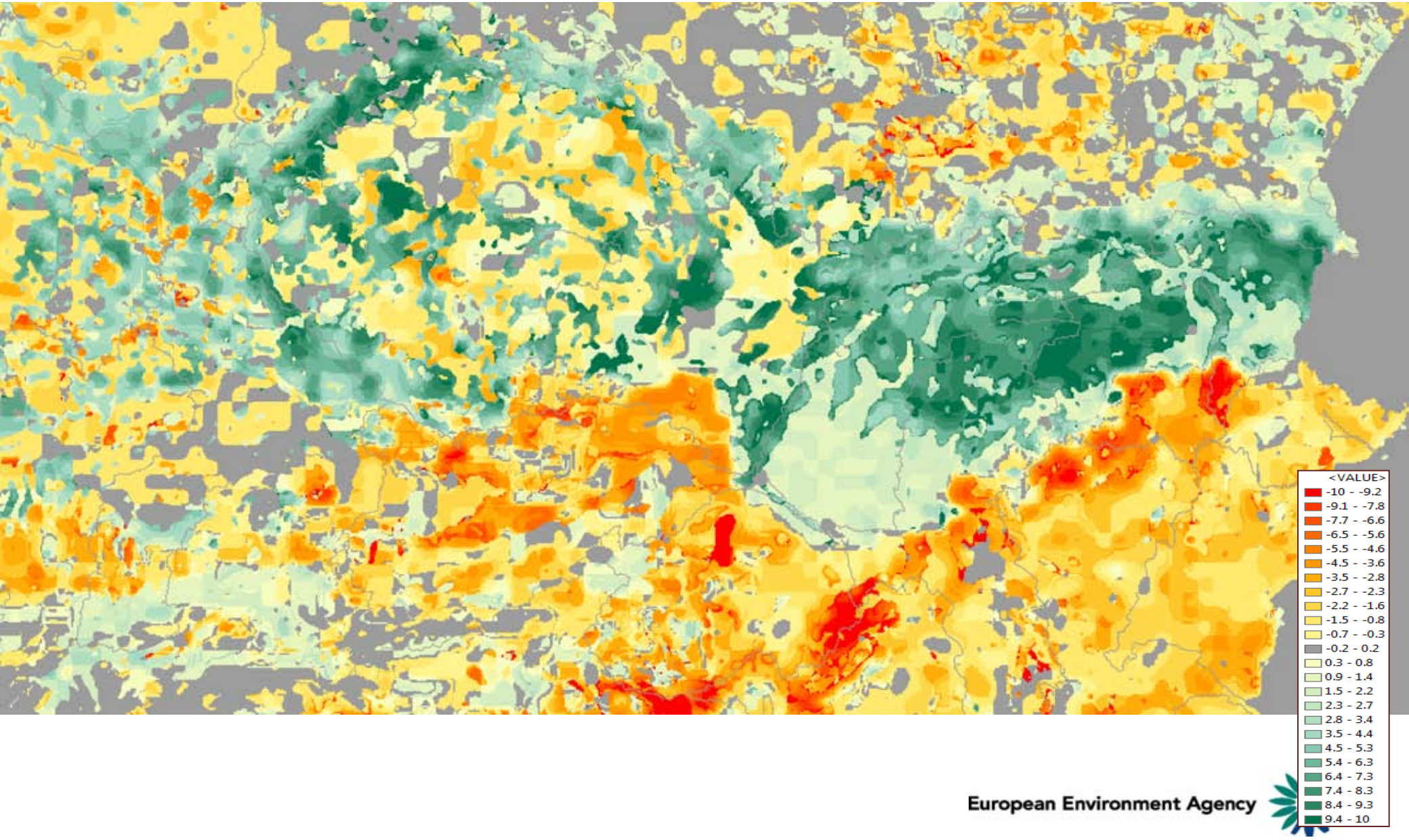
Landscape ecosystem potential (integrity): the EEA nlep indicator – 2010 (now-casting)



Change in nlep, 2000 – 2010, 0-100 scale



Species biodiversity index: “Art.17” reporting to the EC on Populations past/present trends (up to 2006)



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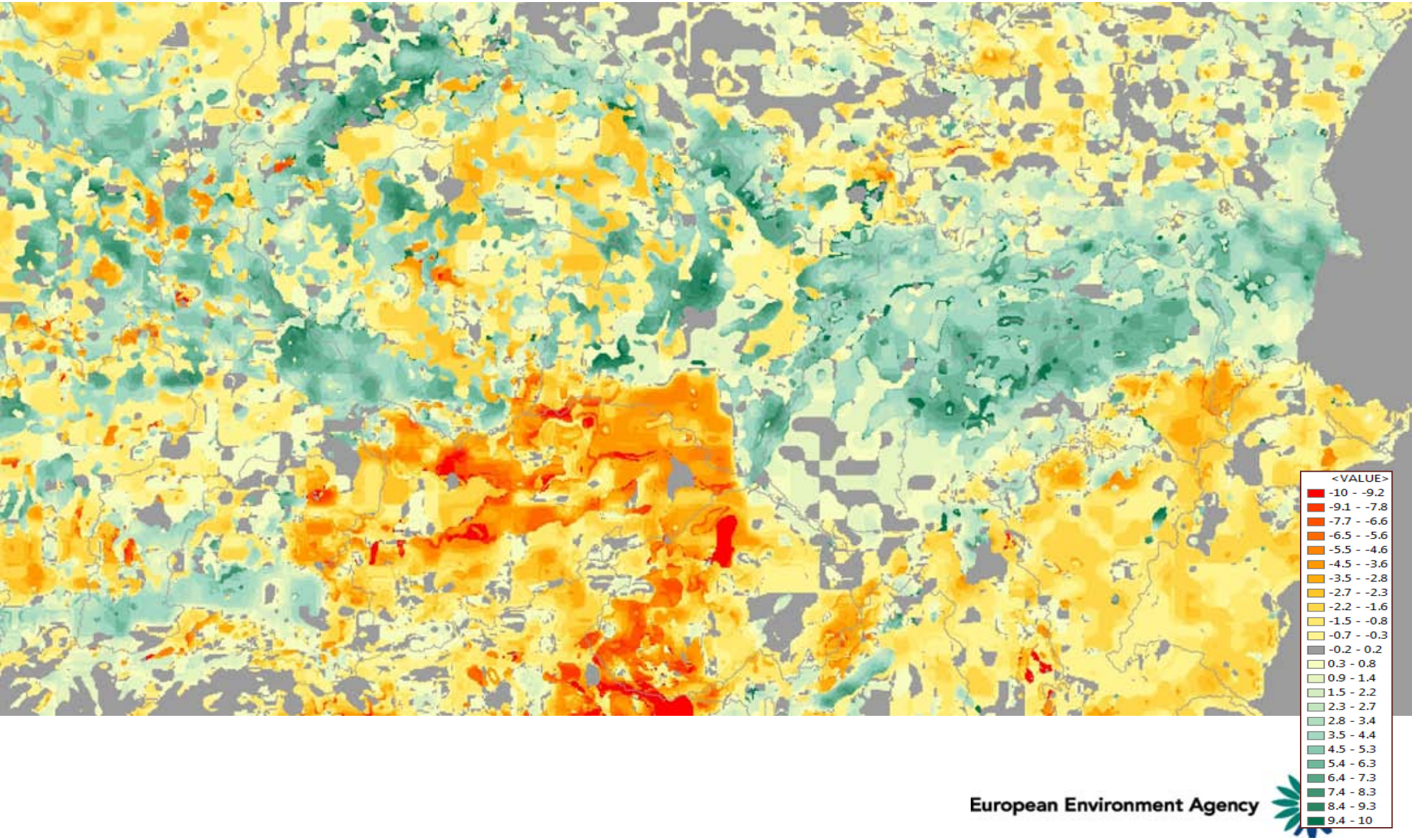
Species biodiversity index: “Art.17” reporting to the EC on Future prospects (after 2006)



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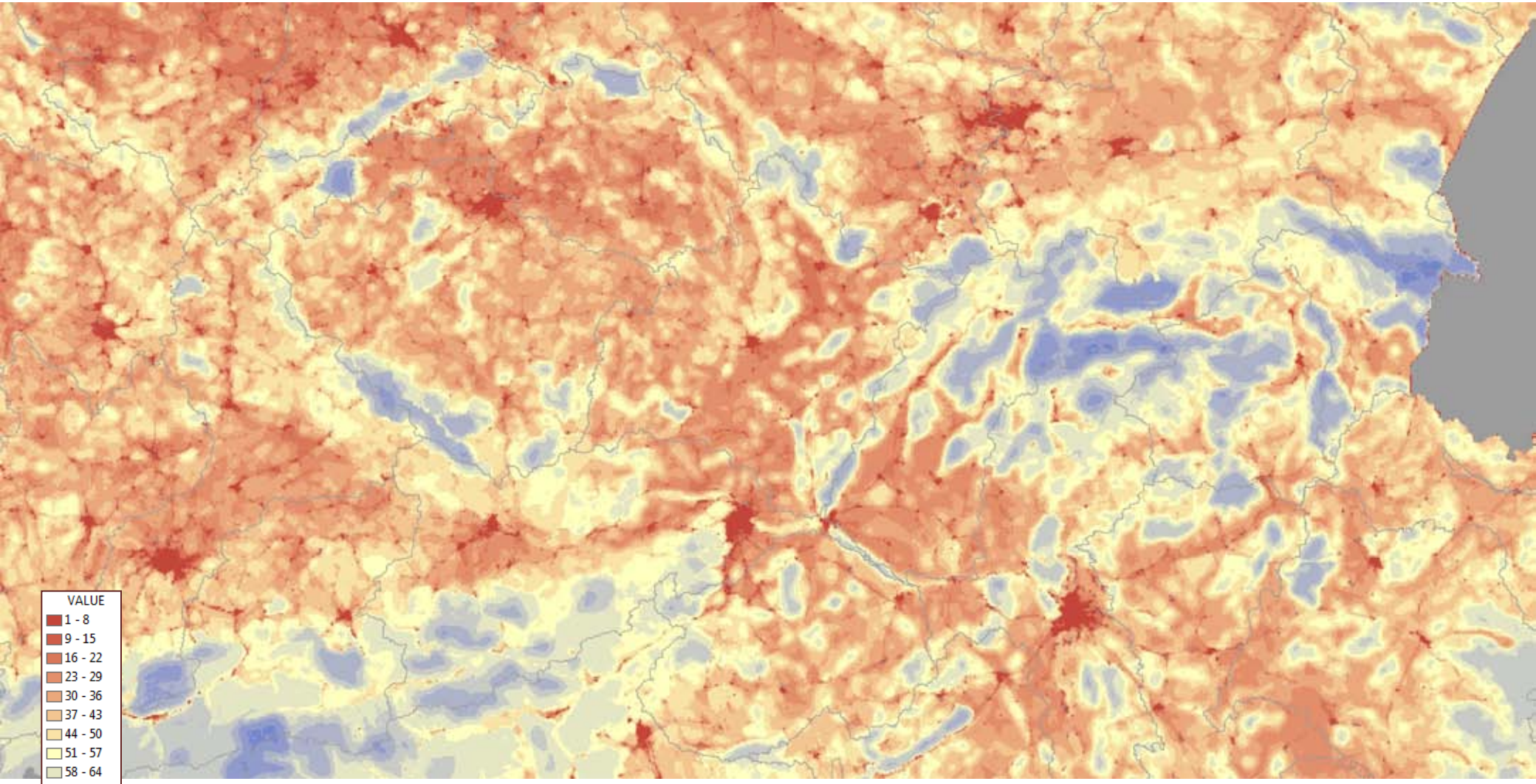
Landscape bio-capacity 2000



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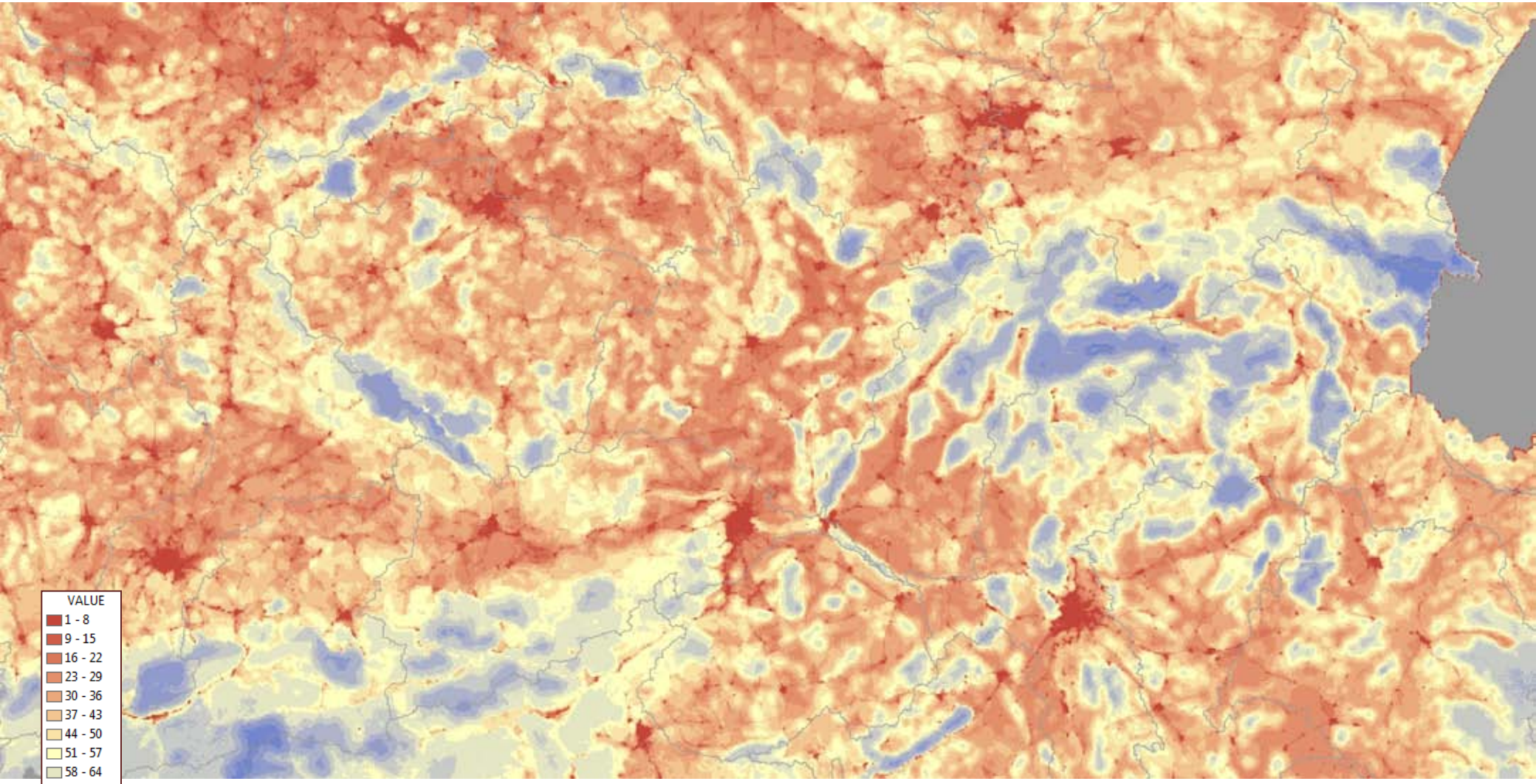
Lansdcape bio-capacity 2010



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Next step

- From preliminary to first operational results:
  - Validation & improvements by EEA and ETCs
  - Open to review by EEA partners (JRC, Eurostat, DGENV…)
  - International review, SEEA revision context, tests with Australia…
  - We need EIONET's comments…

- Country applications:
  - On a case by case basis – e.g., Slovakia meeting next week
  - Starting from national or regional priorities: detailed, more accurate accounts under the umbrella of the EU broad picture for biomass/carbon/freshwater/landscape/biodiversity
  - According to existing data in countries…