Developing and organising physical accounts

Natural Capital Accounting Workshop, EEA, Copenhagen, 27-28 June 2013

Ecosystem component of Natural capital

- Definition, source Encyclopedia of Earth:

*"Natural capital is the **stock** of **natural ecosystems** that **yields a flow** of **valuable** ecosystem goods or services **into the future**. For example, a stock of trees or fish provides a flow of new trees or fish, a flow which **can be sustainable** indefinitely. Natural capital may also provide services like recycling wastes or water catchment and erosion control. Since the flow of services from ecosystems requires that **they function as whole systems**, the **structure and diversity** of the system are important components of natural capital."*

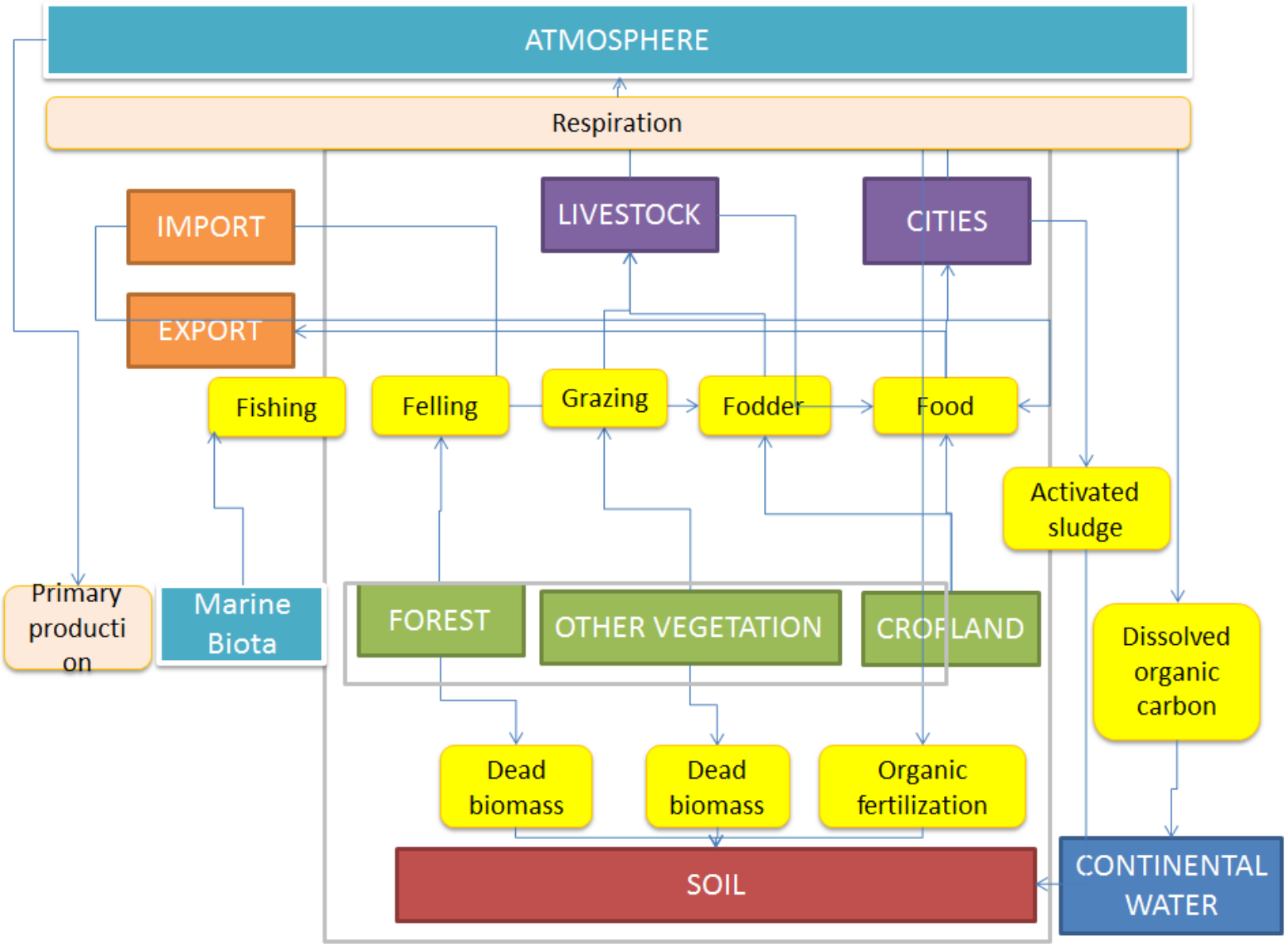
How to organize physical accounts

- EEA experience: fast-track ecosystem accounts
- Steps:
  - Define the expected outcome:
    - At EEA, cross-topic spatial explicit database → account for stocks and flows (answering the question: how much?)
    - Basis (input data) for building indicators, balances, …
  - Top-down:
    - **Select building blocks or "accounting subsystems" → and what is being measured in each**
    - For each of them, make a **conceptual diagram**, identifying stocks and flows
  - Bottom-up:
    - Find/build **appropriate data to describe the stocks and flows** (win-win situation: build multi-purpose data)
    - Adapt conceptual diagrams accordingly

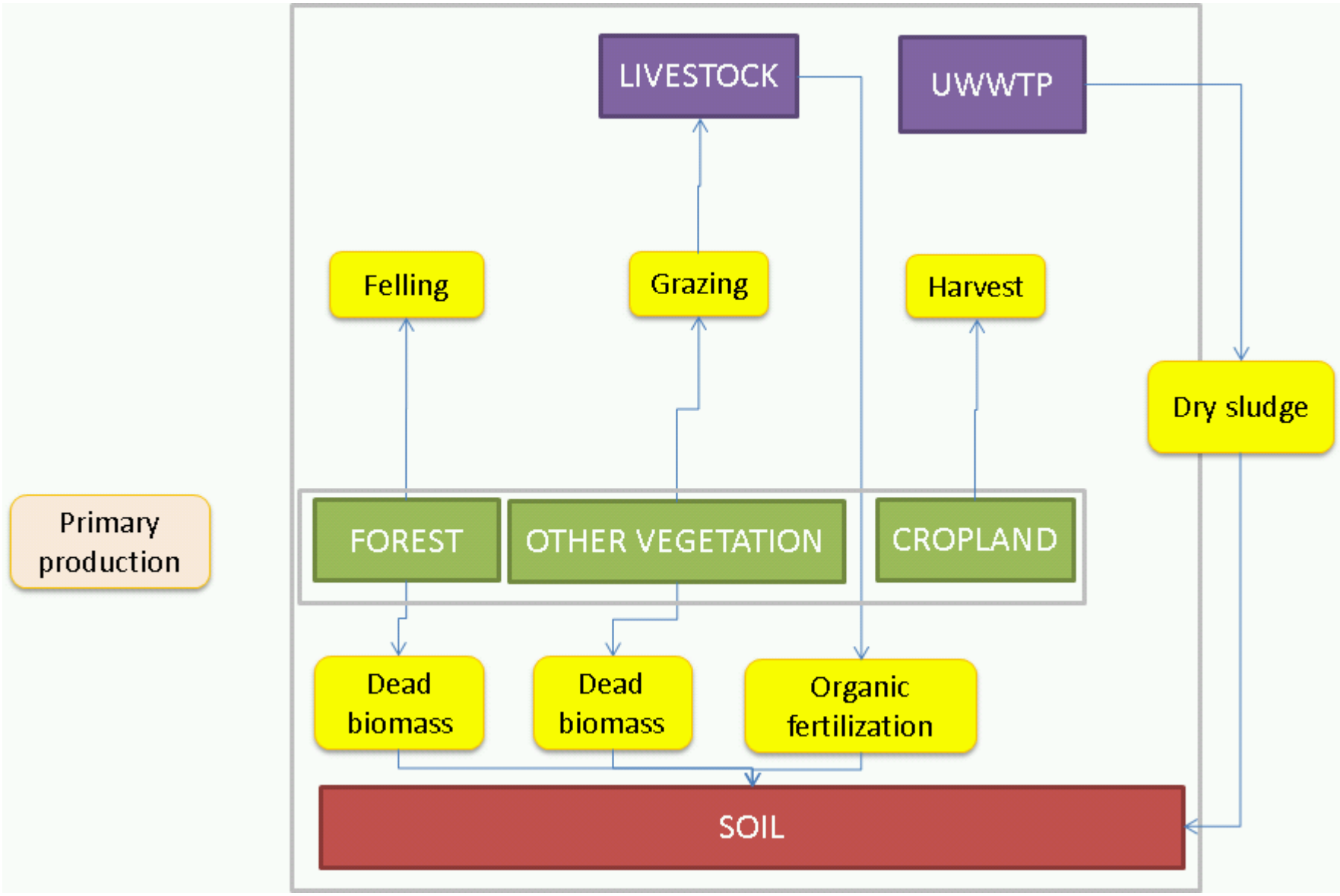
Fast track ecosystem accounts (EEA)

- Reference: SEEA http://unstats.un.org/unsd/envaccounting/seea.asp
- Building blocks / accounting subsystems
  - **Land/biodiversity**: land accounts →**hectares** of land cover and land cover changes (flows)
  - **Water**: following SEEA-W, **cubic metres** by water body type, including uses (abstractions and returns)
  - **Carbon**: **organic carbon content in tons**, in different ecosystem compartments (forest, soil, other vegetation), and the exchange between them (flows)

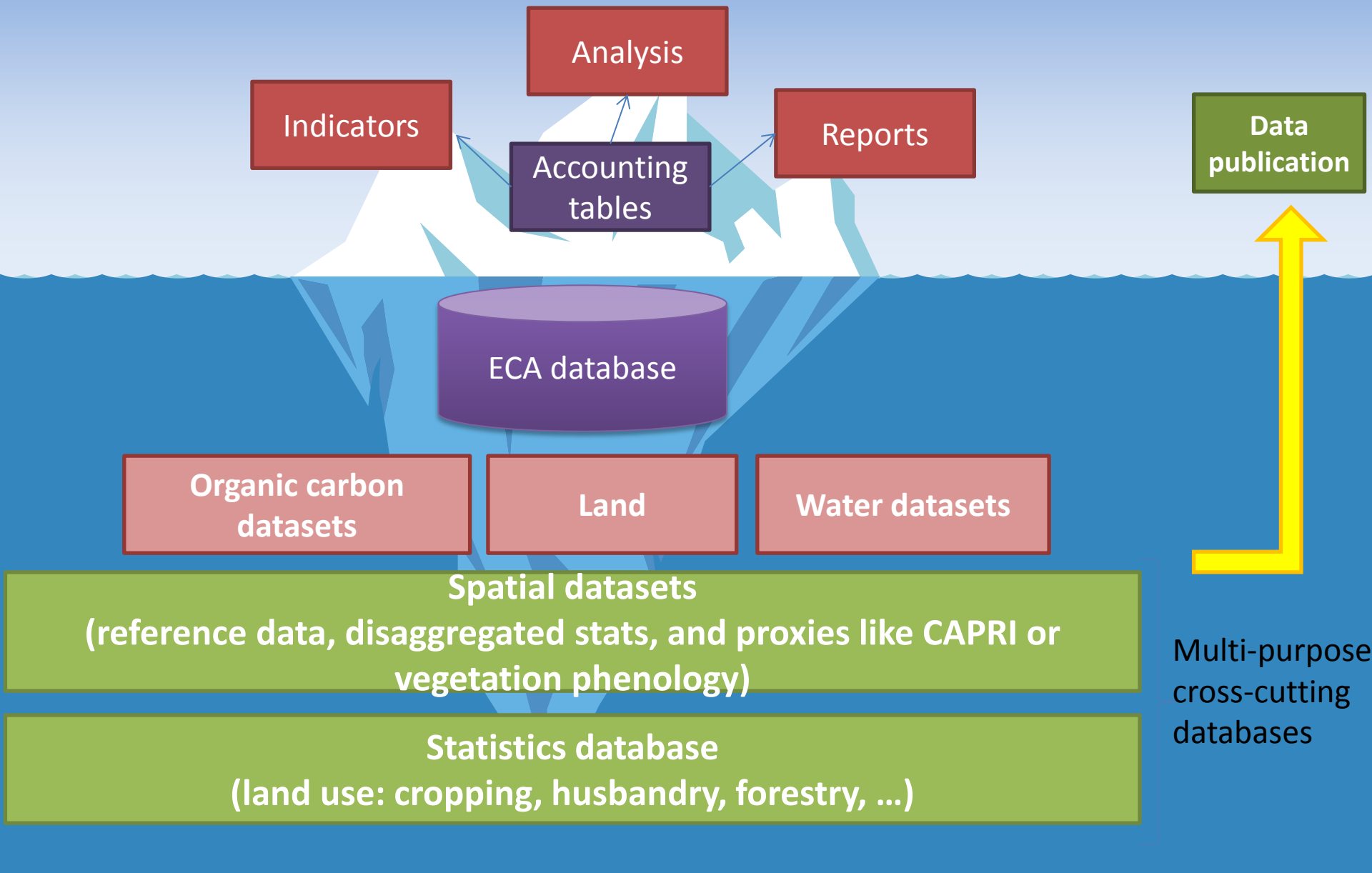
Example: C Accounting conceptual diagram



C Accounting conceptual diagram – after data availability

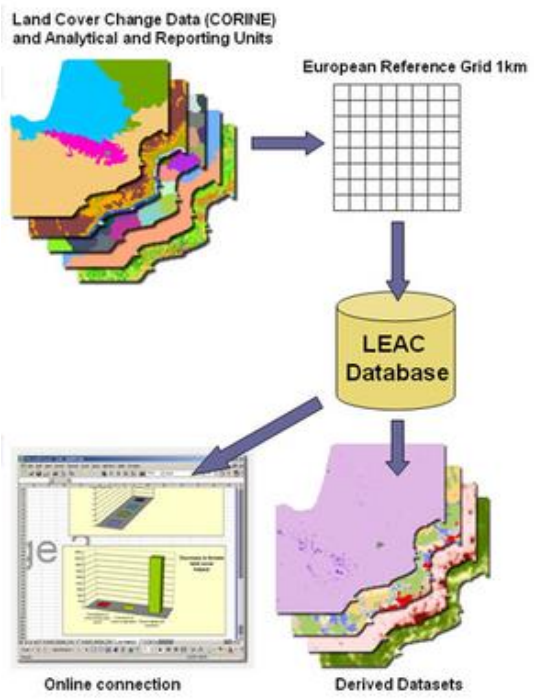


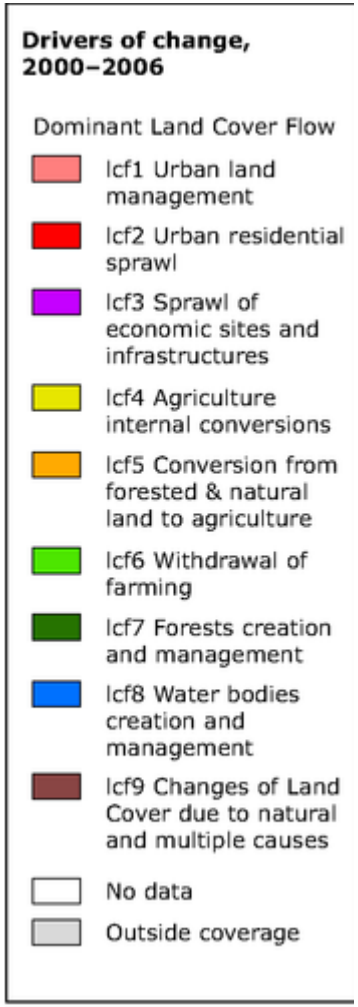
Example: data organisation



Land

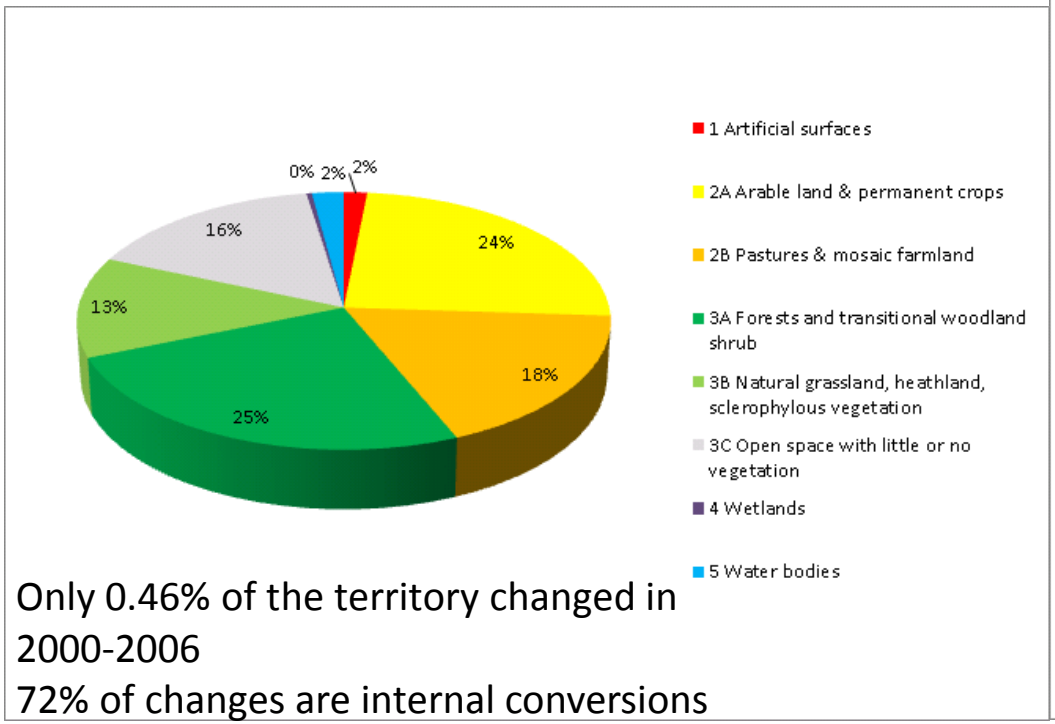
- Simple, but powerful
- Accounts for **hectares**
- Land cover changes → land cover flows
- Includes many analytical layers, allowing powerful querying





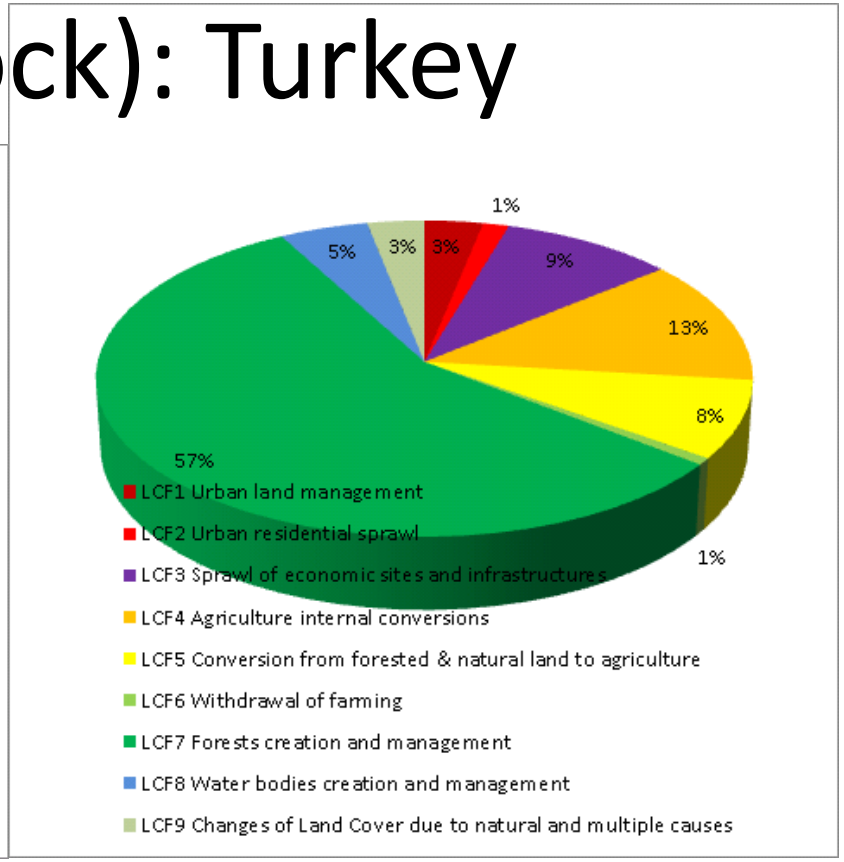
- Biodiversity under development, on-going discussion on how to use reported data under Habitats Directive article 17
- Drawbacks:
  - Land cover is very static, land use much more dynamic
  - Flows not directly linked to natural capital

Land cover (stock): Turkey



Only 0.46% of the territory changed in 2000-2006

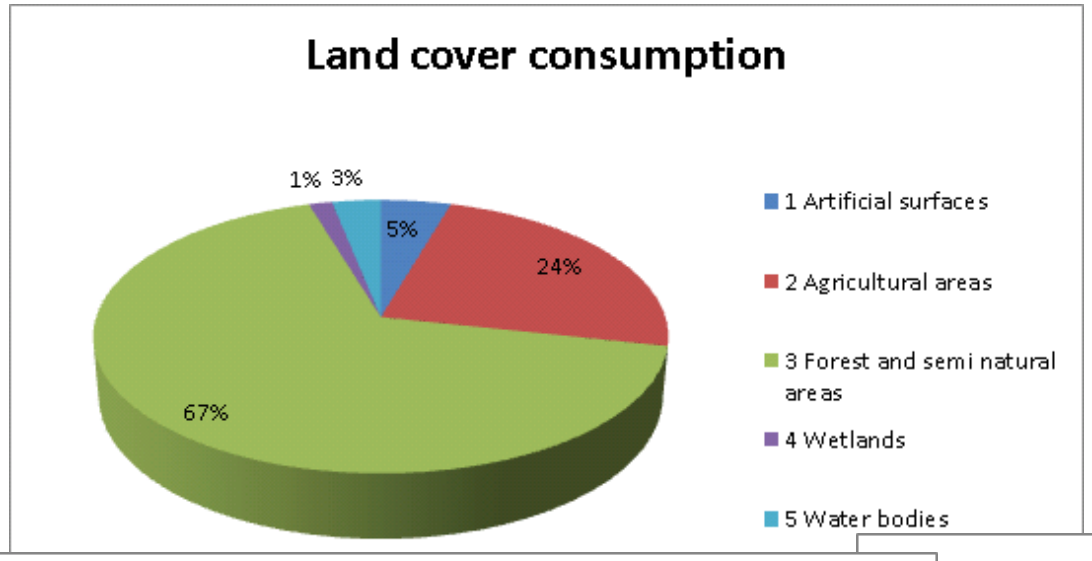
72% of changes are internal conversions

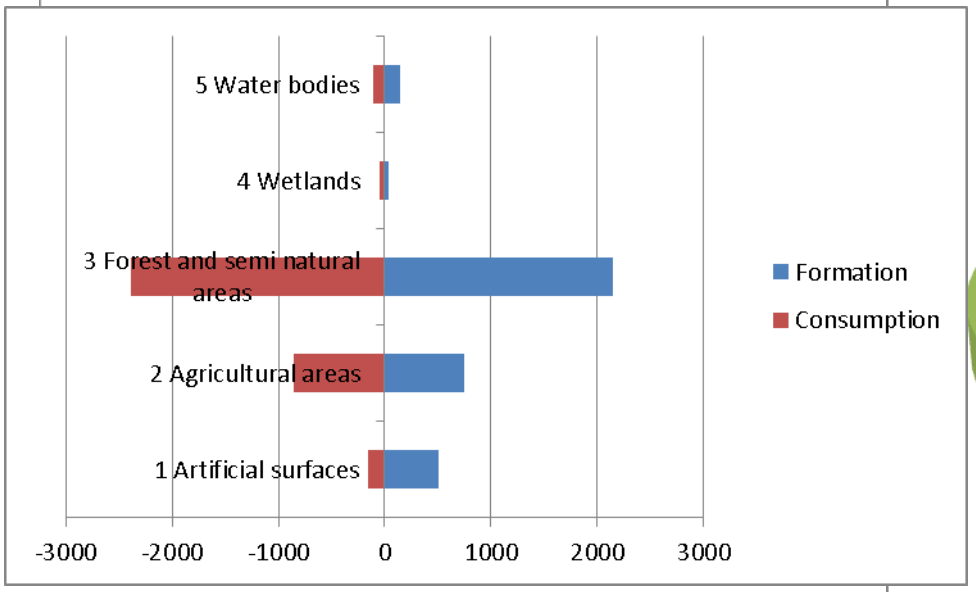


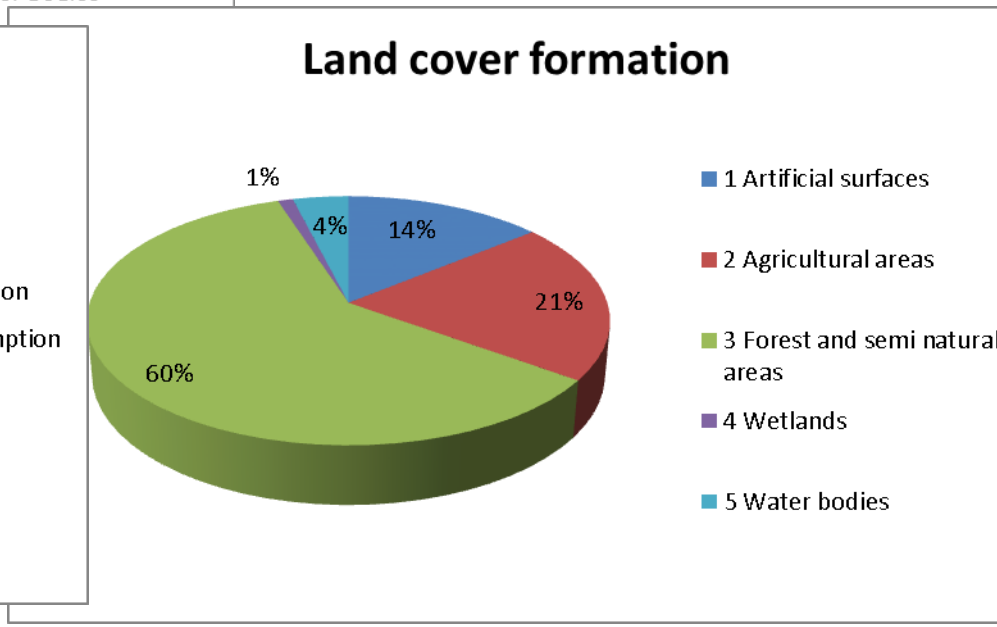
CLC class	Area Km2
1 Artificial surfaces	12240
2A Arable land & permanent crops	191581
2B Pastures & mosaic farmland	138683
3A Forests and transitional woodland shrub	196501
3B Natural grassland, heathland, sclerophylous vegetation	99071
3C Open space with little or no vegetation	126017
4 Wetlands	2835
5 Water bodies	16644

Land cover flows 2000-2006	Area Km2
LCF1 Urban land management	114
LCF2 Urban residential sprawl	51
LCF3 Sprawl of economic sites and infrastructures	339
LCF4 Agriculture internal conversions	455
LCF5 Conversion from forested & natural land to agriculture	286
LCF6 Withdrawal of farming	25
LCF7 Forests creation and management	2018
LCF8 Water bodies creation and management	173
LCF9 Changes of Land Cover due to natural and multiple caus	111
Grand Total	**3570**

Land cover flows



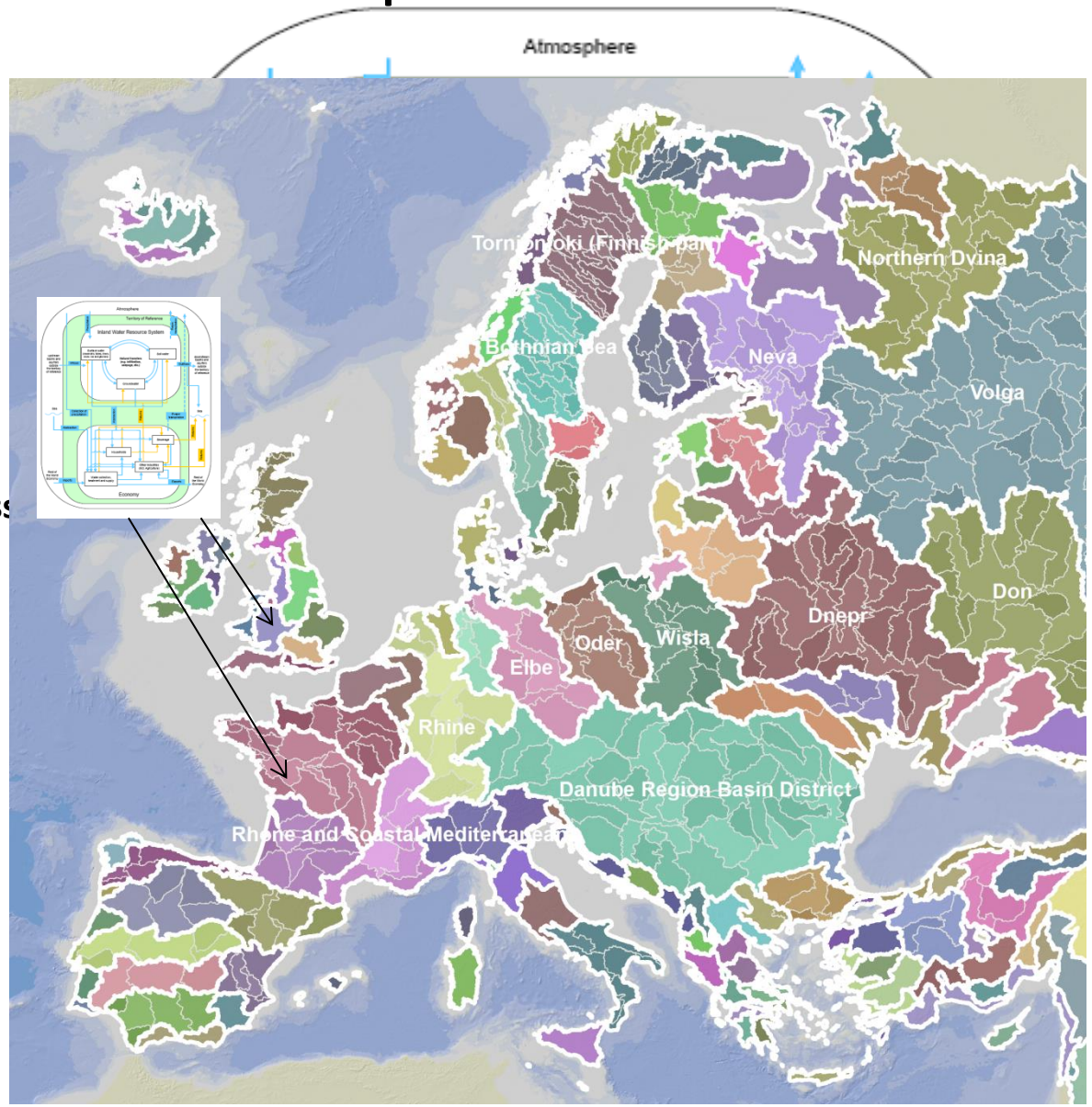




Water accounts conceptual model

- SEEA-W concept : water balances in a strict accounting framework so to link the physical and economic worlds
  - **The accounting spatial unit: 'territory of reference', made of 'statistical units'**
  - **Analysis carried out across the inland resource system (natural assets) and the economy**
  - **Exchanges between the different components: rain on soil that receives irrigation; rivers fill reservoirs used for abstraction and supply; etc.**

- Applies to the physical catchments



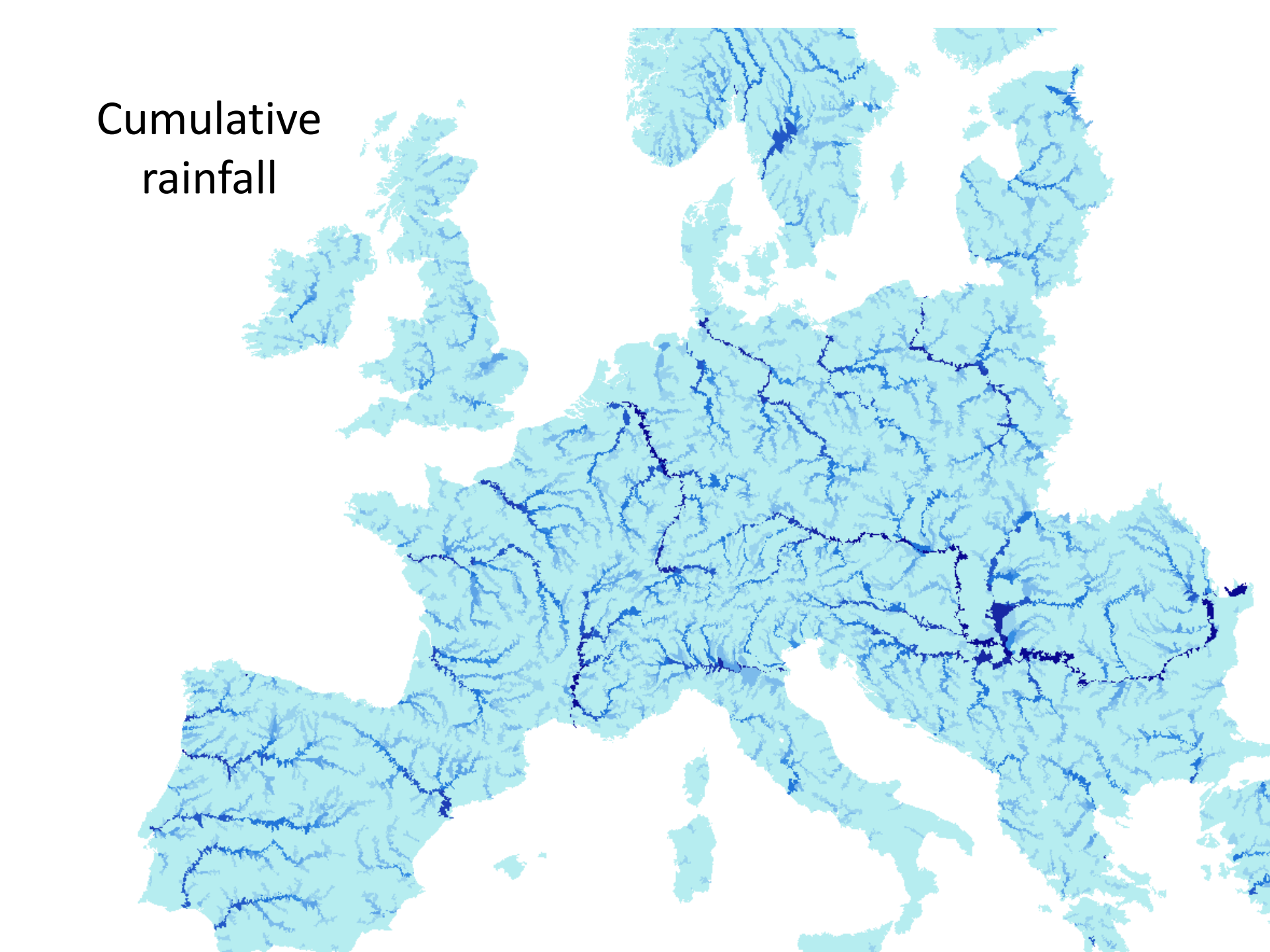
Water accounts example table

Year	2,004
Month	1
Basin	WSB0000275

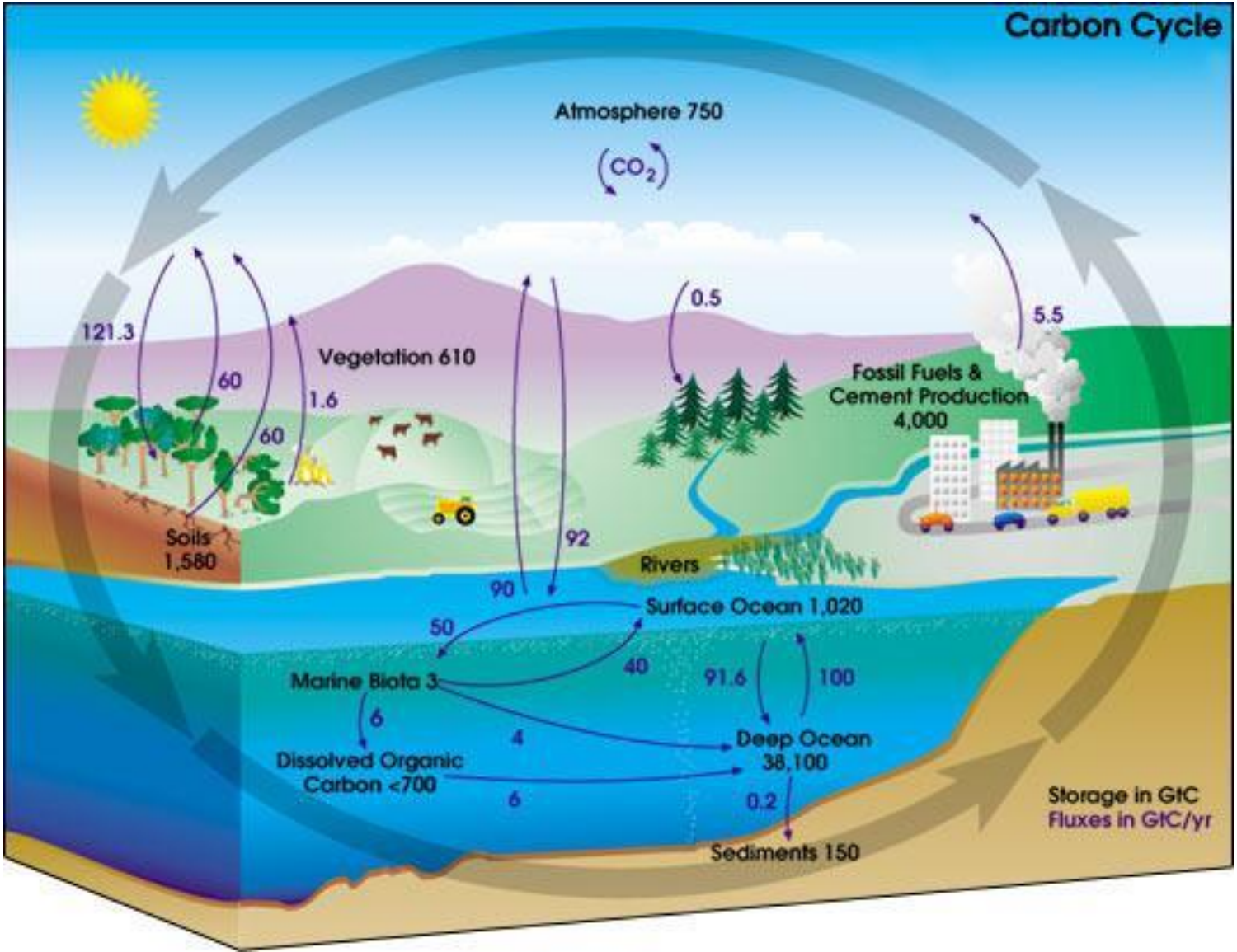
Basin : WSB0000275 : Loire main - Lower Year : 2004 Month : 1

Somme de Volume	Étiquettes de col											
Étiquettes de lignes	1311 : Reservoirs		1312 : Lakes		1313 : Rivers		1314 : Glaciers, snow and ice		132 : Groundwater		133 : Soil Water		Total général
1 : Opening Stocks	-	3,073	-	608	-	15,058		-	2,731			-	**21,470**
2 : Returns						9							**9**
3 : Precipitations		8		1		4	-		-		1,715		**1,729**
4a : Inflows from upstream territories						6,963							**6,963**
4b : Inflows from resources in the territory		248		15		484							**747**
5 : Abstractions	-	2	-	1	-	6		-	3			-	**12**
6 : Evaporation / Actual Evapotranspiration	-	2	-	0	-	1				-	390	-	**393**
7b : Outflows to the sea					-	8,152						-	**8,152**
7c : Outflows to other resources in the territory	-	446	-	47	-	254						-	**747**
Total général	-	**3,266**	-	**641**	-	**16,009**	-	-	**2,734**		**1,325**	-	**21,326**

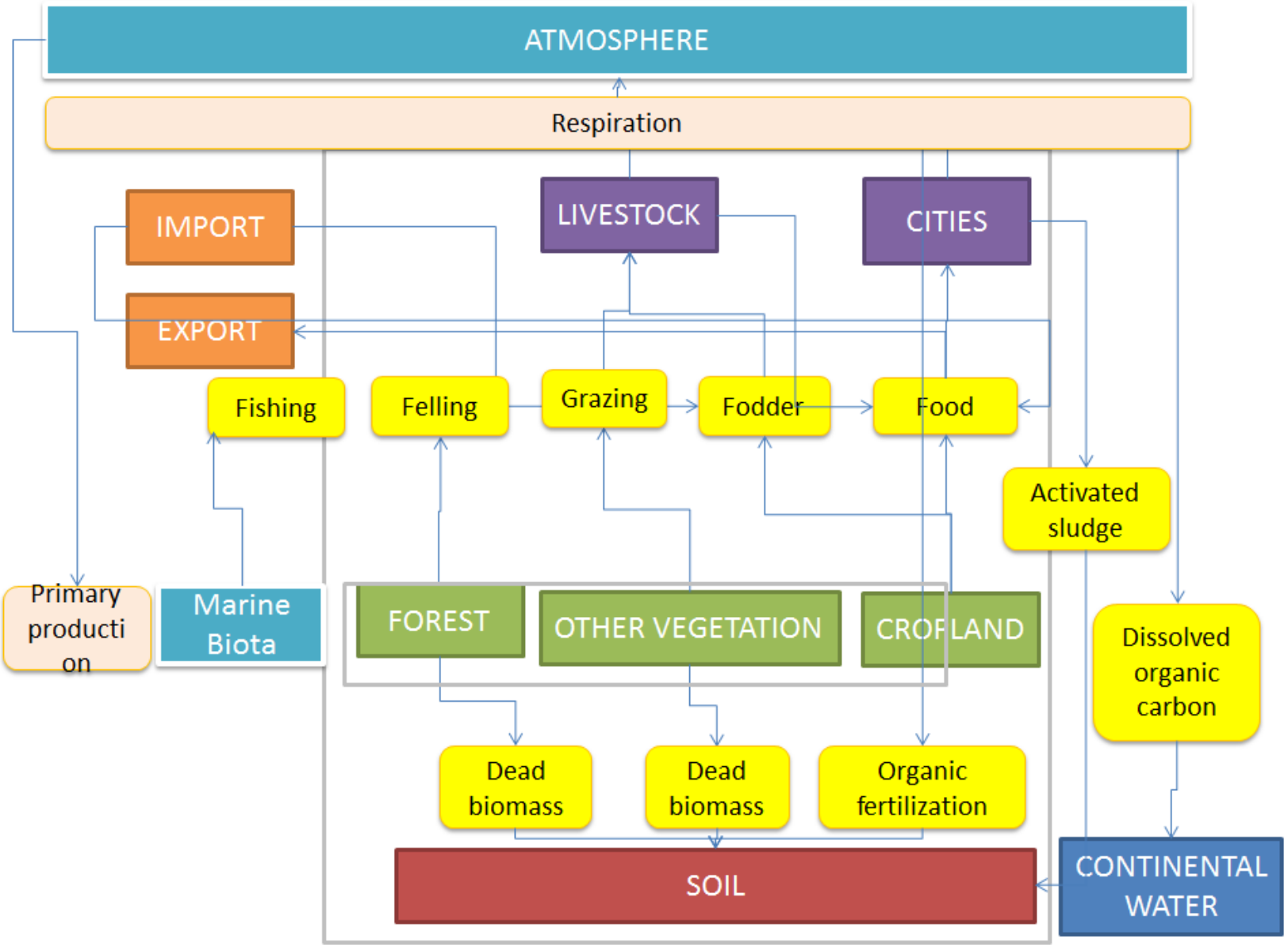
Cumulative rainfall



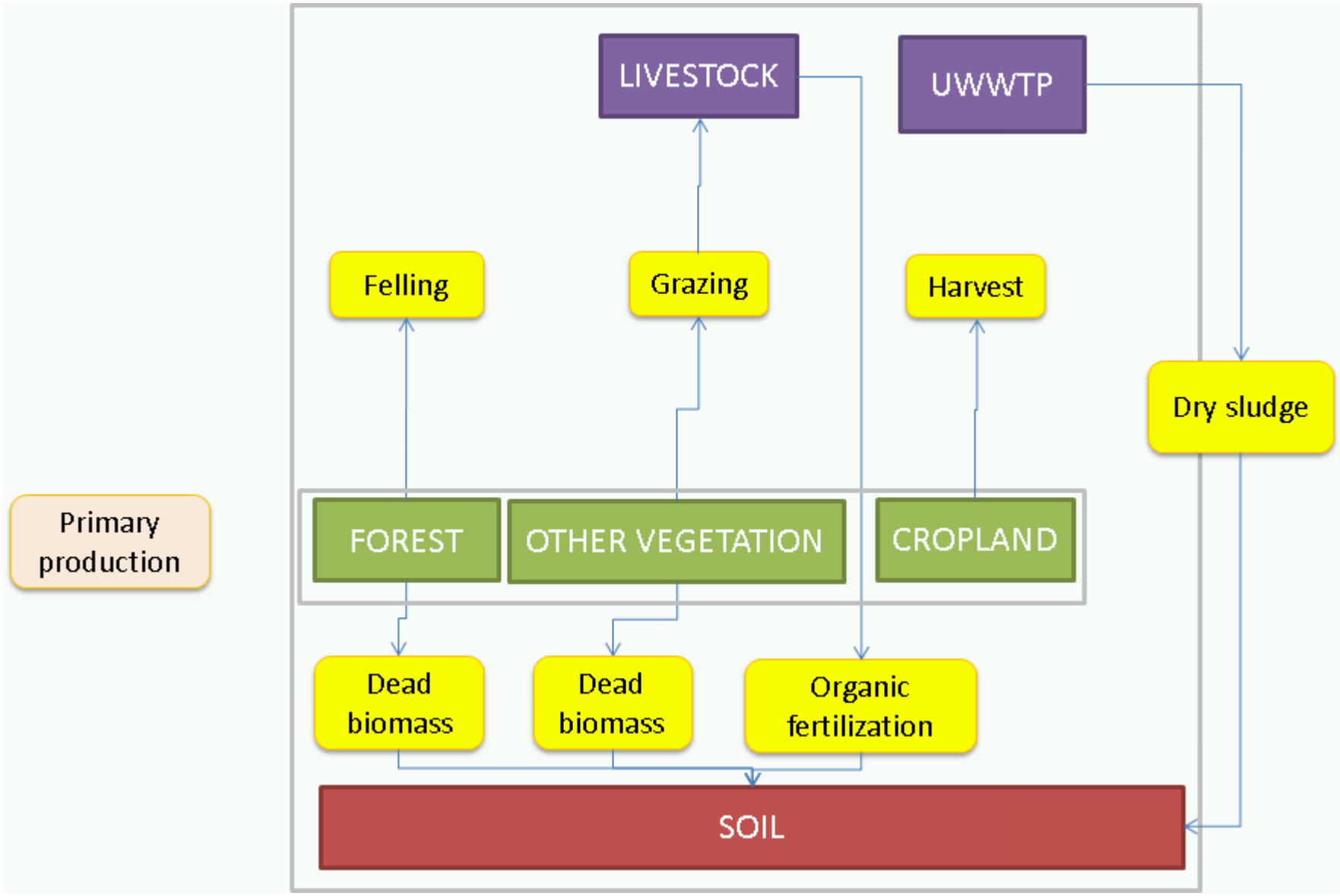
Carbon – IPCC diagram



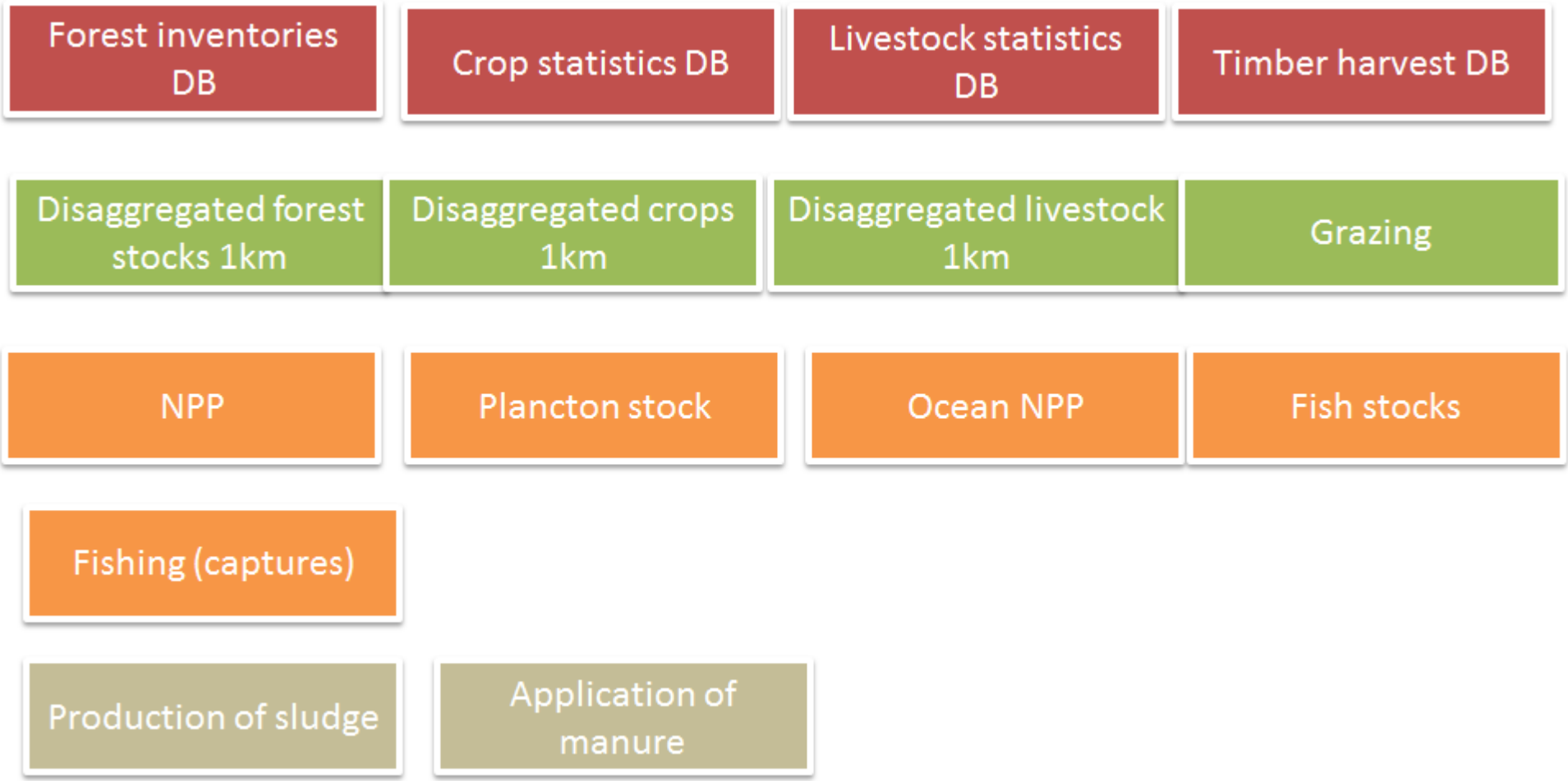
Accounting conceptual diagram



Accounting conceptual diagram – after data availability



“By-products” – datasets built



Statistics examples

Forestry – removal of trees

Regions | Harvest_ConiferousData

ID	REGION	NAME	2000	2001	2002	2003	2004
1	AT11	Burgenland (A	427.302126592391	432.555715782309	442.080083987714	422.10097545367	456.113504311345
2	AT12	Niederösterre	1578.98857516756	1798.6912102929	1886.82345840641	1737.12051205695	1955.00536872173
3	AT13	Wien	2218.92410196995	2021.26992848993	2183.56895721735	2366.06053501167	2518.42642438007
4	AT21	Kärnten	1592.99348203858	1699.40054546558	1907.57766314162	2184.53977256151	2073.80017756519
5	AT22	Steiermark	893.150446438646	859.684111502949	1007.02773705027	2069.49837701057	1249.34653038712
6	AT31	Oberösterreich	3242.75566868965	3284.17020178306	3715.91079704571	4455.48984701958	4238.15170325081
7	AT32	Salzburg	911.579626656225	1037.22599959319	1242.66943397675	1210.02876968835	1246.10094337876
8	AT33	Tirol	360.636657518892	199.866063205246	281.991401187943	285.422596907454	329.517153077381
9	AT34	Vorarlberg	2.66931492810797	3.13622388483206	2.35046798622556	3.73861429023451	3.53819492760059
10	BE	Belgium	3113	3074.5	3300	3547.5	4163.5
11	BG	Bulgaria	1767.474791758	1547.57124068391	1765.27575624726	1765.27575624726	2305.13897413415
12	CY	Cyprus	23.6752953813104	20.6396885069817	16.7385069817401	13.434693877551	10.7892051557465
13	CZ	Czech Republi	14136.1	13948	14311	15026	15312
14	DE	Germany	47612.4	31579.9	36494.7	44359.7	48200.9
15	DK	Denmark	2670.8	1273.8	1170.873	1337.776	1225.4
16	EE	Estonia	6522.22222222222	7466.66666666667	7677.77777777778	7666.66666666667	4777.77777777778
17	ES11	Galicia	4256.60466458049	4485.85487883014	4669.46489024291	4708.2852926559	4758.12229575365
18	ES12	Principado de	154.291784440276	162.601558879566	169.256984631858	170.664131790914	172.470604495107
19	ES13	Cantabria	52.6318428761686	55.4664639430759	57.7367554154273	58.216759898153	58.8329818692198
20	ES21	País Vasco	1054.20551810183	1110.98242362445	1156.45591775011	1166.07031365097	1178.41311919936
21	ES22	Comunidad Fo	247.069409147196	260.375957310534	271.03337574799	273.286658503338	276.179386364933
22	ES23	La Rioja	33.0731982640383	34.8544390381799	36.281062083831	36.5826909563401	36.9699172115883
23	ES24	Aragón	83.5812655806188	88.0827461153403	91.6880508914331	92.450315329807	93.4288980547465

Cropping

DATA_HarvestedProduction_KTons

ID	CROPCODE	CTRY	GEO	GEONAME	Y2000	Y2001	Y2002	Y2003	Y200
2	C1040	BE	BE10	Région de Bruxelles-	1.6	0.9	0.6	0.6	
3	C1040	BE	BE21	Prov. Antwerpen	89.1	79.2	103.8	93.8	
4	C1040	BE	BE22	Prov. Limburg (BE)	157.6	154.9	166.8	159.1	
5	C1040	BE	BE23	Prov. Oost-Vlaander	257.1	225.5	282	294.5	
6	C1040	BE	BE24	Prov. Vlaams-Braban	265.4	264.6	281.6	285.8	
7	C1040	BE	BE25	Prov. West-Vlaander	336.1	263.7	364.5	388.9	
8	C1040	BE	BE31	Prov. Brabant Wallor	220.9	218.7	217	206.1	
9	C1040	BE	BE32	Prov. Hainaut	499.4	449.6	502.6	513.9	
10	C1040	BE	BE33	Prov. Liège	262	280.1	275.3	260.5	
11	C1040	BE	BE34	Prov. Luxembourg (B	61.9	60.2	62.5	62.7	
12	C1040	BE	BE35	Prov. Namur	361.8	361.3	382.6	347.5	
14	C1040	BG	BG31	Severozapaden	1363.5019295	1575.0300400	1731.8100044	991.99479435	1940.9
15	C1040	BG	BG32	Severen tsentralen	1251.9520303	1446.1747458	1590.1283336	910.83838601	1782.1
16	C1040	BG	BG33	Severoiztochen	1346.3048064	1555.1650256	1709.9676078	979.48329274	1916.4
17	C1040	BG	BG34	Yugoiztochen	721.52987187	833.46506401	916.42895657	524.93792738	1027.1
18	C1040	BG	BG41	Yugozapaden	142.20500163	164.26610374	180.61730545	103.45905516	202.43
19	C1040	BG	BG42	Yuzhen tsentralen	417.00636028	481.69902081	529.64779219	303.38654435	593.61
21	C1040	CZ	CZ01	Praha	42.3	47.9	33.6	25	
22	C1040	CZ	CZ02	Střední Čechy	1249.5	1438	1307.6	1142.2	
23	C1040	CZ	CZ03	Jihozápad	1161.1	1274.3	1192	967.2	

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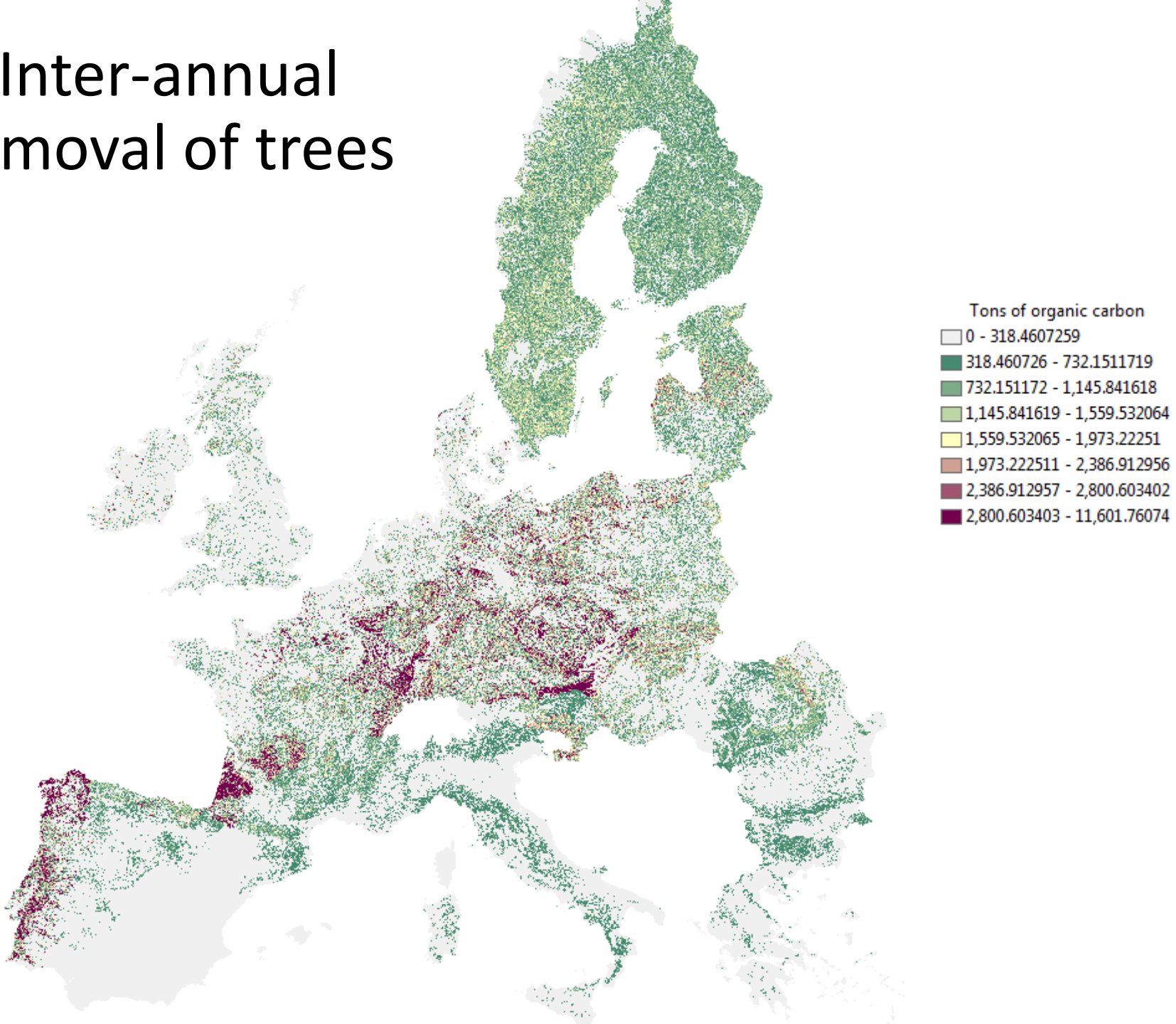
Inter-annual removal of trees



Lessons learnt and way forward

Main challenges

- From the definition: "Since the flow of services from ecosystems requires that **they function as whole systems**, the **structure and diversity** of the system are important components of natural capital."
  - Holistic approach is needed
    - → a lot of work on the lower part of the iceberg
    - → including **access to thematically detailed, accurate and comparable data**
    - → A new approach for working with data (thematic, inter-connected between themes, timely fashion, robust time series) is needed to support this type of assessment
- The background question is always sustainability, and how to address it → needs further development

A green Europe!

Thank you!

Questions?

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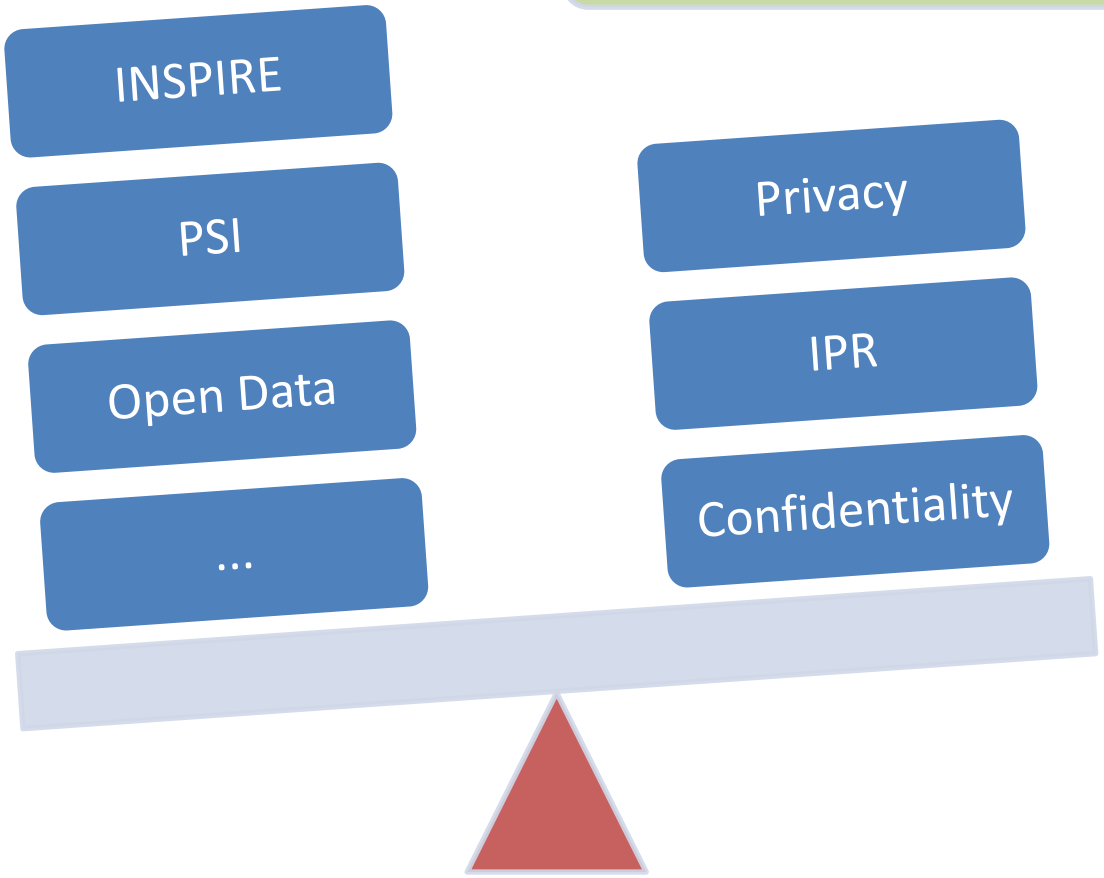
Data sharing

Legislation promoting availability

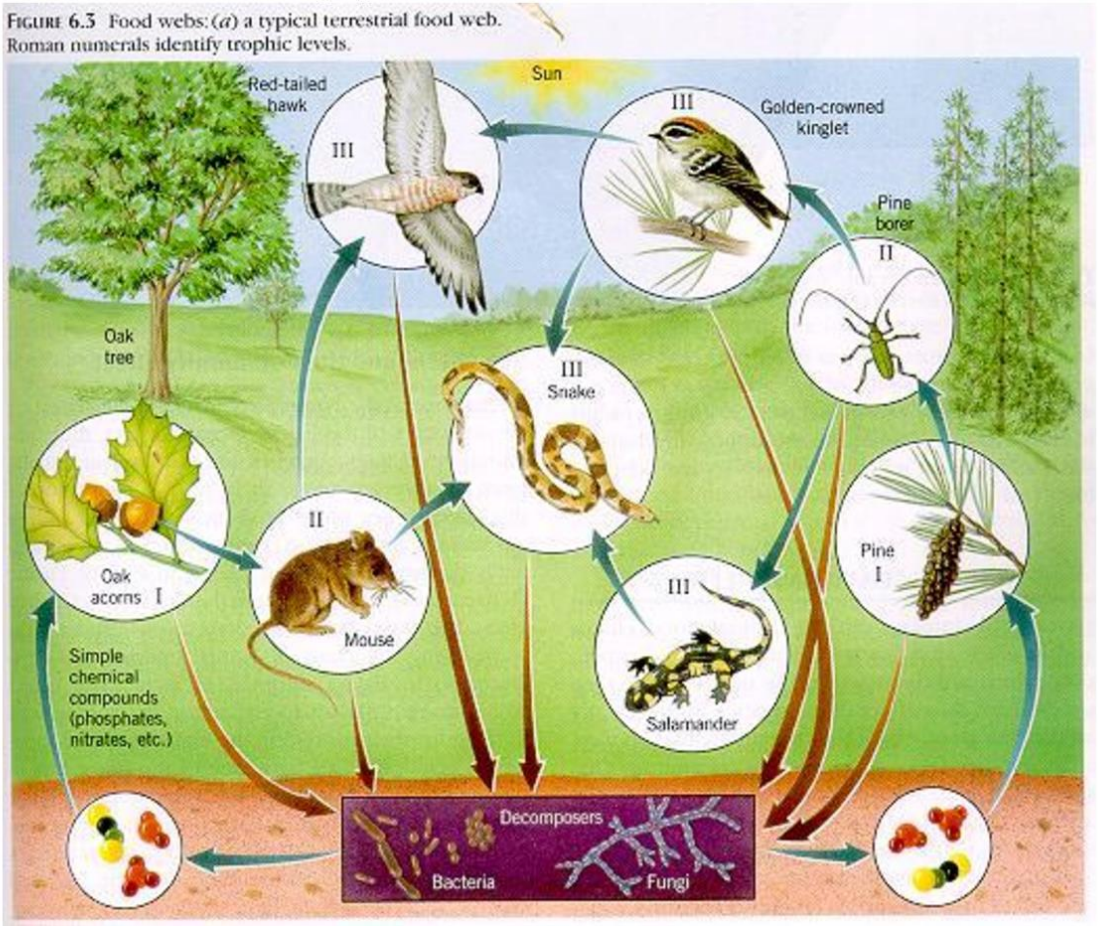
Legislation limiting availability



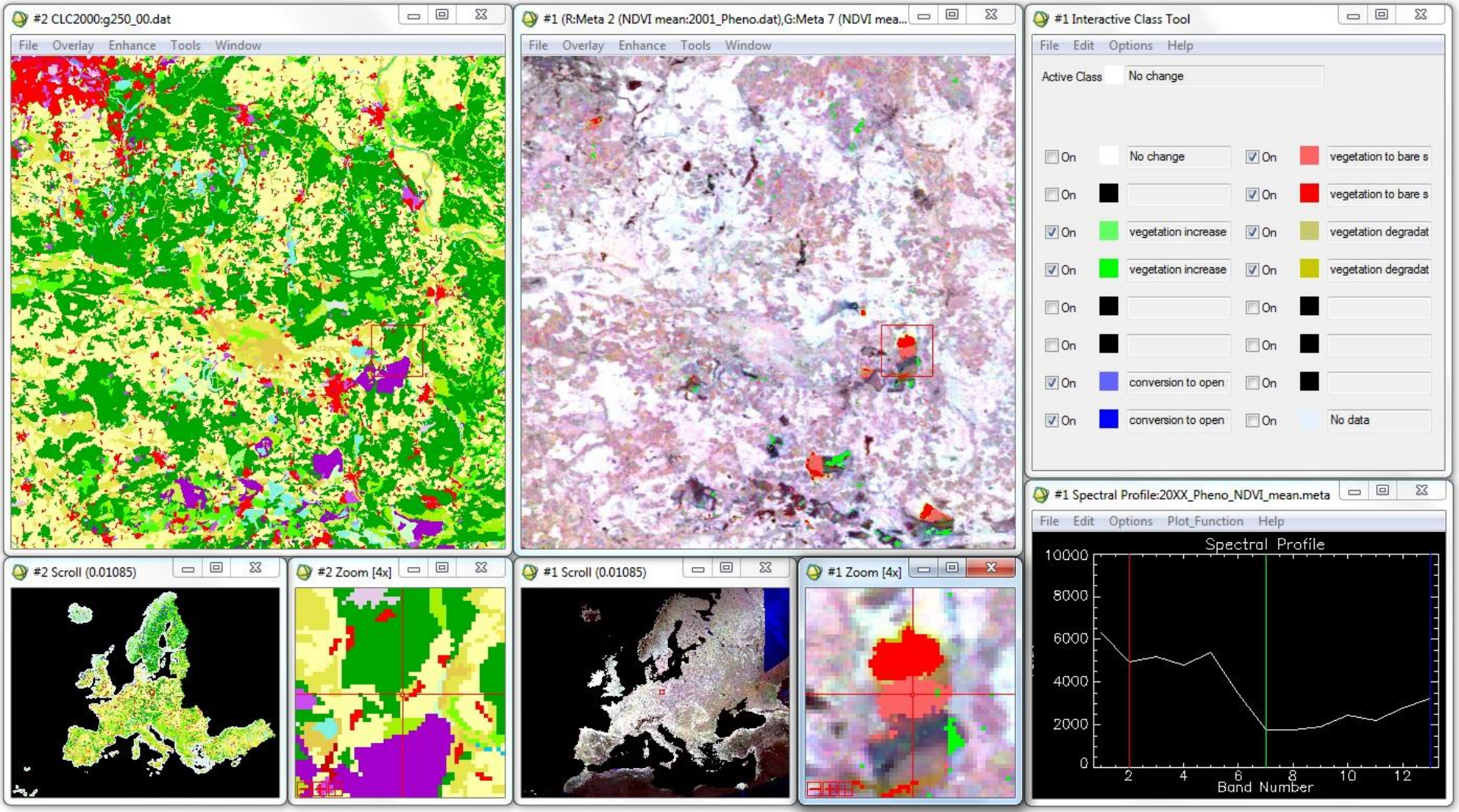
Vegetation – dynamics & ecosystemic approach

- Vegetation phenology can be measured/monitored yearly (current time series 2000 – 2012)
- Proxy for vegetation activity and use changes

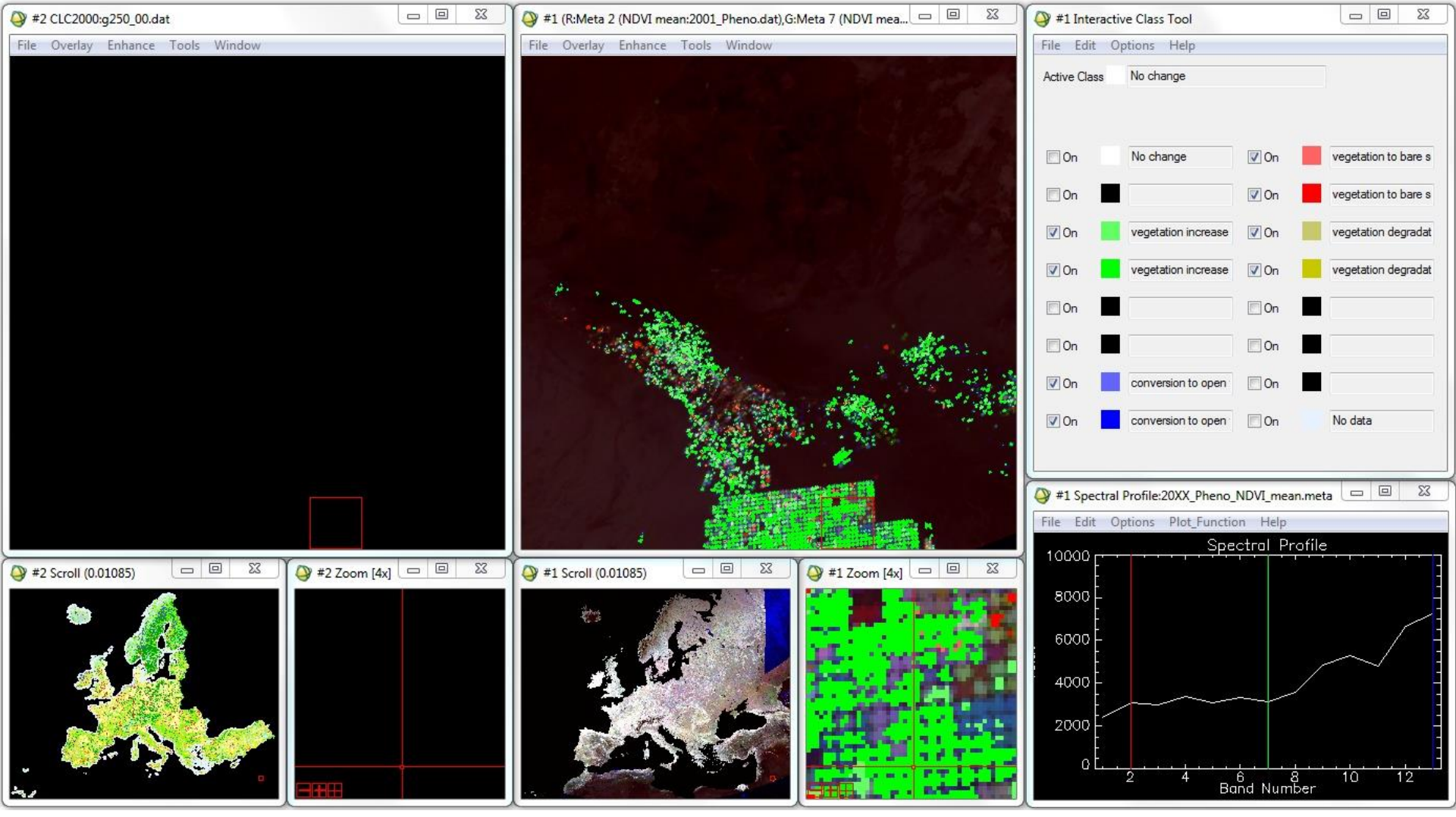
The Energy Connection Notes



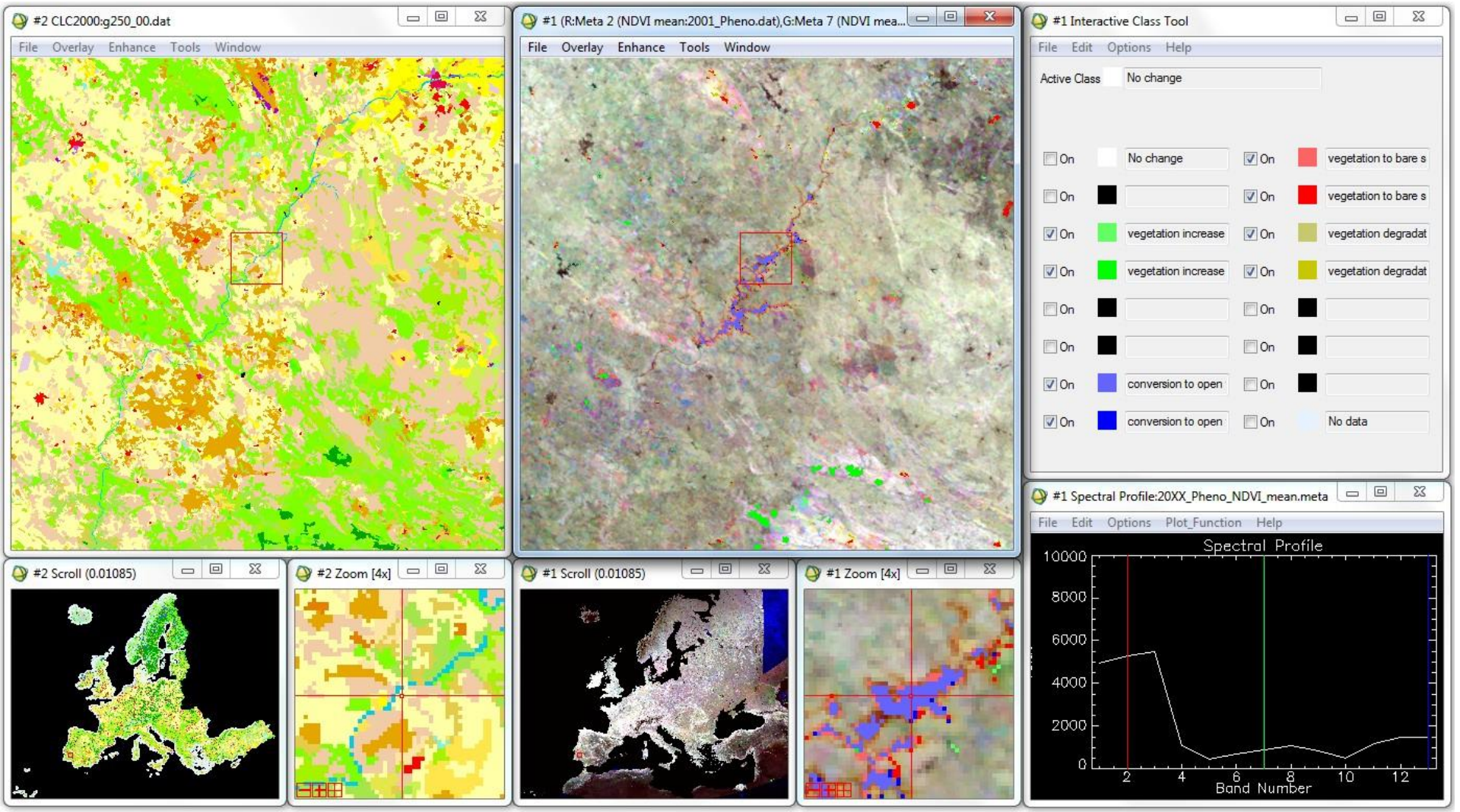
Vegetation phenology - mining



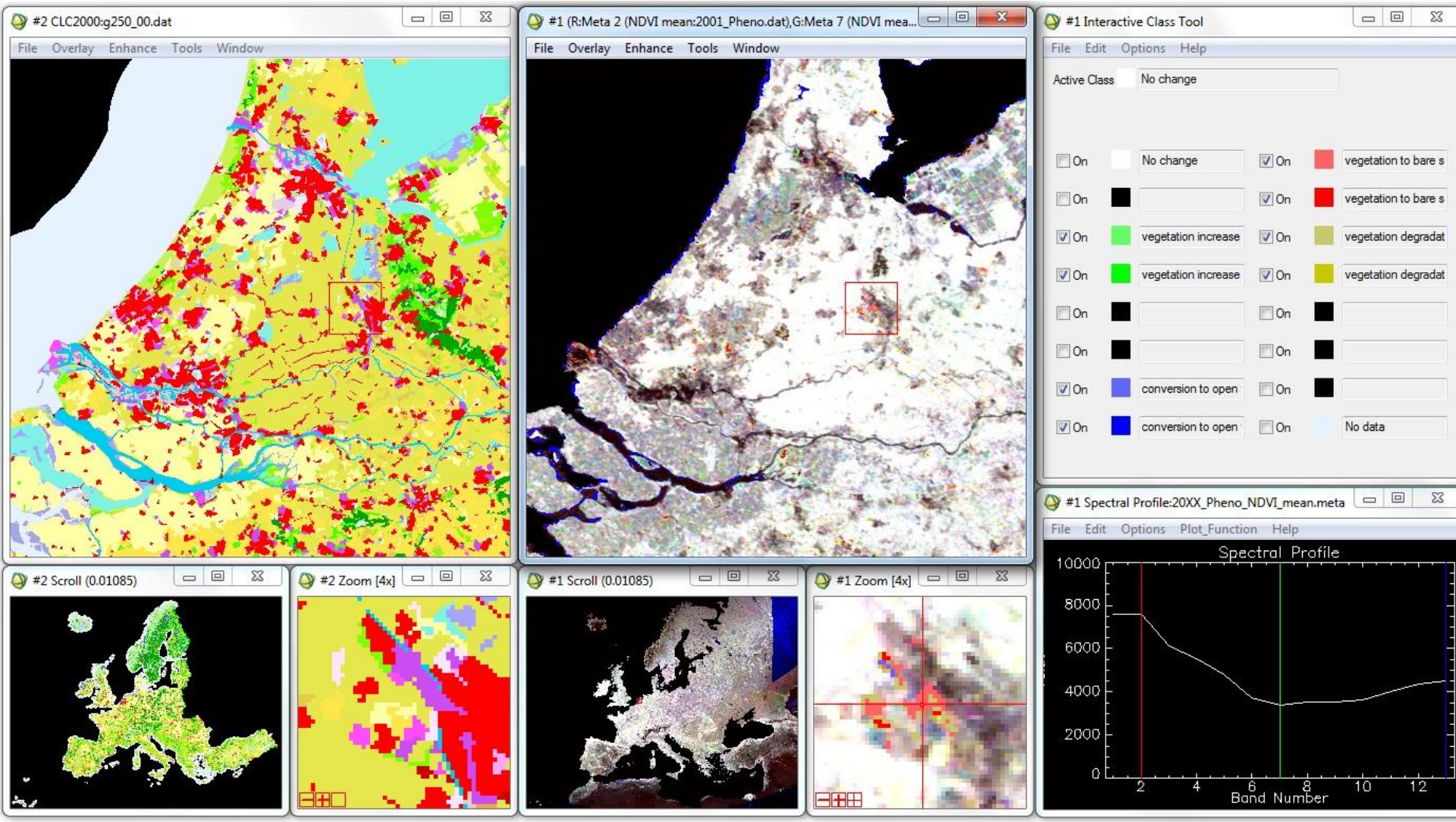
Vegetation phenology – development of irrigation



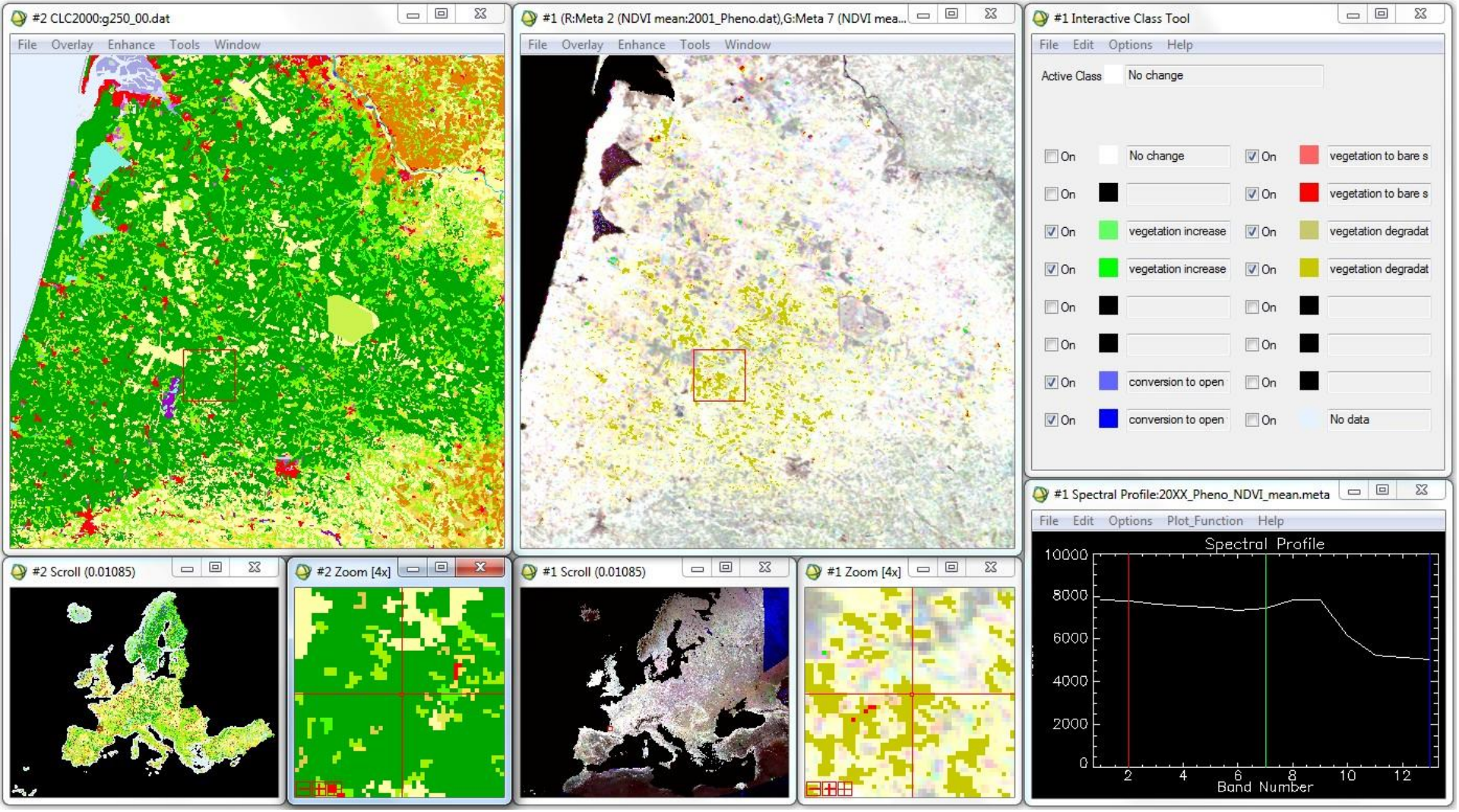
Development of water bodies



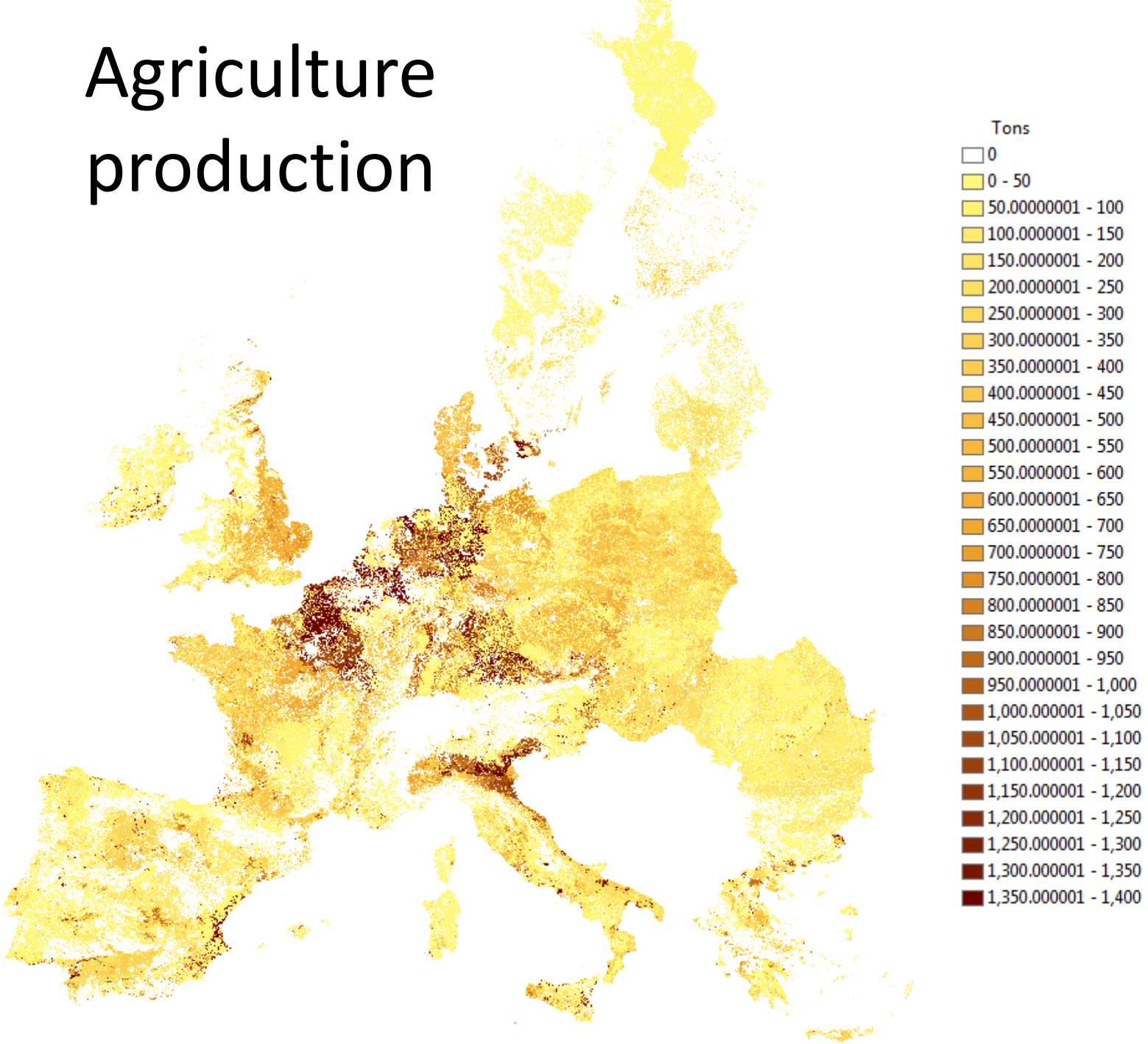
Urbanisation



Forest management / storms



Agriculture production



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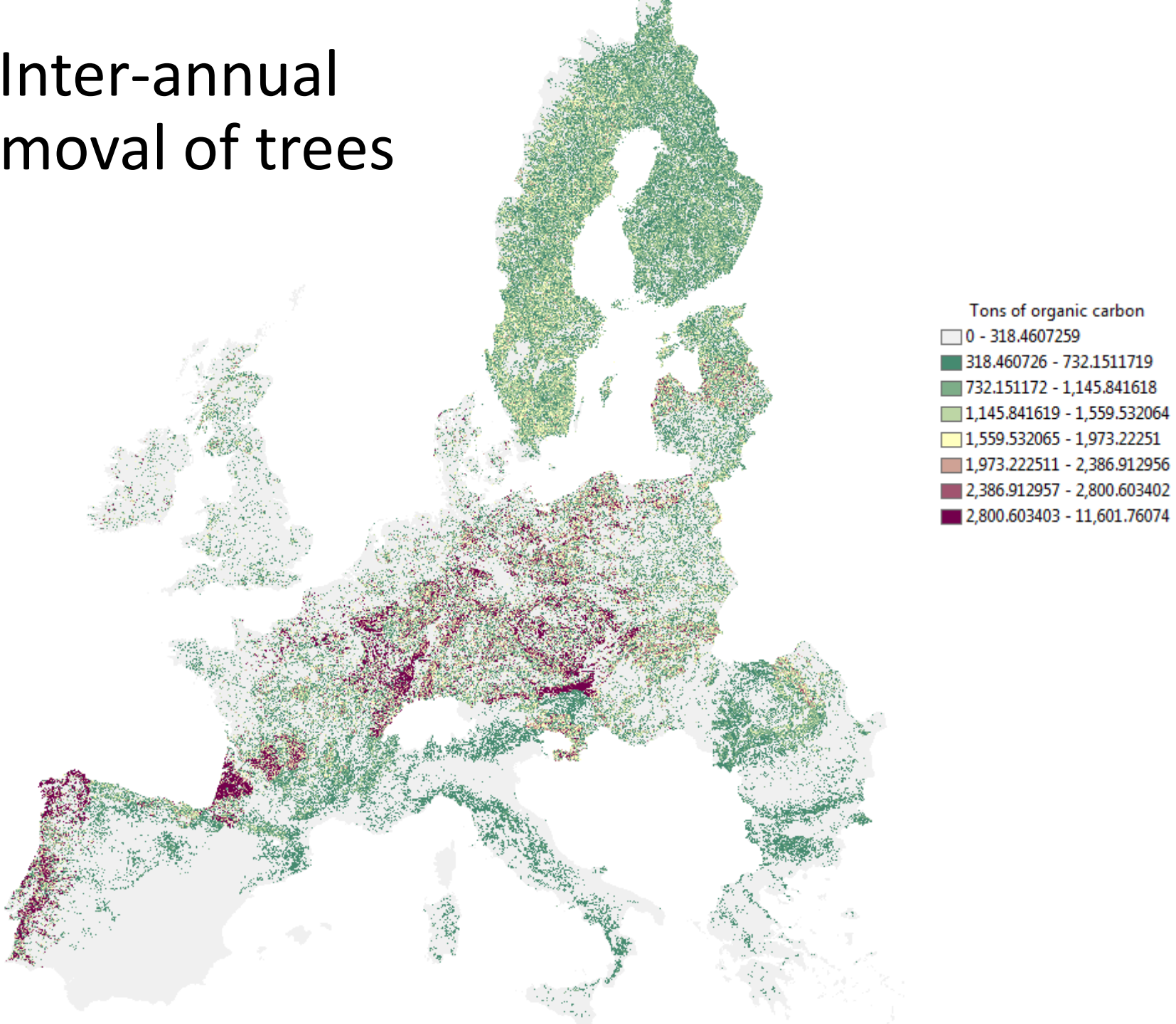

Combined map