
Landscape, biodiversity and soil: Policies, targets, problems and driving forces

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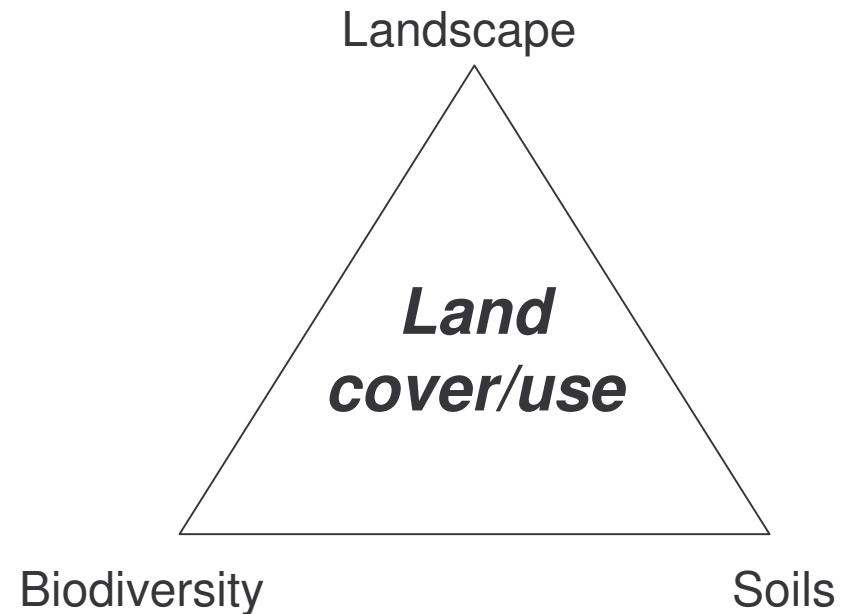
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Overview

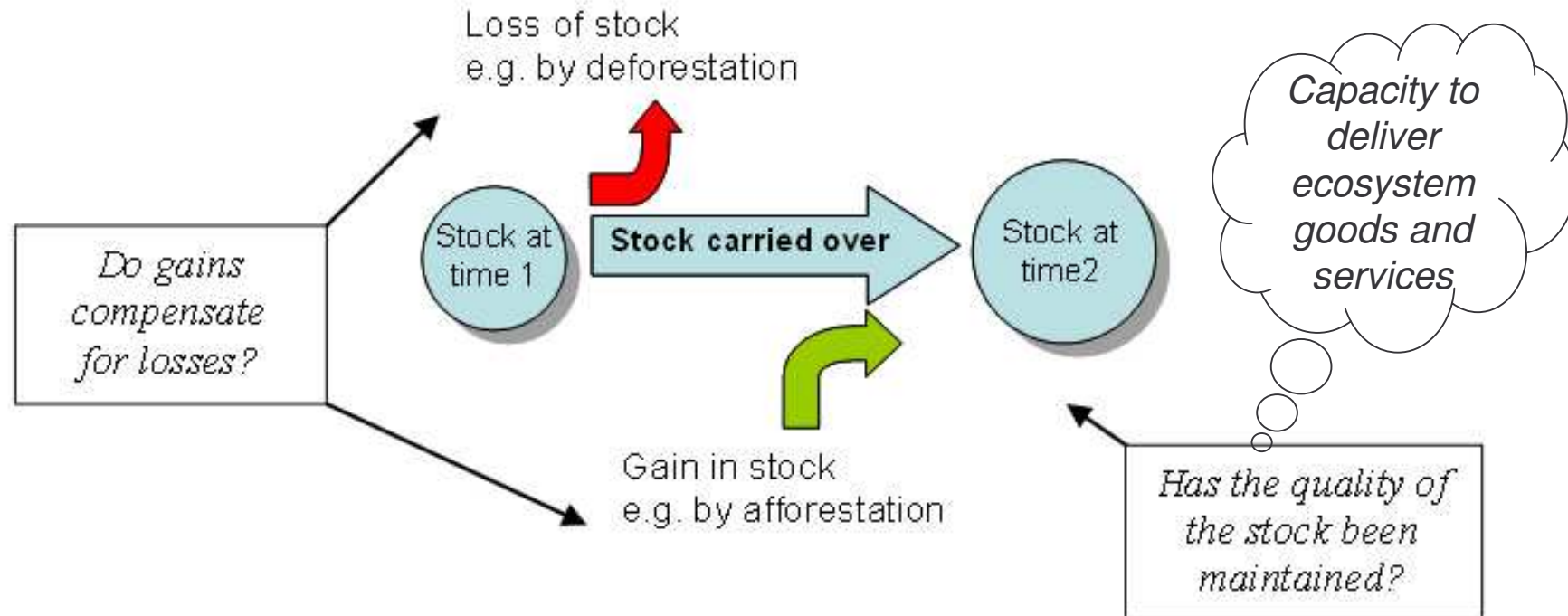
- The nature of the ‘topic complex’
 - ~ *why landscape, biodiversity and soil?*
- Policies and Targets
- Problems
- Driving forces
 - Activities (direct drivers)
 - Underlying factor (indirect drivers)

The 'Topic Complex'

- What links landscape, biodiversity and soils?
- The analysis of land patterns of land cover and the way they change over time are fundamental to our understanding of what is happening to the resources associated with biodiversity, soils and landscape...



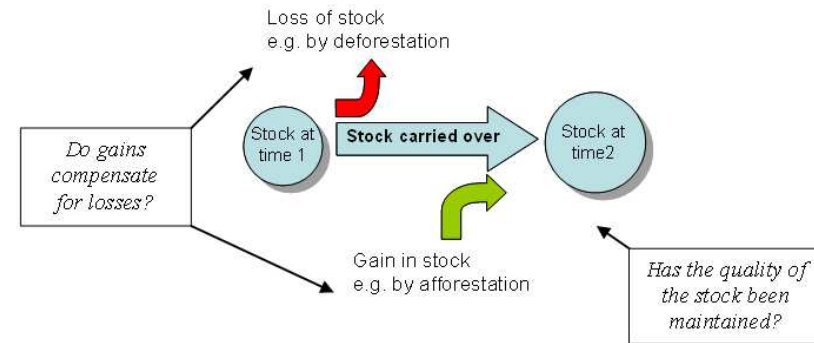
Land cover flows...



- We can therefore build 'land accounts' that can sit alongside our other material flow accounts

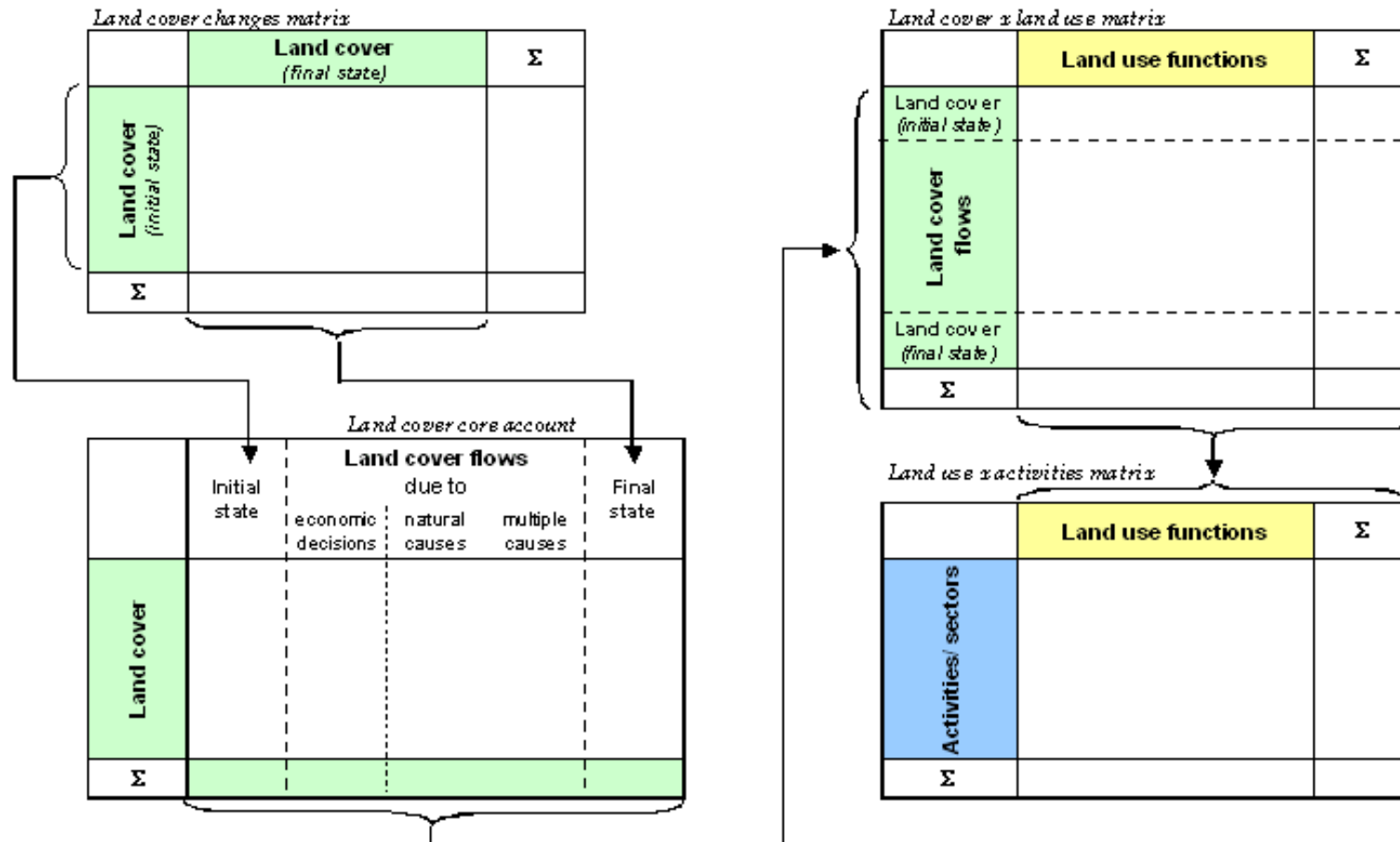
Land cover accounts

- We can therefore build 'land accounts' that can sit alongside our other material flow accounts...
- Indeed such accounts are seen to be an essential part of systems of integrated environmental and economic accounting



United Nations Handbook of National Accounting - Integrated Environmental and Economic Accounting in 2003 emphasises the importance of constructing Land and Ecosystem Accounts

Integrated Land and Ecosystem Accounts



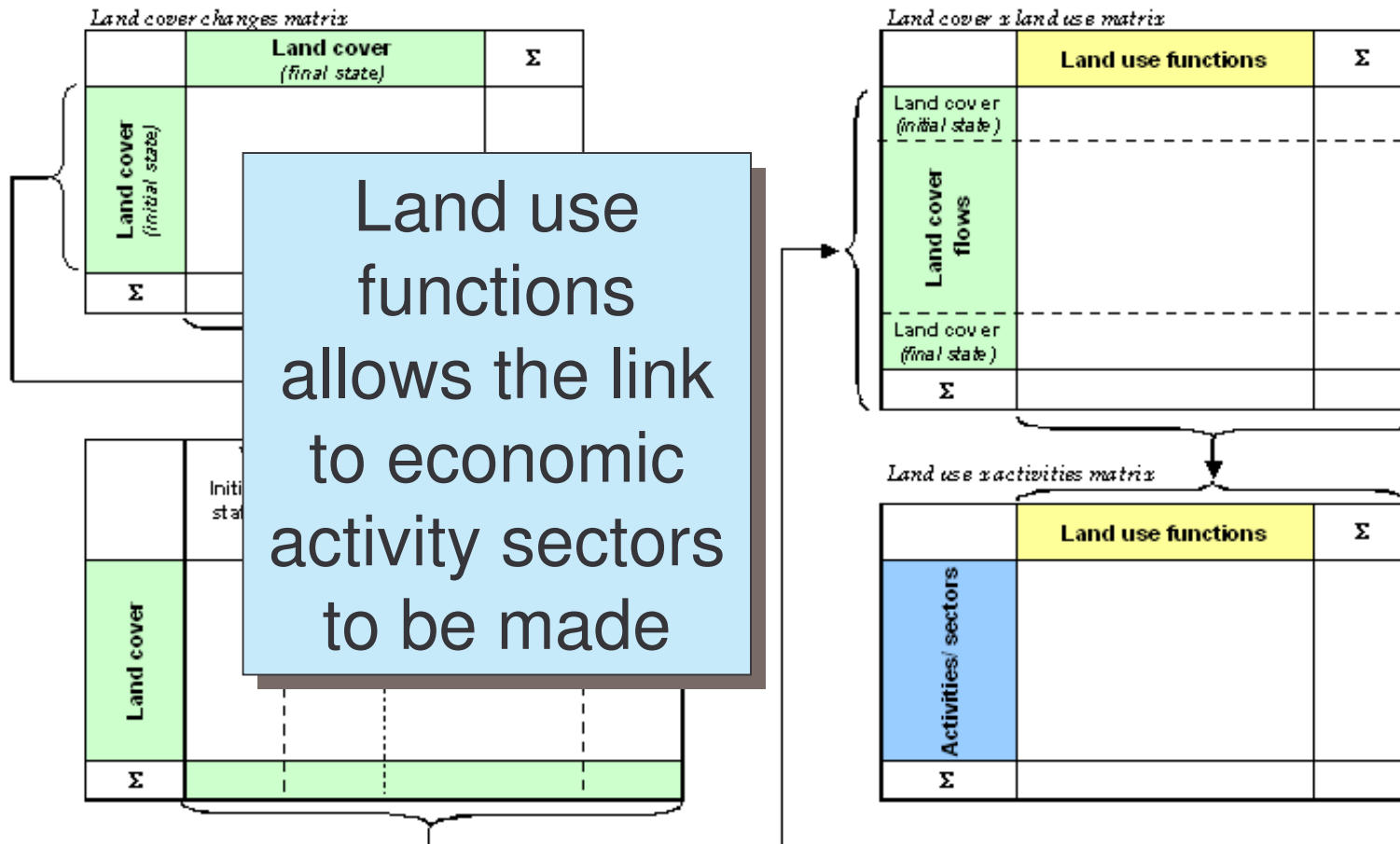
Integrated Land and Ecosystem Accounts

	1	2A		
	Artificial areas	Arable land & permanent crops	Total, km ²	
Total land cover 1990, km²	161860	1174325	5854	3597223
Total Consumption of 1990 land cover, km ²	1843	24608	381	97074
Total Formation of 2000 land cover, km ²	10556	18144	280	97074
<i>Net Formation of Land Cover (formation-consumption)</i>	8712	-6463	899	
<i>Net formation as % of initial year</i>	5,4	-0,6	2,0	
<i>Total turnover of land cover (consumption+formation)</i>	12399	42752	1661	194148
<i>Total turnover as % of initial year</i>	7,7	3,6	3,6	5,4
<i>No land cover change</i>	160016	1149717	5473	3500149
<i>No land cover change as % of initial year</i>	98,9	97,9	99,2	97,3
Total land cover 2000, km²	170572	1167861	5754	3597223

Integrated Land and Ecosystem Accounts

Land cover account of Europe (24 countries), 1990-2000		
	1	2A
	Artificial areas	Arable land & permanent crops
LCF1 Urban land management	737	15
LCF2 Urban residential sprawl		1924
LCF3 Sprawl of economic sites and infrastructures	77	2728
LCF4 Agriculture internal conversions		17252
LCF5 Conversion from other land cover to agriculture	273	
LCF6 Withdrawal of farming		2393
LCF7 Forests creation and management	254	
LCF8 Water bodies creation and management	191	252
LCF9 Changes due to natural and multiple causes	311	44
Total Consumption of 1990 land cover, km²	1843	24608
No Change	160016	1149717
Total land cover 1990, km²	161860	1174325

Integrated Land and Ecosystem Accounts



Integrated Land and Ecosystem Accounts

Legend

-  DENSE URBAN SYSTEMS
-  DISPERSED URBAN AREAS
-  BROAD PATTERN INTENSIVE AGRICULTURE
-  RURAL MOSAIC & PASTURE LANDSCAPE
-  FORESTED LANDSCAPE
-  OPEN SEMI-NATURAL OR NATURAL LANDSCAPE
-  COMPOSITE LANDSCAPE

Source, EEA



Policies and Targets for Landscape

- Landscape is **not** a direct target of EU policy, but....
- Is the subject of the ‘European Landscape Convention’ which recognises the importance of landscape to human well being:
- The ELC sees landscape as:
 - *‘a distinctive and recognisable area an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors’.*

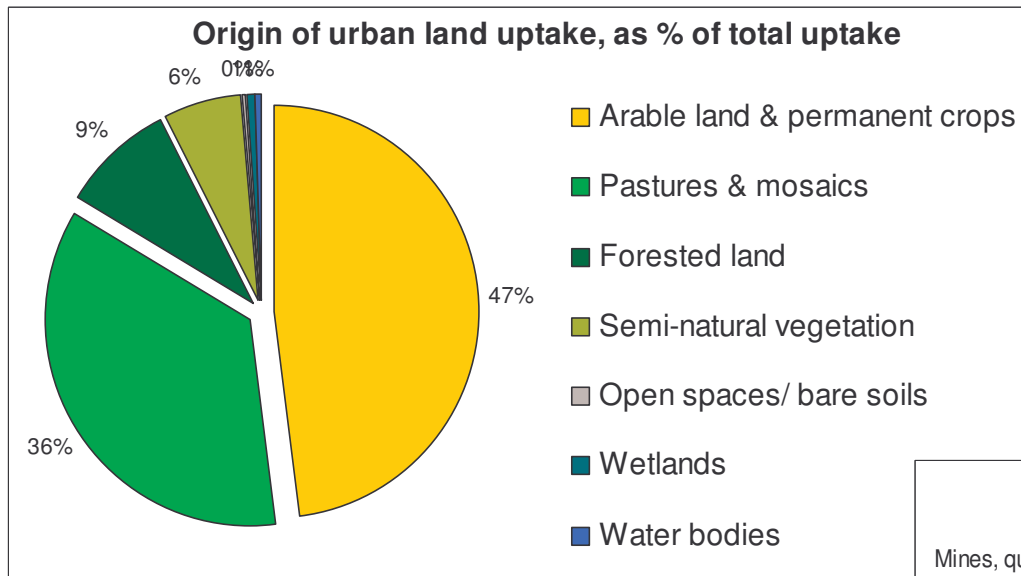
Policies and Targets for Landscape

- While landscape is not an explicit concern for the EU, land cover and land use is:
- Notions of ‘multifunctionality’ and ‘integrated land management’ are part of a number of key initiatives
 - Water framework directive
 - Habitats directive
 - CAP and agri-environmental strategies
 - European Spatial Development Perspective

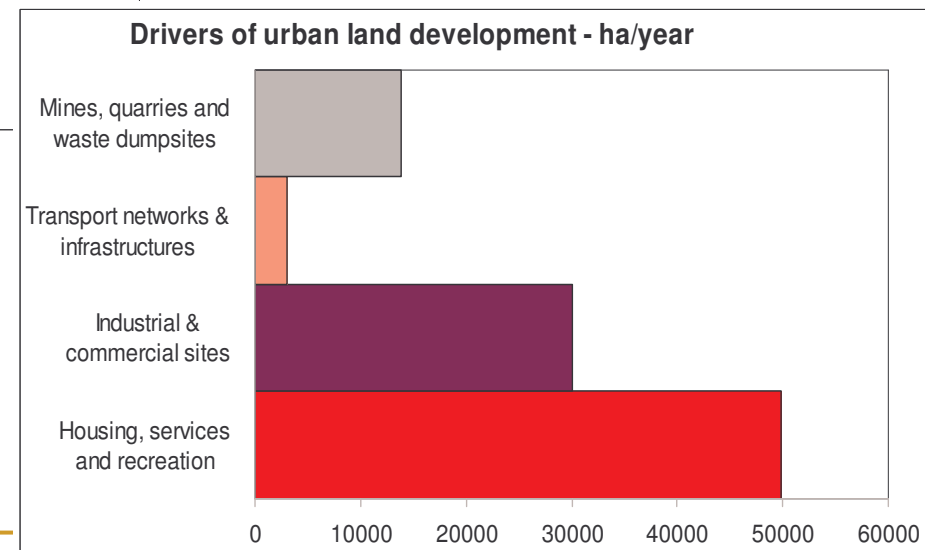
Problems related to landscape

- Often related to land cover change or management:
 - Urban expansion
 - Agricultural intensification vs abandonment
 - Fragmentation and homogenisation
 - Direct and indirect impacts (e.g. diffuse pollution)
 -

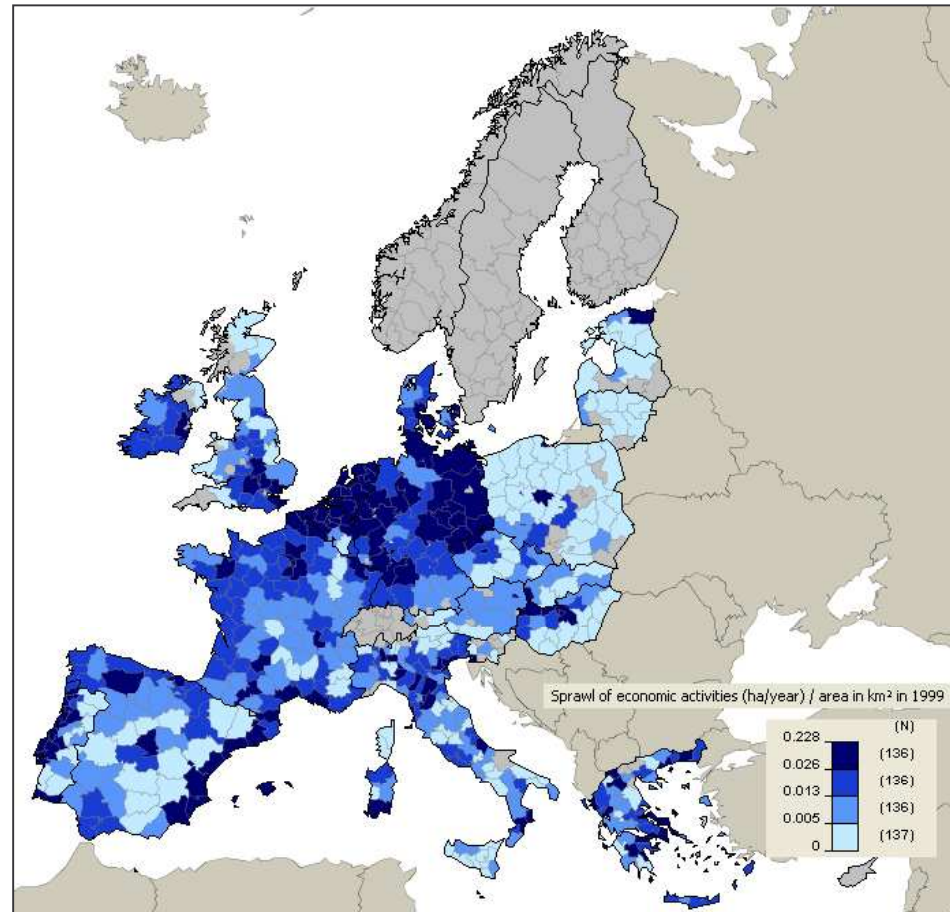
Problems related to landscape



Between 1990-2000 urban areas expanded by about 5.3% ~ doubling in 21st century?

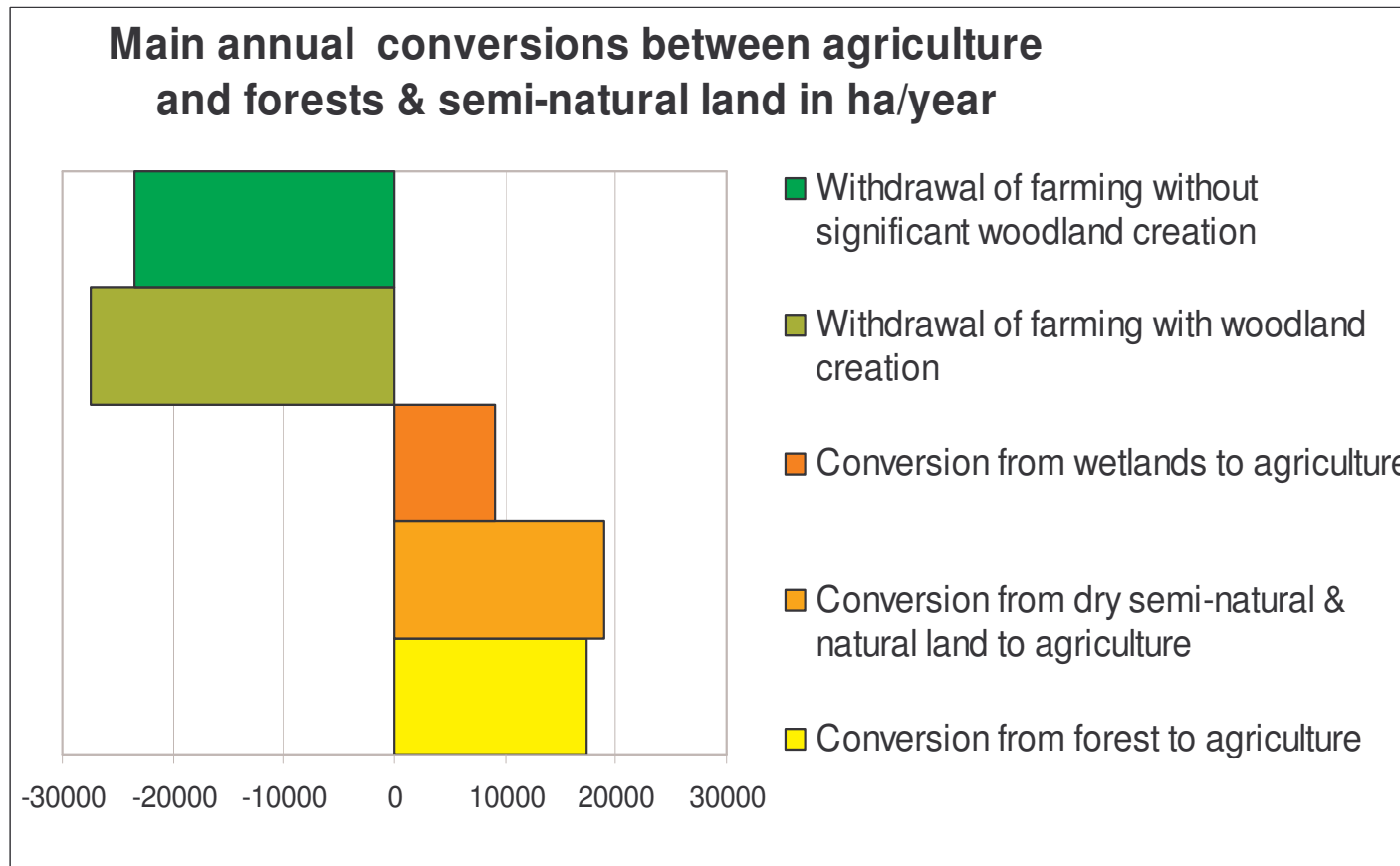


Problems related to landscape

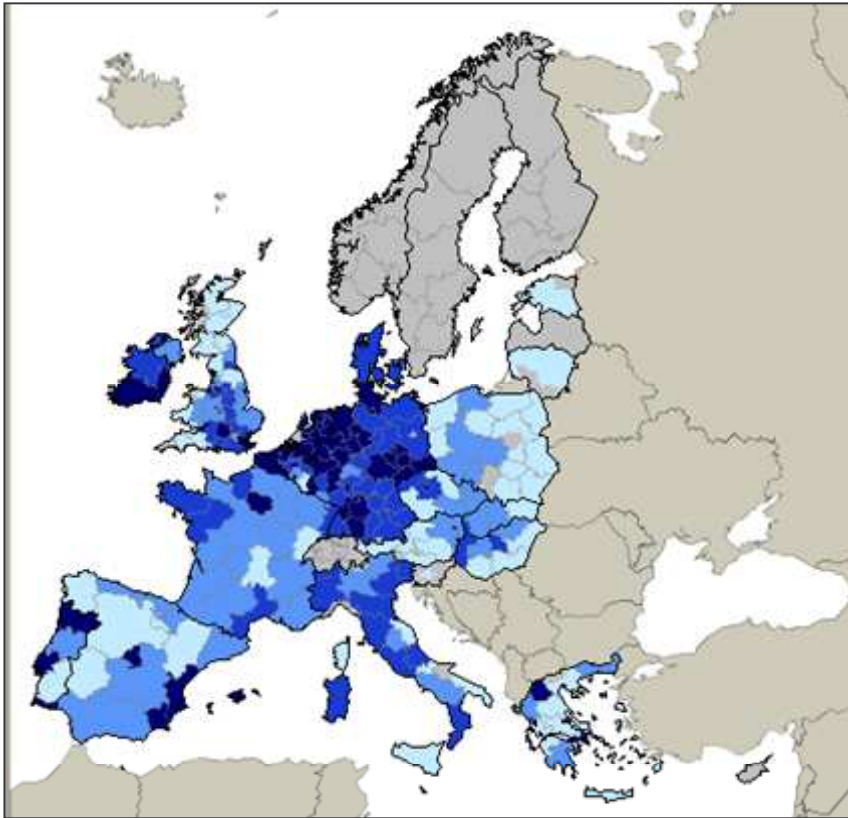


Urban sprawl,
1990-2000

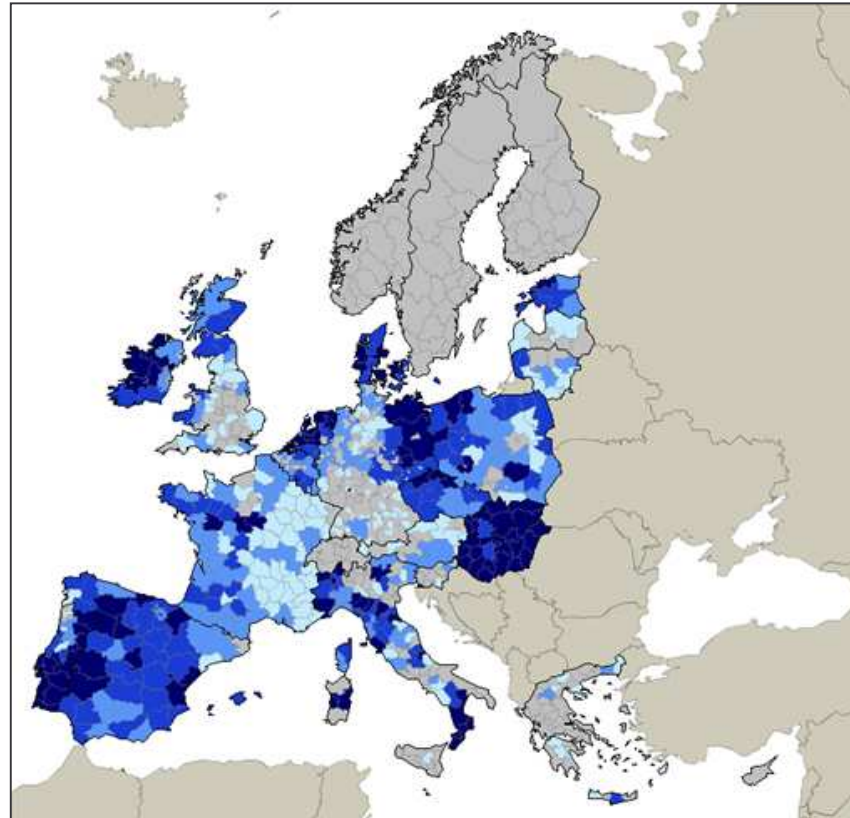
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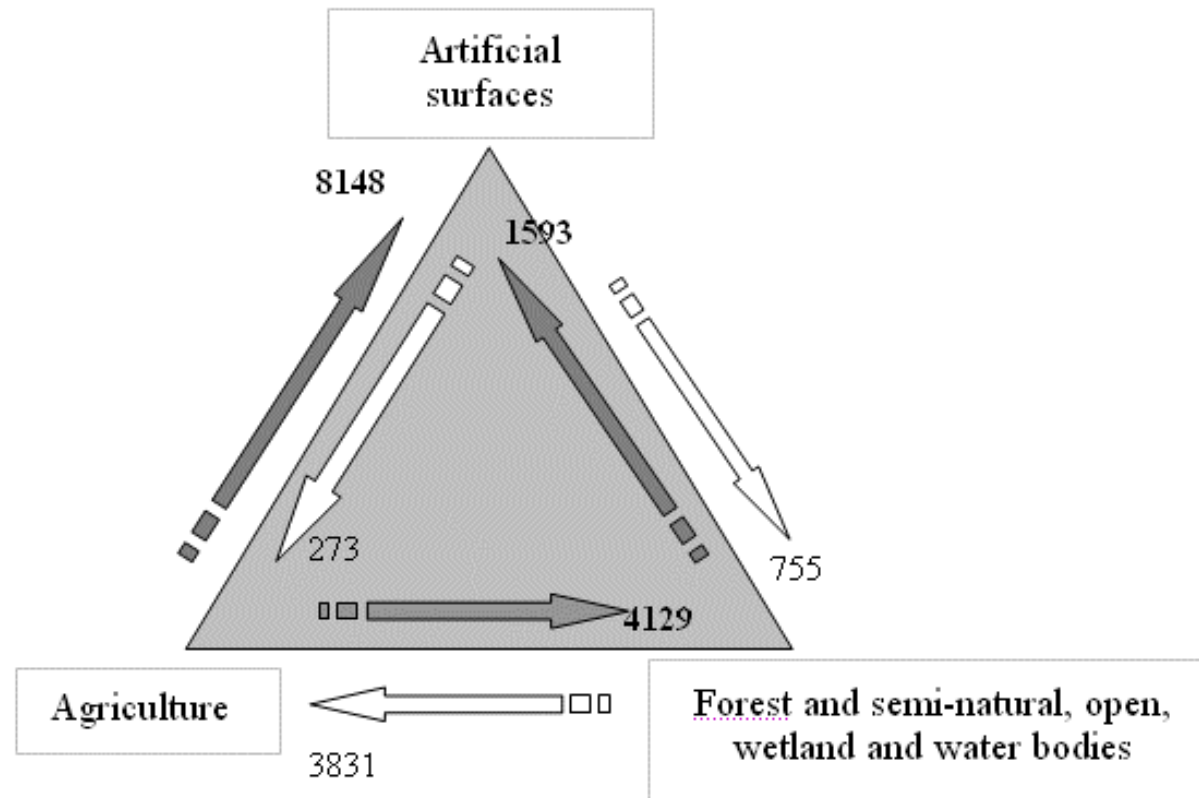
Loss of agriculture to urban



Withdrawal of farming

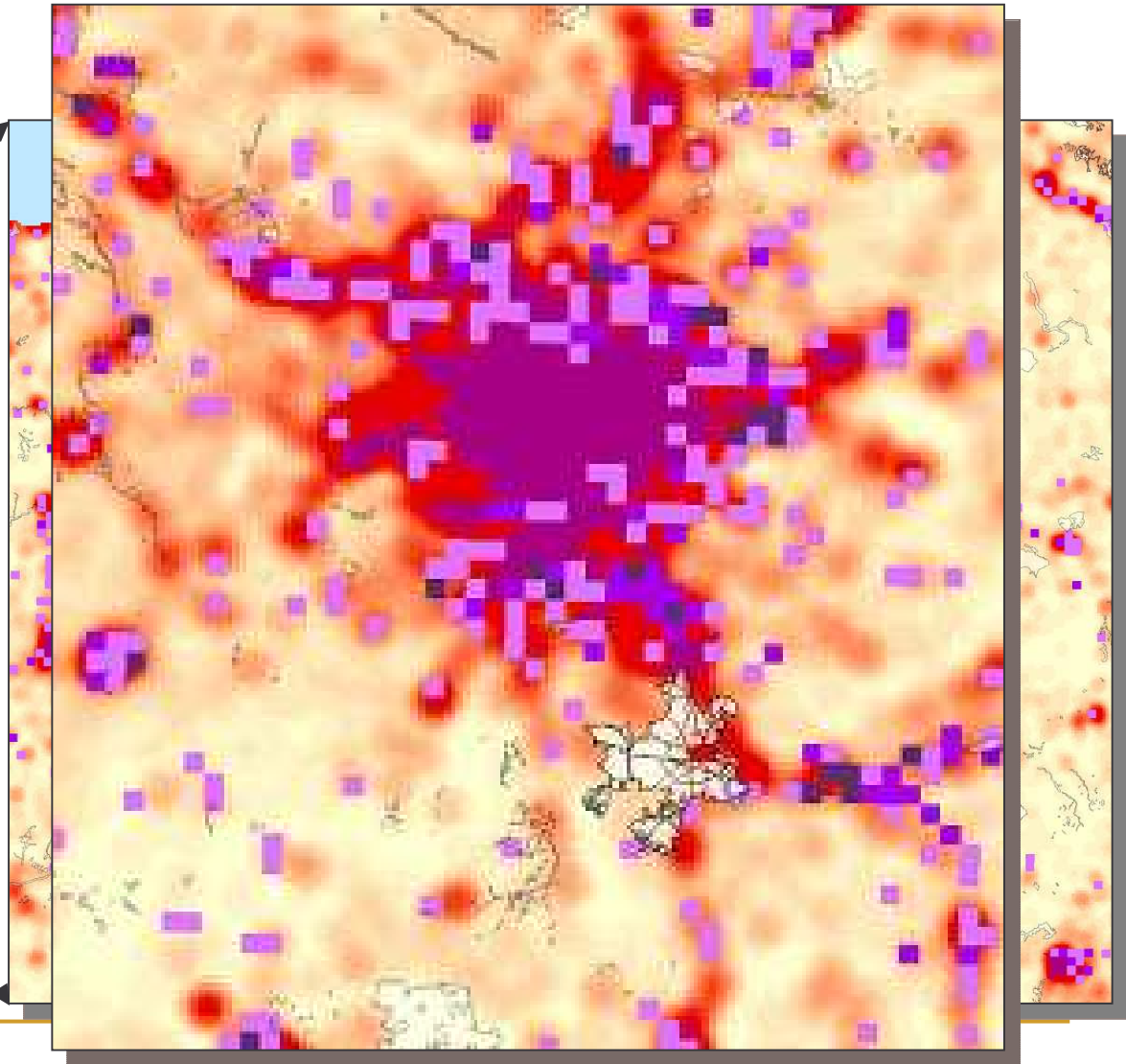
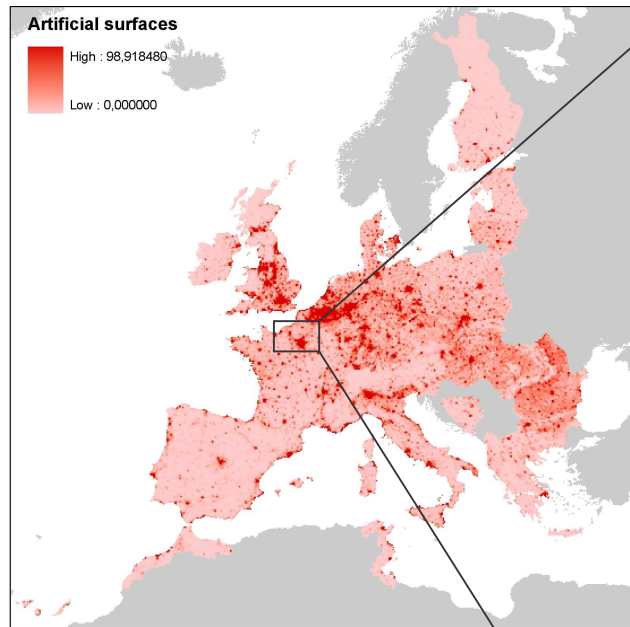
Problems related to landscape

Present trends....



	<i>Stock 1990, km²</i>	<i>LCF1 Urban land management</i>	<i>LCF2 Urban residential sprawl</i>	<i>LCF3 Sprawl of economic sites and infrastructures</i>	<i>LCF4 Agriculture internal conversions Total</i>	<i>LCF5 Conversion from other land cover to agriculture</i>	<i>LCF6 Withdrawal of farming</i>	<i>LCF8 Water bodies creation and management Total</i>	<i>LCF9 Changes of Land Cover due to natural and multiple causes</i>	<i>Total flows, km²</i>	<i>Stock 2000, km²</i>
1 Artificial areas	161860					273			311	584	
<i>211 Non-irrigated arable land</i>	1027807	12	1538	2417	13493		2121	225	39	19844	
<i>212 Permanently irrigated land</i>	28180	1	66	101	790		34	7	5	1004	
<i>213 Rice fields</i>	5688		2	2	619		8	0		631	
<i>221 Vineyards</i>	39067		45	42	926		59	2		1074	
<i>222 Fruit trees and berry plantations</i>	24656		92	84	948		58	1	1	1184	
<i>223 Olive groves</i>	39007		54	48	225		82	13	0	424	
<i>241 Annual crops associated with permanent crops</i>	9919	2	127	34	252		31	3		448	
2A Arable land & permanent crops Total	1174325	15	1923	2728	17252		2393	252	44	24608	
<i>231 Pastures</i>	367361	15	625	668	7412		924	114	6	9764	
<i>242 Complex cultivation patterns</i>	244214	4	952	639	2543		317	43	3	4500	
<i>243 Agriculture mosaics with natural vegetation</i>	177077	1	278	274	10	935	1261	58	5	2822	
<i>244 Agro-forestry areas</i>	31457		12	14	97		358	38	1	521	
2B Pastures & mosaics Total	820109	19	1867	1595	10062	935	2860	253	15	17607	
3A Forested land	1030635					1796			1317	3113	
3B Semi-natural vegetation	264932					1734			1323	3058	
3C Open spaces/ bare soils	52593					155			1041	1196	
4 Wetlands	46915					96			229	325	
5 Water bodies	45854					50			252	302	
Stock & Consumption of land cover 1990, km²	3597223	34	3791	4323	27314	5039	5253	506	4534	50794	
1 Artificial areas											170572
<i>211 Non-irrigated arable land</i>					8987	1464				10451	1018414
<i>212 Permanently irrigated land</i>					3631	383				4014	31191
<i>213 Rice fields</i>					520	27				547	5604
<i>221 Vineyards</i>					760	122				882	38874
<i>222 Fruit trees and berry plantations</i>					956	281				1237	24709
<i>223 Olive groves</i>					784	141				925	39509
<i>241 Annual crops associated with permanent crops</i>					56	32				88	9560
2A Arable land & permanent crops Total					15695	2450				18144	1167861
<i>231 Pastures</i>					7832	486				8318	365916
<i>242 Complex cultivation patterns</i>					3740	419				4160	243873
<i>243 Agriculture mosaics with natural vegetation</i>						780	1124			1904	176159
<i>244 Agro-forestry areas</i>					48	904				952	31887
2B Pastures & mosaics Total					11619	2590	1124			15333	817835
3A Forested land							2792		4	2796	1036079
3B Semi-natural vegetation							1244		2167	3411	260090
3C Open spaces/ bare soils							23		1790	1813	52147
4 Wetlands							70		313	383	45885
5 Water bodies							0		260	260	46754
Stock & Formation of land cover 2000, km²					27314	5039	5253		4534	42140	3597223

Problems related to landscape



Driving forces

- **Activities (Direct drivers of change)**
 - Land cover flows e.g.
 - 'Urban sprawl'
 - Abandonment
 - Afforestation/deforestation
 - Land management
 - Direct and diffuse impacts
 - **Underlying factors (Indirect drivers of change)**
 - The liberalisation-globalisation agendas
 - The development of consumerism and consumer values
 - The need for energy security
 - Development of the service based economy
 - Aging societies
 - Multiculturalism
 - The goals of balanced development
 - The rise of individualism and leisure lifestyles
 - Climate change
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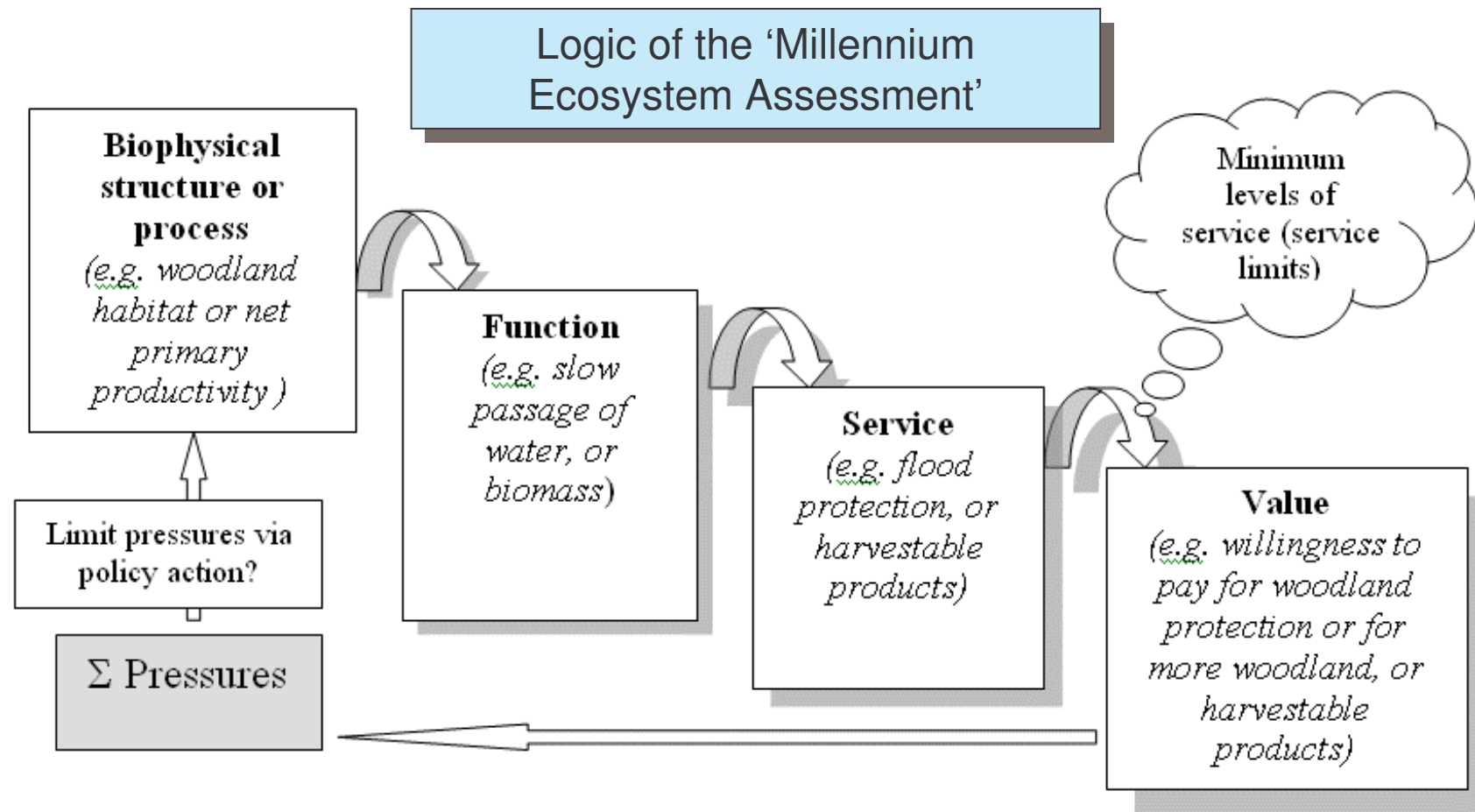
Policies and Targets for Biodiversity and Soils

- Considerable overlap with those for 'landscape'
 - Habitats Directive and requirements of Convention on Biodiversity ~ halt the loss of biodiversity by 2010:
 - *At the species level, 42% of Europe's native mammals, 43% of birds, 45% of butterflies, 30% of amphibians, 45% of reptiles and 52% of freshwater fish are threatened with extinction; most major marine fish stocks are below safe biological limits; some 800 plant species in Europe are at risk of global extinction....*

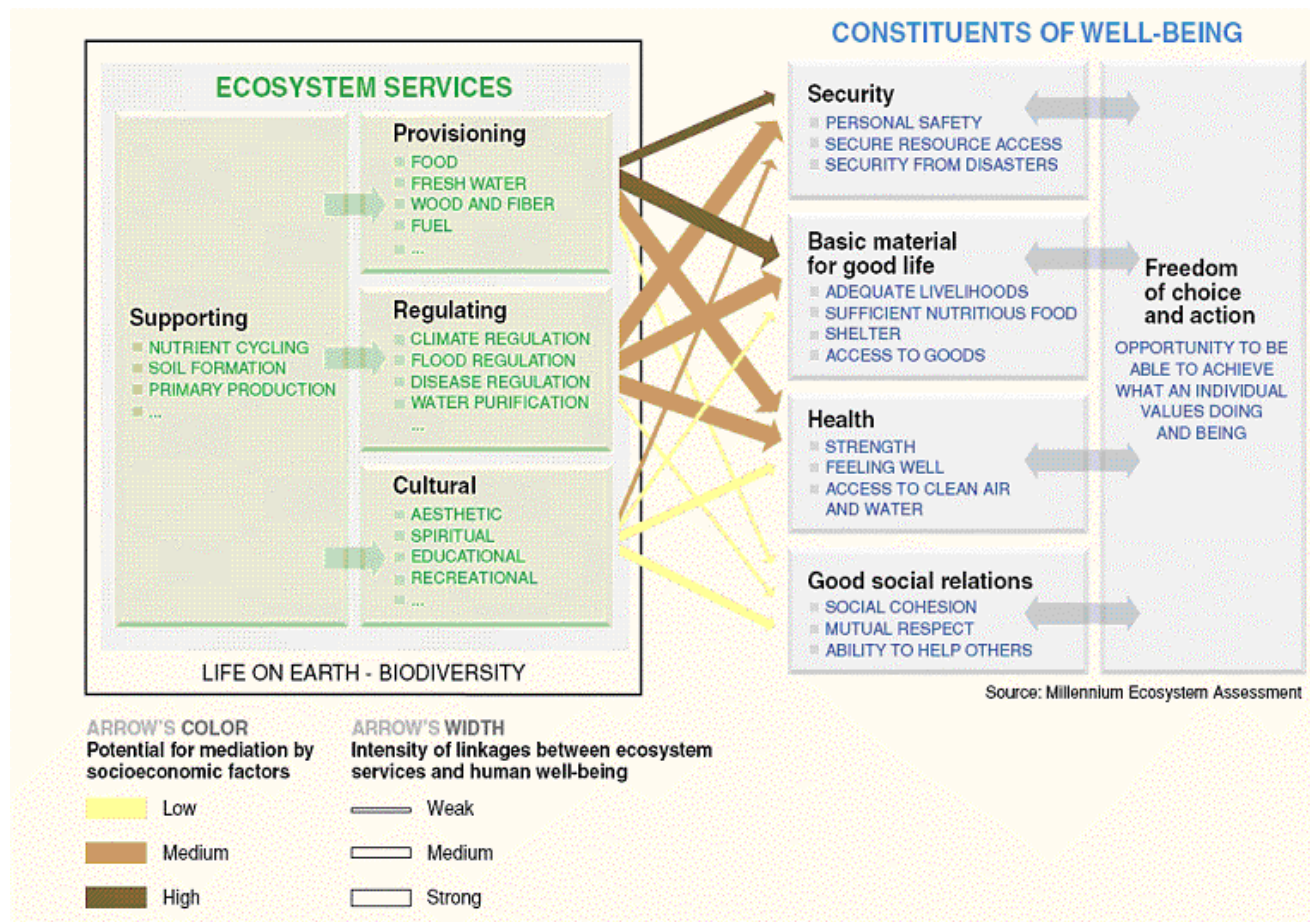
Policies and Targets for Biodiversity and Soils

- Water Framework Directive
 - “all inland and coastal waters to achieve ‘good status’ by 2015”
- Thematic Strategy for Soil Protection:
 - Protection and sustainable management of an important, non-renewable resource...
 - Erosion by water and wind
 - Loss of resource by land cover change

Problems related to biodiversity and soils



Problems related to biodiversity and soils



An upwards arrow indicates that the condition of the service globally has been enhanced and a downwards arrow that it has been degraded. Definitions of "enhanced" and "degraded" for the three categories of ecosystem services shown in the table are provided in the note below. Supporting services, such as soil formation and photosynthesis, are not included here as they are not used directly by people.

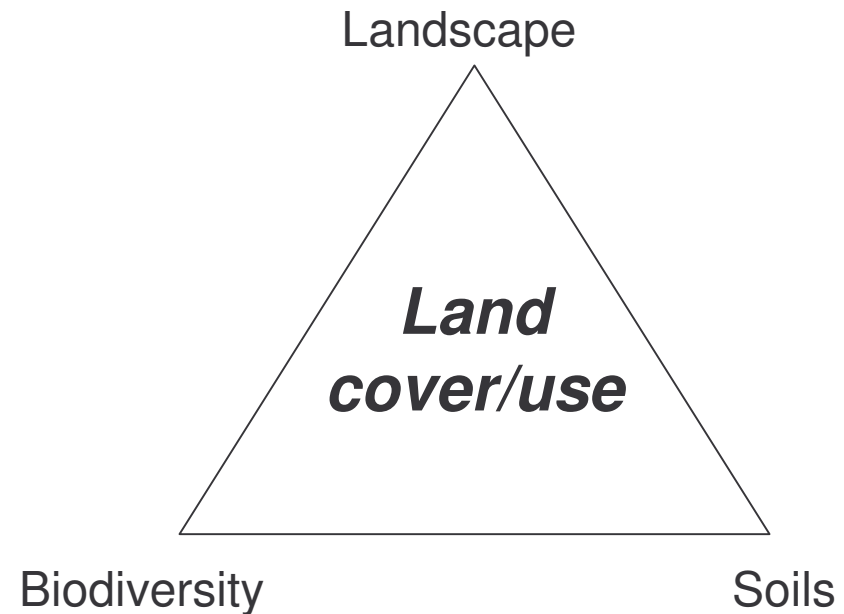
Service	Sub-category	Status	Notes
Provisioning Services			
Food	crops	▲	substantial production increase
	livestock	▲	substantial production increase
	capture fisheries	▼	declining production due to overharvest
	aquaculture	▲	substantial production increase
	wild foods	▼	declining production
Fiber	timber	+/-	forest loss in some regions, growth in others
	cotton, hemp, silk	+/-	declining production of some fibers, growth in others
	wood fuel	▼	declining production
Genetic resources		▼	lost through extinction and crop genetic resource loss
Biochemicals, natural medicines, pharmaceuticals		▼	lost through extinction, overharvest
Water	fresh water	▼	unsustainable use for drinking, industry, and irrigation; amount of hydro energy unchanged, but dams increase ability to use that energy
Regulating Services			
Air quality regulation		▼	decline in ability of atmosphere to cleanse itself has declined
Climate regulation	global	▲	net source of carbon sequestration since mid-century
	regional and local	▼	preponderance of negative impacts
Water regulation		+/-	varies depending on ecosystem change and location
Erosion regulation		▼	increased soil degradation
Water purification and waste treatment		▼	declining water quality
Disease regulation		+/-	varies depending on ecosystem change
Pest regulation		▼	natural control degraded through pesticide use
Pollination		▼*	apparent global decline in abundance of pollinators
Natural hazard regulation		▼	loss of natural buffers (wetlands, mangroves)
Cultural Services			
Spiritual and religious values		▼	rapid decline in sacred groves and species
Aesthetic values		▼	decline in quantity and quality of natural lands
Recreation and ecotourism		+/-	more areas accessible but many degraded
<p>Note: For provisioning services, we define enhancement to mean increased production of the service through changes in area over which the service is provided (e.g., spread of agriculture) or increased production per unit area. We judge the production to be degraded if the current use exceeds sustainable levels. For regulating services, enhancement refers to a change in the service that leads to greater benefits for people (e.g., the service of disease regulation could be improved by eradication of a vector known to transmit a disease to people). Degradation of regulating services means a reduction in the benefits obtained from the service, either through a change in the service (e.g., mangrove loss reducing the storm protection benefits of an ecosystem) or through human pressures on the service exceeding its limits (e.g., excessive pollution exceeding the capability of ecosystems to maintain water quality). For cultural services, degradation refers to a change in the ecosystem features that decreases the cultural (recreational, aesthetic, spiritual, etc.) benefits provided by the ecosystem.</p> <p>* Indicates low to medium certainty. All other trends are medium to high certainty.</p>			

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-

Conclusions and questions

- What are the cross-cutting drivers for landscape, biodiversity and soils?
- Does the distinction between direct and indirect drivers apply to this topic complex?



Conclusions and questions

- *“By examining all uses of land in an integrated manner, it makes it possible to minimize conflicts, to make the most efficient trade-offs and to link social and economic development with environmental protection and enhancement, thus helping to achieve the objectives of sustainable development.”*
Agenda 21, Chapter 10



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Integrated Land and Ecosystem Accounts

- The *SEEA Handbook* highlights five specific advantages of asset accounts for land. They offer
 1. A comprehensive picture of land cover and land use for a nation from which information about trends can be derived and indicators of change constructed;
 2. A way of integrating diverse data sources on land cover and land use with other types of information such as on population, economic activity, water balances, species or fertilizer use;

Integrated Land and Ecosystem Accounts

3. A way of standardizing classifications of land cover, land use and the causes (driving forces) of changes in land cover and land use;
4. A framework in which changes in land use, land cover, habitats and biodiversity to be linked to the driving forces that may transform them; and,
5. A system with sufficient flexibility to be applied at national, regional, watershed or landscape type level.