

# Implementing ecosystem accounting in Europe - the EU KIP INCA project

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# Accounting for natural capital and ecosystem services

## 'KIP INCA' goals:

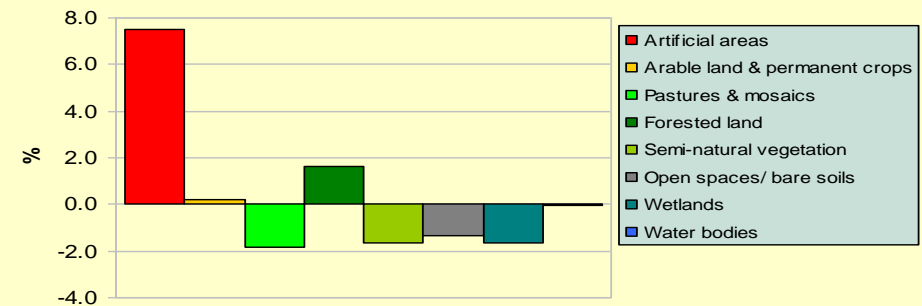
- Cooperation: ESTAT, EEA, ENV, JRC, RTD
- Develop integrated EU ecosystem accounting system
- Track ecosystem assets & their condition
- Track and project ecosystem service flows -> understand benefits and trade-offs
- Valuation of benefits from 'nature'

## Project outputs:

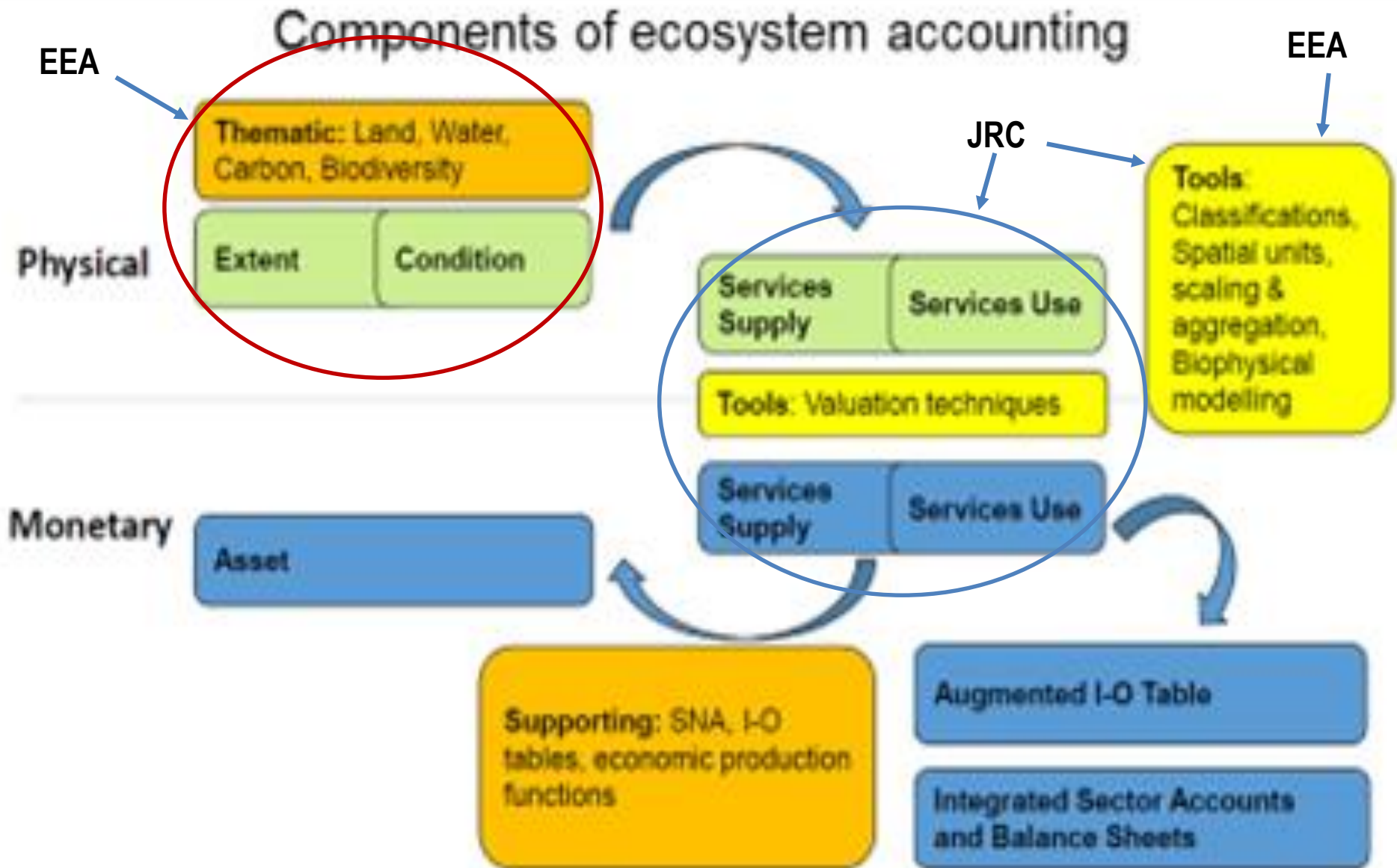
- Design of EU ecosystem accounting system
- Accounts of ecosystem extent, condition etc.
- KIP INCA spatial data architecture
- Information for better management of natural capital
- Implementation to 2020 (+ beyond..)



Net Change in Land Cover  
% of initial year



# System of SEEA - E.E.A.



# Current EU (KIP INCA) Proposal for ES Accounts

Service	Physical unit
<b>Provisioning services</b>	
Crops	Harvest (ton per ha)
Timber	Timber growth and harvest (ton per ha)
Marine fish	Catch (ton per fishing zone)
Water	Water abstraction for public, industrial and agricultural use (m3 per unit area)
Livestock	Amount of animal feed (grass) provided
<b>Regulating services</b>	
Pollination	Share of the crop harvest pollinated (ton per ha)
Erosion control (soil protection)	Avoided erosion in ton/ha/year compared to bare soil
Water purification	Removal of in-stream nitrogen (ton per km river)
Air filtration	Deposition of air pollutants (ton per ha)
Carbon sequestration (in vegetation and soil)	C sequestration in ton/ha/year
Flood control	Land area protected
<b>Cultural services</b>	
Recreation	Number of visits in ecosystems (person-days) / ha, include budget for surveys in some countries
Tourism	Number of overnight stays generated per ha/year

# Developing an integrated ecosystem accounting system:

Connecting satellite data, biodiversity monitoring, environmental reporting and statistics to create spatially explicit accounts

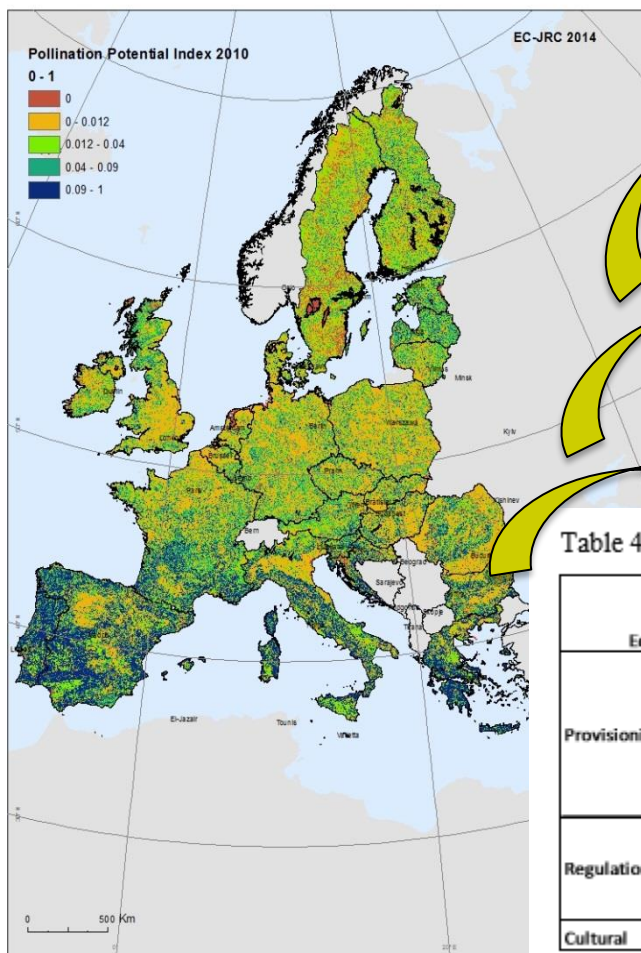


Table 4.2 Ecosystem extent account

Cover	Urban and associated		Rainfed herbaceous cropland		Forest tree cover		Inland water bodies		Open wetlands	Total
	Use	Infrastructure	Residential	Permanant crops	Maintenance	Forestry	Protected	Infrastructure	Aquaculture	
Ownership	Government	Private	Private	Private	Private	Government	Government	Government	Private	Government
Units: hectares										
Opening Stock										
Additions to Stock										

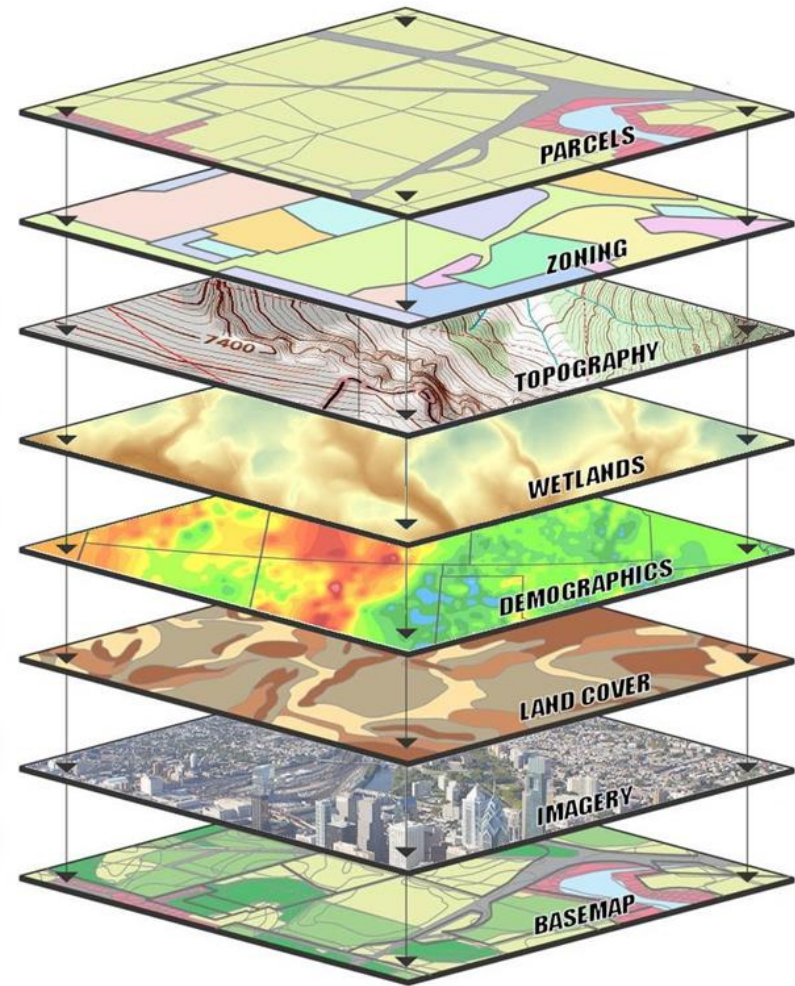
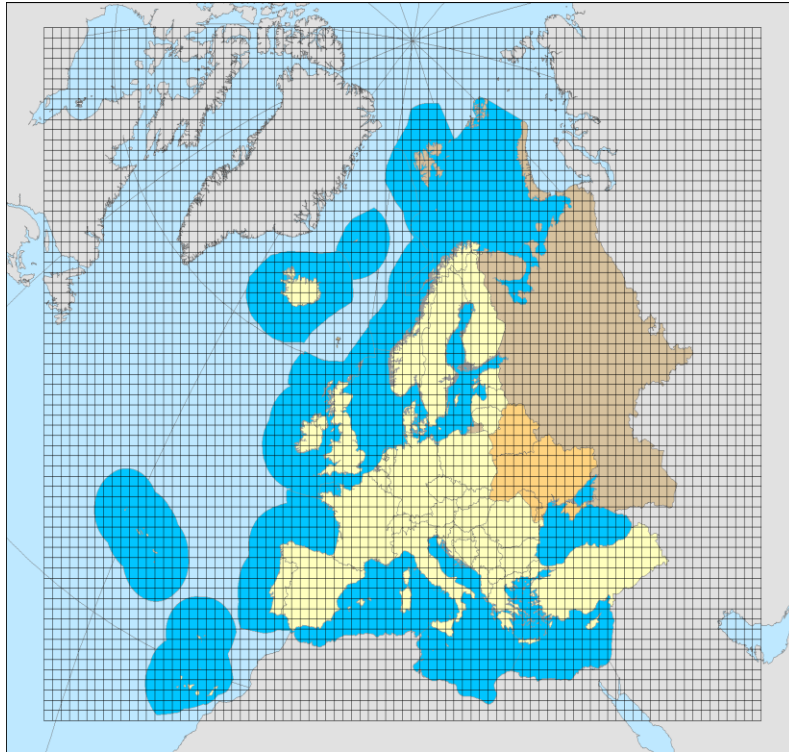
Table 4.3 Ecosystem condition account (similar to SEEA EEA Table 4.3: see also SEEA EEA Table 4.4 with changes in condition account)

Ecosystem type	Ecosystem extent	Ecosystem condition					
		Area	Vegetation	Biodiversity	Soil	Water	Carbon
Units: hectares							
Urban and associated							
Rainfed herbaceous							

Table 4.4 Ecosystem services supply account (LCEU by CICES)

Ecosystem service	Units	Land cover type								Provincial total
		Urban	Pasture	Cropland	Forest	Heath	Peat	Water	Other nature	
Provisioning	Hunting	kg meat	-	9,100	14,732	8,100	678	70	1,513	34,193
	Drinking water extraction	10 <sup>3</sup> m <sup>3</sup> water	4,071	7,026	11,227	3,117	214	-	478	26,995
	Crop production	10 <sup>6</sup> kg produce	-	-	1,868	-	-	-	-	1,868
	Fodder production	10 <sup>6</sup> kg dry matter	-	533	251	-	-	-	-	784
Regulation	Air quality regulation	10 <sup>3</sup> kg PM <sub>10</sub>	272	404	717	700	45	7	40	2,254
	Carbon sequestration	10 <sup>6</sup> kg carbon	875	8,019	273	50,664	393	149	-	61,429
Cultural	Recreational cycling	10 <sup>3</sup> trips	2,690	1,863	2,611	1,565	30	3	139	9,121

# Combining different data sets in one common spatial reference grid – via a shared data architecture



Note: Shared data semantics & other standards also required for full data integration.

# Where are we now with KIP INCA?

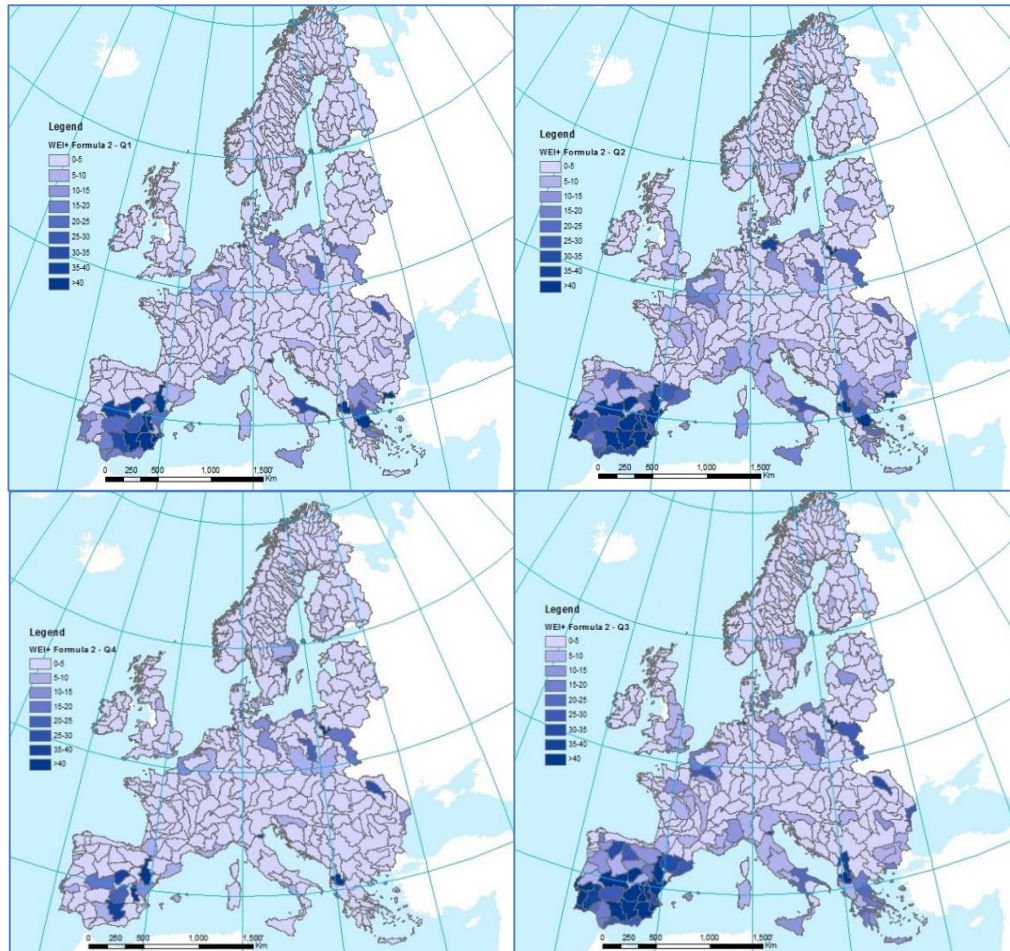
- Partners have developed good cooperation since 2015
- KIP INCA proposal is available – implementation is ongoing at all partners
- Major task is to develop a shared spatial data platform => develop data sharing system & joint reference data
- First pilot accounts will become available in 2017 (ecosystem extent, 1st ecosystem service accounts, possibly pilot ecosystem condition accounts)

***The following slides show some work of EEA.***

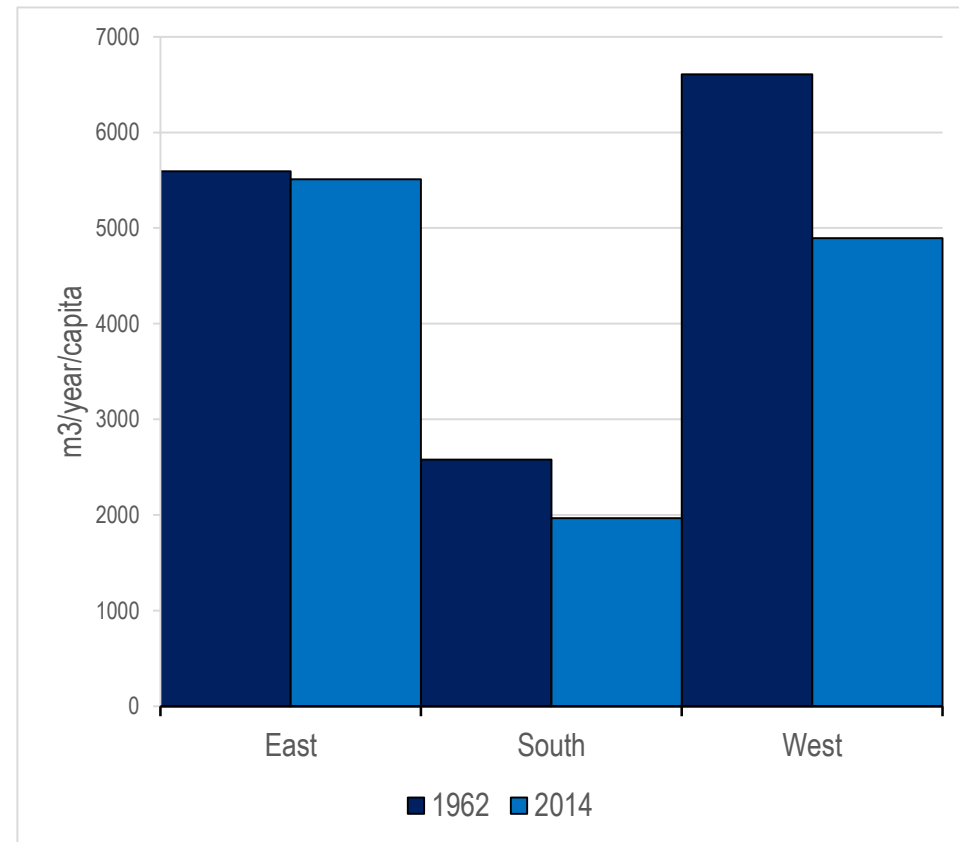


# Water accounts for estimating water use in Europe

## Seasonal WEI+ in 2014



## Trend in renewable water resources per capita in Europe (1962-2014)



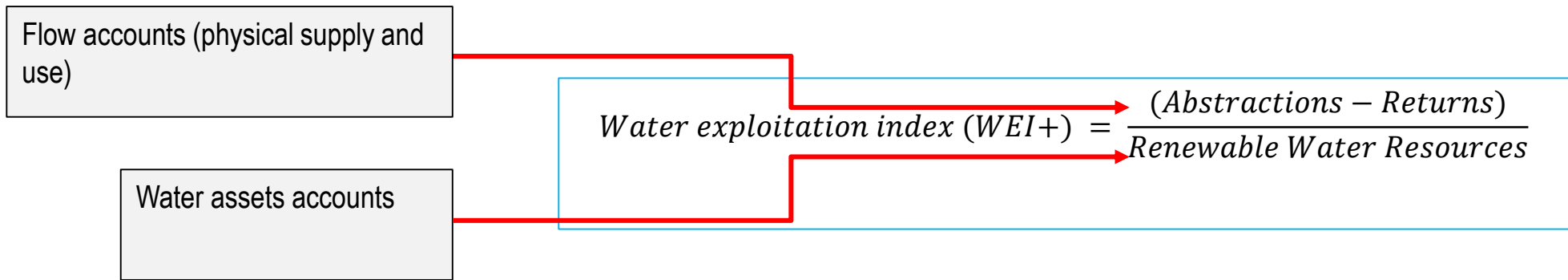
Data source: EEA 2016; World Bank 2016



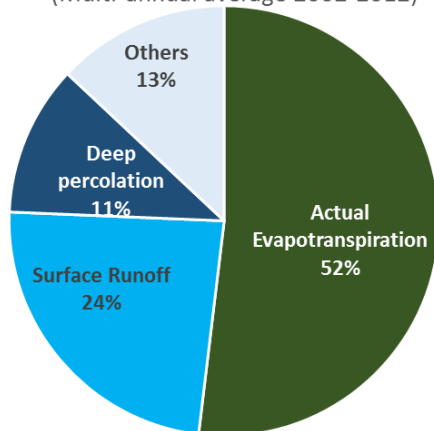


# Outputs of water assets and flow accounts are used in: *assessing*

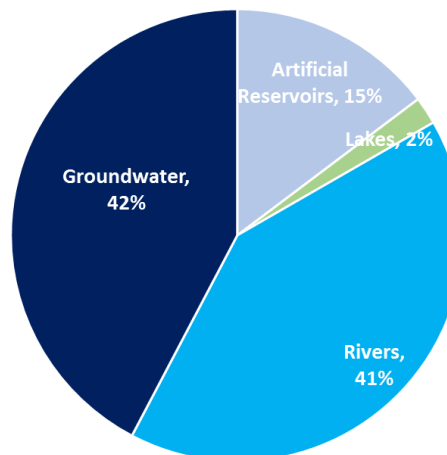
- Water scarcity conditions in Europe
- Resource efficiency and sustainability of water use across Europe



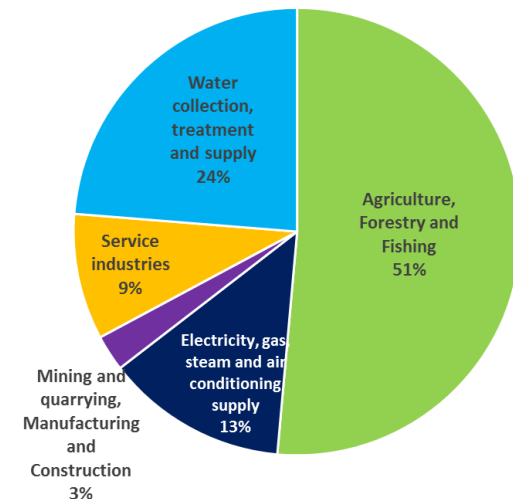
Natural water balance of Europe  
(Multi-annual average 2002-2012)



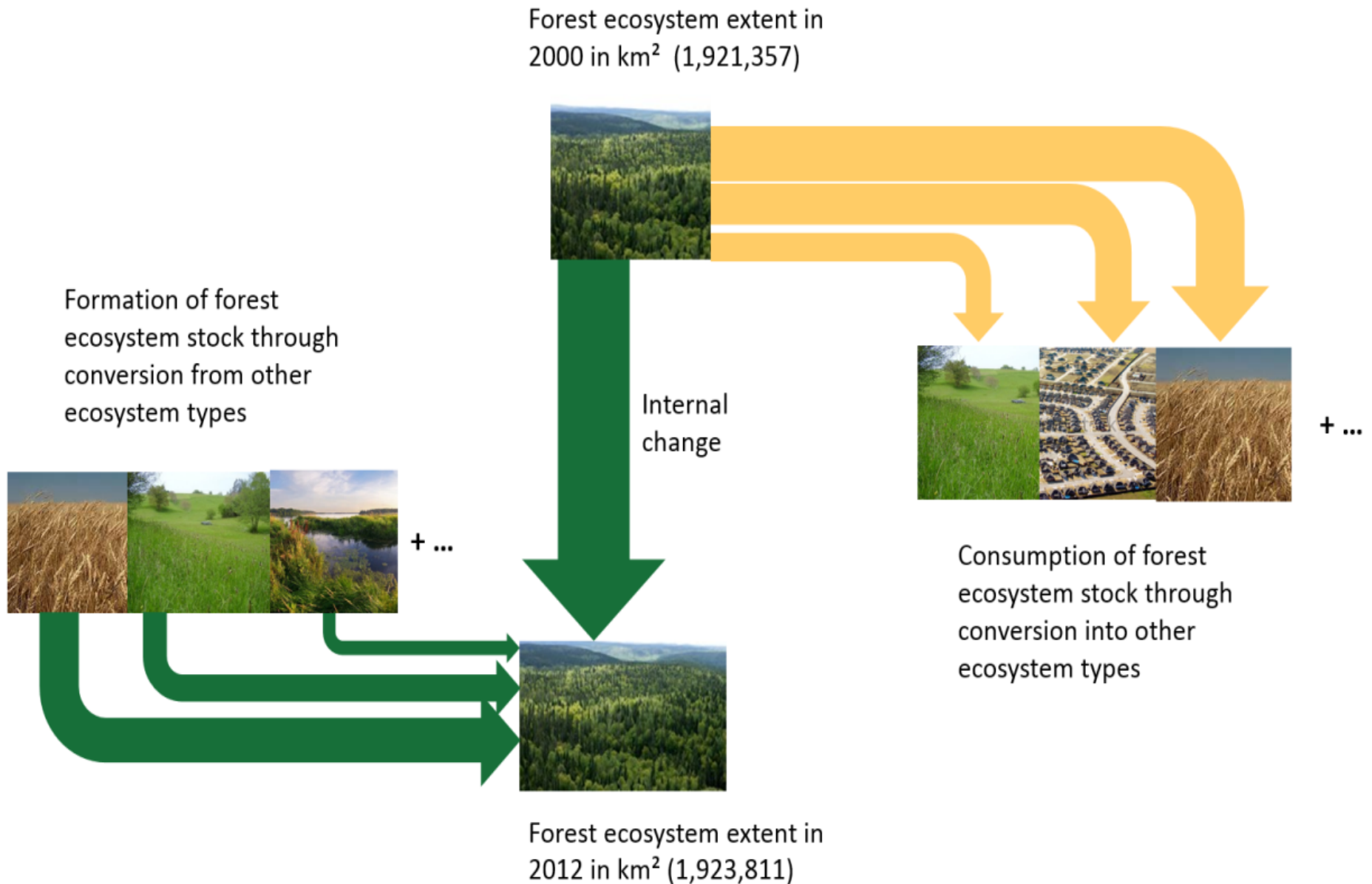
Water abstraction by source  
(2014)



Water use by sector (2014)



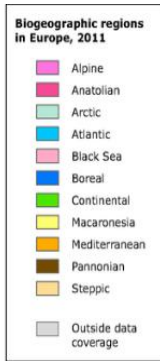
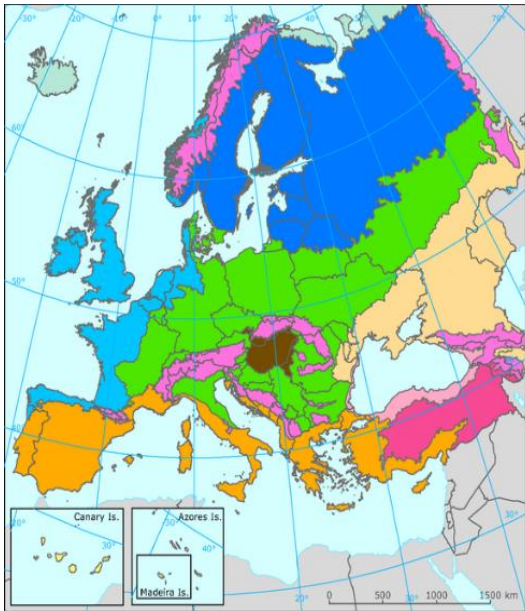
# Illustration of flows between ecosystem types



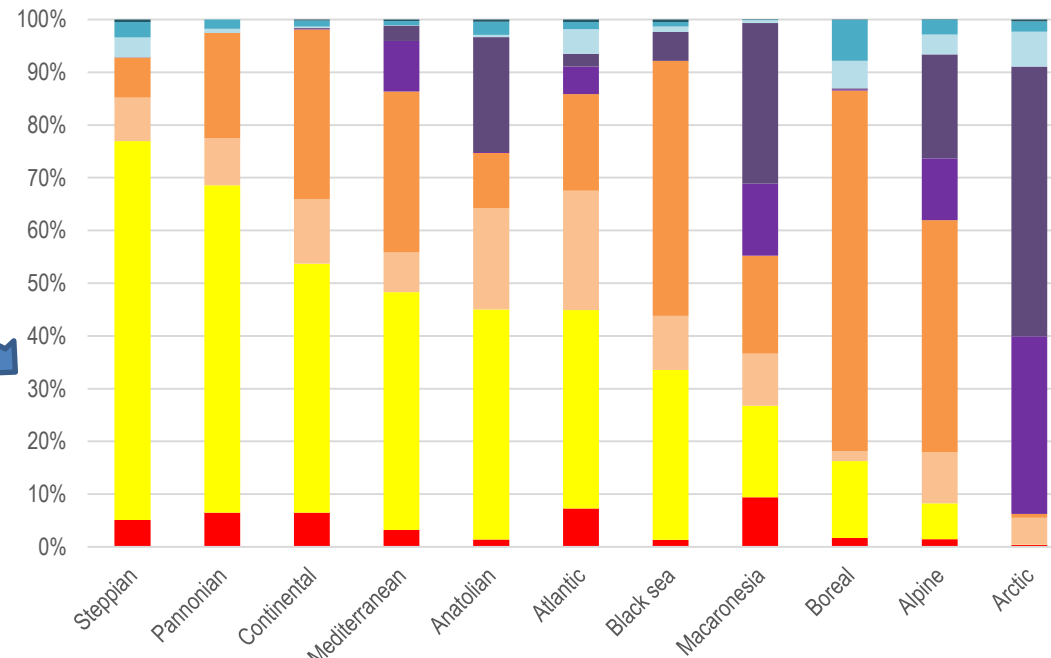
# Ecosystem extent accounts for Europe

AREA in KM2	MAES ECOSYSTEM TYPES									Total
	1 Urban	2 Cropland	3 Grassland	4 Woodland and forest	5 Heathland and shrub	6 Sparsely vegetated land	7 Inland wetlands	8 Rivers and lakes	9 Marine Inlets and transitional waters	
<b>Ecosystem Extent 2006</b>	232,739	2,036,471	652,873	2,010,199	279,699	346,798	129,149	141,502	28,651	5,858,081
Reductions to initial ecosystem extent	2,542	11,816	4,724	69,772	1,254	2,182	188	273	98	92,851
Additions to initial ecosystem extent	8,280	6,868	3,248	70,402	585	1,914	248	1,257	48	92,851
Net additions to ecosystem extent (additions - reductions)	+5,738	-4,948	-1,476	+630	-669	-268	+60	+984	-50	
Net additions as % of initial year	+2.5	-0.2	-0.2	+0.0	-0.2	-0.1	+0.0	+0.7	-0.2	
Total turnover of ecosystem extent (reductions + additions)	10,822	18,684	7,972	140,174	1,839	4,096	436	1,530	146	185,702
Total turnover as % of initial year	4.6	0.9	1.2	7.0	0.7	1.2	0.3	1.1	0.5	3.2
Stable ecosystem stock	230,196	2,024,655	648,149	1,940,426	278,444	344,616	128,961	141,230	28,553	5,765,231
% of stable ecosystem stock	98.9	99.4	99.3	96.5	99.6	99.4	99.9	99.8	99.7	98.4
<b>Ecosystem extent 2012</b>	238,476	2,031,524	651,397	2,010,828	279,030	346,530	129,208	142,487	28,601	5,858,081

# Extent accounts by biogeographic region



Percentage of MAES ecosystem type per Biogeographic region in 2012  
- sorted by extent of Cropland



Area in KM2	MAES ecosystem types									Total
	1 Urban	2 Cropland	3 Grassland	4 Woodland and forest	5 Heathland and shrub	6 Sparsely vegetated land	7 Inland wetlands	8 Rivers and lakes	9 Marine Inlets and transitional waters	
<b>Alpine</b>										
Ecosystem extent 2006	9,364	43,982	63,075	286,073	75,773	128,210	24,596	18,235	72	649,380
Reductions to 2006 ecosystem extent	28	79	59	3,590	13	65	6	2	0	3,841
Additions to 2006 ecosystem extent	178	26	46	3,478	3	104	1	6	0	3,841
Stable ecosystem stock	9,336	43,902	63,016	282,483	75,760	128,146	24,591	18,233	72	645,539
Net additions to ecosystem extent	150	-53	-13	-112	-10	39	-5	4	0	0
Net additions as % of 2006	1.60	-0.12	-0.02	-0.04	-0.01	0.03	-0.02	0.02	0.00	0.00
Ecosystem extent 2012	9,514	43,928	63,062	285,961	75,763	128,249	24,591	18,239	72	649,380
<b>Anatolian</b>										
Ecosystem extent 2006	5,370	183,635	80,823	43,928	833	91,867	1,805	10,154	1,686	420,102
Reductions to 2006 ecosystem extent	150	525	399	171	4	200	31	43	1	1,525
Additions to 2006 ecosystem extent	594	296	93	211	0	12	19	294	6	1,525
Stable ecosystem stock	5,221	183,110	80,424	43,757	829	91,666	1,774	10,111	1,684	418,577
Net additions to ecosystem extent	444	-229	-306	41	-4	-188	-13	251	5	0
Net additions as % of 2006	8.27	-0.12	-0.38	0.09	-0.49	-0.20	-0.71	2.47	0.28	0.00
Ecosystem extent 2012	5,815	183,407	80,517	43,968	829	91,678	1,793	10,405	1,691	420,102

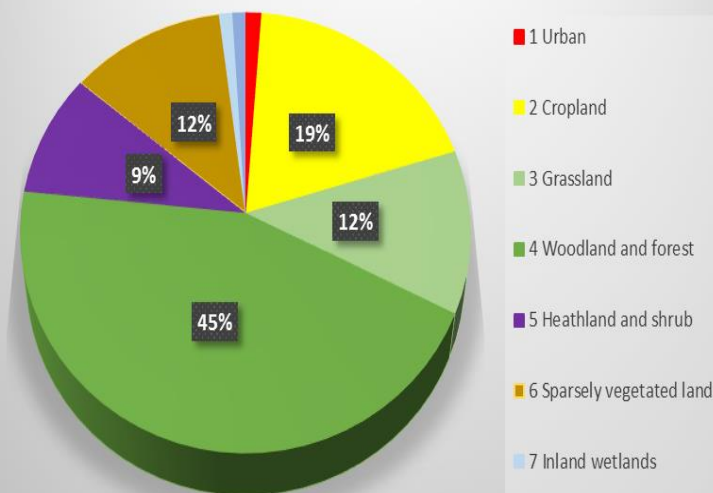
- 1 Urban
- 2 Cropland
- 3 Grassland
- 4 Woodland and forest
- 5 Heathland and shrub
- 6 Sparsely vegetated land
- 7 Inland wetlands
- 8 Rivers and lakes
- 9 Marine Inlets and transitional waters



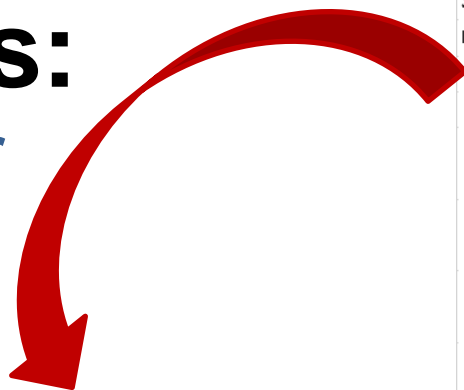
# Ecosystems in Europe's mountains, 2006 - 2012

	1 Urban	2 Cropland	3 Grassland	4 Woodland and forest	5 Heathland and shrub	6 Sparsely vegetated land	7 Inland wetlands	8 Rivers and lakes	9 Marine Inlets and transitional
EEA countries, area in ha									
EEA mountain area in 2006	1,585,222	25,272,242	15,815,426	58,542,559	12,242,683	16,040,917	1,395,339	1,282,394	11,520
Consumption of initial ecosystem extent	23,076	70,664	45,770	626,390	46,055	92,271	592	1,760	-
Formation of final ecosystem extent	80,783	39,353	32,723	618,973	28,718	80,728	582	24,518	200
Turnover (consumption + formation)	103,859	110,017	78,493	1,245,363	74,773	172,999	1,174	26,278	200
Turnover as % of initial year	6.55	0.44	0.50	2.13	0.61	1.08	0.08	2.05	1.74
Net formation (formation - consumption)	57,707	-31,311	-13,047	7,417	-17,337	-11,543	-10	22,758	200
Net formation as % of initial year	3.64	-0.12	-0.08	-0.01	-0.14	-0.07	0.00	1.77	1.74
Stable ecosystem extent	1,562,146	25,201,578	15,769,656	57,916,169	12,196,628	15,948,646	1,394,747	1,280,634	11,520
EEA mountain area in 2012	1,642,929	25,240,931	15,802,379	58,535,142	12,225,346	16,029,374	1,395,329	1,305,152	11,720

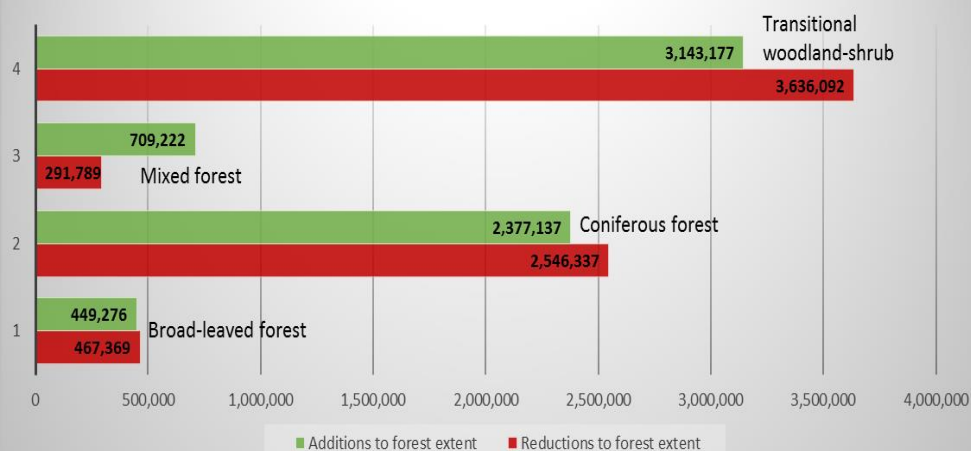
Distribution of MAES ecosystem types in Europe's mountains in 2012



# Tier II accounts: to be further developed





















Change in forest extent 2006-2012 in ha



Forest, semi natural areas, wetlands and water bodies in Europe			2000	2012	Change 2000 - 2012 in %
Area in KM2					
3 Forest and semi natural areas	31 Forests	311 Broad-leaved forest	585,162	582,206	-0.51%
		312 Coniferous forest	831,237	811,093	-2.42%
		313 Mixed forest	294,950	298,608	1.24%
	32 Scrub and/or herbaceous vegetation associations	321 Natural grasslands	228,357	227,171	-0.52%
		322 Moors and heathland	173,120	172,742	-0.22%
		323 Sclerophyllous vegetation	107,592	106,288	-1.21%
		324 Transitional woodland shrub	297,762	318,920	7.11%
	33 Open spaces with little or no vegetation	331 Beaches, dunes, sands	7,968	8,046	0.98%
		332 Bare rocks	94,025	94,434	0.43%
		333 Sparsely vegetated areas	226,797	226,726	-0.03%
		334 Burnt areas	1,940	1,356	-30.10%
		335 Glaciers and perpetual snow	16,542	15,969	-3.47%
	4 Wetlands	41 Inland wetlands	411 Inland marshes	13,809	13,861
412 Peat bogs			115,832	115,348	-0.42%
42 Maritime wetlands		421 Salt marshes	5,496	5,524	0.51%
		422 Salines	682	706	3.48%
5 Water bodies	51 Inland waters	511 Water courses	13,492	13,414	-0.58%
		512 Water bodies	127,350	129,072	1.35%
	52 Marine waters	521 Coastal lagoons	6,298	6,308	0.16%
		522 Estuaries	3,657	3,651	-0.15%
		<b>Total</b>		5,858,081	5,858,081

# Potential summary of results – illustration !

MAES ecosystem type	Trends 2000 – 2006	Trends 2006 - 2012
Urban		
Cropland		
Grassland		
Woodland and forest		
Heathland and shrub		
Sparsely vegetated land		
Inland wetlands		
Rivers and lakes		
Marine inlets and transitional waters		



Thank you for your attention.

Do you have any comments or questions?



