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Session: Policy uses of environmental accounts

Indicators for Water and Land Issues

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Indicators are strange objects

They need to be at the same time:

- in small number AND give the appropriate details expected by the user
- explicit and stand alone AND express interactions
- understandable by the general public, decision-makers (generally with cost-benefit considerations in mind) AS WELL AS by scientists.

Environmental accounts can help in solving some of these contradictions

- **Accounts are a language**
- **Accounts are an analytical and aggregation model**

Accounts are a language

- **Integrated nomenclatures and definitions are technically useful for cross checking and assimilating heterogeneous data sources → they may help different communities in understanding each other**
- coherent, exhaustive, structured & transparent basis for
 - calculating monetary indicators related to environment issues
 - bringing together indicators describing the various aspects of ecosystem condition.

Accounts are an analytical and aggregation model

- Remark: model only valid when the conservation of value applies: material and energy (1st law of thermodynamics), land
- However: when accounting balances are relevant, they supply aggregated indicators (their totals) that can be detailed by sub-indicators related either to their composition or to the sectors (in the broader sense) involved.

2 examples

- Translation of water accounts into the DPSIR framework
- Aggregation/ disaggregation of indicators derived from land accounts

Translation of water accounts into the DPSIR framework

- Policy targets:
 - The EU Water Framework Directive
 - The EU objective of halting biodiversity loss in Europe by 2010

DPSIR & Water: e.g. the Rivers

ECOLOGICAL CONDITIONS OF THE RIVERS

Driving forces	Pressure	State	Impacts	Responses
Hydro-electricity production	Disruption of the natural course of the rivers by dams	Hydrographic network integrity, by large, medium and small rivers	Regional impacts on the ecological conditions of rivers on terrestrial biotopes and species	River basin management schemes
Population growth	Modification of the natural hydraulic condition	Periodicity of water stress in rivers	Impacts on the ecological conditions of rivers on the economy	Enforcement of the respect of the natural discharge rates Pricing policy of the use of water
Development of recreational services		Decrease in the fish stocks and composition		
Use of fertilisers and pesticides	Water abstraction (in summertime)	Decrease in other aquatic fauna (benthic)	Impacts on the ecological conditions of rivers on amenities	Taxation of polluting emissions Water protection expenditure
Irrigation		Decrease in birds and mammals linked with the riverine biotope		
Seasonal use of water (tourism...)	Polluting emissions to water	Eutrophication		



**Composite index:
Ecological conditions
of the rivers**

Length of large, medium and small rivers (km) weighted by their discharge, the integrity index and the other state indicators;
breakdown by river basins, ecological and administrative regions.

Translation of water accounts into the DPSIR framework: **D-P**

INDICATORS & TYPE			ACCOUNTING VARIABLES		COMPUTABLE INDICATORS	
			Natural Asset, Supply & Use, Emission (hybrid) accounts, Satellite accounts	Satellite accounts, SNA		
			<i>Physical</i>	<i>Monetary</i>	<i>Physical</i>	<i>Monetary</i>
DRIVING FORCES	<i>Socio-economic values</i>	Consumption	Water received by sectors and self-supply	Intermediate and final consumption of water (national accounts)	<u>Accounting variables</u>	<u>Accounting variables</u>
		Production, Supply	Operation of the water resource by the sectors, dams, Supply of water to sectors	Investments in dams, channels, irrigation schemes, sewerage...; running costs of water supply and prices; turnover of the distribution of water	<u>Accounting variables</u>	<u>Accounting variables</u>
		Other	Seasonal demands for amenities (sport, tourism, parks, private gardens...), Abstraction rights allocated	Turnover of sectors depending on water, Abstraction rights allocated	<u>Accounting variables</u>	<u>Accounting variables</u>
PRESSURE	<i>Use of the resource & Emissions</i>	Use	Abstraction from water bodies (by sectors), minus Water lost in transport and irrigation (returns); Artificial evapo-transpiration & direct discharge to sea (consumption of water)	Abstraction rights used, Value of the distributed water	<u>Accounting variables</u>	<u>Accounting variables</u>
		Emissions	Discharge of waste water, discharge of pollutants (fluxes)	-	<u>Accounting variables</u>	Non internalised costs (social costs) of the use of the water system as a sink

Translation of water accounts into the DPSIR framework: **S-I-R**

INDICATORS & TYPE			ACCOUNTING VARIABLES		COMPUTABLE INDICATORS	
			Natural Asset, Supply & Use, Emission (hybrid) accounts, Satellite accounts	Satellite accounts, SNA		
			<i>Physical</i>	<i>Monetary</i>	<i>Physical</i>	<i>Monetary</i>
STATE	<i>Availability & Limiting factors, Water quality</i>	Stocks	Natural and semi-natural assets (reservoirs, lakes, channels, rivers, groundwater, water in soil...)	-	<u>Accounting variables</u>	Asset value of water in reservoirs
		Flows	Precipitation, runoff, infiltration, evapotranspiration; availability of the water resource	-	<u>Accounting variables</u>	-
		Quality	Quality of the available water resource by type of water bodies	-	<u>Accounting variables</u>	Damage costs (Restoration costs or Avoidance costs)
IMPACTS	<i>Vulnerability of economy, ecosystem and human life</i>	Depletion of the resource	Storage and transport of water; treatment before use	Transport and storage of water, Purification before use	<u>Accounting variables & Seasonal stress, Local shortages, Stress on the river ecosystems</u>	<u>Accounting variables & Economic losses due to water shortages, to the maintenance of minimum flows in rivers</u>
		Degradation of the environment	Quality of aquifers and rivers, quality/ health of water ecosystems	-	<u>Accounting variables</u>	Damage costs (Restoration costs or Avoidance costs)
		Health	Supply of polluted water to households	-	<u>Accounting variables</u>	Health costs related to use of polluted water
RESPONSES	<i>Society responses</i>	Protection activities	Sewerage and water treatment	Protection expenditure	<u>Accounting variables</u>	<u>Accounting variables</u>
		Changes in Process & Behaviour	Recycling of water, irrigation techniques, desalination of sea water	Costs and economic benefits	<u>Accounting variables</u>	<u>Accounting variables & ecological benefits calculations</u>
		Economic and legal instruments	Abatement of polluting discharges to water; minimum flows and reserves	Taxes, Incentives	<u>Accounting variables</u>	<u>Accounting variables</u>

Conclusion: it seems it works !

- Not as a set of indicators, which has to be defined altogether with scientists and users, for specific targets
- But as a reservoir for producing a range of indicators tailored to user needs

Aggregation/ disaggregation of indicators derived from land accounts

- Policy objectives
 - Environment in land planning (ESDP) and urban planning (Urban strategy)
 - EU agricultural policy: IRENA, the 35 agri-environmental indicators

Land Accounts: e.g. Italy

Units : ha

Consumption of Land Cover									TOTAL	Land cover flows	Formation of Land Cover								TOTAL
1	2A	2B	3A	3B	3C	4	5	1			2A	2B	3A	3B	3C	4	5		
<i>Artificial surfaces</i>	<i>Arable land & permanent crops</i>	<i>Pastures & mixed farmland</i>	<i>Forests and transitional woodland shrub</i>	<i>Natural grassland, heathland, sclerophyllous vegetation</i>	<i>Open spaces with little or no vegetation</i>	<i>Wetlands</i>	<i>Water bodies</i>		<i>Artificial surfaces</i>	<i>Arable land & permanent crops</i>	<i>Pastures & mixed farmland</i>	<i>Forests and transitional woodland shrub</i>	<i>Natural grassland, heathland, sclerophyllous vegetation</i>	<i>Open spaces with little or no vegetation</i>	<i>Wetlands</i>	<i>Water bodies</i>			
1576		56						1632	LCF1 Urban land management	1632							1632		
	23113	24703	742	1184	105		0	49847	LCF2 Urban residential sprawl	49847							49847		
31	22286	9218	1019	905	91	67	453	34069	LCF3 Sprawl of economic sites and infrastructures	34069							34069		
	45236	10146						55382	LCF4 Agriculture internal conversions		34128	21255					55382		
78		3968	2658	3146	37	76	180	10124	LCF5 Conversion from other land cover to agriculture		7749	2375					10124		
	26308	58028						84336	LCF6 Withdrawal of farming			16030	26983	41246	13	64	84336		
500			101859	24494	1985		16	128854	LCF7 Forests creation and management			124175	4479	200			128854		
256	1266	122	175	14	137		431	2399	LCF8 Water bodies creation and management					431		1969	2399		
474	340	143	6589	17442	1633	532	761	27914	LCF9 Changes of Land Cover due to natural and multiple causes			25	18569	8072	623	624	27914		
2915	118549	106383	113042	47184	3988	676	1821	394557	TOTAL	85548	41876	39660	151184	64294	8715	688	2593	394557	
									Land cover 1990, ha	1348014	#####	4831508	8818218	2678056	1066023	69104	908812	30678278	
									Consumption of initial land cover	2915	118549	106383	113042	47184	3988	676	1821	394557	
									Formation of new land cover	85548	41876	39660	151184	64294	8715	688	2593	394557	
									Net Formation of Land Cover	82634	-76672	-66724	38142	17110	4726	12	772	0	
									Land cover 2000, ha	1430647	#####	4764784	8856360	2693166	1070749	69116	909585	30678278	

Summary balance of consumption and formation of land cover – ITALY 1990-2000

IRENA 24: an EU agri-environmental indicator derived from land accounts

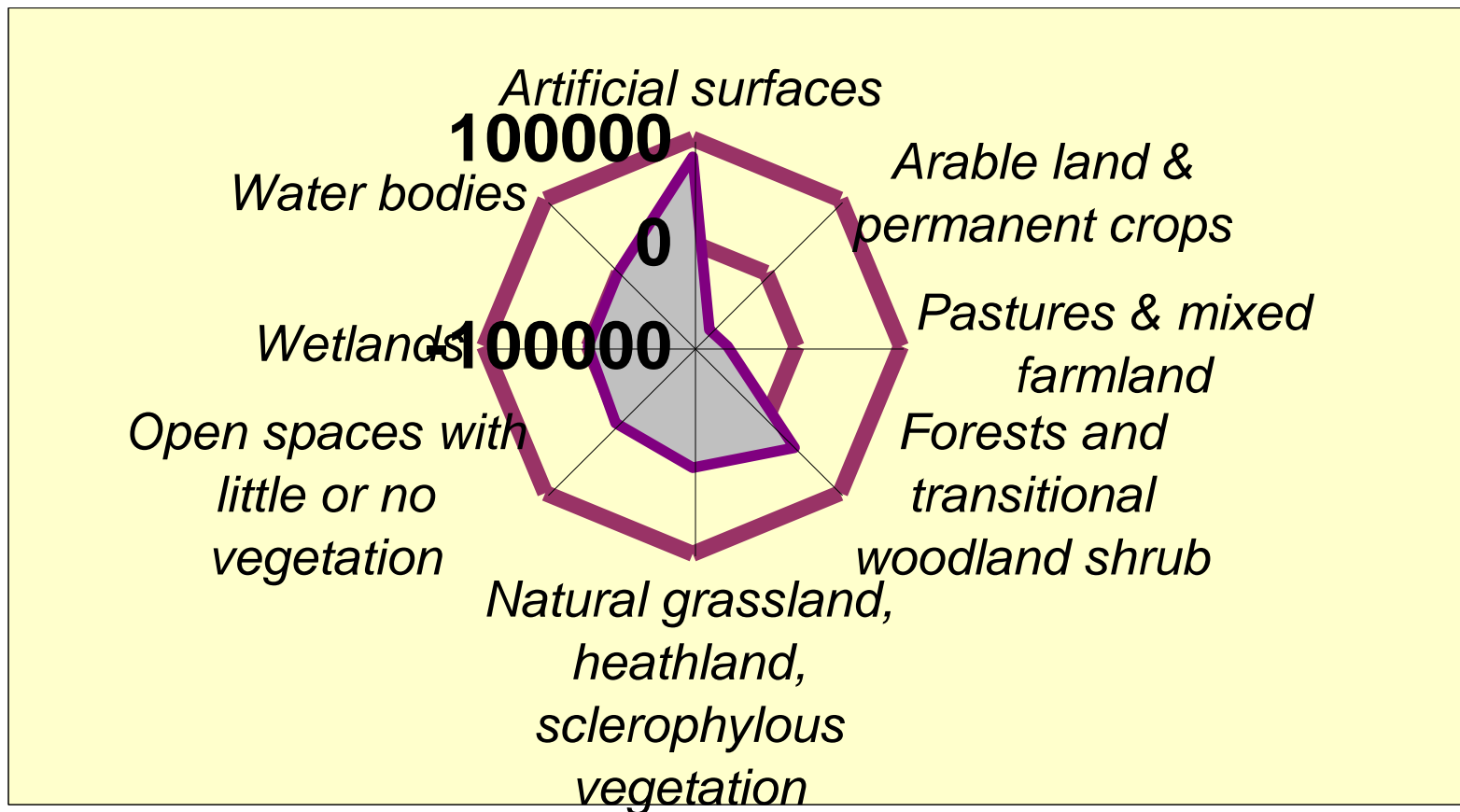
ITALY 1990-2000 ha

CORINE LAND COVER CLASSES	2A	2B		
	Arable land & permanent crops	Pastures & mixed farmland	TOTAL CHANGE OF THE PERIOD	MEAN ANNUAL CHANGE
Land cover flows				
LCF511 Intensive conversion from forest to agriculture	1489		1489	149
LCF512 Diffuse conversion from forest to agriculture		1169	1169	117
LCF521 Intensive conversion from semi-natural land to agriculture	6090		6090	609
LCF522 Diffuse conversion from semi-natural land to agriculture		1061	1061	106
LCF53 Conversion from wetlands to agriculture	91	145	236	24
(1) Formation of agricultural land cover over forests & semi-natural land	7670	2375	10045	1005
LCF61 Withdrawal of farming with woodland creation	3044	23939	26983	2698
LCF62 Withdrawal of farming without significant woodland creation	23263	34089	57352	5735
(2) Consumption of agricultural land cover by forests & semi-natural land	26308	58028	84336	8434
IRENA 24a : Net Formation of Agricultural Land Cover over Forests & Semi-natural Land = (1)-(2)	-18637	-55653	-74291	-7429

(Negative numbers mean that, on the average, farmland abandonment is more important than the new extension of agriculture)

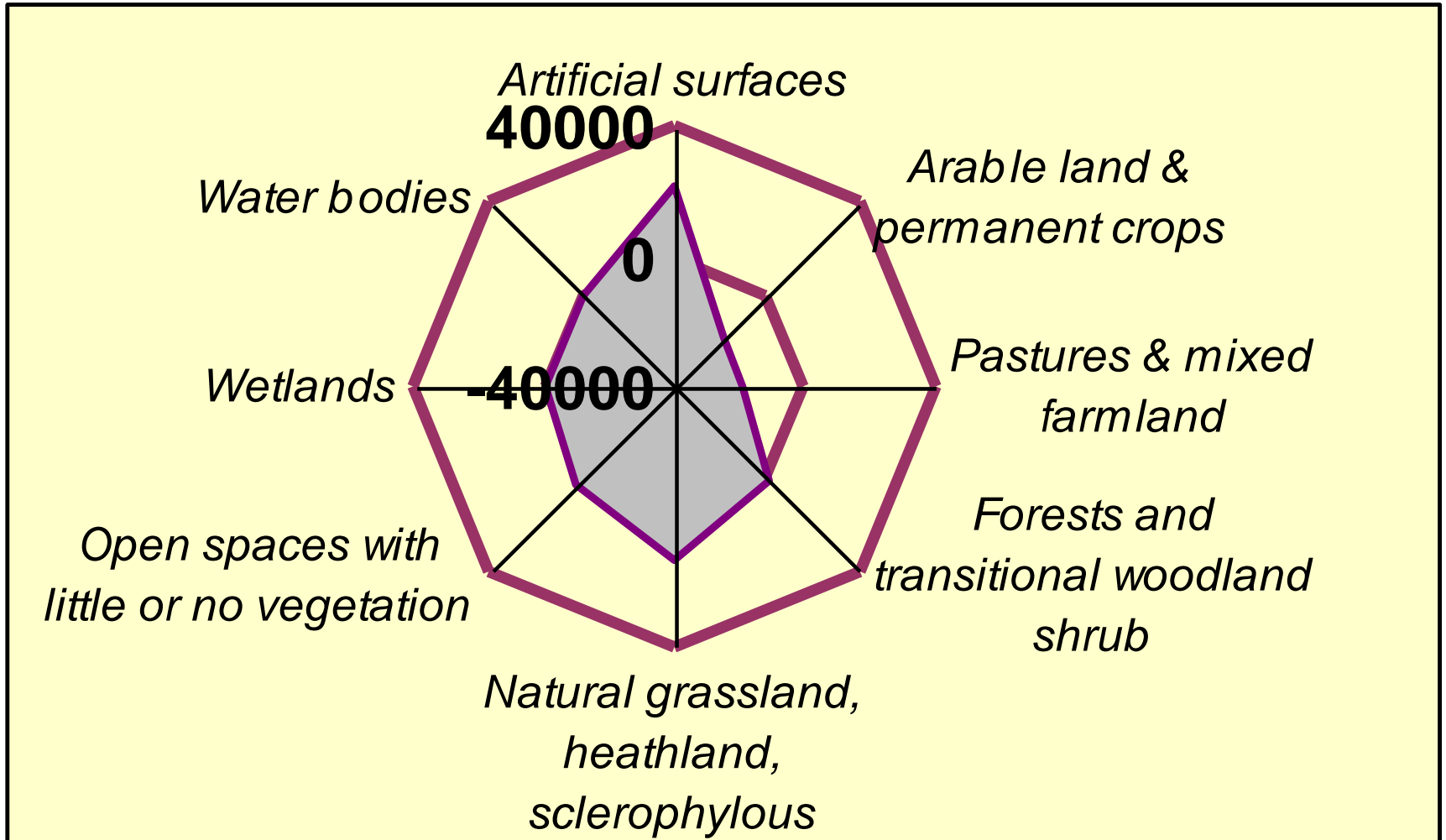
National and Regional « Net Land Cover Change » a – Italy 1990-2000

Units : ha



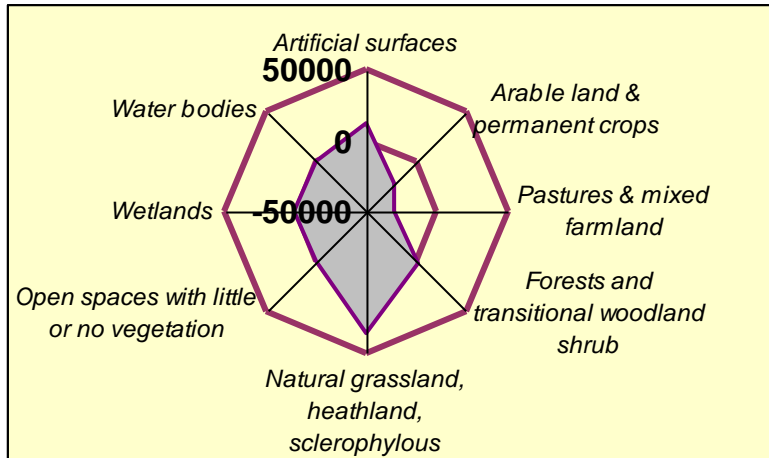
National and Regional « Net Land Cover Change » b – Italian Coast (all) 1990-2000

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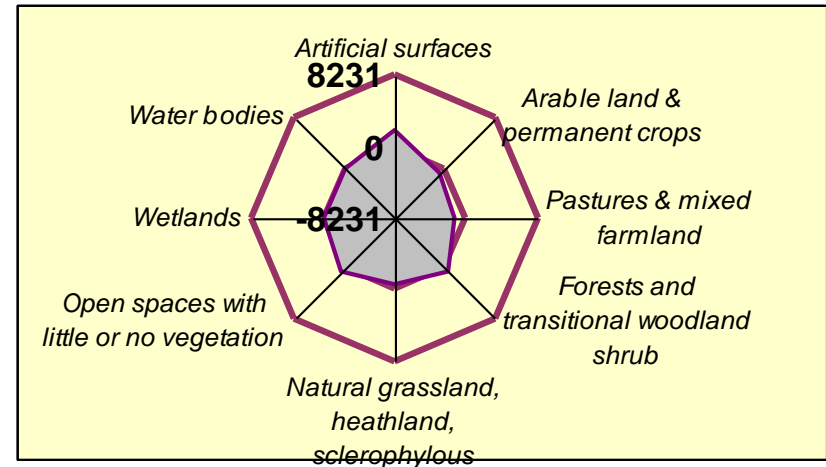


National and Regional « Net Land Cover Change » c – 3 Italian Regions 1990-2000

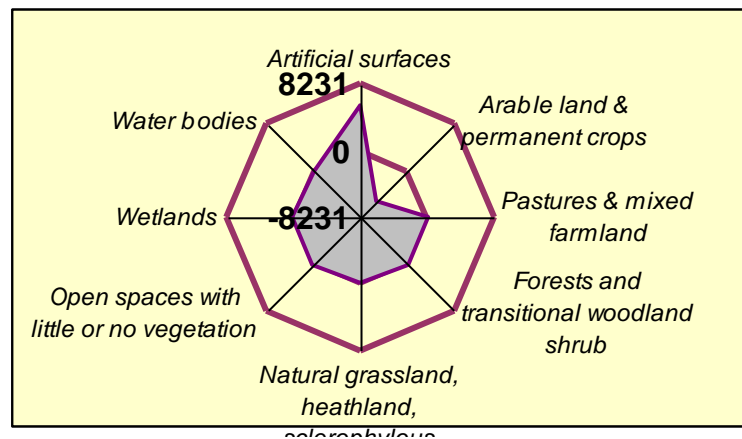
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Net land cover change 1990-2000 SARDEGNA



Net land cover change 1990-2000 BASILICATE



Net land cover change 1990-2000 LOMBARDIA

Conclusion:

- It is possible to deliver information matching better the needs (sometimes, contradictory needs) of the users in terms of thematic and geographic aggregation/disaggregation
- The EEA will not publish land accounts but is creating a **web-based data service** from which it will be possible to produce accounts (and derived maps and indicators) at any scale