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Environmental statistics, monitoring and assessment

Reflections by the European Environment Agency on the FDES Role and Revision

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Changing background (1)

- Early environmental reporting post Stockholm 1972 and the creation of the first ministries of environment
  - Statistical offices on the frontline
  - PSR reporting: StatCan, OECD (Tony Friend)
  - Policy focus on abatement of key pressures (SO2, Waste Water…)
  - First attempts at defining a systemic framework in the late 1970's (StatCan's Stress-Response System, Norwegian Resource Accounts, French Patrimony Accounts, Peskin's framework, Hueting's environment as scarcity, Ayres material-energy balances…)
  - UNECE environmental statistics manual (Kahnert), OECD statistical compendia (Averous)…
  - FDES 1984: table of contents for a collection of statistics
  - FDES 1988 Human Settlements: a unique endeavor of a social approach to the environment
  - FDES 1991 Natural Environment: a systematic integration of environmental statistics alongside the PSR sequence
  - Nature made of inventories of resources more than natural capital or ecosystems,

Changing background (2)

- Policy agenda
  - Rio 1992, Kyoto, CBD, Desertification, MDG, also Stern Report, TEEB, Beyond GDP, …search for an operational information system connecting the environmental, economic and social
  - Because first generation of environmental policies have been effective in their own without making the point, high marginal costs of increasing norms – monetary justification of policies is required
  - Integration of environmental and sector policies
- Information technology
  - Fast development of monitoring systems, space and in situ
  - Fast development of data bases, GIS, distributed interactive systems
- Demand for environmental information
  - Development of international of regional agreements requiring (detailed) data collections for compliance purposes
  - Global monitoring, GEOSS, GTOS, GCOS, GOOS, IGBP, GLP, HDEC…
  - Policy demand for assessments, indicators, outlooks, GIS, local data, fresh data
  - and now, again accounts: SEEA “as a UN standard”, Beyond GDP, Stiglitz report (social dimension)…

More attention paid to impacts and costs

- E.g. from climate change mitigation to adaptation
- E.g “Stern report” cost of inaction for climate change
- E.g. TEEB’s cost of inaction regarding biodiversity and ecosystems
- E.g. TEEB’s GDP of the Poor
- E.g. EU sustainable consumption and production policy
- E.g. enlargement of PPP to environmental liability and mitigation of impacts (EU ELD 2004)
- E.g. EEA ecosystem approach to environmental accounting

➔ Impacts on ecosystems, on human well being and on the economy

➔ Detection of impacts requires special attention to spatial and time distributions (average values may hide impacts)

➔ Measurement of costs requires institutional cooperation

The important connections

- Appropriate data collection methods
  - ➔ Questionnaires to people, institutions
  - ➔ Data bases for the physical environment
  - ➔ Cooperation statistical offices-environmental agencies/ data centers as an option

- FDES as a hub
  - ➔ Access of environmental agencies to socio-economic statistics
  - ➔ Development of environment statistics in sector statistics

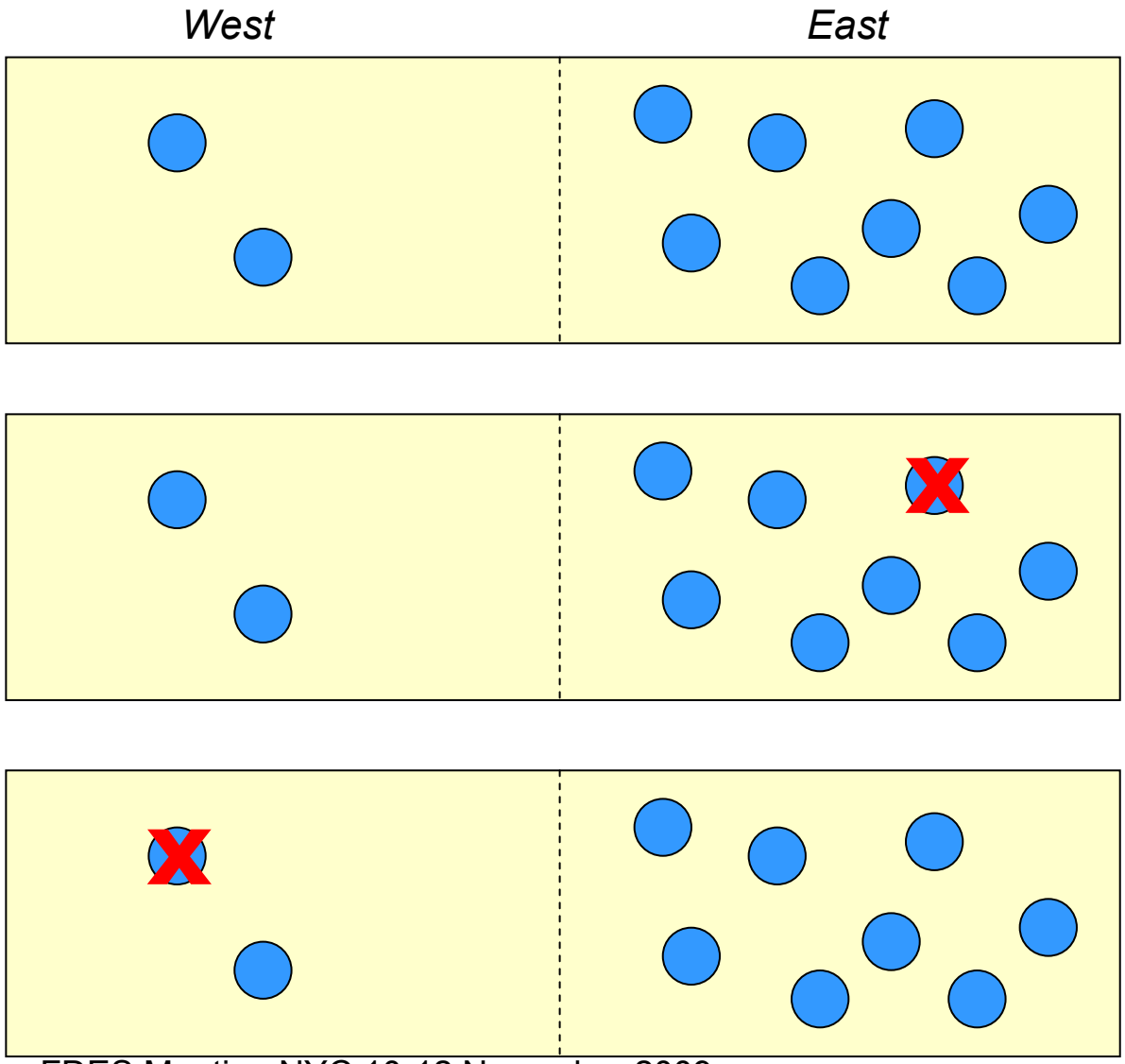
- Synthesis and communication
  - ➔ Addressing what matters
  - ➔ PSR, DPSIR and Eco-Health approaches
  - ➔ Indicators and accounts

❑ Appropriate data collection methods

Primary data sources for water accounting...

Accounting domains	Monitoring	Hydrological modelling	Statistics
Primary resource (rainfall…)	***	***	
Evapotranspiration	*	***	
Groundwater replenishment	*	**	
River run-off	***	*	
Abstraction	**	*	***
Exchanges between sectors, supply	*		***
Losses, leakage and disposal	*	*	**
Use by sectors, industries	*	*	***
Evaporation resulting from irrigation	*	**	**

Importance of collecting data by catchments – an example



The total water resource of the country **10 lakes** distributed over **2 catchments**. The western catchment with 2 lakes is close to a scarcity threshold while water resource is abundant in the eastern catchment (8 lakes).

Scenario A: 1 lake is lost in the east

Scenario B: 1 lake is lost in the west.

Resource loss of 1 lake in the **eastern** catchmen

(a) Aggregated national loss (without catchments): (10-9)% = **10%**

(b) National average of loss by catchments:

$$\frac{(2\text{-}2)\% + (9\text{-}8)\%}{2} = \mathbf{5.5\%}$$

Resource loss of 1 lake in the **western** catchmen

(a) Aggregated national loss (without catchments): (10-9)% = **10%**

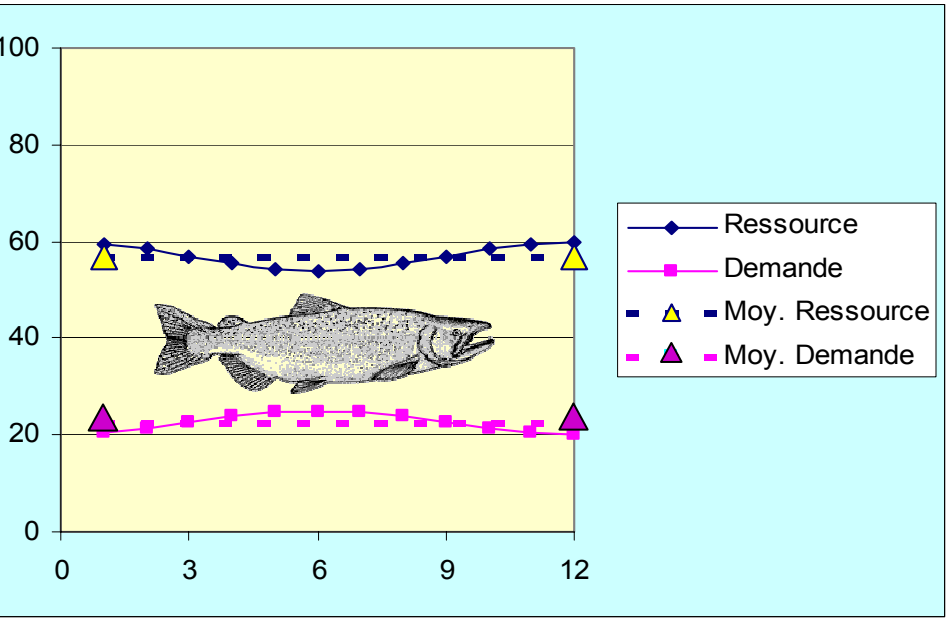
(b) National aggregation of loss by catchments

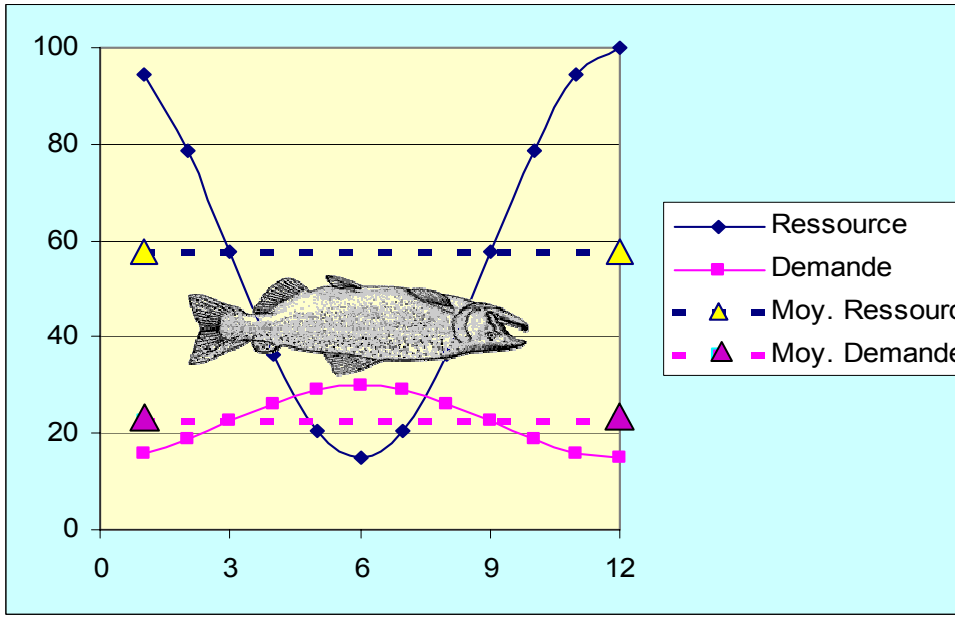
$$\frac{(2\text{-}1)\% + (9\text{-}9)\%}{2} = \mathbf{25\%}$$

Time frame: e.g. water resource/demand

Mean annual values may tell the same stories for very different conditions

(e.g. no water shortage in this river in both cases)

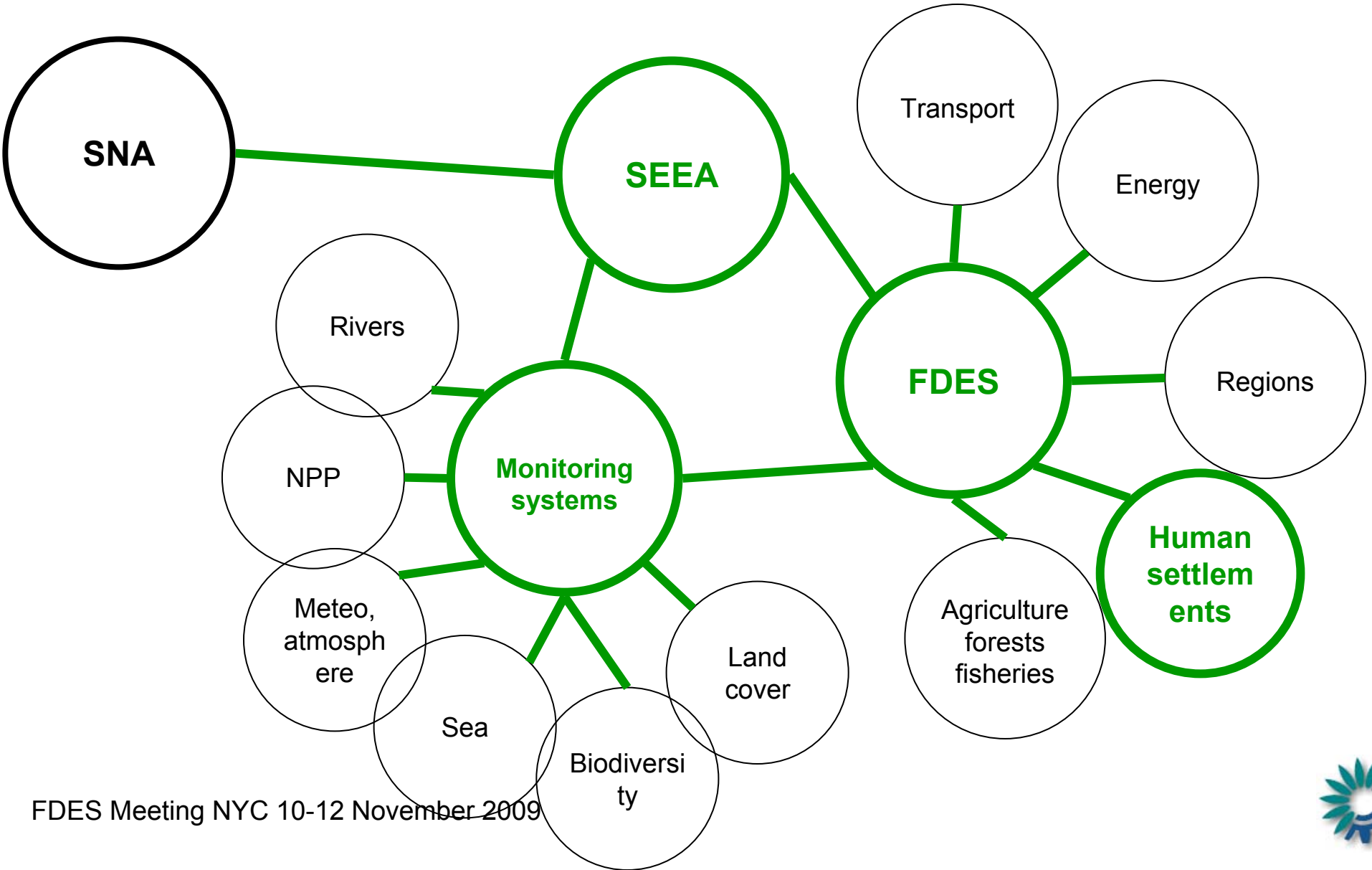




Cooperation statistical offices-environmental agencies

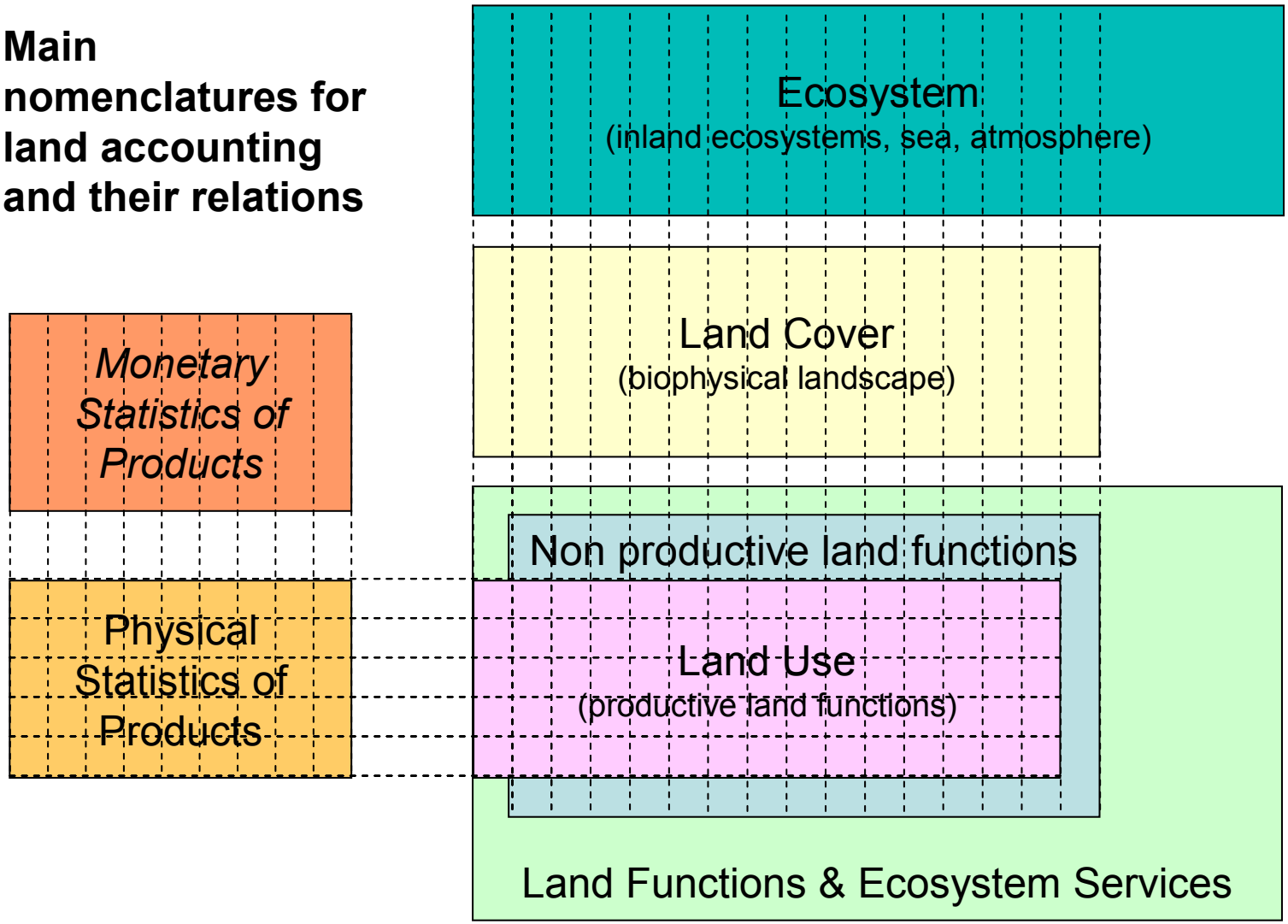
- Creation of **environmental data centers** in Europe, “Shared Environmental Information System”
- One-stop shops
- One organization leading on one subject according to best skills (**Eurostat**: Resource use, Waste; **EEA**: Water, Biodiversity, Land use, Air, Climate; **JRC**: Soil, Forests, Urban…)
- Avoid duplications in data collection, dissemination
- QA/QC
- Foster institutional cooperation between environmental agencies, statistical offices, research…
- Free access to data
- Data + query tools + information

❑ FDES as a hub


SNA
SEEA
Transport
Energy
Rivers
FDES
Regions
NPP
Monitoring systems
Human settlements
Meteo, atmosphere
Agriculture forests fisheries
Land cover
Sea
Biodiversity

Hub: Correspondence between classifications

Main nomenclatures for land accounting and their relations



Xiaoning Gong (FAO) & Jean-Louis Weber (EEA) – UNCEEA 2009

Agriculture & Ecosystem Capital: key issues

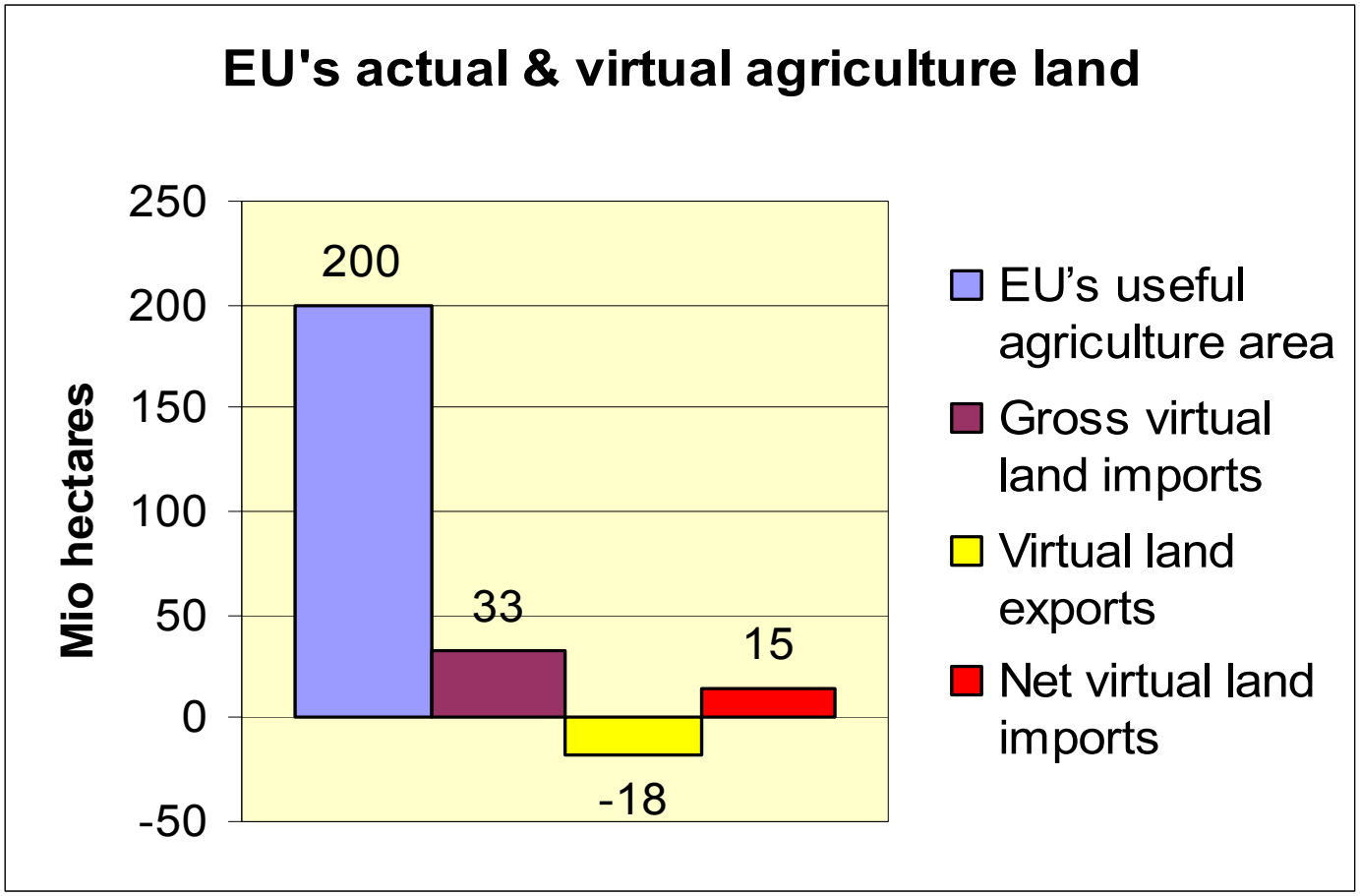
a. soil conservation
b. biocapacity
c. carbon sequestration
d. water conservation
e. sustainable agricultural landscape
f. biodiversity conservation
g. conversion of marginal land to agriculture
h. conversion of forest to agriculture
i. conversion of agriculture land to artificial land cover
j. farmland abandonment
k. desertification
l. dependency from inputs
m. dependency from (external) markets
n. resilience to pests
o. capacity of feeding local populations

Expected contribution of agriculture statistics to simplified ecosystem accounts

	Key issues	Monitoring and modeling	Statistics, censuses, samplings
Landscape ecological potential	d., f., g., h., i.	Satellites (land cover at various scales), GIS (roads, protected areas)	Land use, sustainable practices
Net primary ecosystem production (biomass, Carbon) related to land potential	a., b., c., k.	Satellites, 1 km² cells (fAPAR, NPP, NEP, HANPP), soil monitoring	Crops, animal stocks, soil
Overall biodiversity index	e.	Species monitoring	Cultivated species diversity
Exergy potential of water systems	d.	Water monitoring, meteo, satellites (humidity)	Rain fed agriculture, irrigation (as water dissipation)
Dependency from artificial inputs (works, energy, water, chemicals, subsidies, income...)	l., m.	Satellites (irrigation)	Irrigation (as limiting factor), energy, chemicals use, subsidies to crops, GMOs, imported and exported crops
Aptitude at supporting healthy populations	n., o.	Species monitoring	Food supply, access to clean water of rural populations, farmers income, health statistics

+ statistics on additional maintenance & restoration costs: remediation, costs of best practices…

International Trade: Virtual land use & agriculture footprints



Source: Manel Van der Sleen, 2009

+ associated virtual water, virtual carbon emissions (CO2, CH4…)

❑ Synthesis and communication

- Meet recurrent policy demands for aggregates…
- Deliver clear and simple messages
- Give free access to data
- Need working on an integrated framework
- Interactions (impacts and feed-backs) between the socio-economic system and the ecosystem should be at the core of such integration
- Example of simplified ecosystem accounting based on basic accounts and indicators – currently discussed in Europe

Framework for Simplified Ecosystem Accoun

Implementation priorities

Expenditure accounts	Sectors	Land protection & management	Water protection & management	Carbon/ biomass Protection & management	Biodiversity protection	Health protection	Agriculture & fishery subsidies
Basic physical balances	Sectors	Land Use (surfaces & commodities)	Water resource, supply & use	Carbon/ biomass resource, supply & use	*Fishing, hunting, harvesting of wild species (non cultivated)*	*LCA: impacts of chemical,, on human and wildlife health*	*Virtual land, water, and carbon use (domestic and in imports)*
	Services	Land functions & ecosystem services	Water functions & ecosystem services	Carbon/ biomass functions & ecosystem services	*Biodiversity related ecosystem services*	*Human morbidity/ environment & food security*	*Dependency from regulating ecosystem services*
	Spatial Units	Land cover stocks & change	Water bodies resource & abstraction	Carbon/ biomass resource and extraction/ harvesting	Natural and semi-natural habitats & species distribution	*Distribution of critical areas for health*	*Water, C, energy, NPK, subsidies*
Health counts	Spatial Units	Landscape patterns	Water quantity & quality	Carbon/ Biomass, productivity	Biodiversity factors	*Ecosystem health factors*	*Net external balances by socio-ecosystems*
Indexes	Spatial Units	**Landscape Index** *(the Landscape Ecological Potential)*	**Water Index** *(exergy loss from evaporation & pollution)*	**Carbon/ biomass Index** *(carbon, biomass, diversion from Nature)*	**Biodiversity Index** *(rarefaction, loss of adaptability)*	**Health Index** *(human, wildlife and plants populations)*	**Dependency Index** *(land, soil, energy, water, N,P,K...)*

Maintenance/ Restoration Costs

mean €

Ecosystem capital depreciation

Φ degradation

Change in Total Ecological Potential

Tak!

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