Valuation of damage to ecosystems due to air pollution

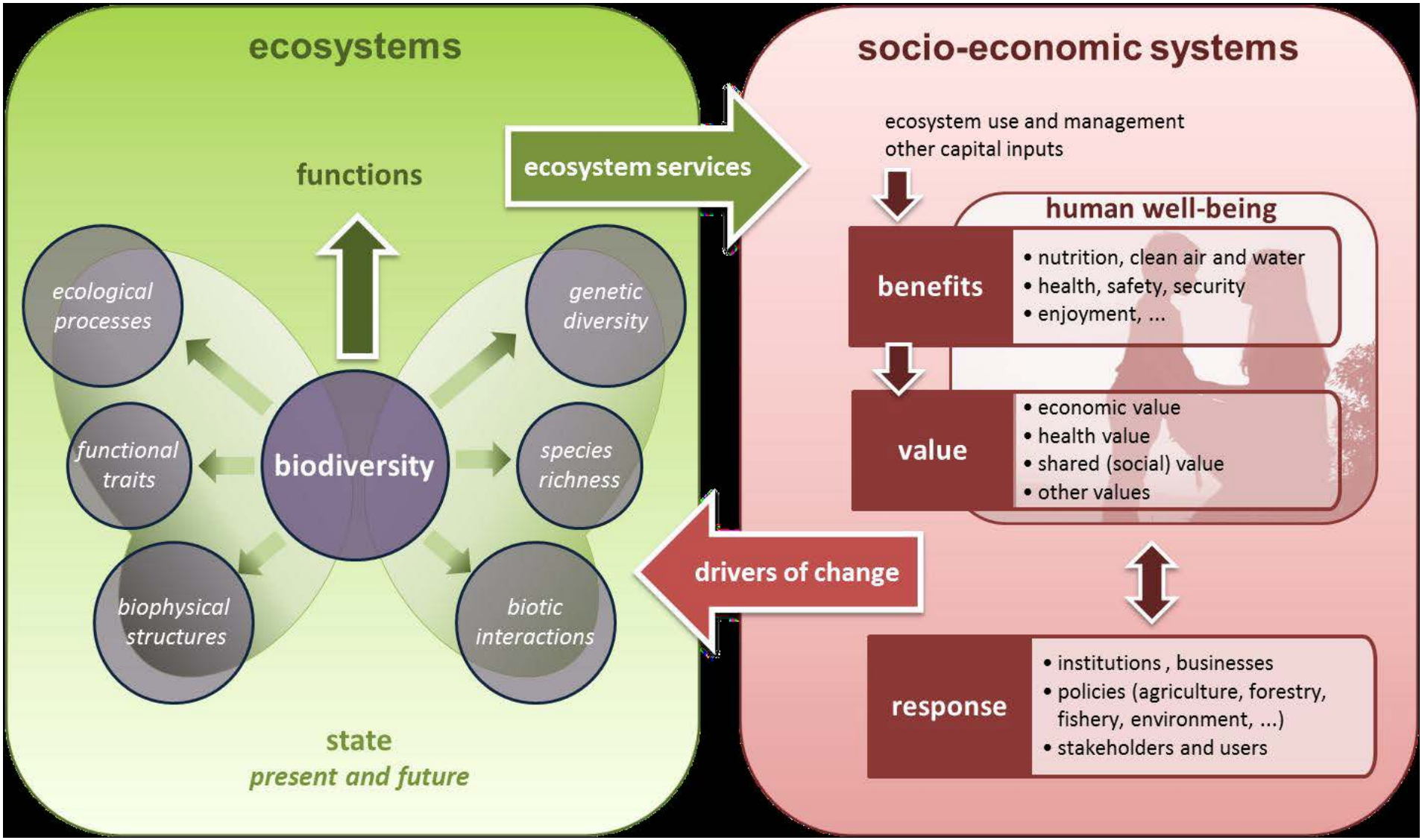
TFIAM/NEBEI – workshop
Zagreb 24-25 October 2013

Introduction - Rob Maas

The Economics of Ecosystems and Biodiversity (TEEB)

And it's for free !

MAES-framework (EC, april 2013)



What is nature worth?

What are we willing to pay for nature conservation?

- *Inventories among the public to protect habitats or species*

  → *wishful answers?*

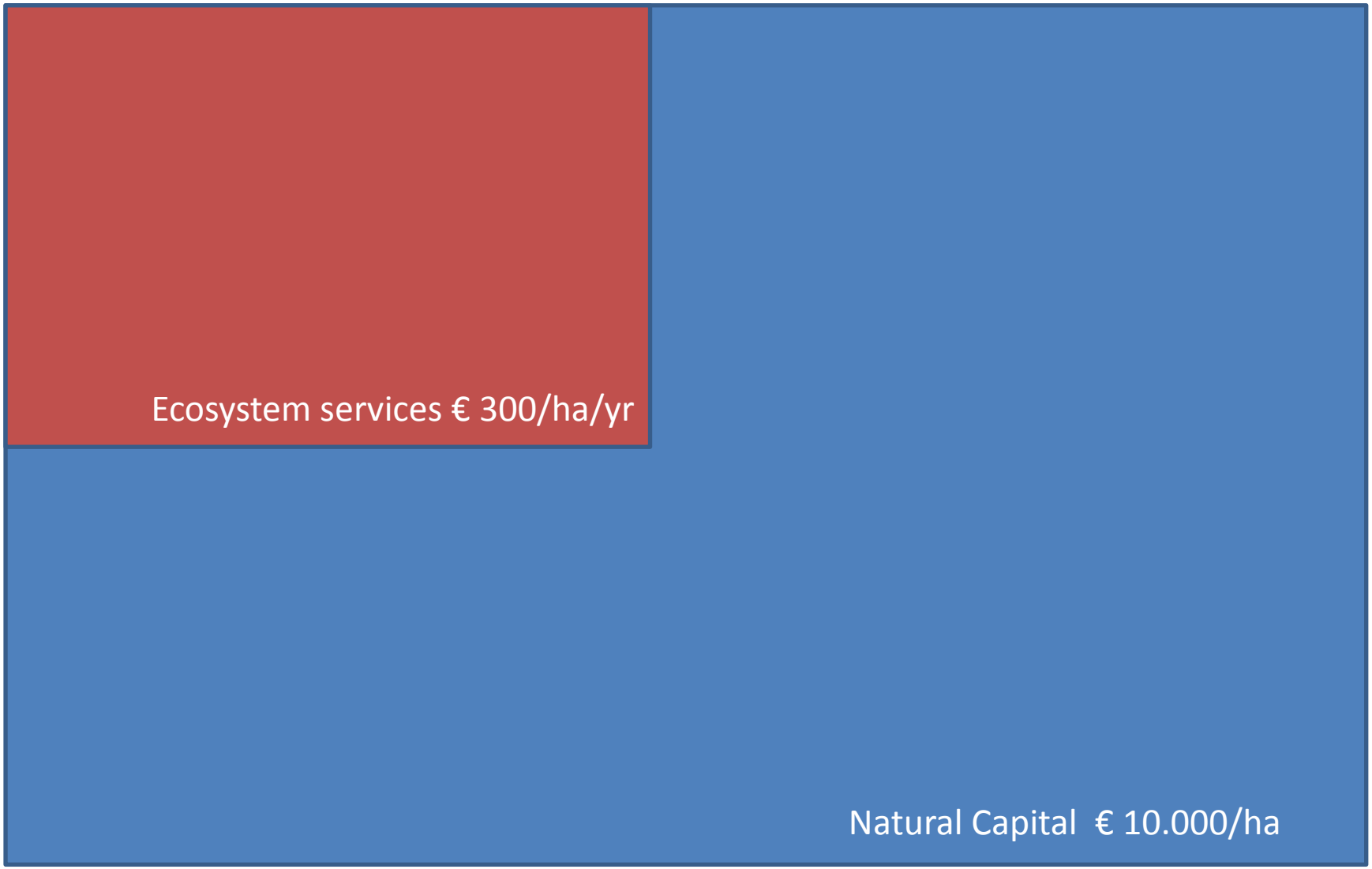
  → *If not, how to get the money flowing?*

- *Revealed preference by nature groups or governments*

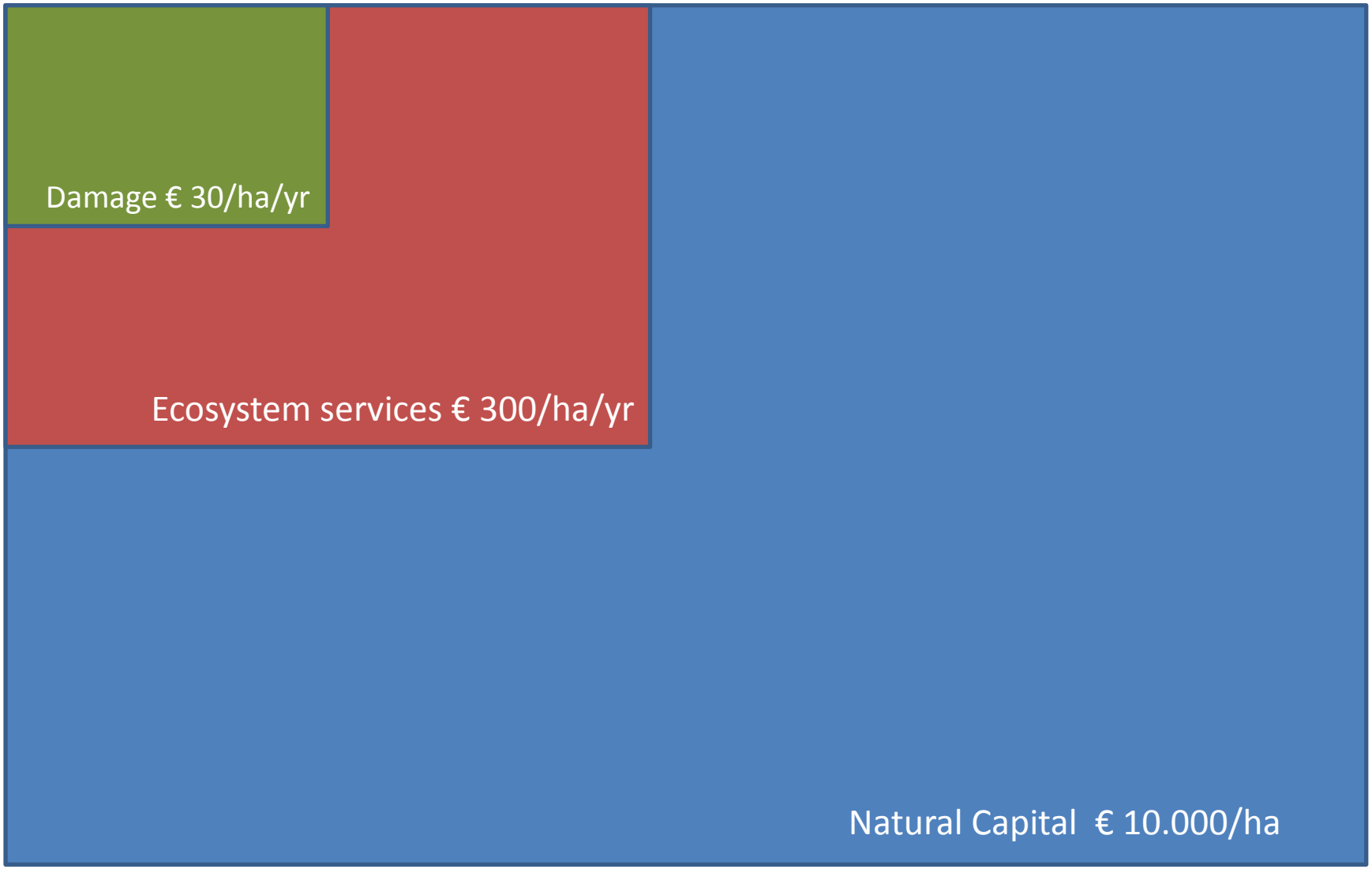
  → *what are we actually paying now?*

Stocks, flows, damage and benefits

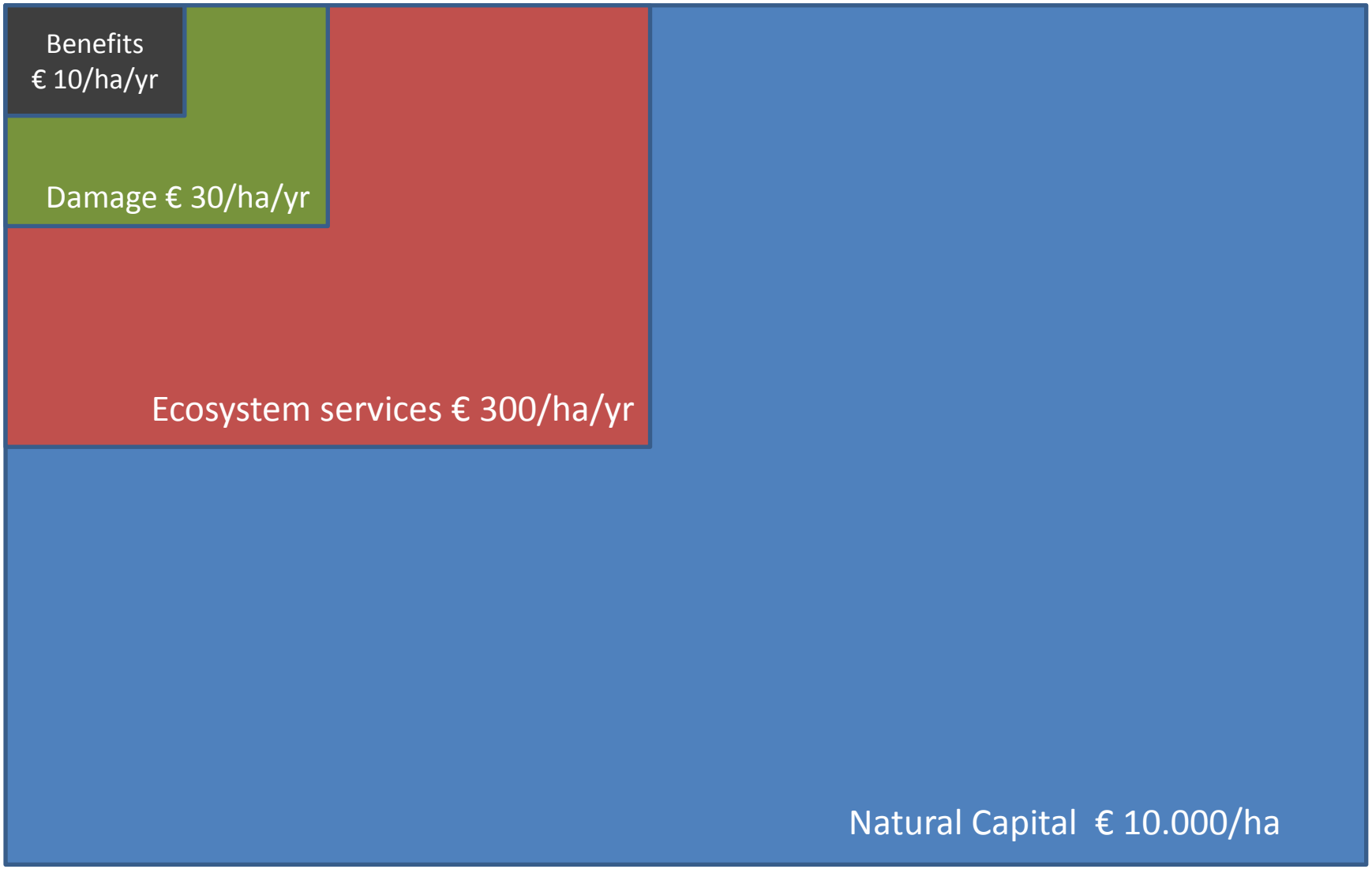
Stocks, flows, damage and benefits



Stocks, flows, damage and benefits



Stocks, flows, damage and benefits



Damage = costs of policy inaction

1. Less ecosystem services (for free)
   (Oxygen production, carbon storage, pollination, species diversity, human health → how to value?)

2. Higher costs for wood-, food-, water-production and recreation
   (costs of substitution of nature by techno-economic activity)

3. Higher costs of restoration of nature areas
   (for Natura2000 areas a 'favourable conservation status' is required; up to € 5.000 ha/yr depending on level of CL-exceedance – NEEDS 2006)

4. Higher mitigation costs around nature areas

Questions to be answered

1. How can we value ecosystem services?

   (Stefan Astrom …. Bent-Arne Saether)

2. What do we know about the damage to ecosystem services?

   (Harry Harmens/Jean-Paul Hettelingh)

3. What is the state-of-the-art in valuing damage due to air pollution?

   (Mike Holland, Jesper Bak, Lars Hein, national experiences)

What do we need?

1. Bold assumptions to get ecosystem damage (and especially biodiversity) into CBA

2. Sensitivity analysis if there are multiple options

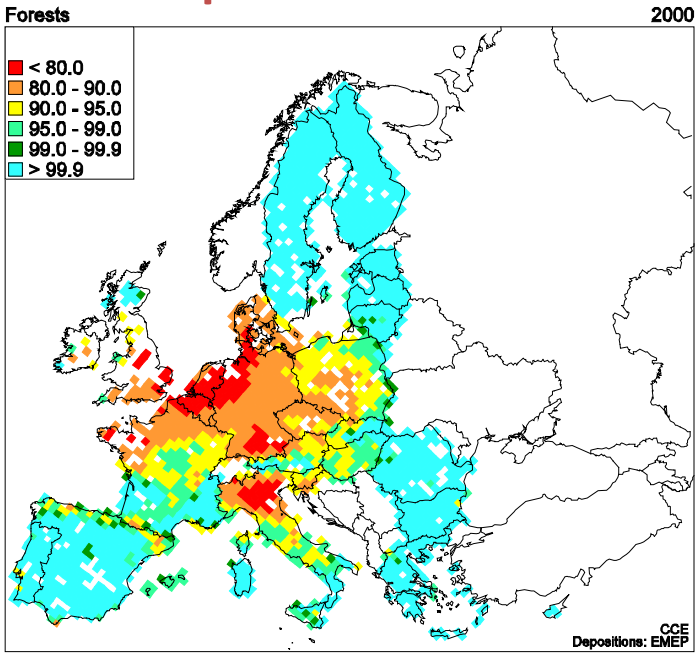
Existence value of species & ecosystems

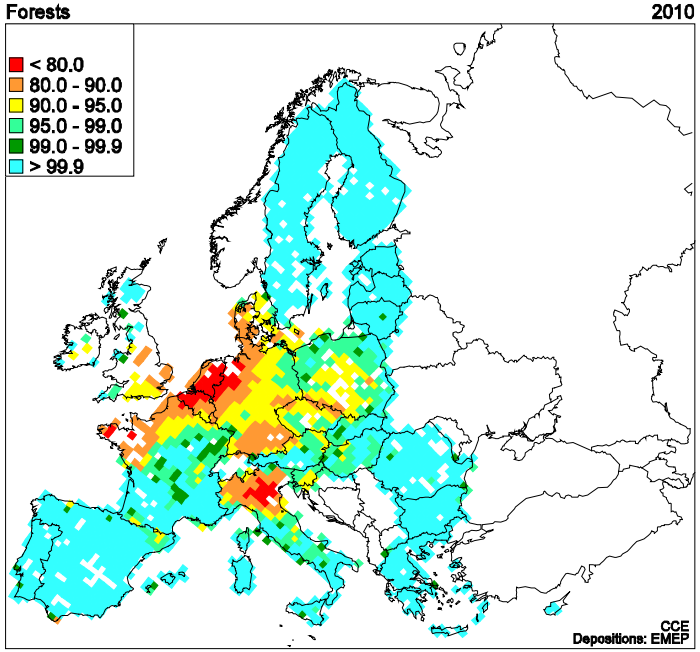
Genetic and Species Diversity	Value Ranges (per Person per Annum)
Single Species	5 – 126US$
Multiple Species	18 - 194US$
Ecosystems and natural habitat diversity	27 - 101US$

Table 1: Value Range for Biodiversity Estimates by CVM (Nunes & van den Bergh 2001)

Plant species diversity in Natura 2000 areas

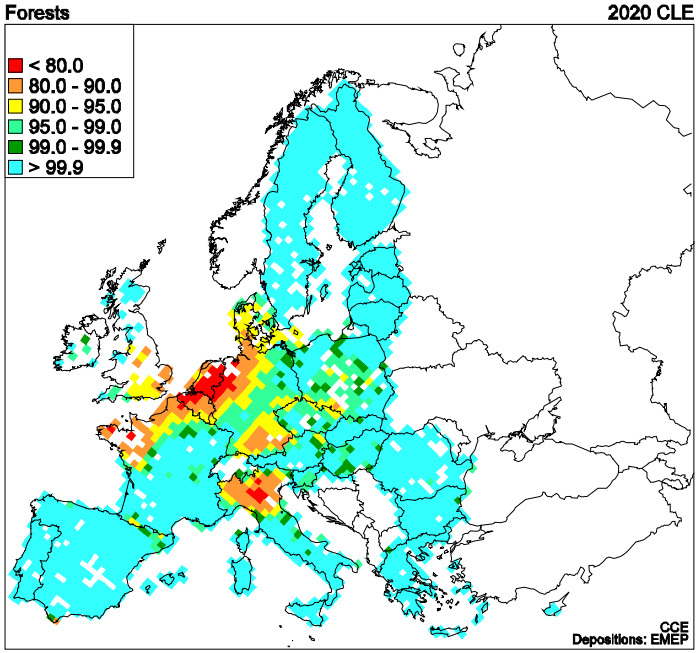
2000

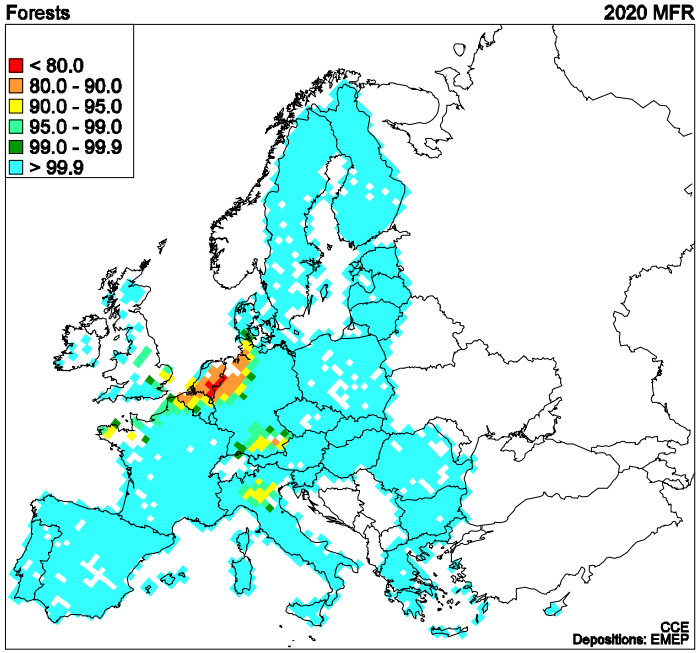




2010 Current Policy

2020 Current Policy





2020 Maximum Feasible N emission reduction

Source:CCE Status Report 2008

What will be risks?

- *If ecosystem benefits are lower than the costs of action, should we refrain from taking action?*

- *If ecosystem benefits are higher than the costs of action, can we leave nature protection to the free market?*

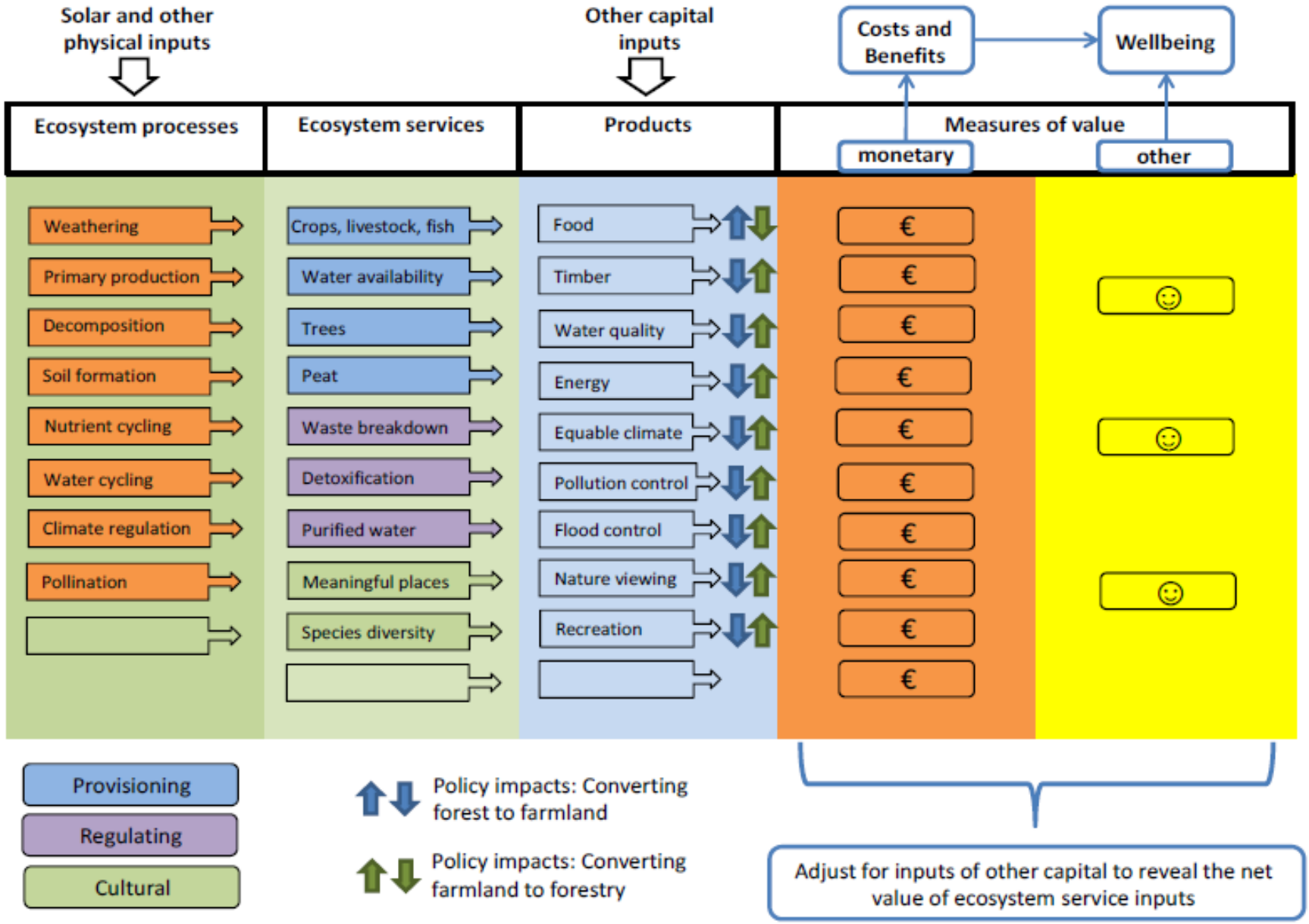
Applicable valuation methods (TEEB –EU, 2013)

Services	Valuation Methods	Comments on Valuation Methods
Provisioning		
Crops/timber		Most ecosystem services of agro-ecosystems will be capitalized in land prices. They should be adjusted for specific capital investments, such as for irrigation and drainage. Bio-economic modeling (production function method) can be used to estimate the value added of the provisioning service vis-à-vis other necessary input factors.
Livestock		
Wild foods		The market price of a close-substitute food or fuel might be a fair proxy. The cost of production should be subtracted.
Wood fuel		
Capture fisheries		The production function method is preferred, see Barbier (2007). Otherwise (adjusted) market prices can be used as a rough proxy, but the cost of other inputs to production should be subtracted.
Aquaculture		
Genetic		Appropriate market prices are for example license fees for prospecting. An alternative valuation method is based on the costs of alternatives approaches to recover genetic information.
Fresh water		Market prices (if available), shadow prices (through production function method).
Regulating		
Pollination		Bio-economic modeling, accounting for the other input factors, including pollination is recommended. Alternatively, expenditures for alternative pollination technologies (replacement cost) might be used.
Climate regulation		The preferred cost-based method is 'damage cost avoided'
Pest regulation		Expenditure on manufactured pest regulation products (replacement cost) might be used
Erosion regulation		The preferred cost-based method is 'damage cost avoided', i.e. the loss in revenues as a result of soil erosion.
Water regulation		Avoided expected damage costs of floods and droughts; revealed or stated preference methods might be used to estimate the willingness to pay to avoid these expected damages
Water purification		Replacement cost might be used (see e.g. Chichilnisky and Heal, 1989), i.e. the costs of water purification by (often) public utilities or private drinking water companies.
Hazard regulation		Avoided expected damage cost; revealed or stated preference methods might be used to estimate the willingness to pay to avoid these expected damages (accounting for risk aversion).
Cultural		
Recreation		Methods include travel cost methods, contingent valuation, choice experiments
Aesthetic		Methods include hedonic price methods, contingent valuation, choice experiments

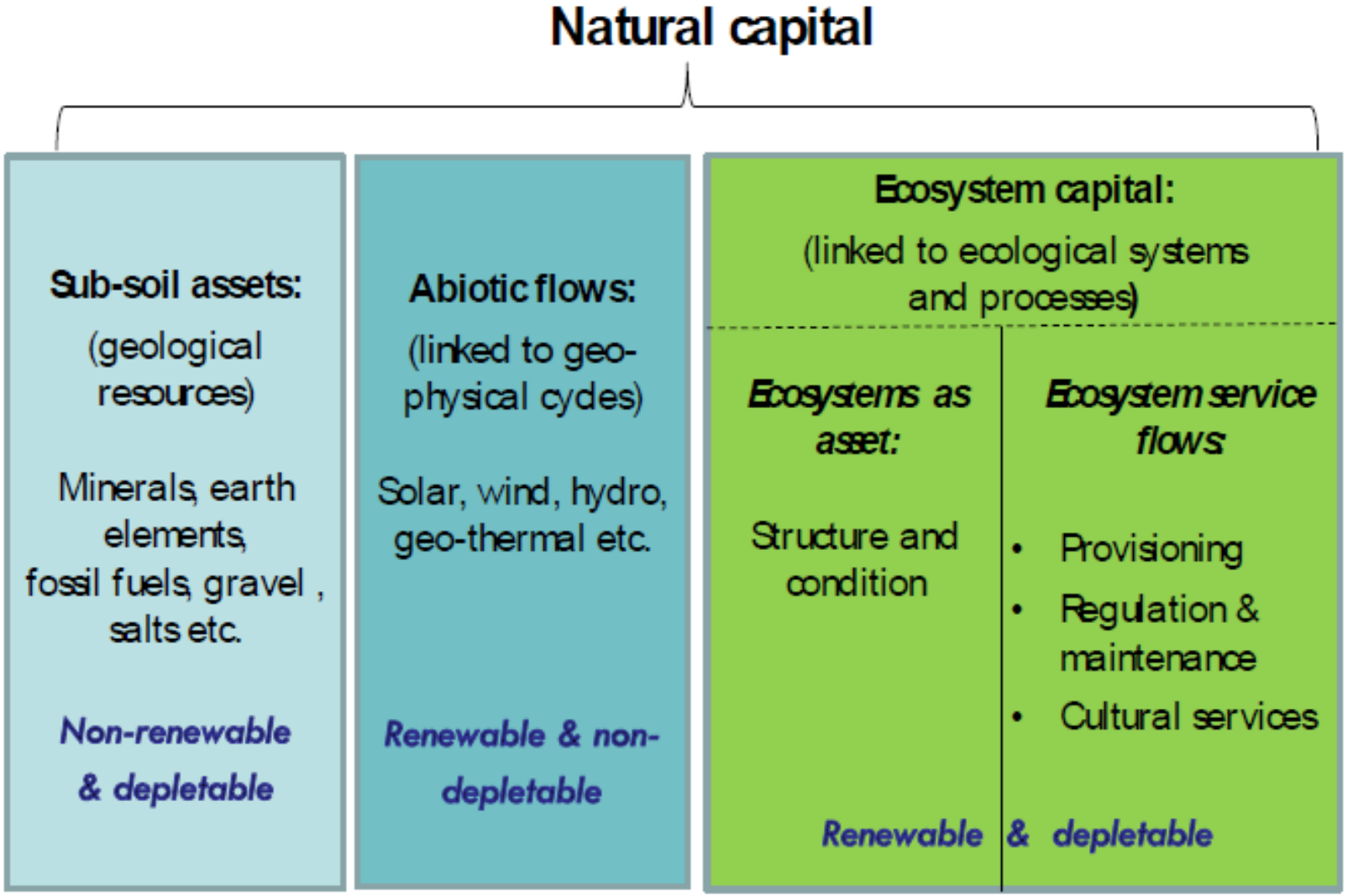
- Market price based methods ((adjusted) market prices, net factor income,)
- Production function methods
- Cost-based methods
- Revealed preference methods (travel cost method, hedonic price methods)
- Stated preference methods (contingent valuation, choice experiments)

Conceptual framework for the economic assessment of policies incorporating ecosystem service flows

n Bateman et al., (2011), Mace et al., (2011) and UK NEA (2011).



Components of Natural Capital:



Northern Brandenburg (Germany): effects of atmospheric deposition