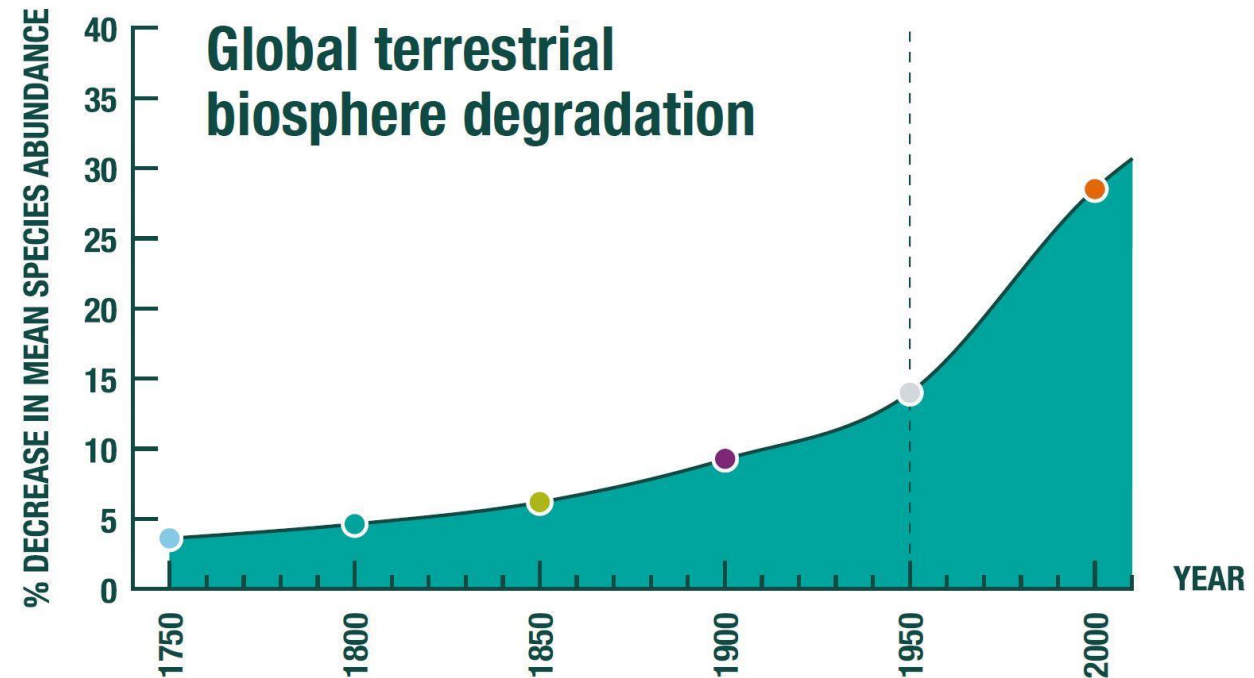
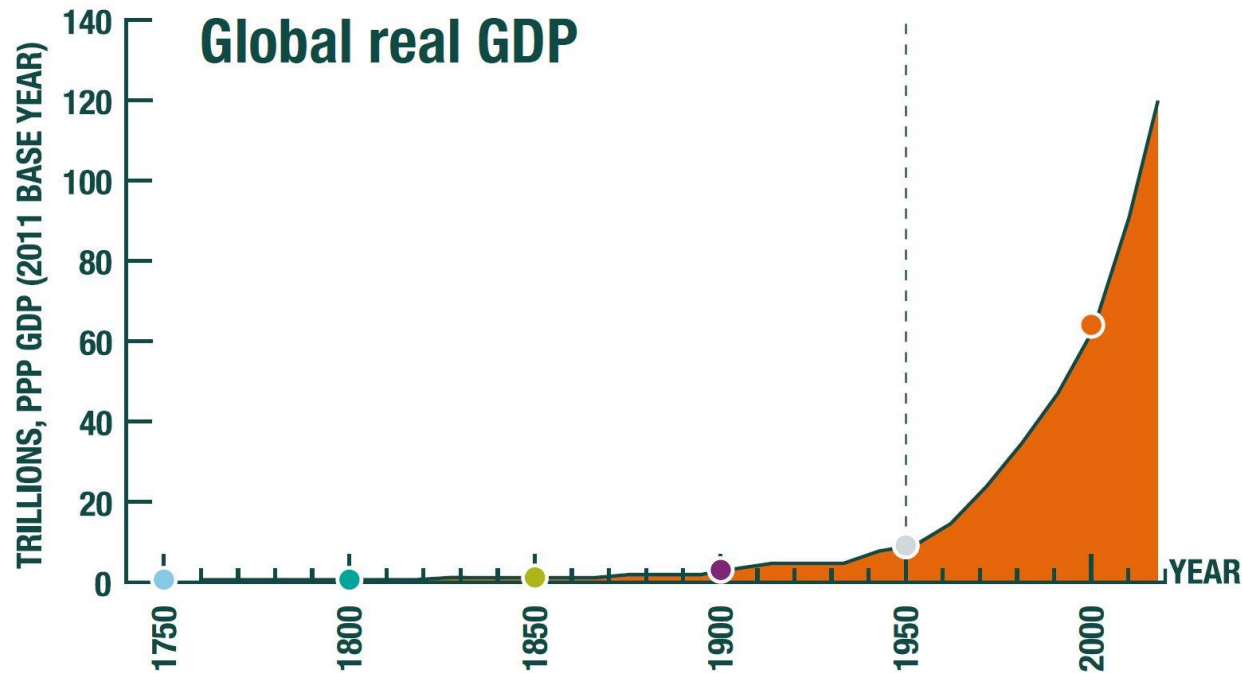


Ecosystem accounting and biodiversity

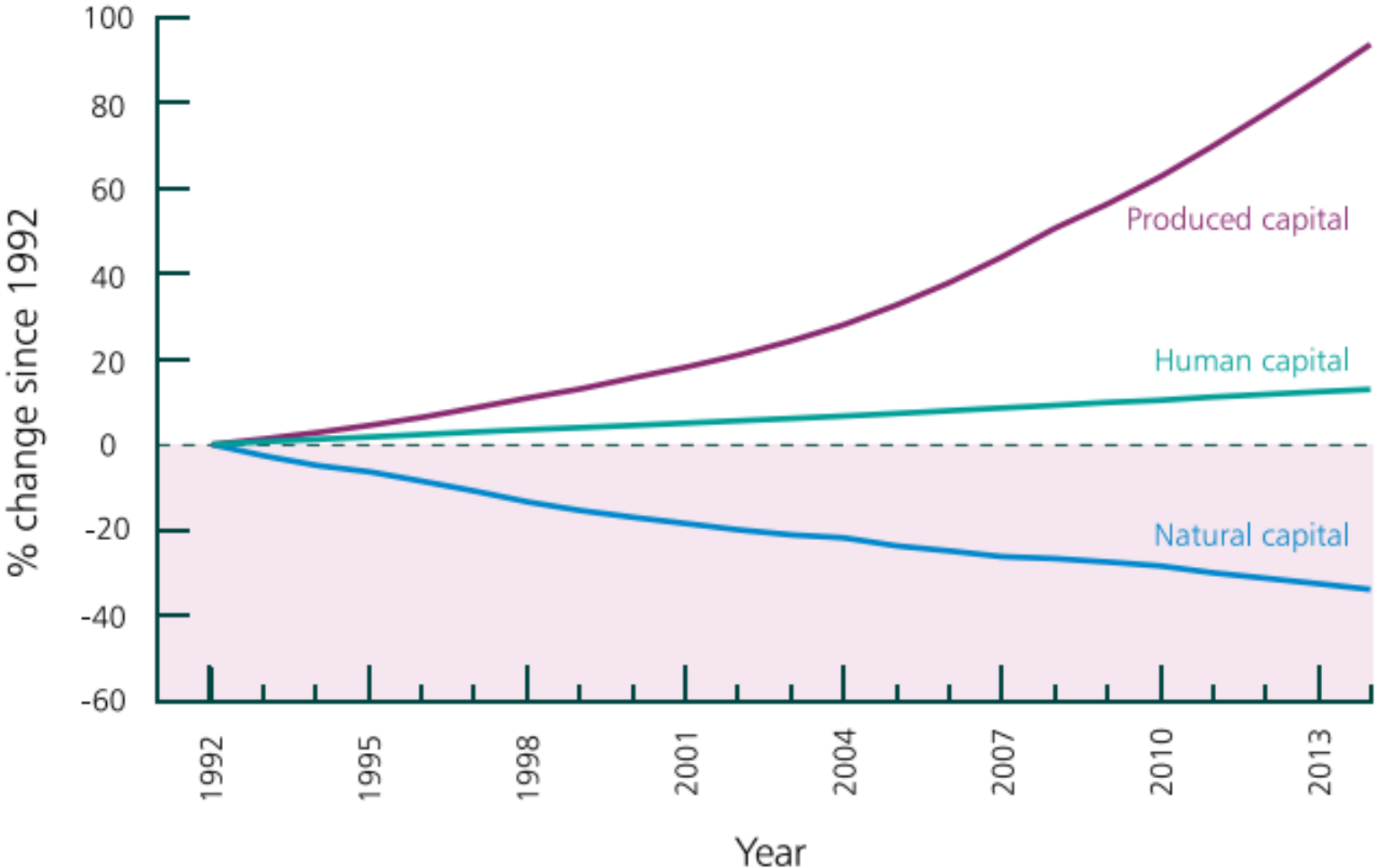
Alejandro Caparrós

Centre for Environmental and Energy Economics
Department of Economics, Durham University

Dasgupta review: It has been the best of times; and the worst of times



The Dasgupta Review



Source: Managi and Kumar (2018).

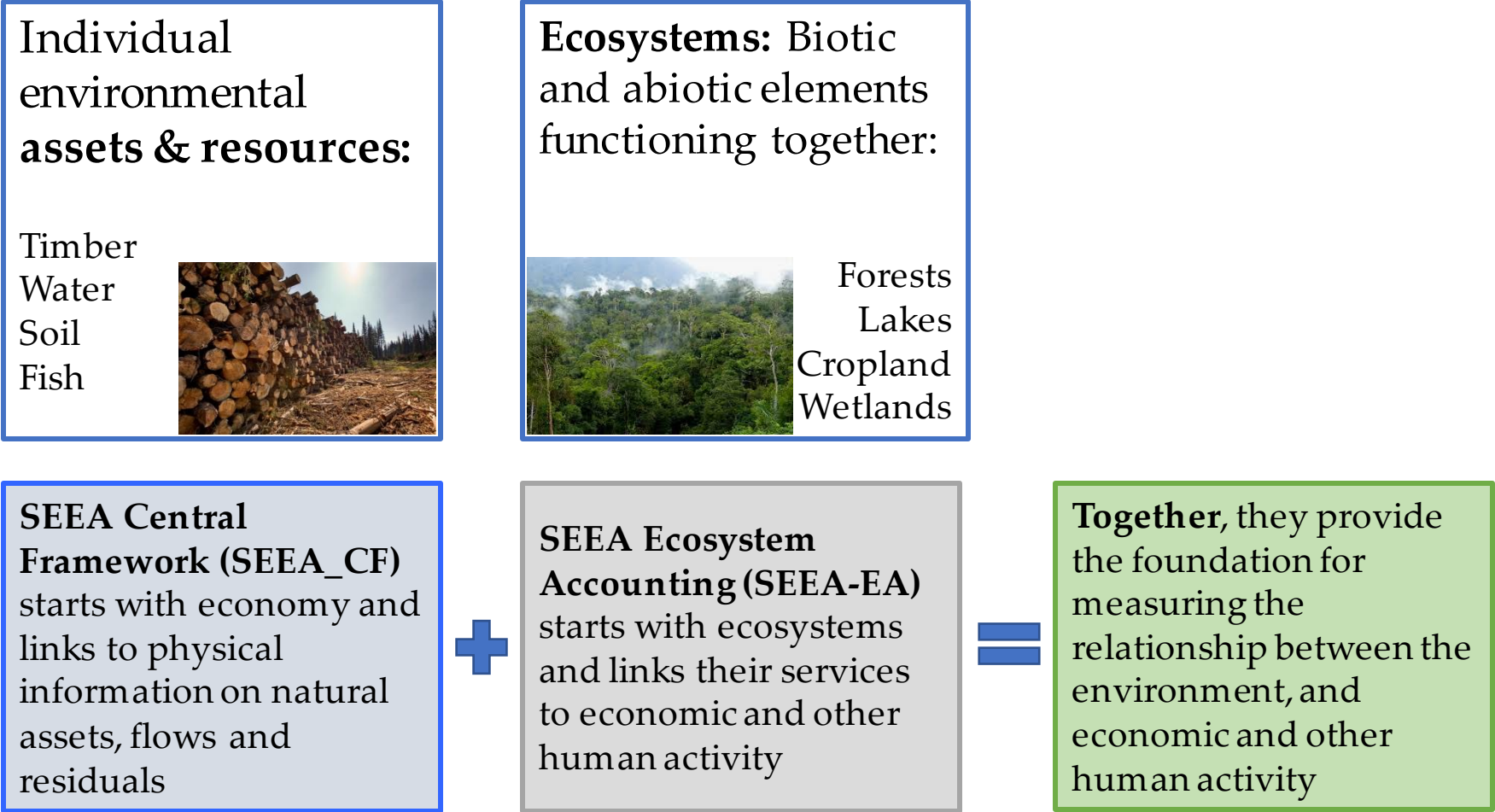
We need more detailed and systematic information

- Millennium Ecosystem Assessment, The Economics of Ecosystems and Biodiversity (TEEB), The Dasgupta Review
- To manage our natural resources, we need systematic, periodic and spatially explicit detailed information, on biodiversity but also on associated economic values

System of Environmental-Economic Accounting (SEEA) – United Nations

- **SNA:** main indicator of economic activity is GDP (exchange values)
- **SEEA Central Framework:** adopted as an international statistical standard by the UN Statistical Commission in 2012
- **SEEA Ecosystem Accounting:** adopted as an international statistical standard by the UN Statistical Commission in 2021 for biophysical accounts, and as a set of recommendations for monetary accounts

Natural Capital Accounting



Source: SEEA

SEEA

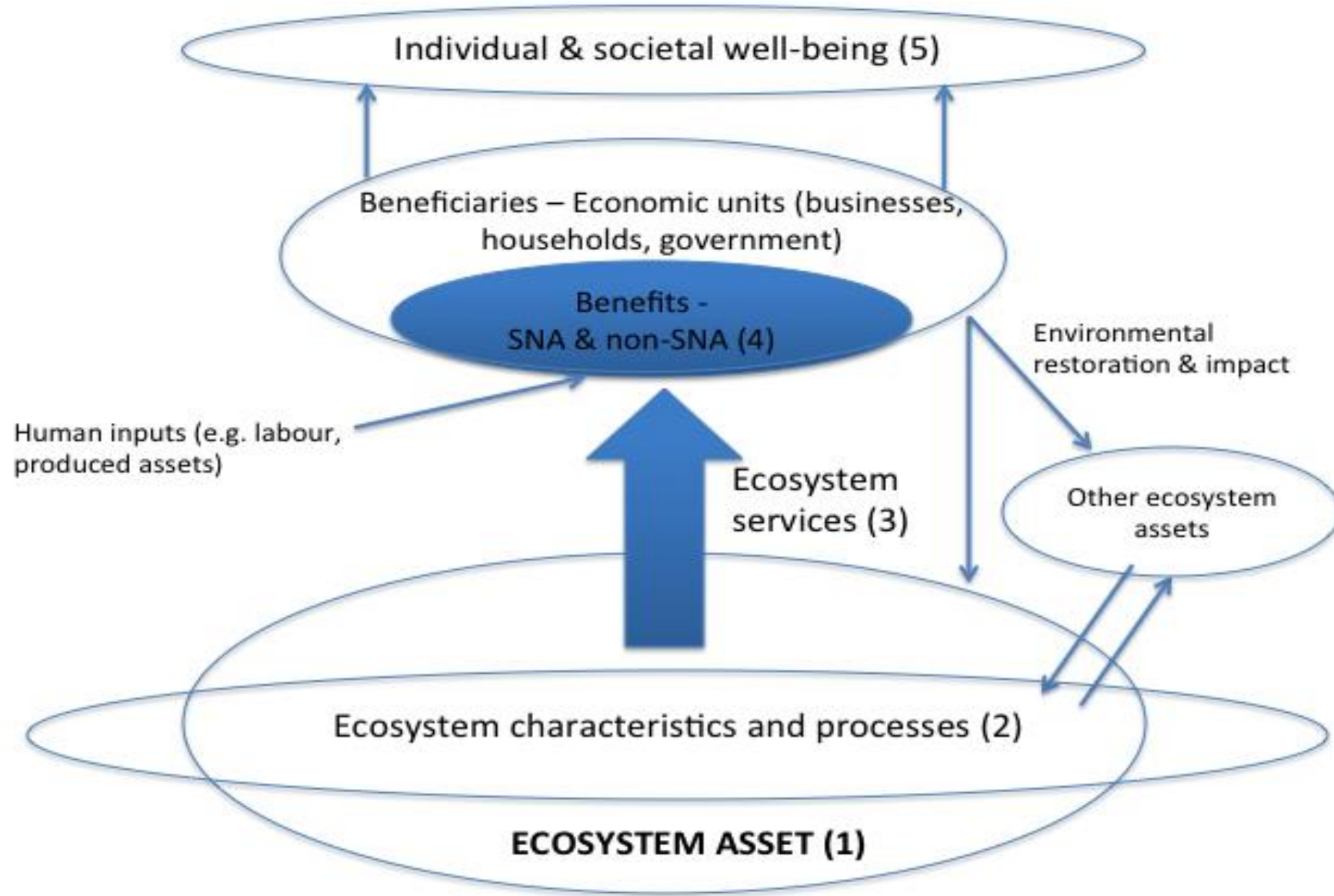
SEEA-CF (Central Framework)	<ul style="list-style-type: none"> • Assets • Physical flows • Monetary flows 	<ul style="list-style-type: none"> • Minerals & Energy, Land, Timber, Soil, Water, Aquatic, Other Biological • Materials, Energy, Water, Emissions, Effluents, Wastes • Protection expenditures, taxes & subsidies
SEEA Water; SEEA Energy; SEEA Agriculture, Forestry and Fisheries	Add sector detail	As above for <ul style="list-style-type: none"> • Water • Energy • Agricultural, Forestry and Fisheries
SEEA-EA (Ecosystem Accounting)	Adds spatial detail and ecosystem perspective	Extent, Condition, Ecosystem Services, Thematic: Carbon, Water, Biodiversity

Source: SEEA



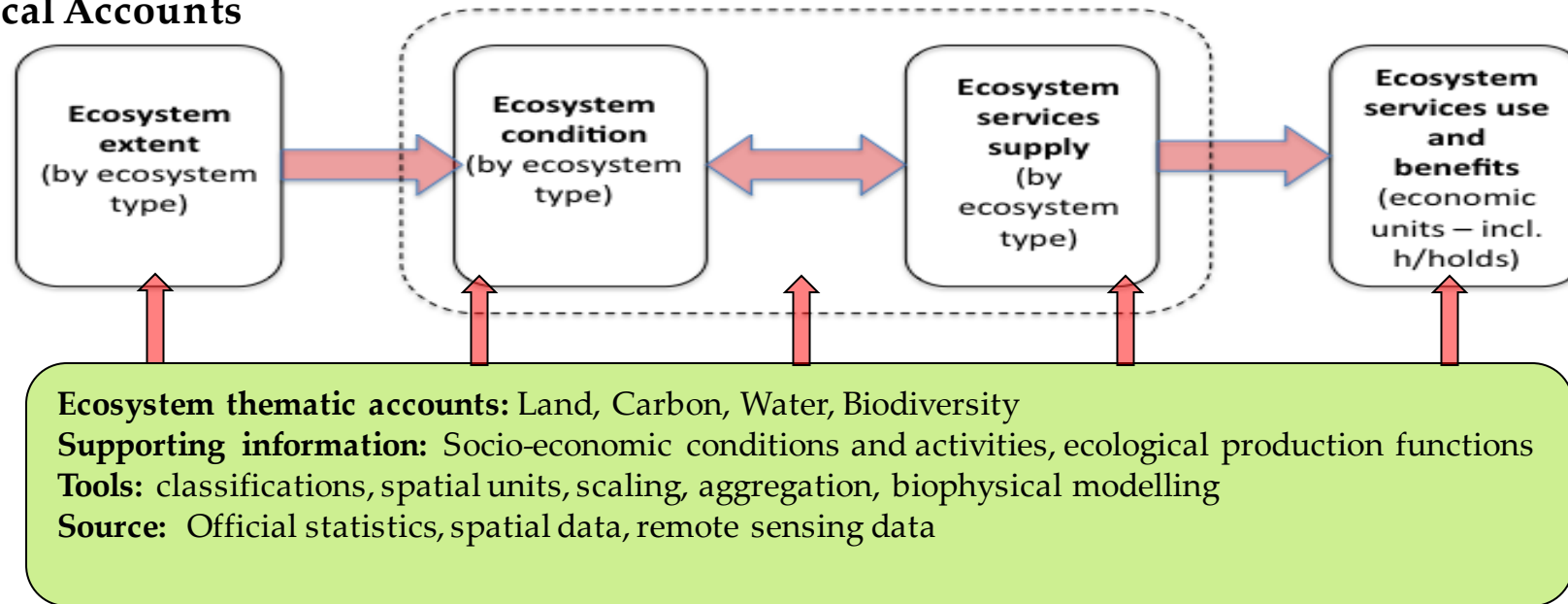
source: PBL, RIVM, WUR, CICES 2014

Ecosystem Accounting model

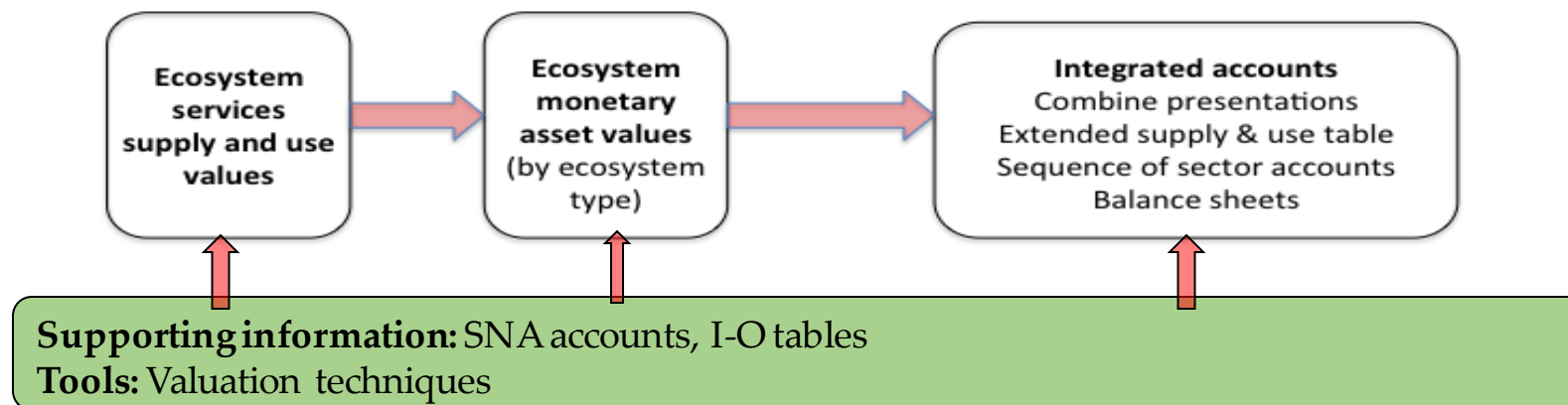


Broad steps in ecosystem accounting

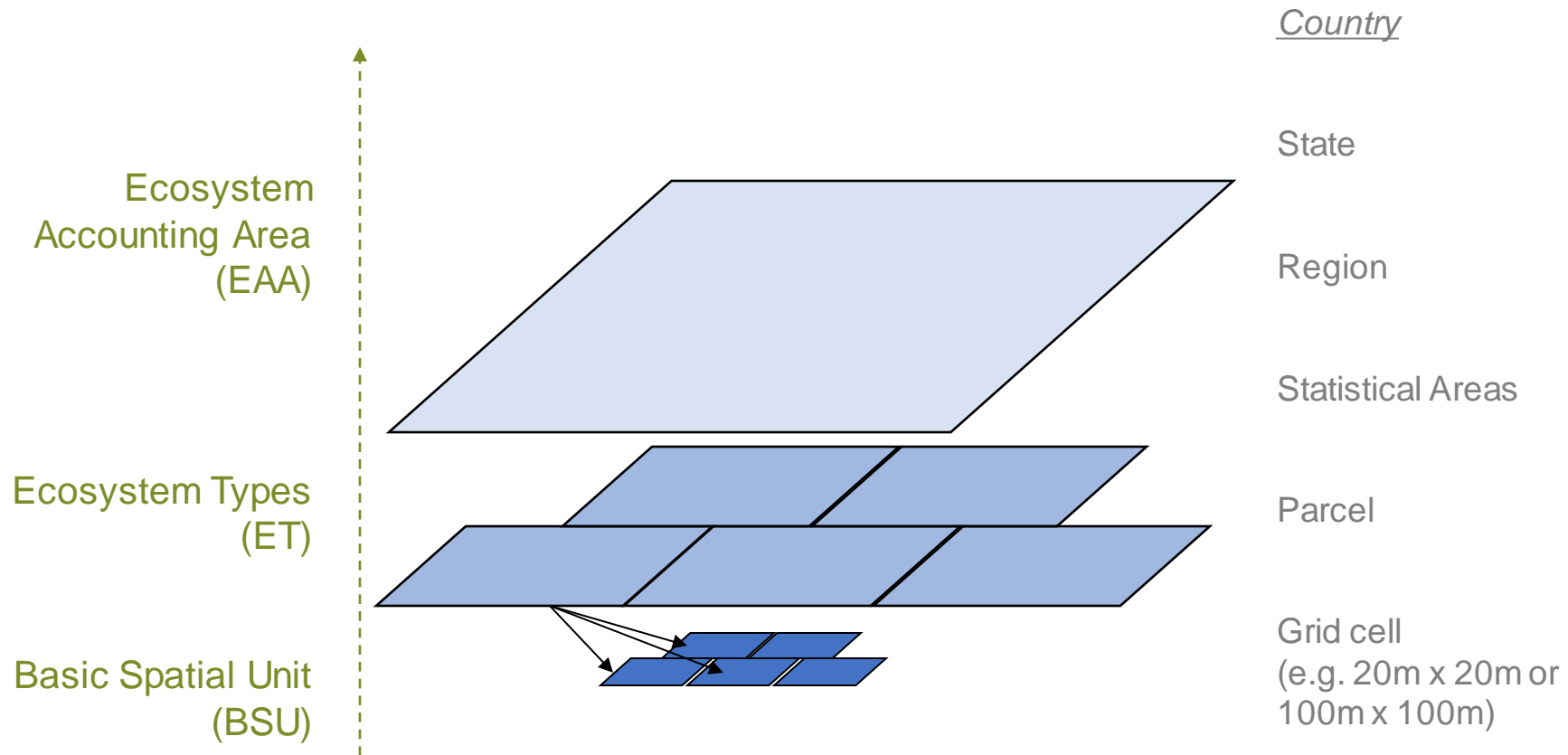
a. Physical Accounts



b. Monetary Accounts



Hierarchical (nested-grid) aggregation



Countries that have compiled SEEA EEA accounts



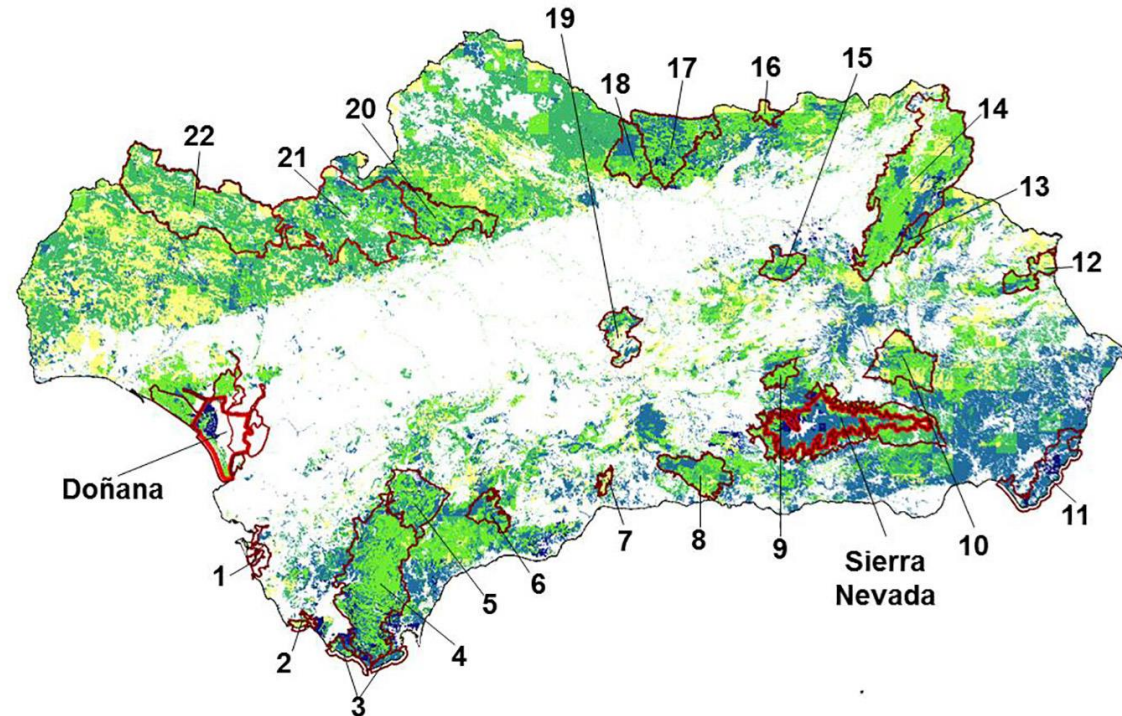
Pilot Applications: Andalusia (Spain)

Biophysical biodiversity indicators

Source: Diaz et al. (2020)



Conservation value indicator

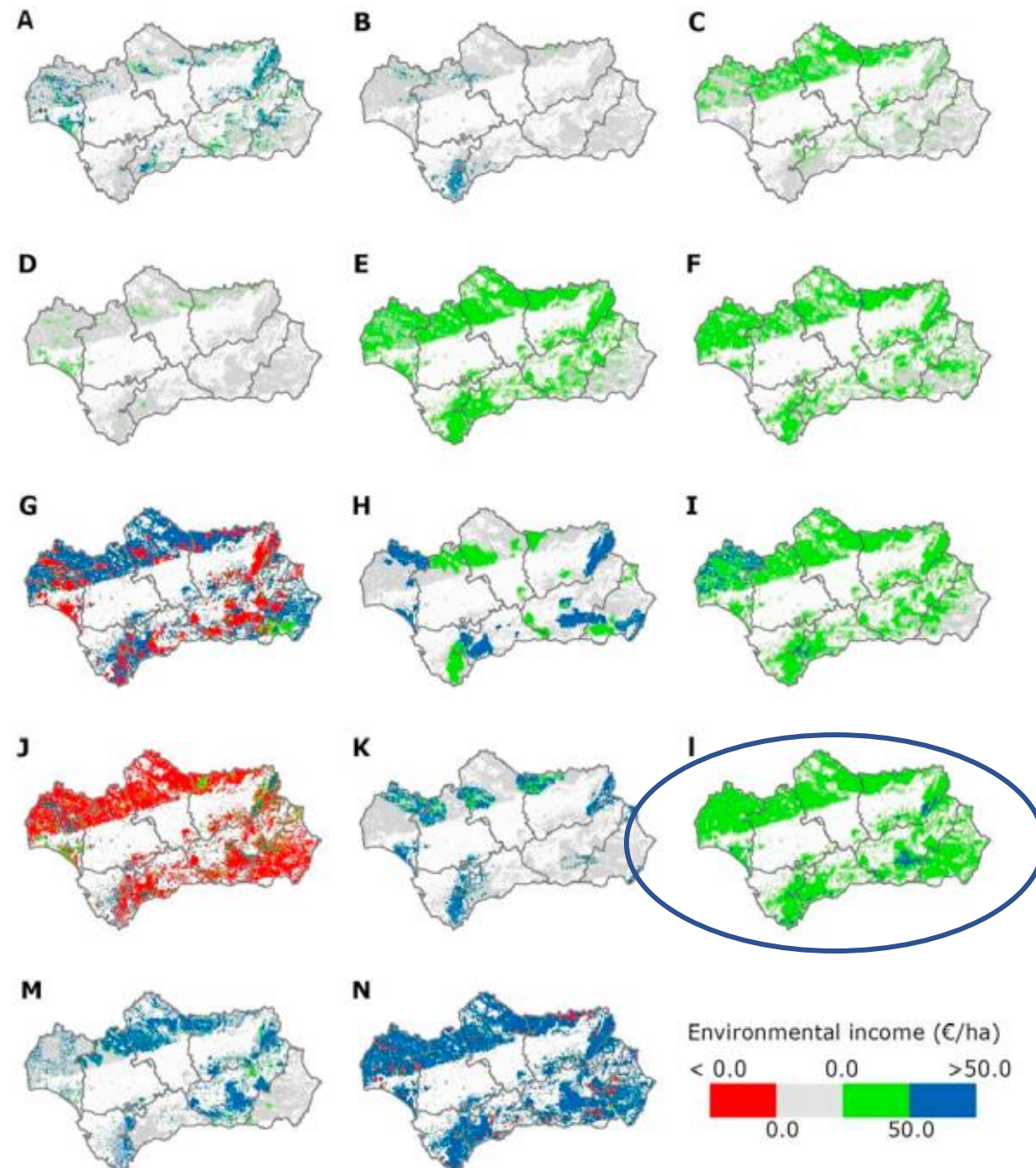


Pilot Applications: Andalusia (Spain)

Environmental income (monetary)

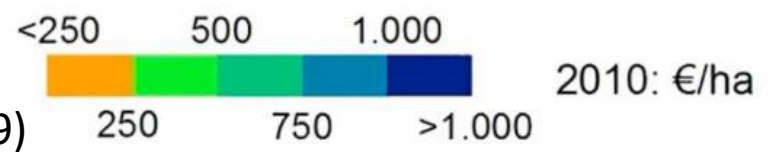
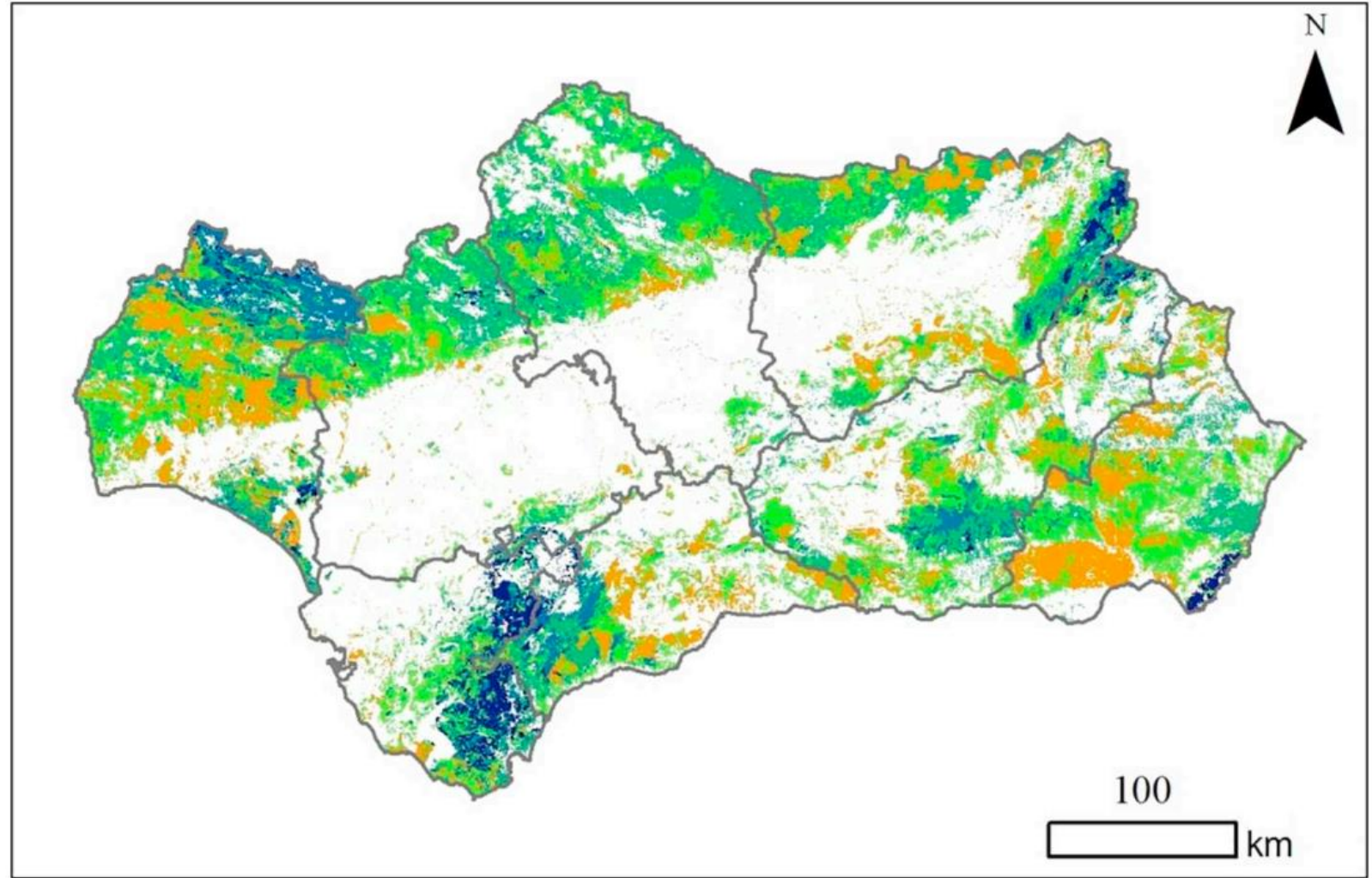
A is timber, B is cork, C is firewood, D is nuts,
E is grazing, F is hunting, G is private amenity,
H is public recreation, I is mushrooms,
J is carbon, K is landscape, L is biodiversity,
M is water and N all products.

Source: Campos, Caparros, Oviedo et al. (2019)



Pilot Applications: Andalusia (Spain)

Ecosystem services (monetary)



Source: Campos, Caparros, Oviedo et al. (2019)

Reforestation with cork-oaks and carbon sequestration (south-west of Spain)

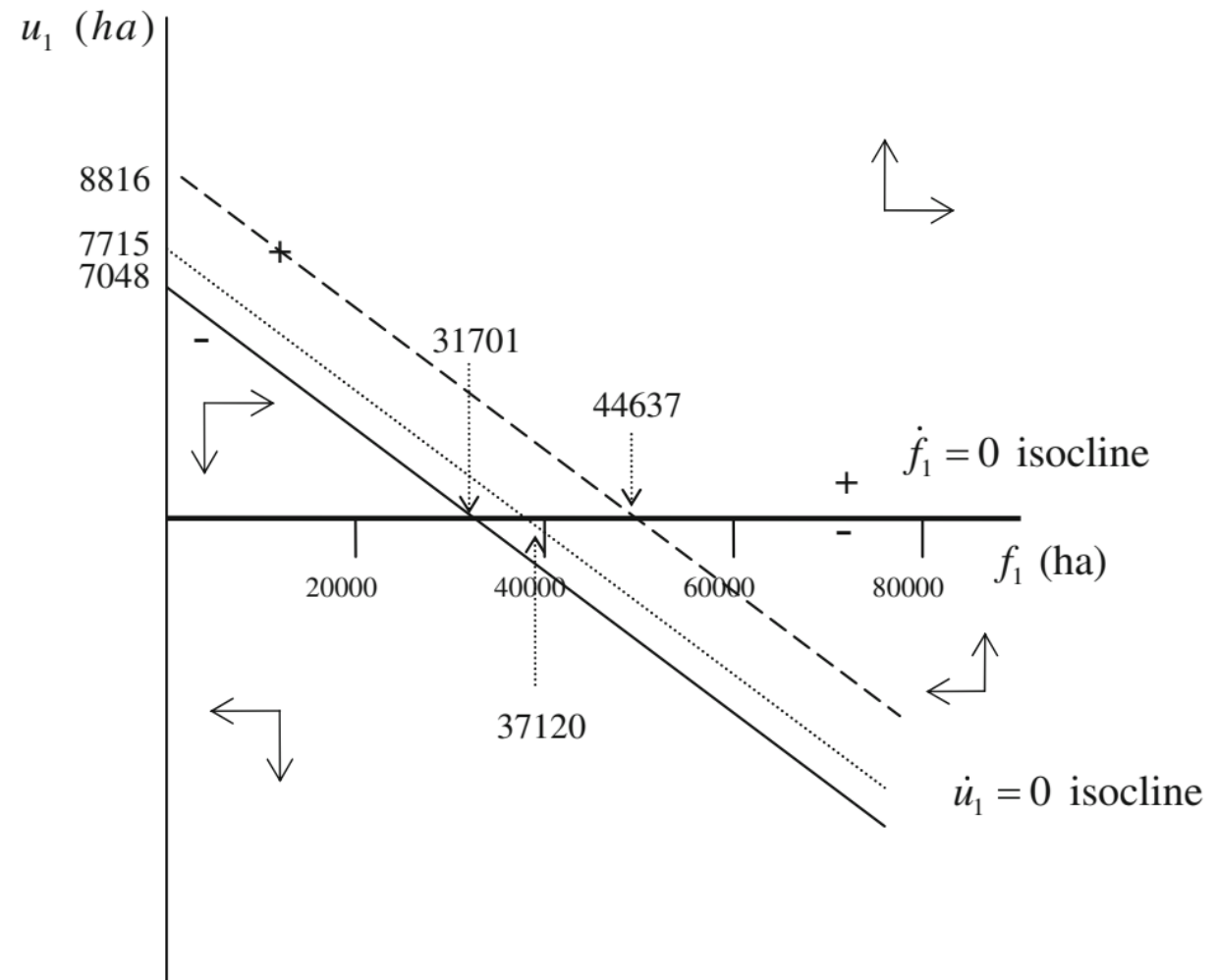


Fig. 2 Phase-diagram for reforestation with cork-oaks. For the $\dot{u}_1 = 0$ isocline the full line is with commercial values plus subsidies; the dashed line adds carbon sequestration values internalized using the CFM method; and the dotted line adds carbon sequestration values internalized using the TYAM method. Carbon price: 50€/tC

Source: Caparros et al. (2011). ERE.

Cork-oak vs eucalyptus considering carbon-sequestration and biodiversity values

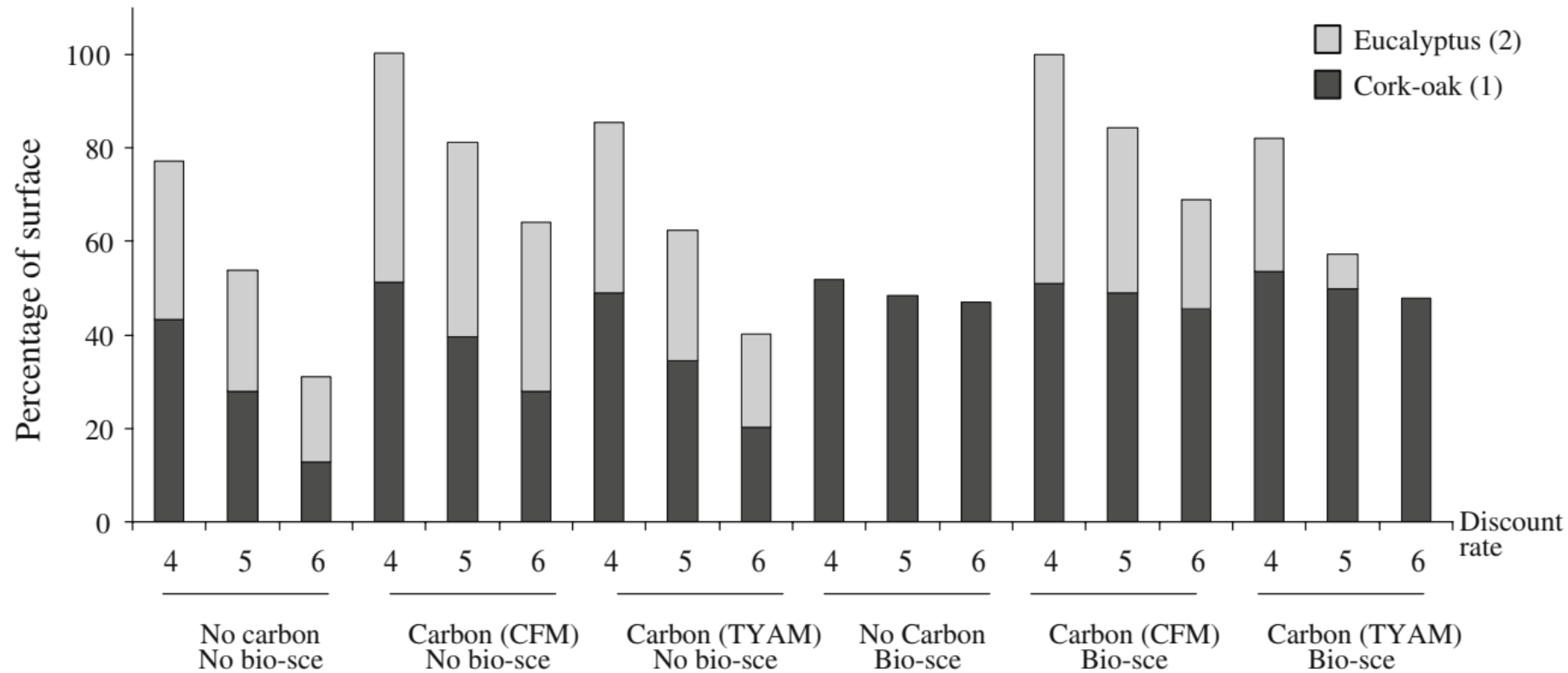


Fig. 4 Sensitivity of equilibrium values of surface reforested with cork-oaks and eucalyptus to discount rates under total or partial internalization of different environmental values (carbon price: 50€/t/C)

Source: Caparros et al. (2011)

Biodiversity conservation – Real Options

- Kassari and Lassere (2004) Species preservation and biodiversity value: a real options approach. JEEM
 - Numerical illustration
- Leroux, Martin and Goeschl (2007) Real options in biodiversity conservation. PAMM and mimeo
 - Based on E. Bulte, D.P. v. Soest, G.C. v. Kooten and R.A. Schipper, Forest conservation in Costa Rica when nonuse benefits are uncertain but rising. American Journal of Agricultural Economics **84**, 150-160 (2002).
 - Calibrated for Costa Rica. Two parameters: biodiversity value per unit of land and biodiversity value trend

Business and Natural Capital Accounting Study: Quarry restoration by Holcim – Spain

Report of the NCAVES Project

Johan Lammerant

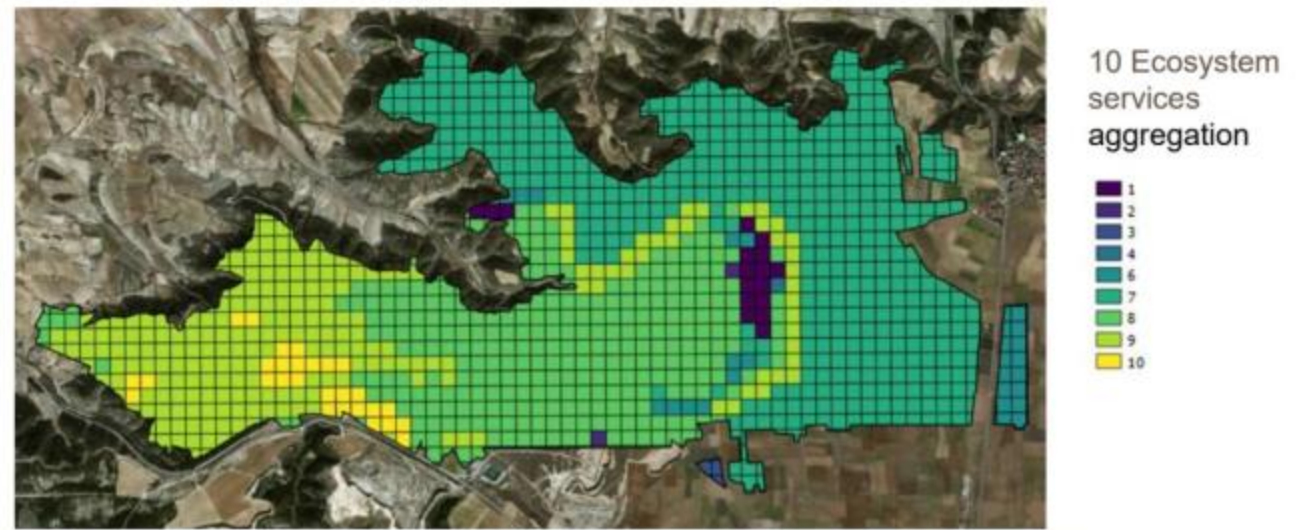
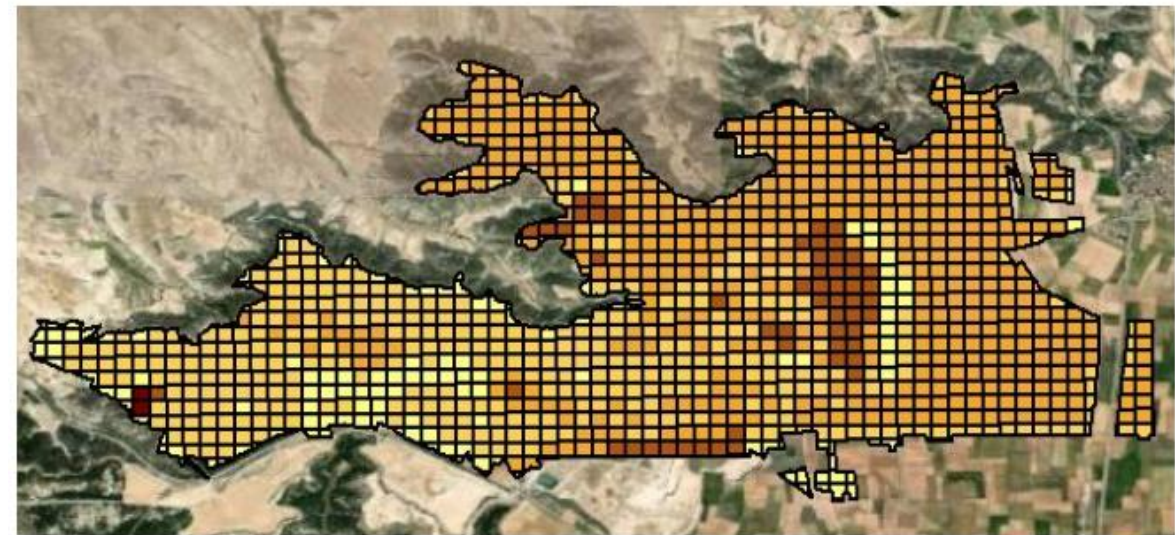


Figure 9: Cumulative number of different ecosystem services provided by different spots in the quarry



Aggregated monetary value (€)



Figure 10: Aggregated monetary value of all ecosystem services identified in the restoration (per grid cells).

Conclusion

- We need systematic, periodic and spatially explicit detailed information on biodiversity, but also on associated economic values
- SEEA Ecosystem Accounting will produce precisely this: initially in biophysical terms, but eventually also in monetary terms