Biodiversity and ecosystem services

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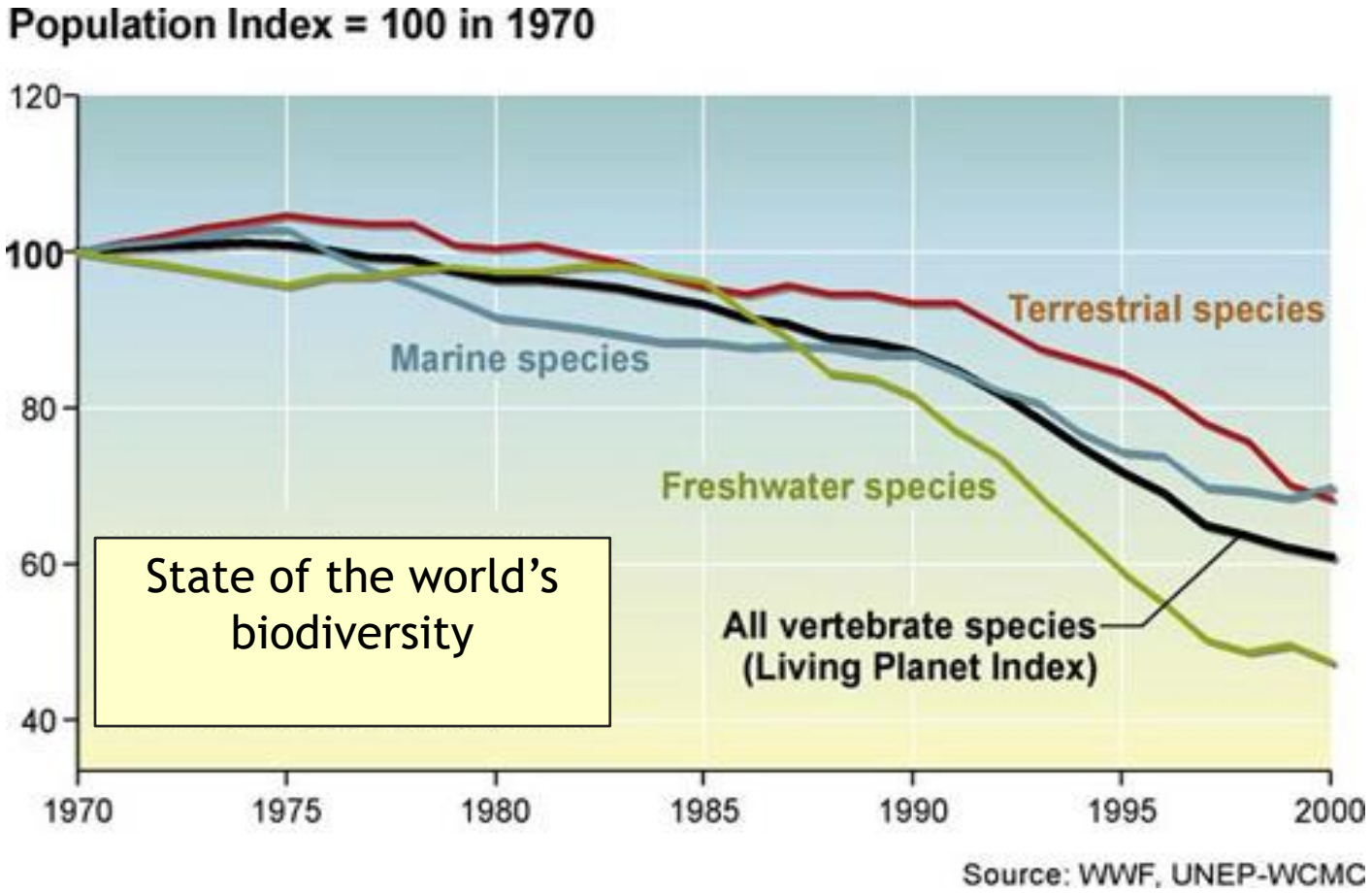
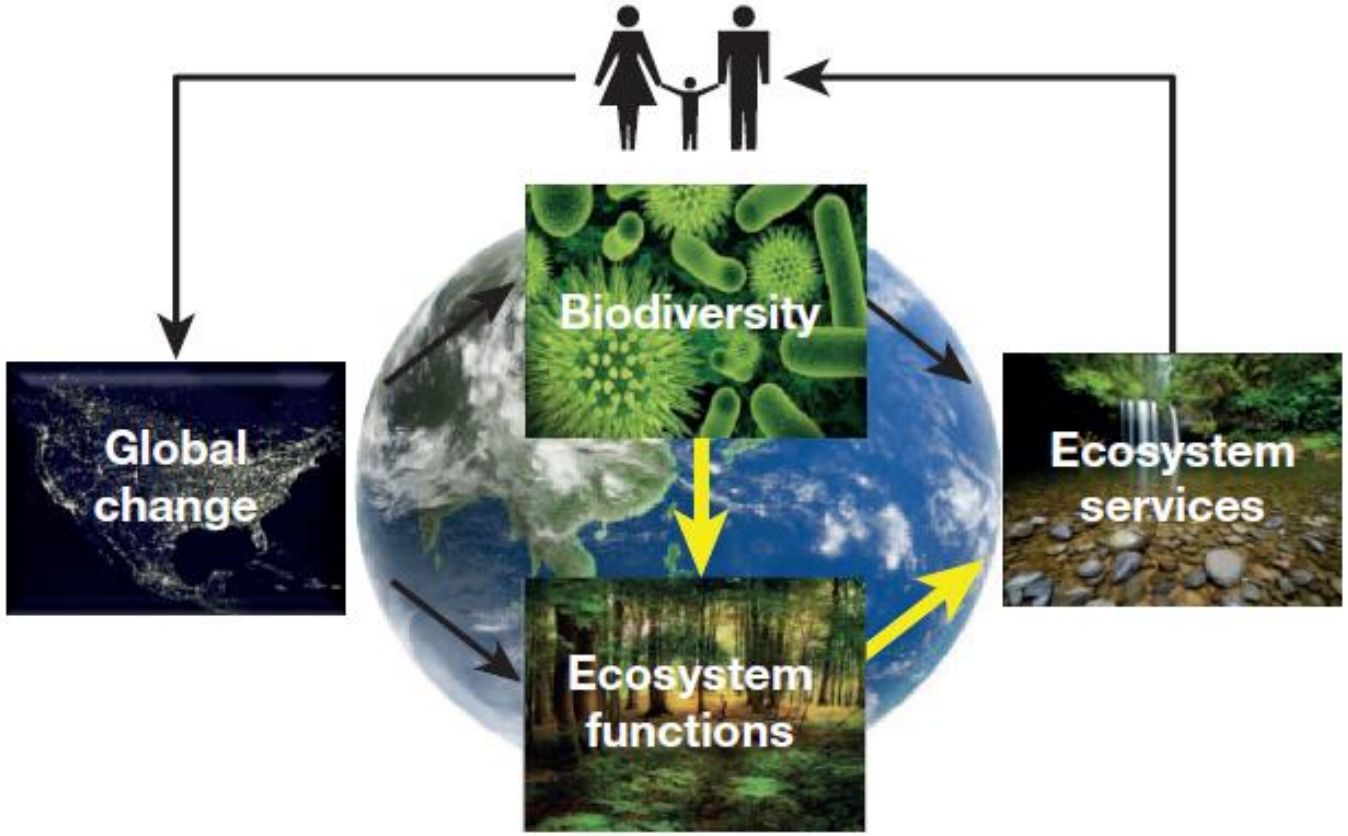
Global declines on biodiversity



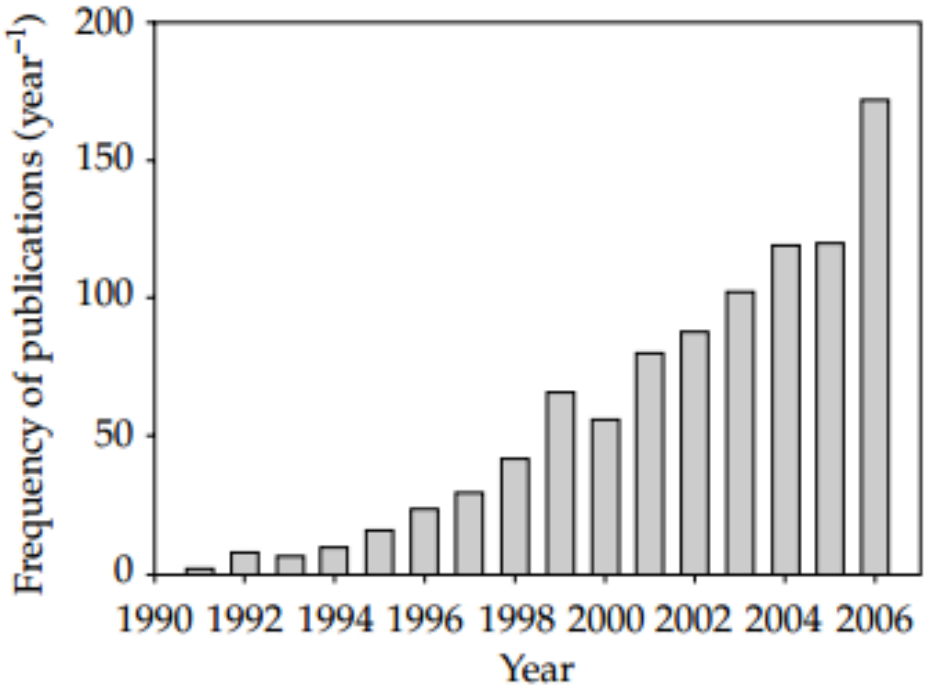
- Extinction of 5-20% of plant and animal species
- Current rates ~ 100 to 1000 times > pre-human levels

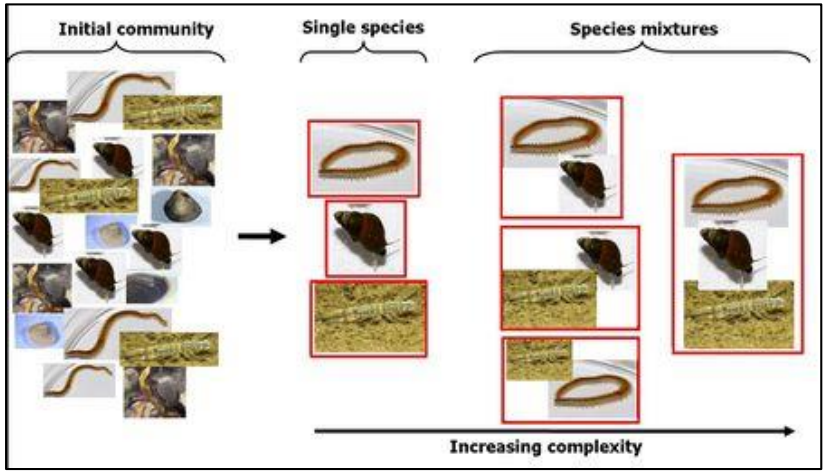
Biodiversity and Ecosystem Functioning



Cardinale et al. 2012. Nature 486:59-67

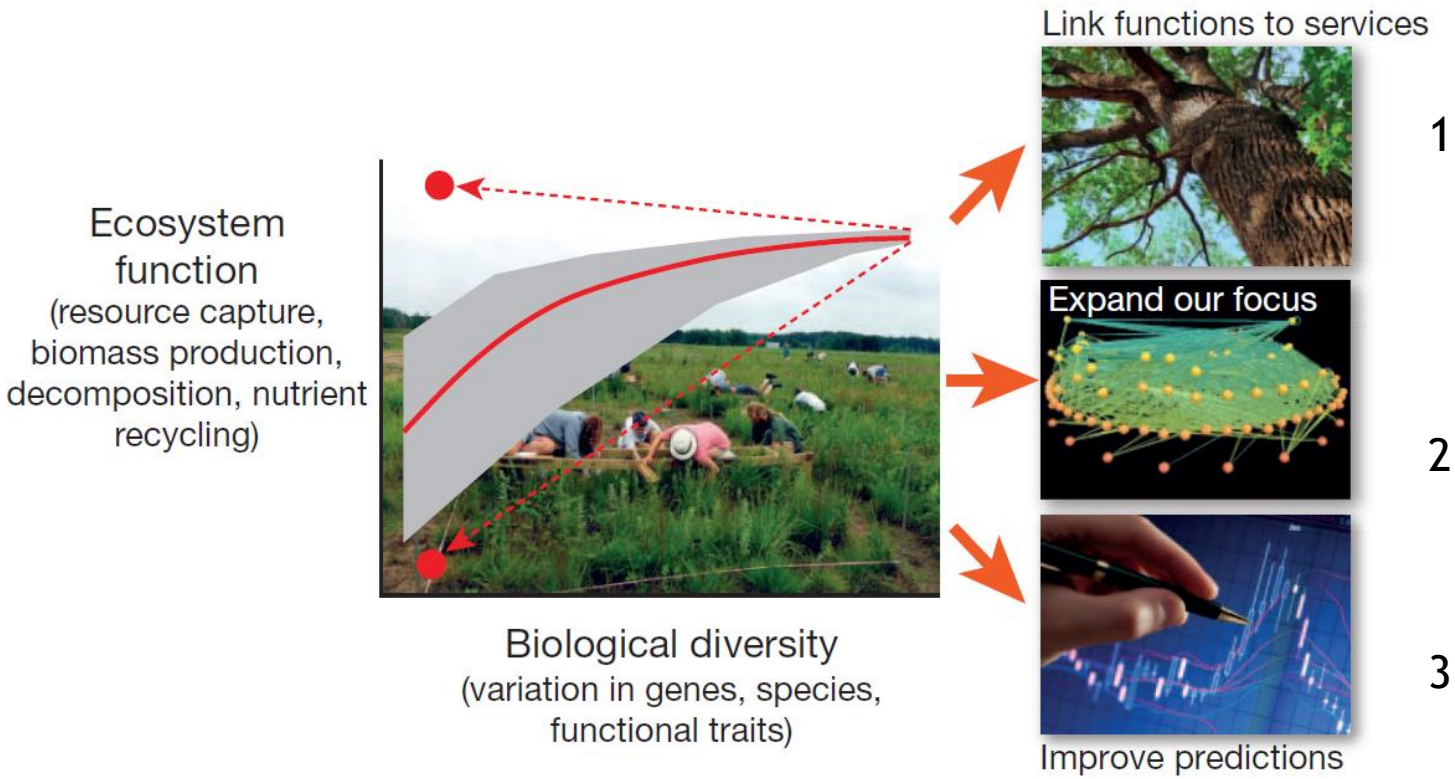
Research on biodiversity and ecosystem functioning





Naeem et al. 2009. Biodiversity, ecosystem functioning, and human wellbeing: an ecological and economic perspective. New York: Oxford University Press.

Research on biodiversity on ecosystem functioning



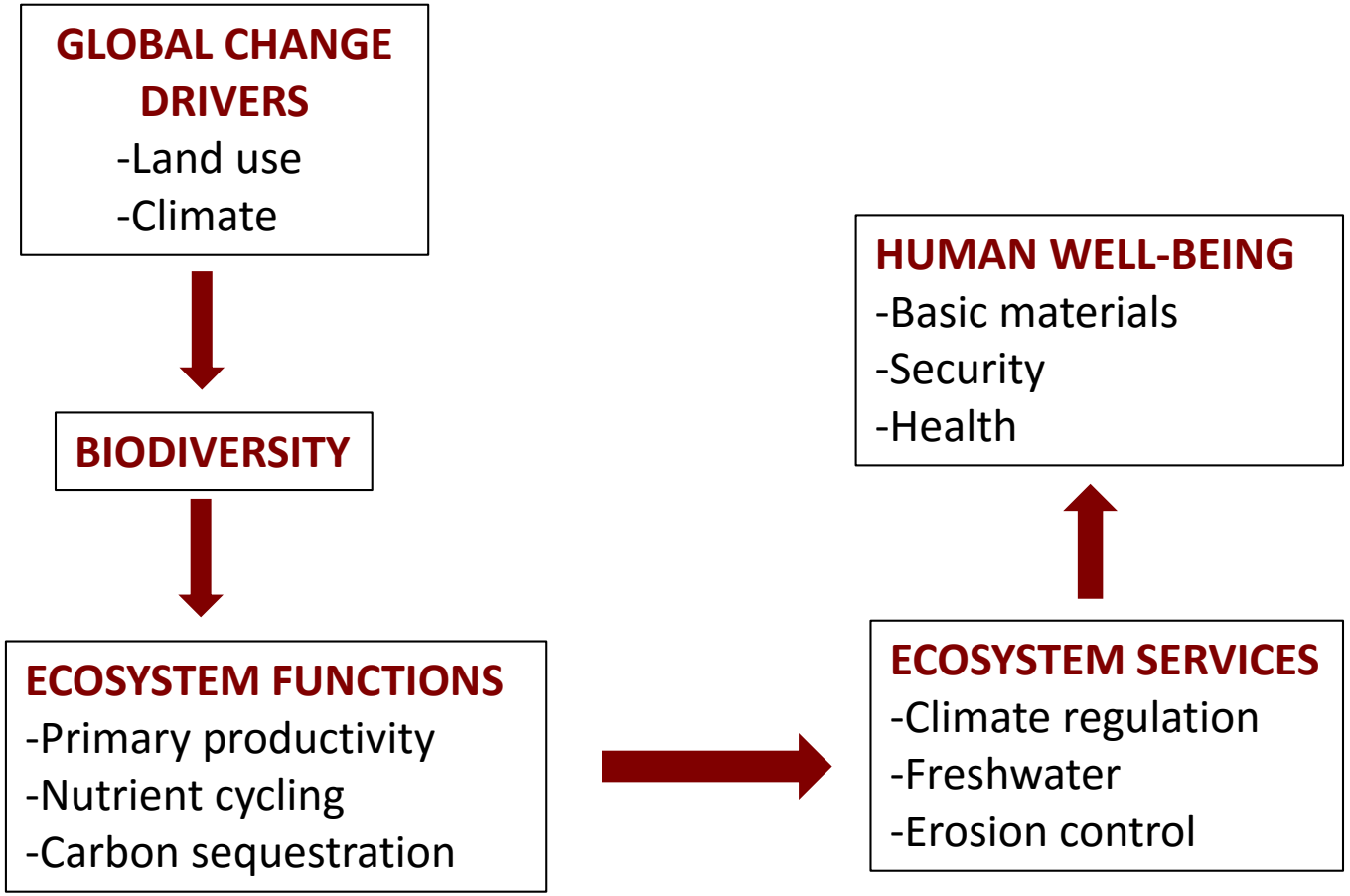
1. Positive association of BD on:
   - Biomass production
   - Decomposition
   - Nutrient cycling

2. BD increases the stability of EF through time.

3. The red line show the average change across all combinations of genes, species, or traits.

Cardinale et al. 2012. Nature 486:59-67

Biodiversity and Ecosystem Functioning



Adapted from MEA 2005; Díaz et al. 2005. *PloS Biol* 4 (8)

How we define biodiversity?

- El número, **abundancia**, composición, distribución espacial de sus entidades (genotipos, **especies**, o comunidades dentro de los ecosistemas), **atributos funcionales**, así como las interacciones entre sus componentes y tipos de vegetación.

Díaz et al. 2006. *PLoS Biol* 4:1300.

Ecosystem processes

The stocks of energy and materials, as well as the complex interactions and flow of energy and materials among biotic and abiotic elements of ecosystems (Díaz & Cabido, 2001).

Ecosystem services

Ecosystem

the benefits that ecosystems provide to humanity either directly or indirectly

Society

MEA 2005

SUPPORTING SERVICES

the services from the ecosystems that help other processes in nature to work.

- Photosynthesis
- Soil Formation
- Biodiversity

REGULATORY SERVICES

the natural services that allow nature to resist or fix temporary problems and also protect humans from difficulties.

1. Control of erosion
2. Water purification
3. Protection against disease

PROVISIONARY SERVICES

Provisionary services are nature's services that we humans can directly use and need to survive.

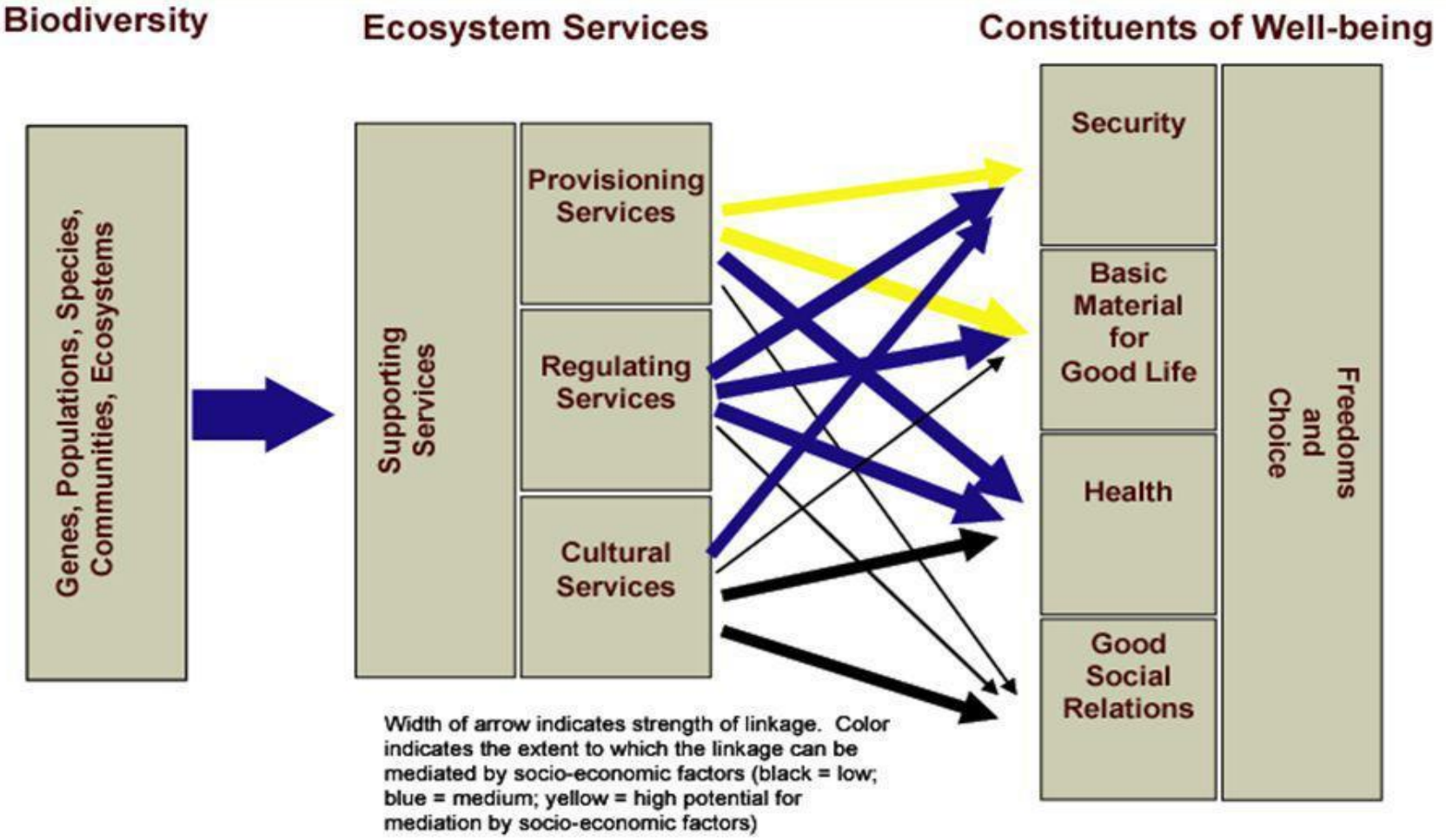
- Drinking water
- Food
- Raw materials

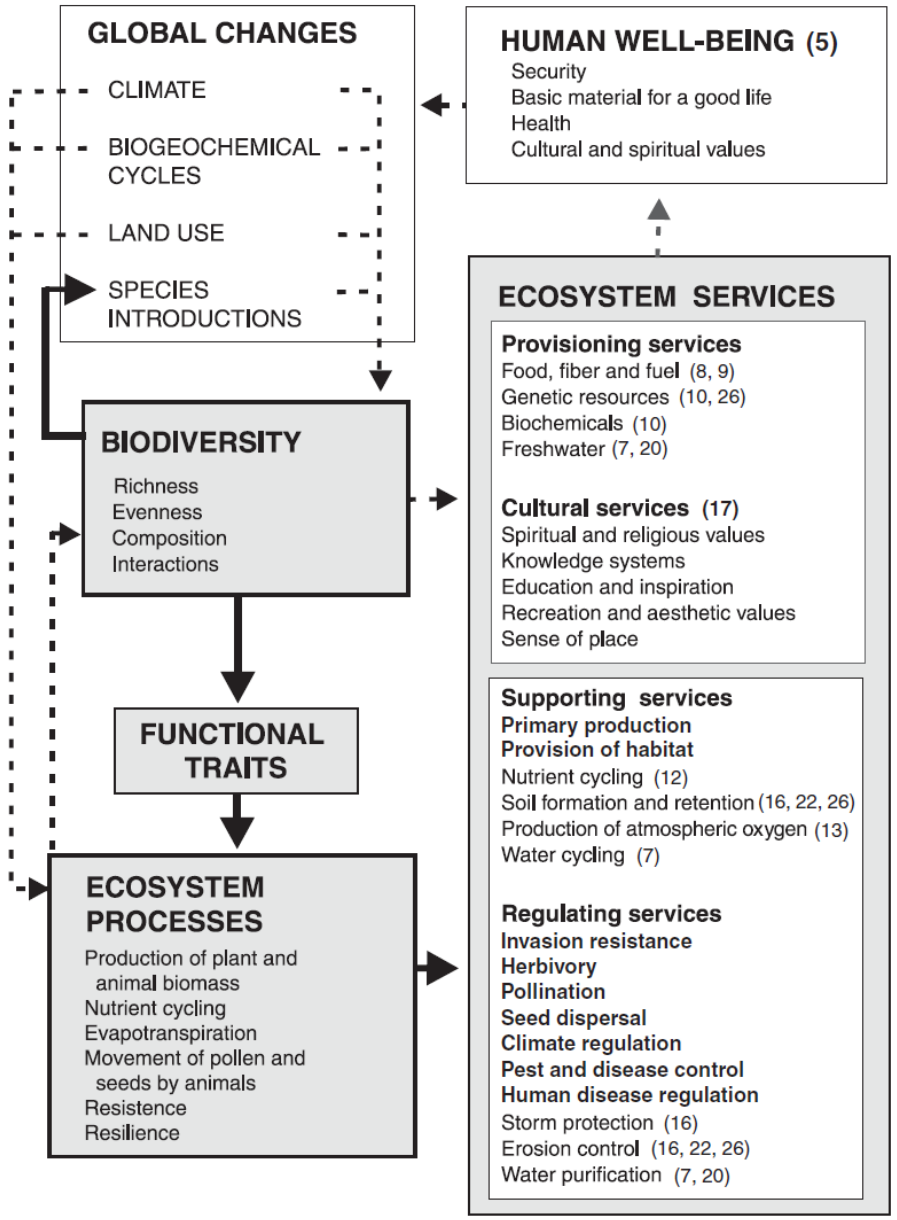
CULTURAL SERVICES

Cultural services are those services in nature that make us humans glad, happy and give meaning to life. Culture is about lifestyle and wellness.

1. Beauty and spiritual values
2. Outdoors and tourism
3. Nature inspires and provides knowledge

Linkages among Biodiversity, Ecosystem services, and Human Well-Being

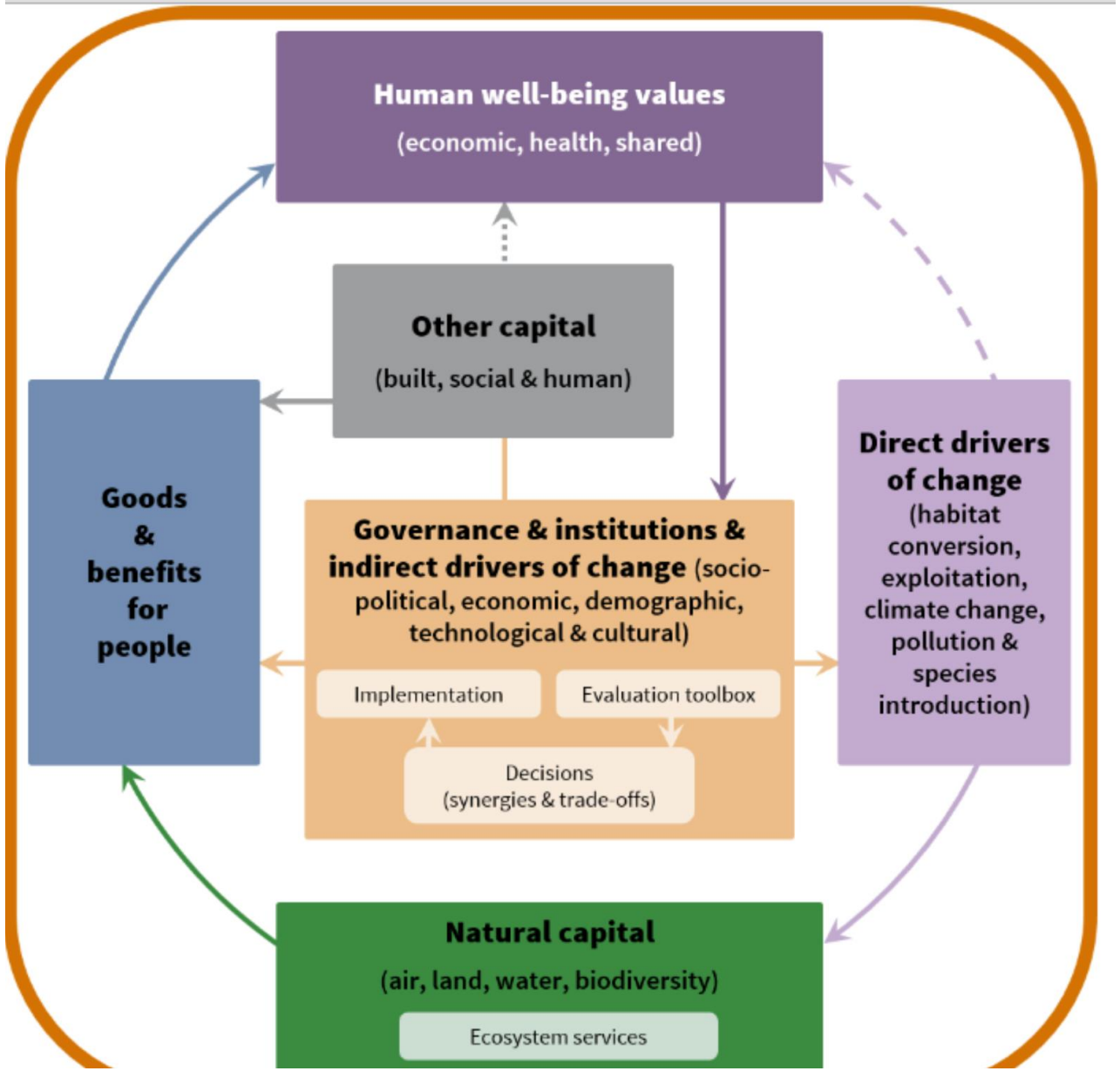




2000

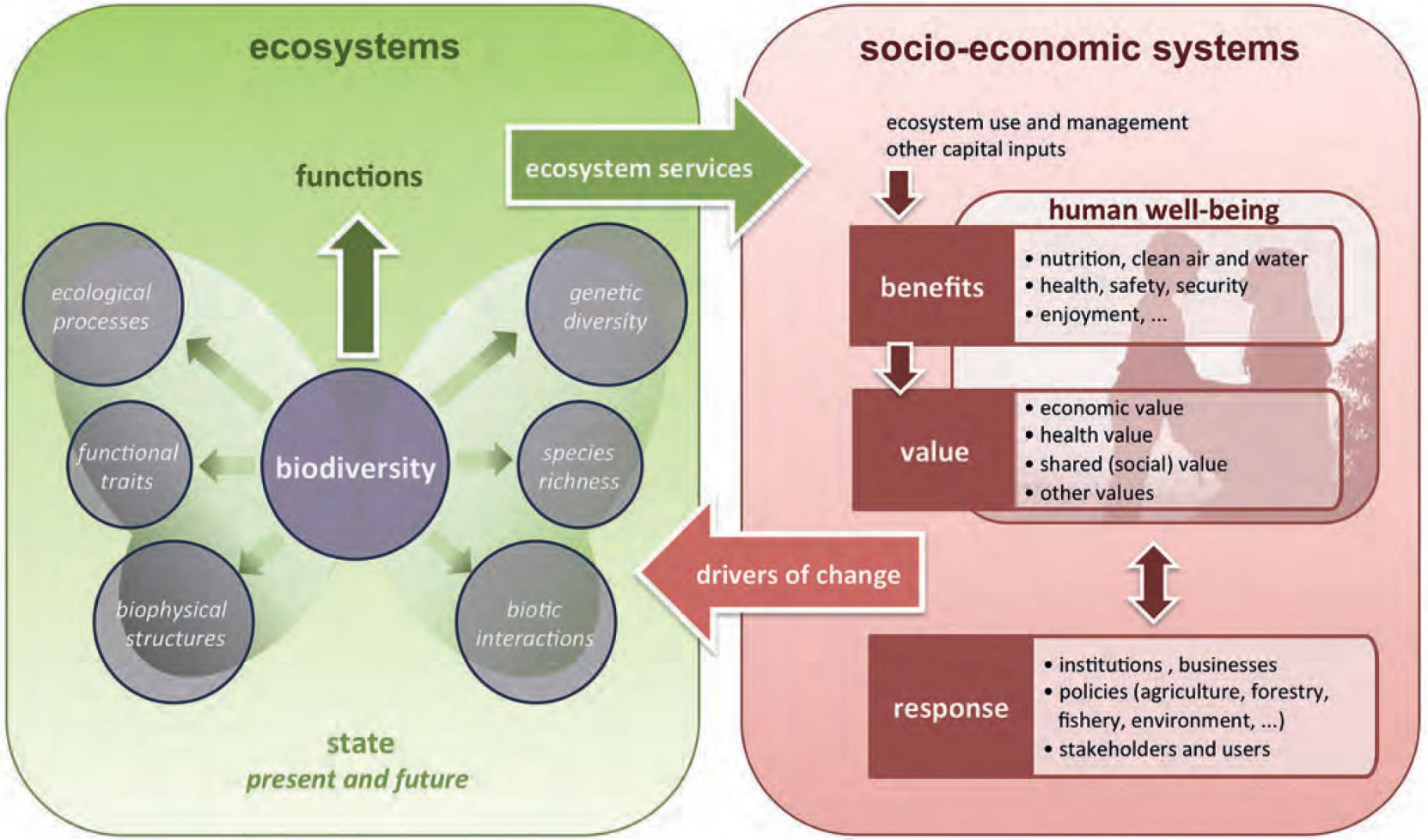
Chapin et al. 2000, Nature 405: 234-242; MEA 2005

2007


Human well-being values
(economic, health, shared)
Other capital
(built, social & human)
Goods & benefits for people
Governance & institutions & indirect drivers of change (socio-political, economic, demographic, technological & cultural)
Implementation
Evaluation toolbox
Decisions
(synergies & trade-offs)
Direct drivers of change (habitat conversion, exploitation, climate change, pollution & species introduction)
Natural capital
(air, land, water, biodiversity)
Ecosystem services

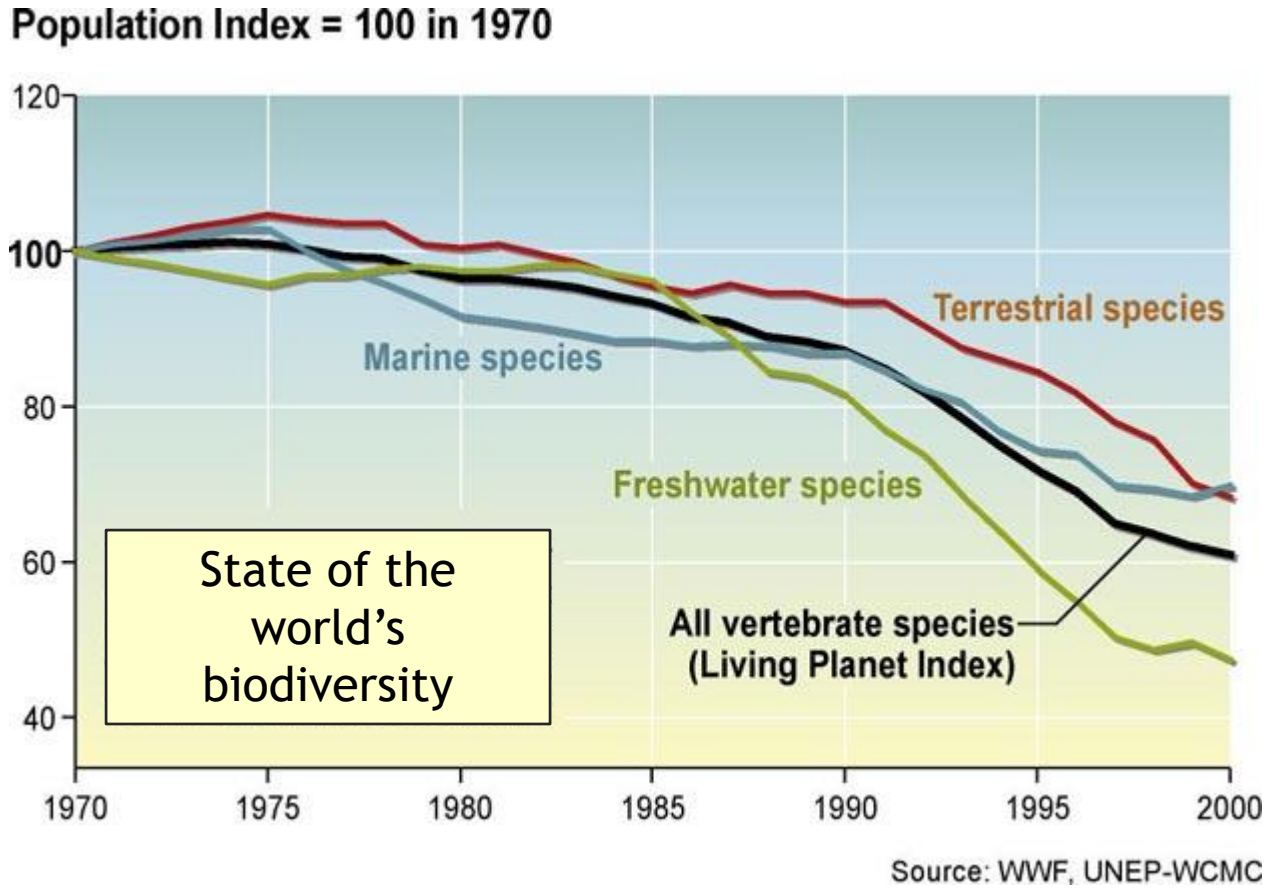
MAES initiative: Mapping and Assessment of Ecosystem Services

2014



Maes et al. 2013. An analytical framework for ecosystem assessments under action 5 of the EU biodiversity strategy to 2020.

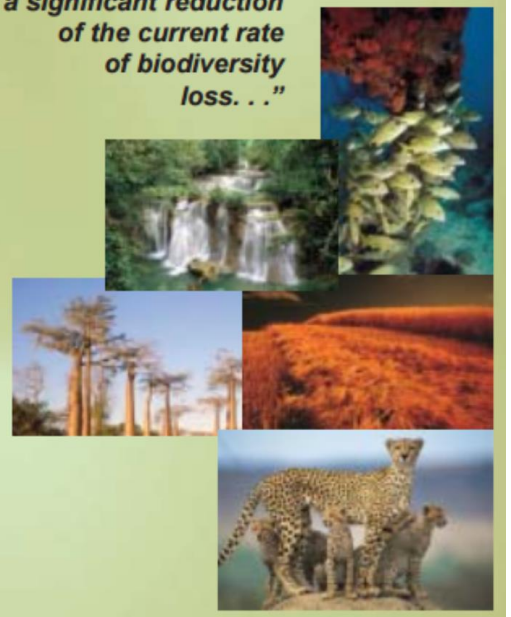
'If biodiversity is not protected for its own sake, will the ecosystem services approach also protect biodiversity?'



Convention on Biological Diversity

The 2010 Biodiversity Target:

". . . to achieve by 2010 a significant reduction of the current rate of biodiversity loss. . ."



Promote sustainable use

Goal 4. Promote sustainable use and consumption

Target 4.1 Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity

Target 4.2 Unsustainable consumption, of biological resources, or that impacts upon biodiversity, reduced

Target 4.3 No species of wild flora or fauna endangered by international trade

Address threats to biodiversity

Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced

Target 5.1 Rate of loss and degradation of natural habitats decreased

Goal 6. Control threats from invasive alien species

Target 6.1 Pathways for major potential alien invasive species controlled

Maintain goods and services from biodiversity to support human well-being

Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods

Target 8.1 Capacity of ecosystems to deliver goods and services maintained

Target 8.2 Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people, maintained

Protect traditional knowledge, innovations and practices

Goal 9. Maintain socio-cultural diversity of indigenous and local communities

Target 9.1 Protect traditional knowledge, innovations and practices

Target 9.2 Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit sharing

Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources

Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources

Ensure provision of adequate resources

Goal 11. Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention

Target 11.1 New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20

Target 11.2 Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4

Thematic programmes of work of the Convention:

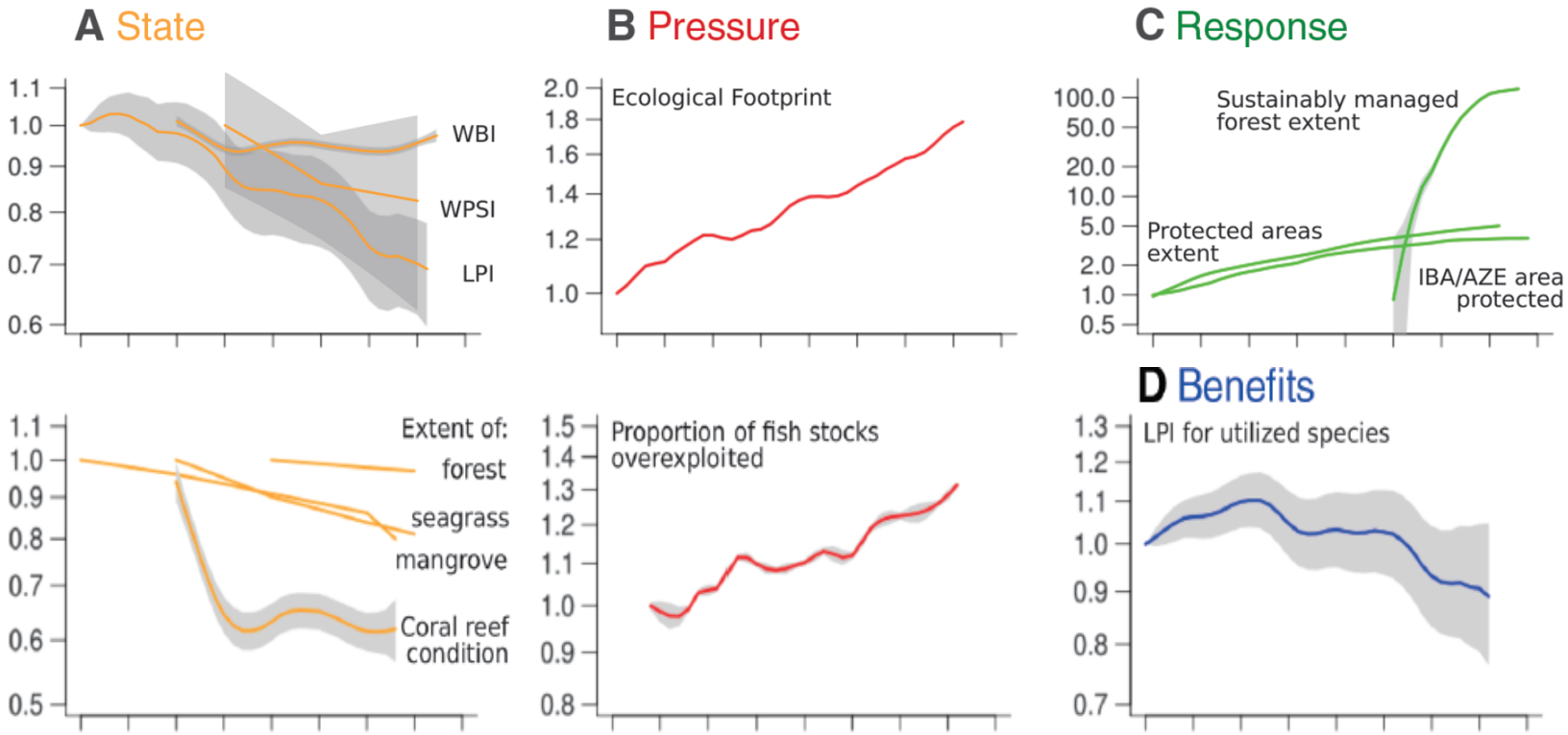
- Agricultural biological diversity
- Inland waters biological diversity
- Marine and costal biological diversity
- Forest biological diversity
- Biological diversity of dry and sub-humid lands
- Mountain biological diversity
- Island biological diversity (proposed)

For more information, please contact

Secretariat of the Convention on Biological Diversity

Global Biodiversity: Indicators of Recent Declines

Stuart H. M. Butchart,[1,2]* Matt Walpole,[1] Ben Collen,[3] Arco van Strien,[4]



Butchart et al. 2010, Nature 328:1164-1168

Intergovernmental Platform on Biodiversity & Ecosystem Services

ipbes

Work Programme by Deliverable

1 a. Capacity Building Needs

1 b. Capacity development

1 c. Indigenous and local knowledge

1 d. Knowledge, information and data

2 a. Guide on production of assessments

2 b. Regional and subregional assessments

2 c. Global assessment

3 a. Pollination

3 b.i. Land degradation and restoration

3 b.ii. Invasive alien species

3 b.iii. Sustainable use of biodiversity

3 c. Scenarios and modelling

3 d. Values

4 a. Catalogue of assessments

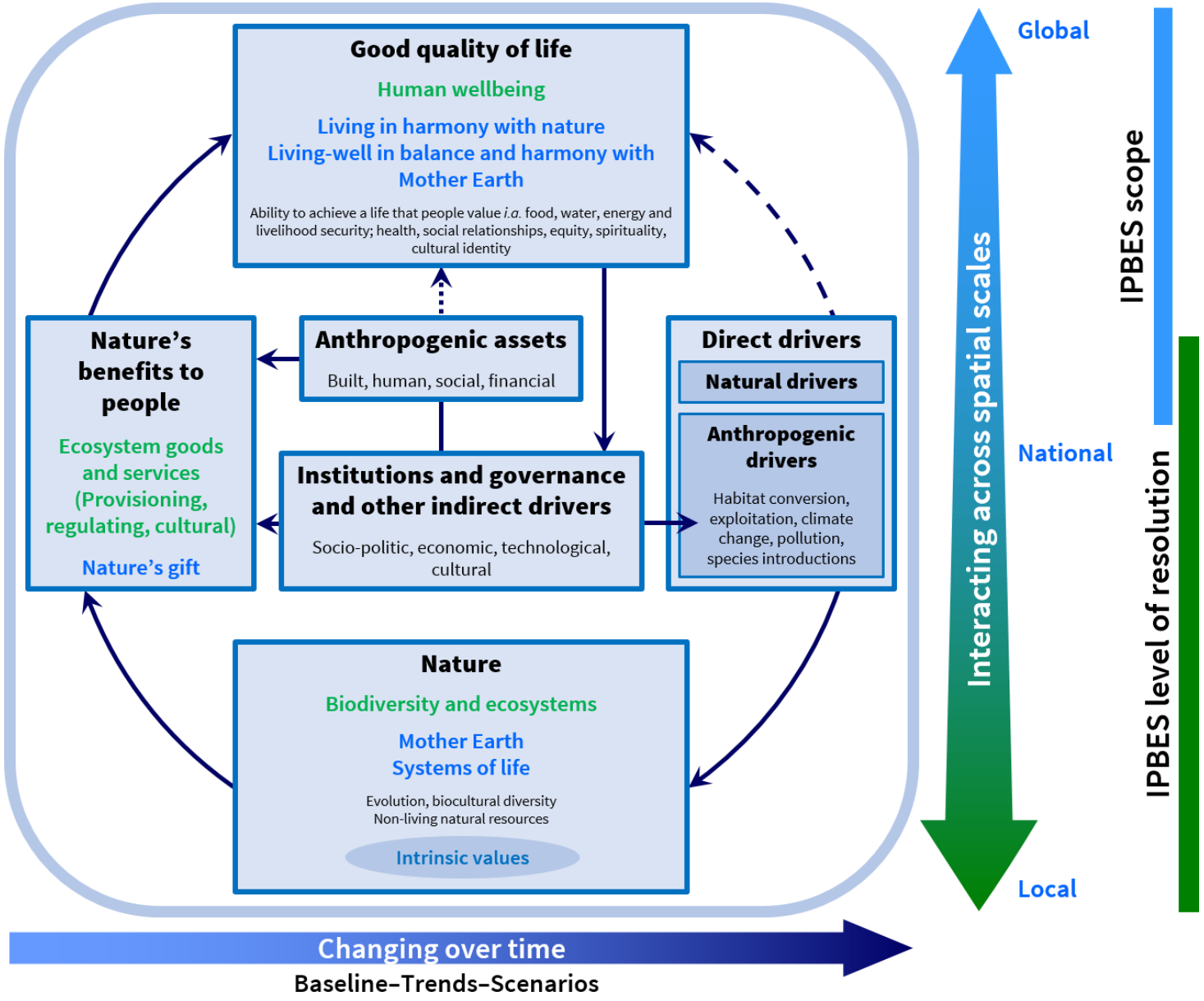
4 b. Information and data management plan

4 c. Policy support tools

4 d. Communication and stakeholder engagement

4 e. Review of the Platform

2015



Díaz et al 2015. Current Opinion in Environmental Sustainability 14: 1-16.

Contact with green space

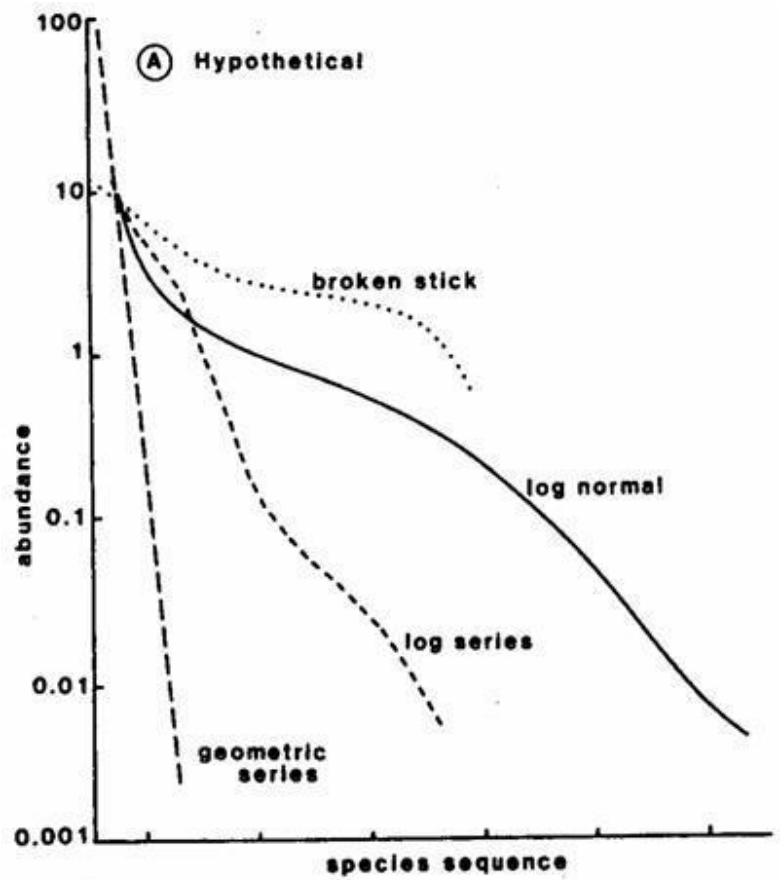
- Stress reduction, cognitive restoration
- Increased physical activity
- Increased social interaction and cohesion
- Heat and humidity regulation
- Air pollution filtration

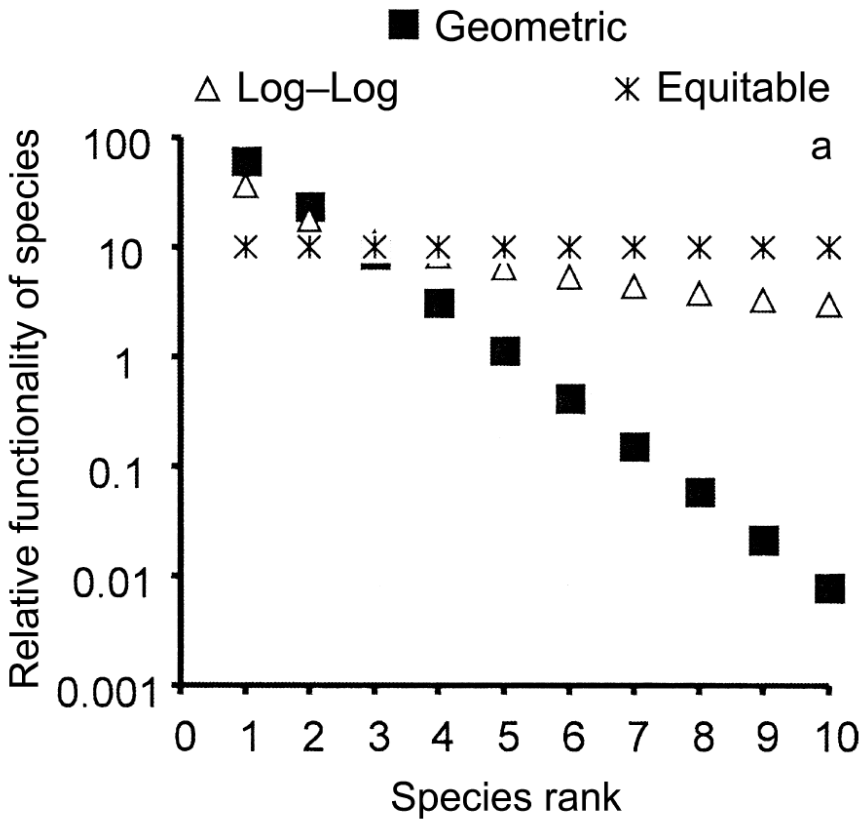
Improved health and wellbeing, including:
- Reduced obesity
- Reduced psychiatric morbidity, including depression and anxiety
- Reduced cardiovascular disease
- Reduced all-cause mortality
- Improved birth outcomes

James et al. 2015 Current Epidemiology Reports, 2, 131-142.

How can we incorpórate BD in ES assesments?

APPLYING COMMUNITY STRUCTURE ANALYSIS

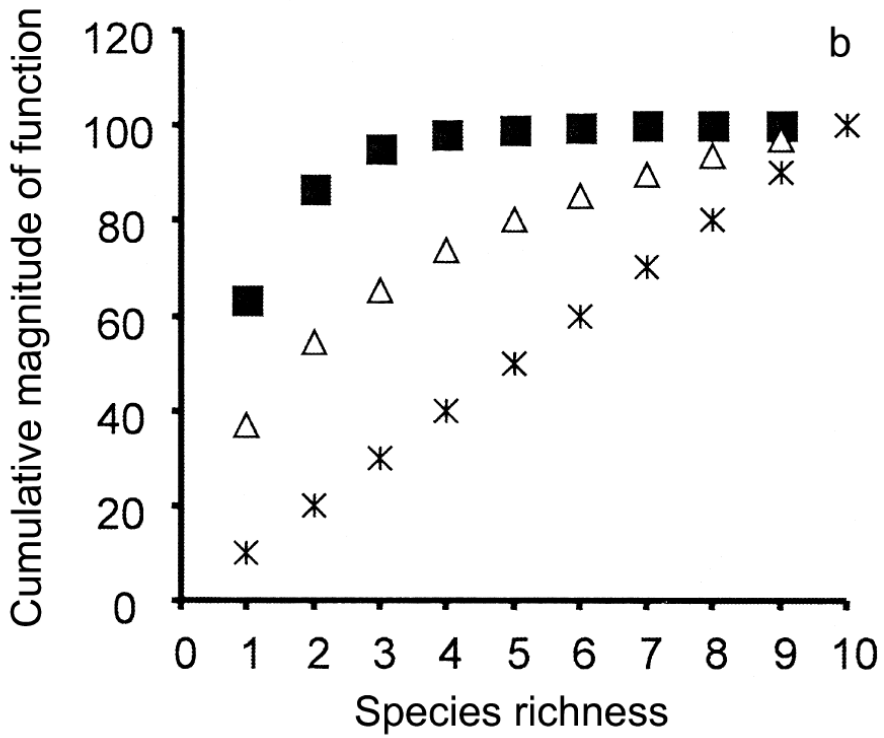


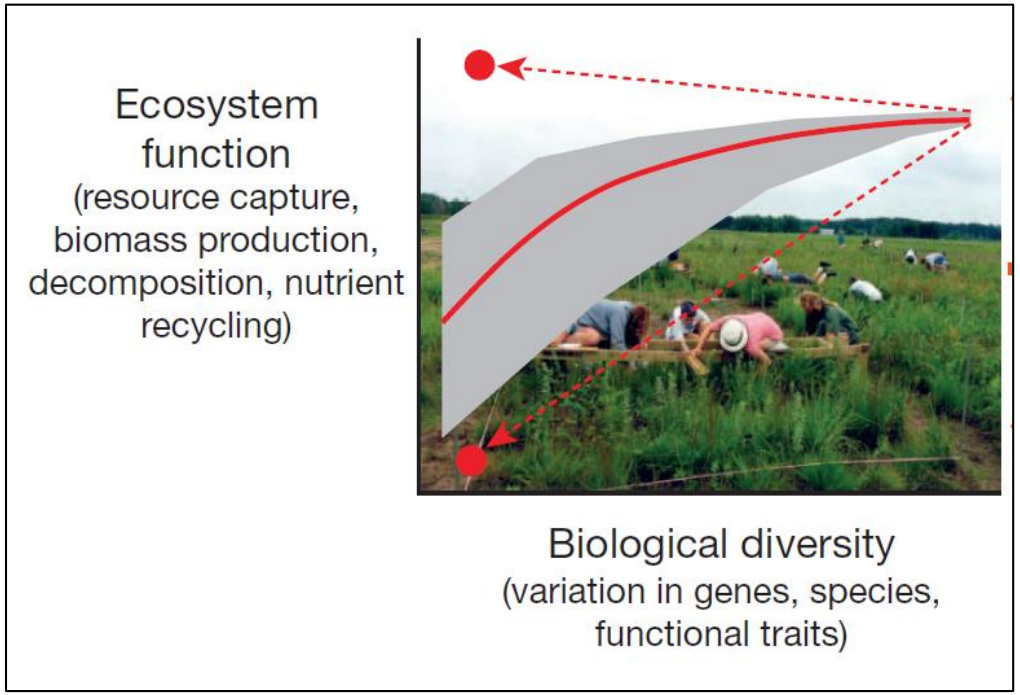


Balvanera et al. 2005. Ecol. Applic. 15:360-375.

APPLYING COMMUNITY STRUCTURE ANALYSIS TO ECOSYSTEM FUNCTION: EXAMPLES FROM POLLINATION AND CARBON STORAGE

PATRICIA BALVANERA,[1,3] CLAIRE KREMEN,[2] AND MIGUEL MARTÍNEZ-RAMOS[1]





Ecological Applications, 15(1), 2005, pp. 360–375

Which components of biodiversity affect ecosystem function?

Species richness

Relative abundance

Functional diversity

kind, range and relative abundance of functional traits in a biological community.

Functional traits

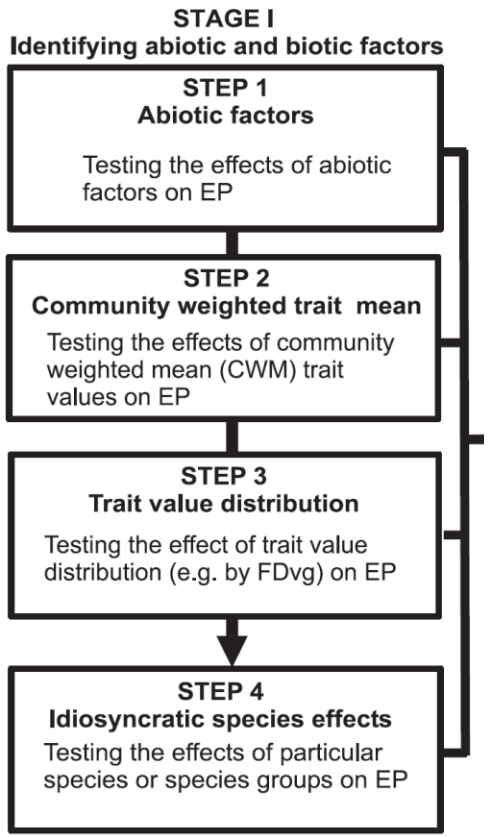
Trait diversity within functional groups

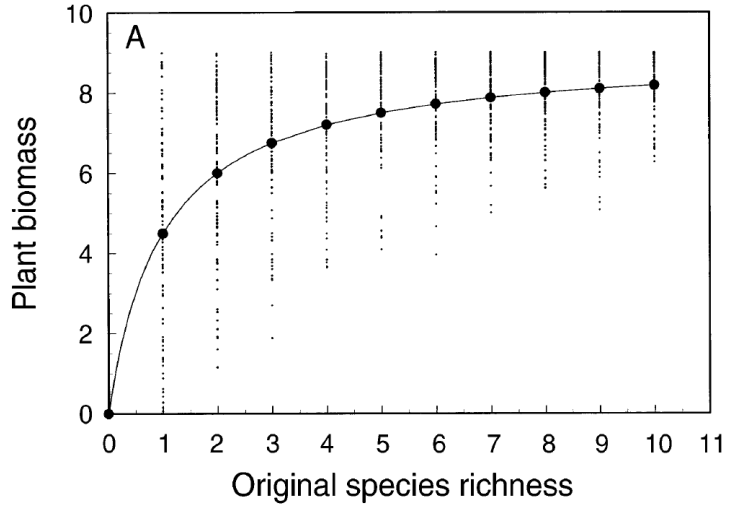
Relative abundance of species within functional groups

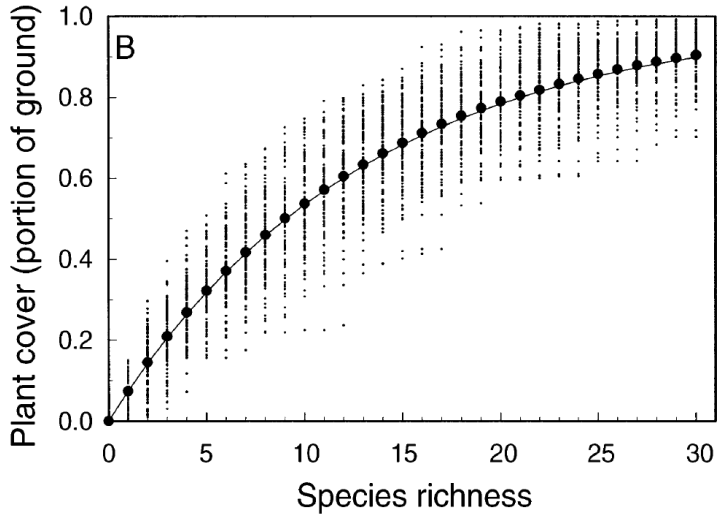
Martín-López et al 2007. Ecosistemas 3: 1

Incorporating plant functional diversity effects in ecosystem service assessments

Sandra Díaz*†, Sandra Lavorel‡, Francesco de Bello‡, Fabien Quétier*‡, Karl Grigulis‡, and T. Matthew Robson‡§







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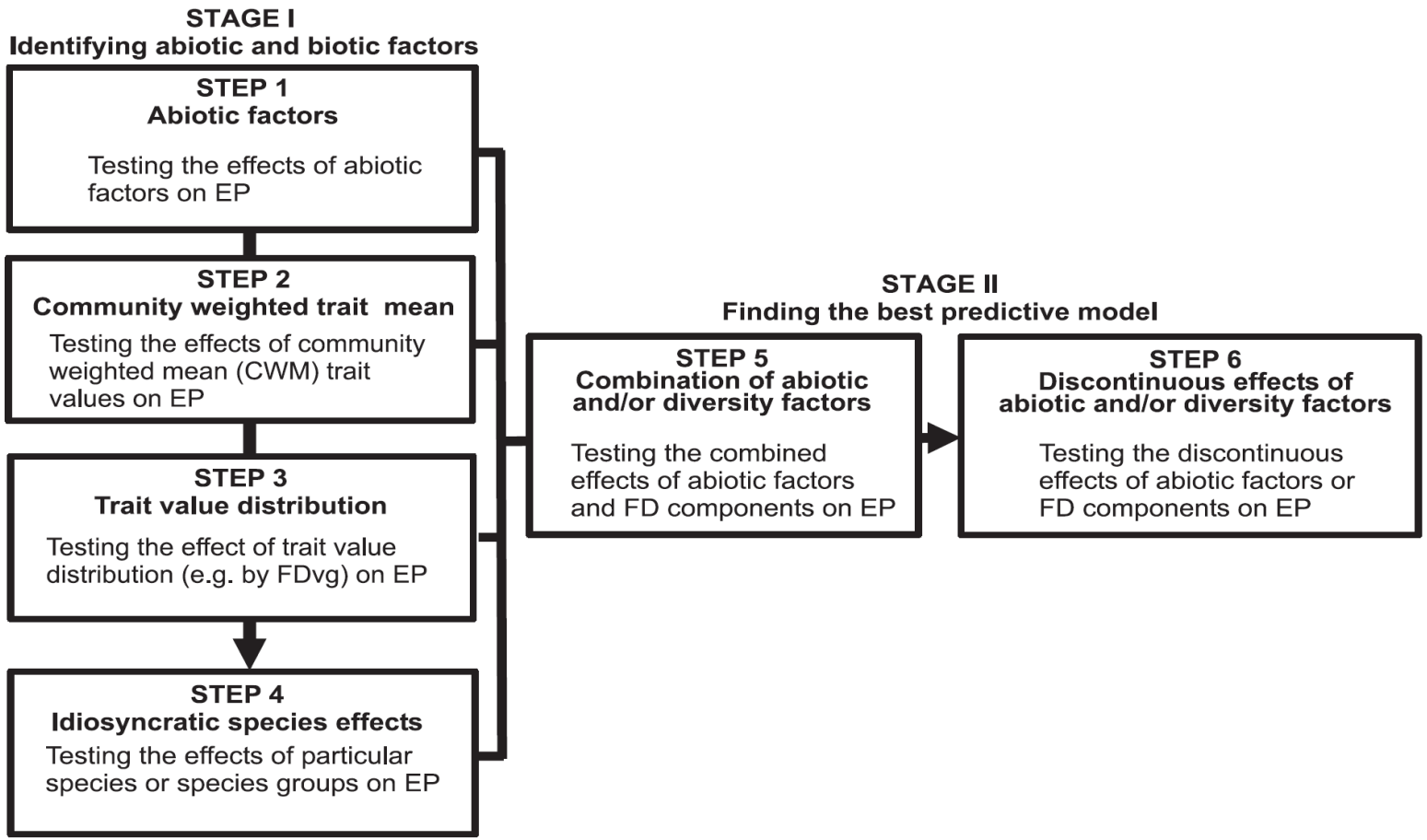
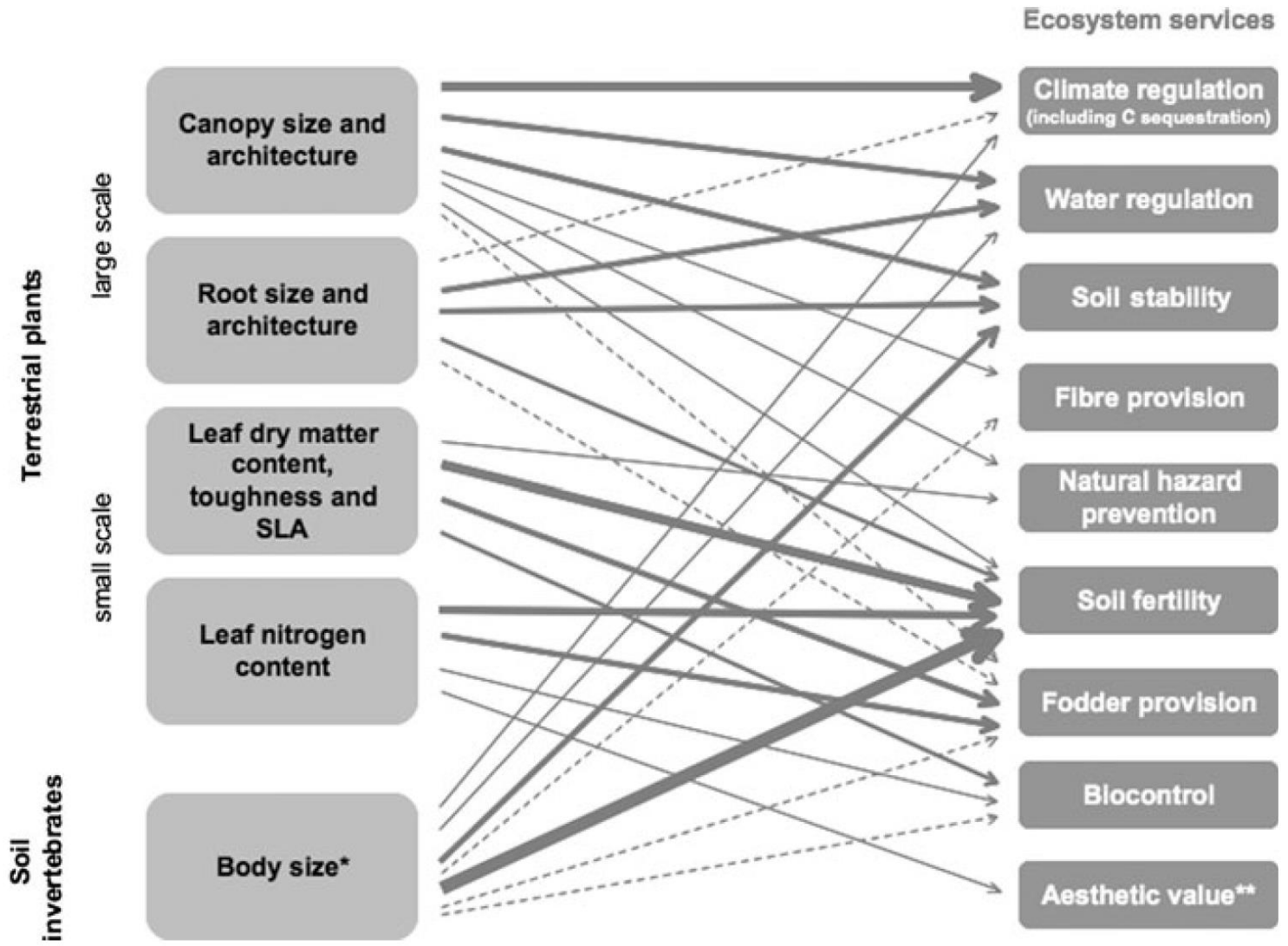


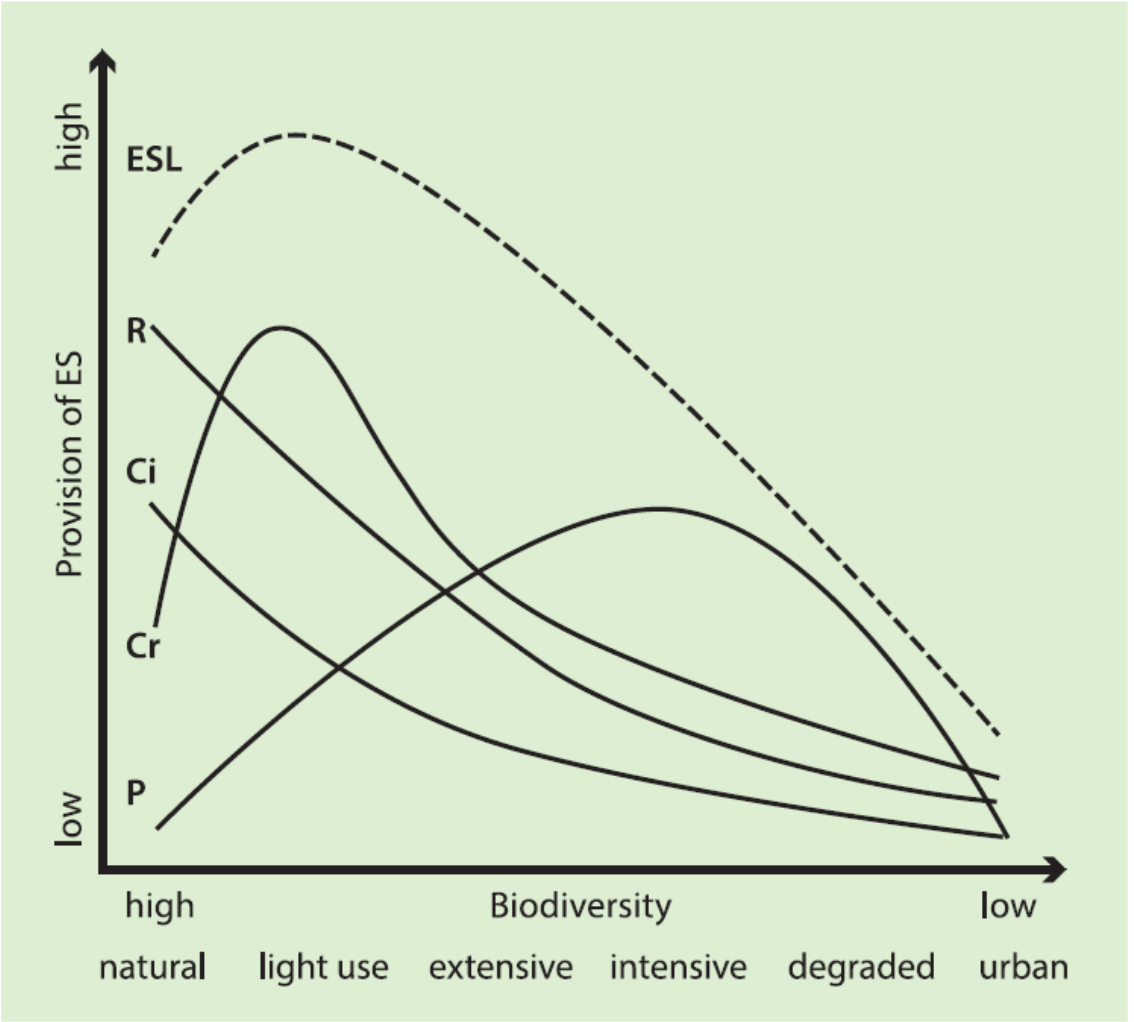
Towards an assessment of multiple ecosystem processes and services via functional traits

Biodivers Conserv (2010) 19:2873–2893
DOI 10.1007/s10531-010-9850-9

ORIGINAL PAPER

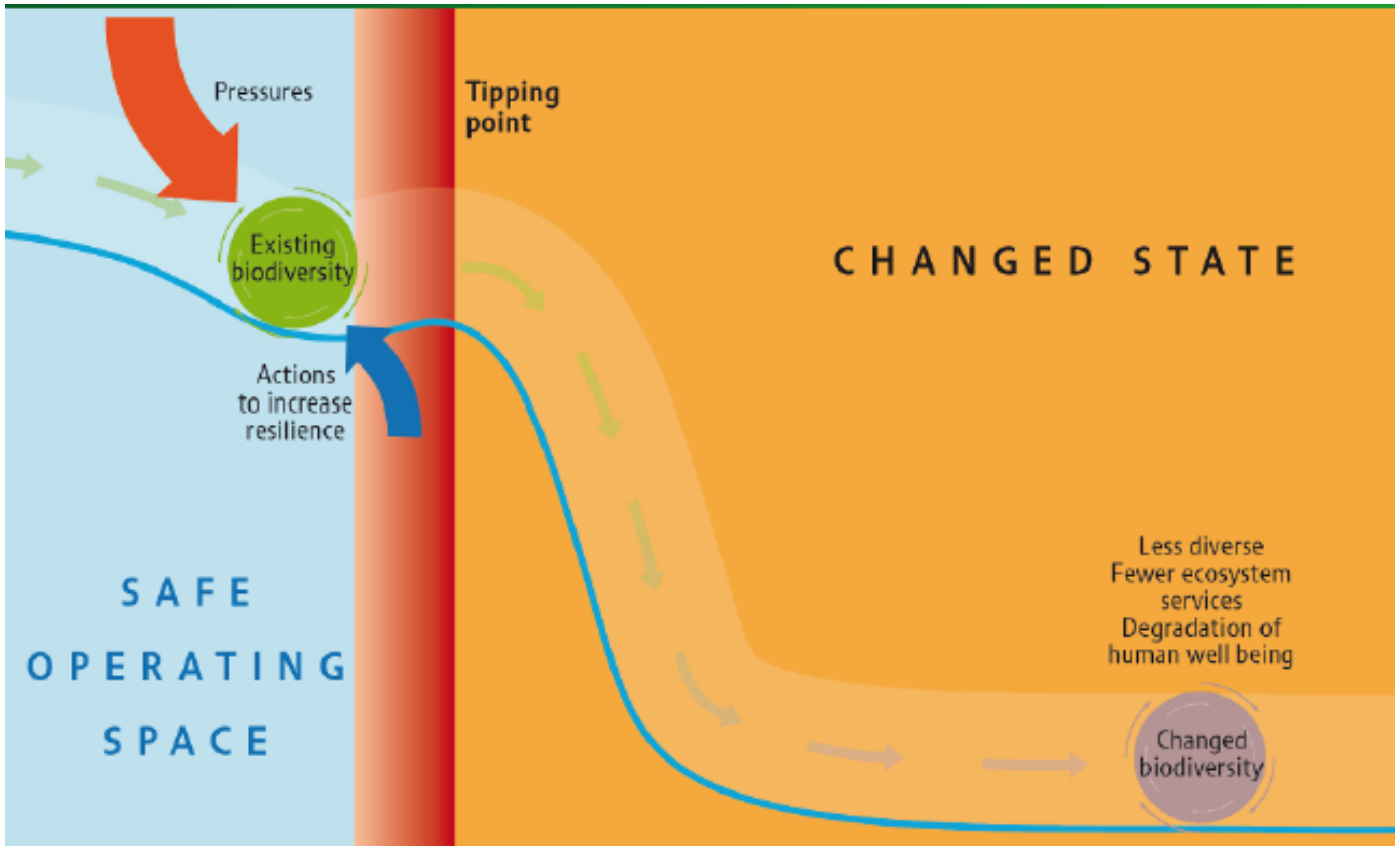


Ecosystem Services	Main Components of Biodiversity Involved
Supporting services	
Amount of primary production	••• functional composition of plant assemblage
	•• species richness of plant assemblage
Regulating services	
Invasion resistance	••• species composition
	••• arrangement of land-scape units
	•• species richness and diversity

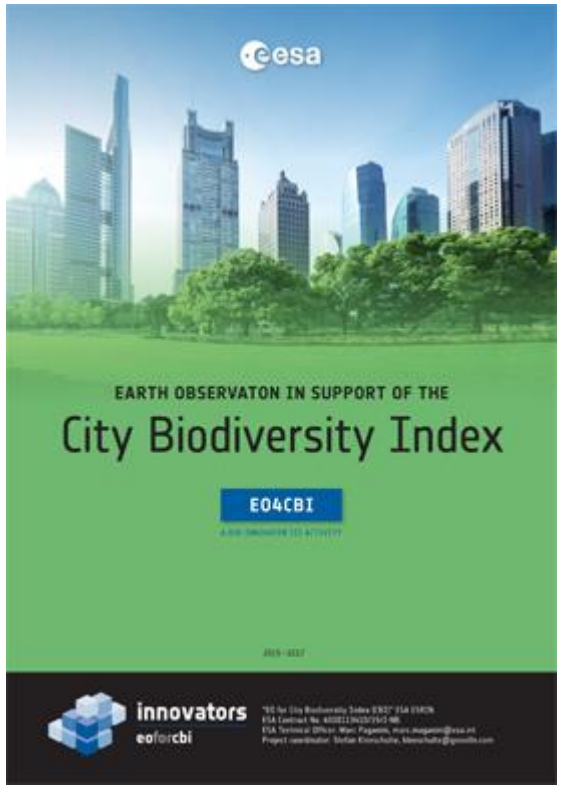


Biodiversity important for resilience

Ecosystem resilience: the capacity to recover after perturbation



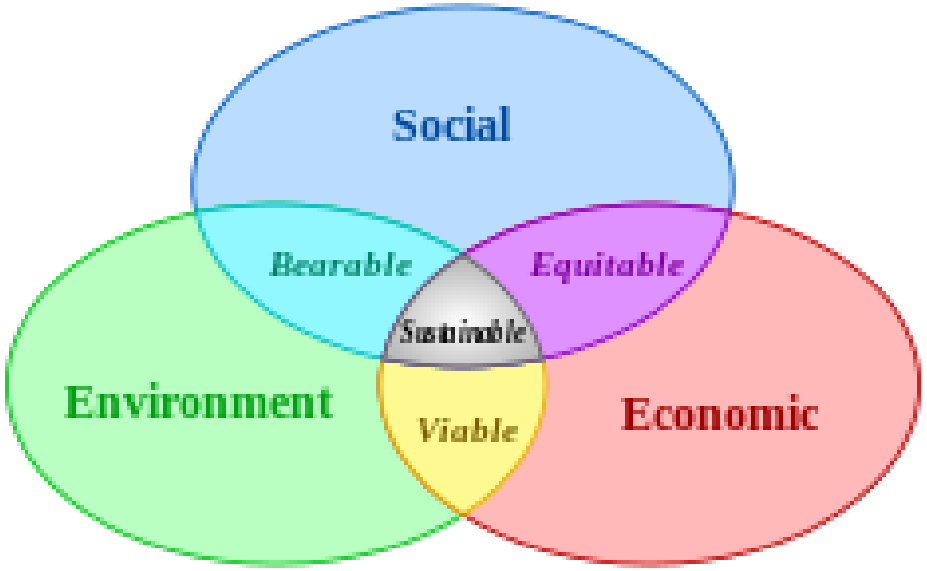
Thompson et al., 2009. CBD Technical Series No 43



Singapore Index on Cities' Biodiversity

Part II: Indicators

NATIVE BIODIVERSITY IN THE CITY	ECOSYSTEM SERVICES PROVIDED BY BIODIVERSITY IN THE CITY	GOVERNANCE AND MANAGEMENT OF BIODIVERSITY IN THE CITY
10 INDICATORS	4 INDICATORS	9 INDICATORS


Social
Bearable
Equitable
Sustainable
Environment
Viable
Economic

Linkages among Biodiversity, Ecosystem services, and Human Well-Being