



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Ecosystem Services – an overview



Dr Anna Phelan

UQ Business School

Ecosystem Services

Functions of the ecosystem that in some way benefit mankind

Ecosystem services purify air and water, mitigate flooding, help with water and food, and protect biodiversity.

They also reduce noise, improve people's physical and mental well-being, regulate the local climate, absorb carbon and provide renewable energy.



Benefits humans derive from our shared "natural capital" assets



Raw materials



Shoreline protection



Tourist attraction



Recreation



Carbon sequestration



Biodiversity



Navigation



Genetic resources



Food production



Aesthetic



Flood protection



Water quality



Micro-climate



Habitat



Livelihoods



Shelter for marine

Ecosystem services are what nature produces without the help of humans

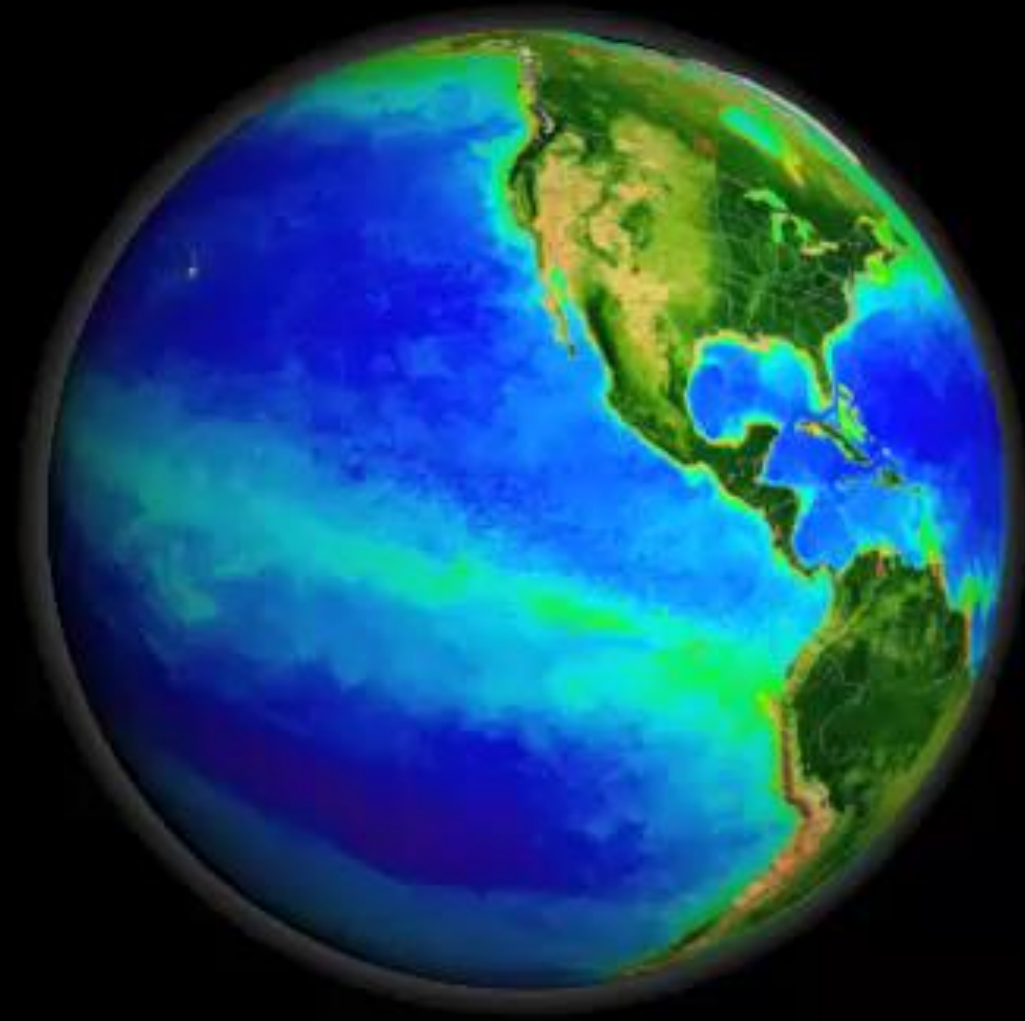
Yet that humans benefit from, and often completely for free

Many of these services are impossible to replace with technology



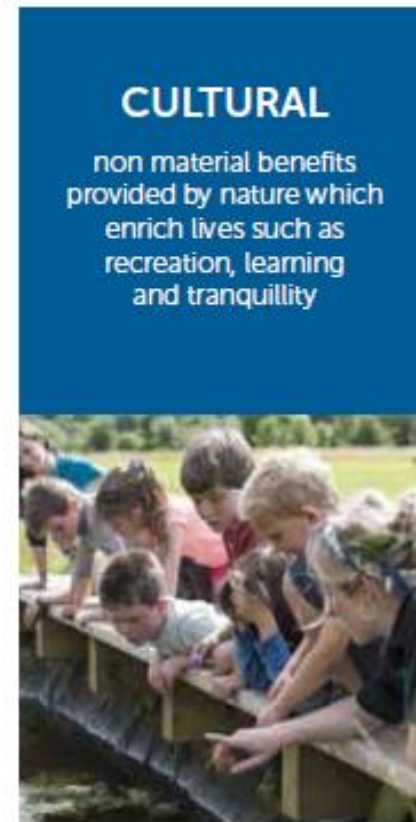
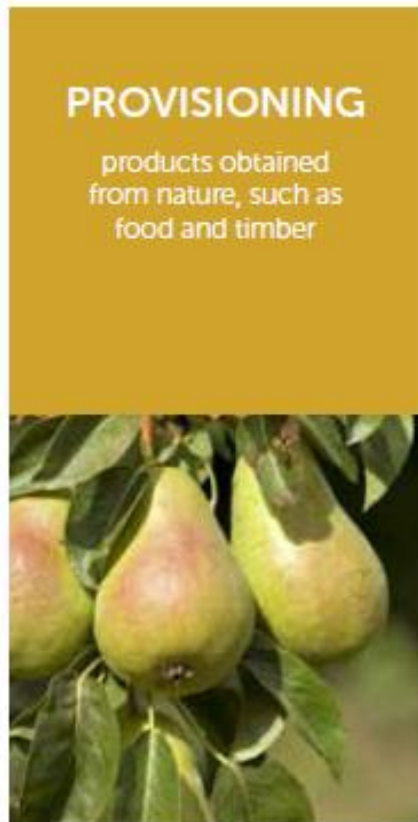
System

From small to large - how
is it is all tied together



The ecological characteristics, functions or processes that directly or indirectly contribute to human wellbeing

Ecology, economics, geography



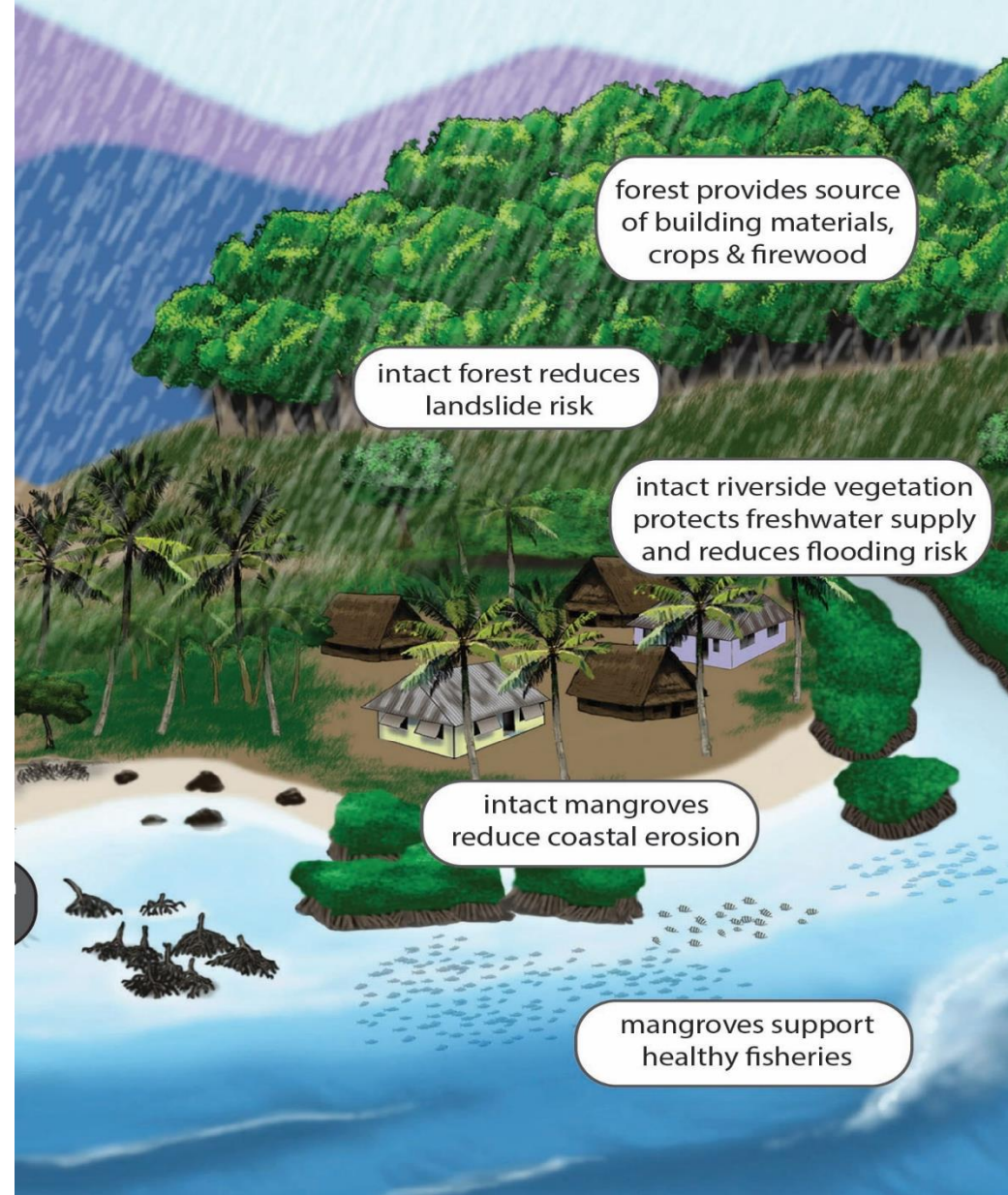
(Millennium Ecosystem Assessment (MEA), 2005, De Groot et al. 2010. UK-NEA, 2011, Braat, 2013, Costanza et al, 2017)

The flow from nature to the human

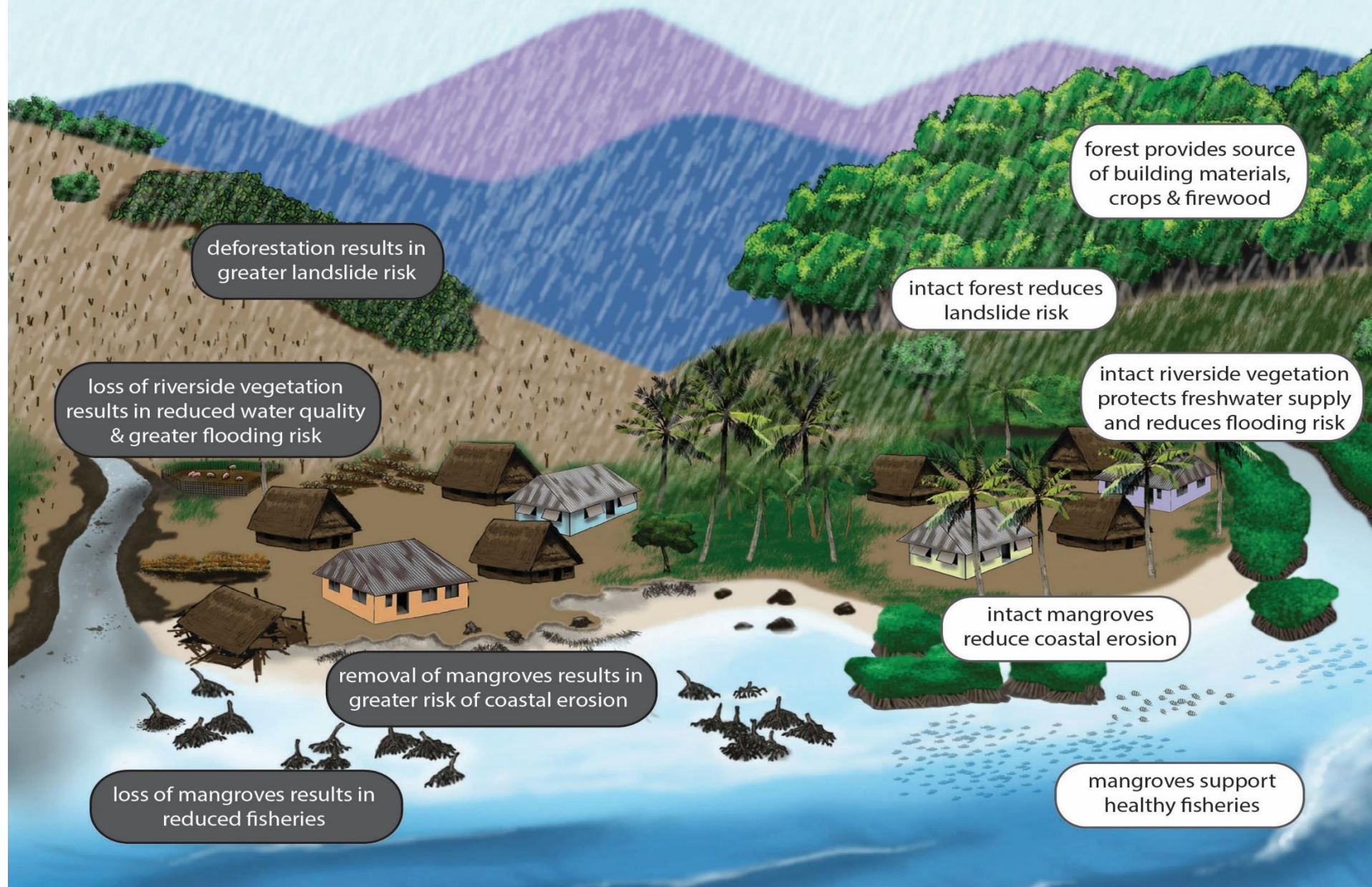
Ecosystem services distribution



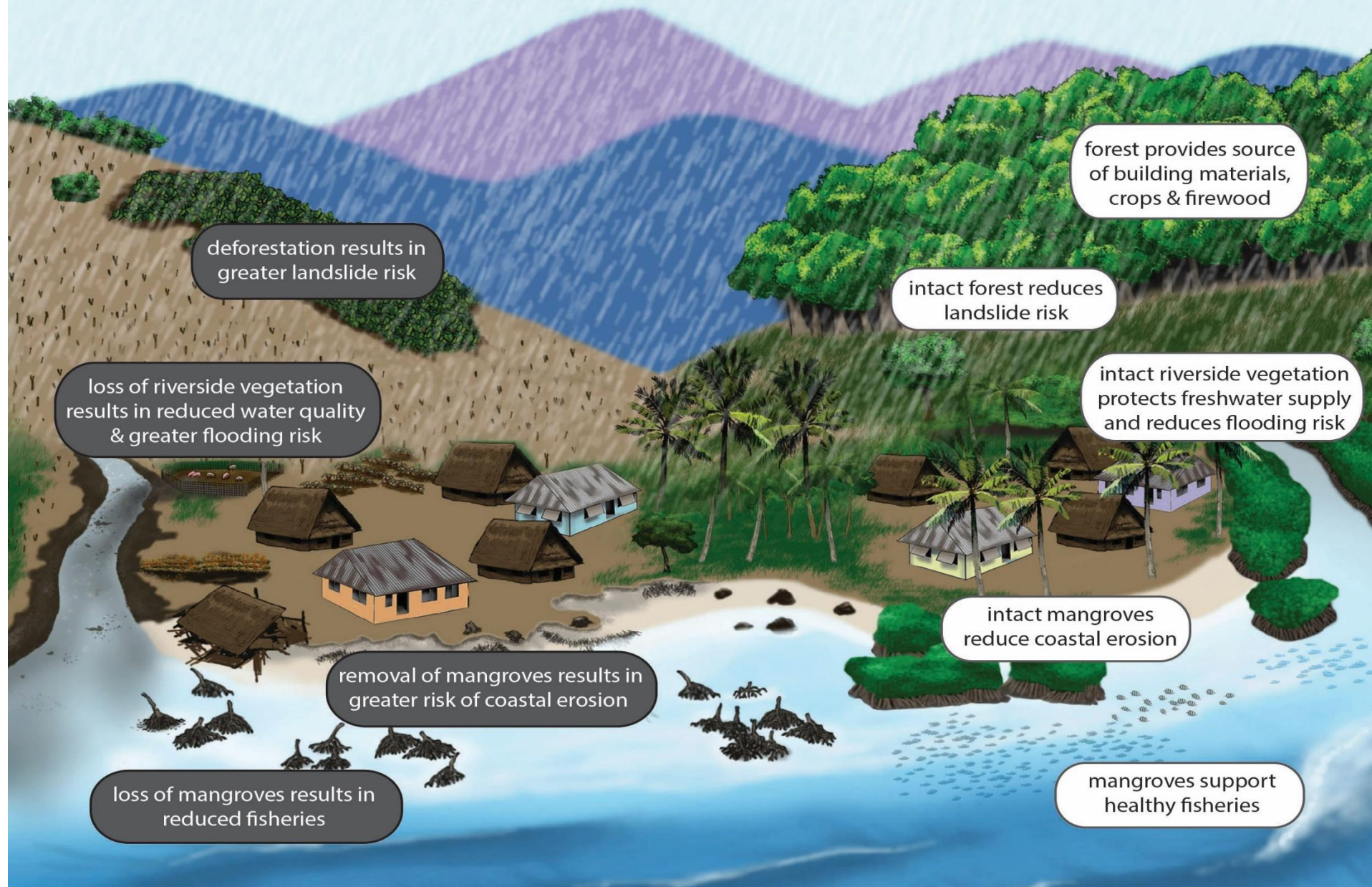
Village with ecosystem based adaptation



Village without ecosystem based adaptation



Village with ecosystem based adaptation



Threats to ecosystem services

Various human activities threaten and affect ecosystems in many ways.

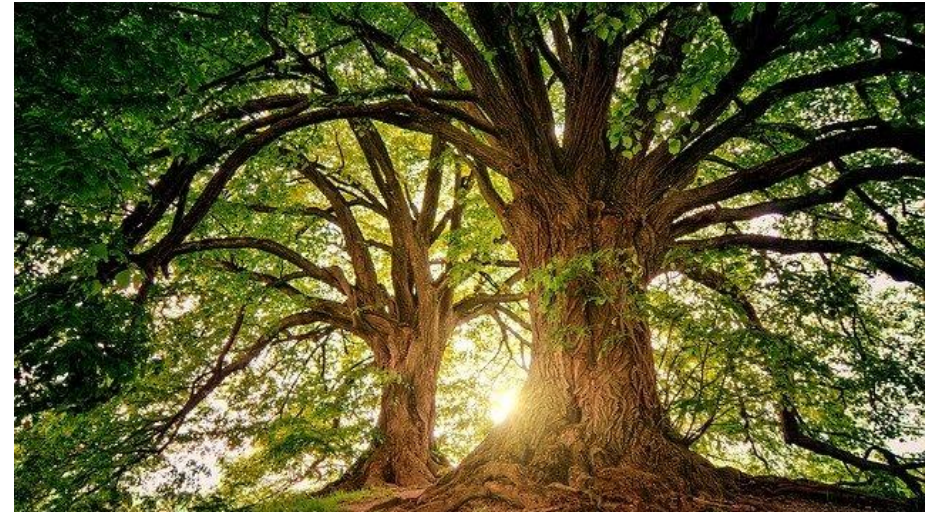
In order for an ecosystem service to deliver a benefit, it requires a functioning ecosystem where there are living organisms that have a positive living environment for them.

Because ecosystem services are considered as public goods for which economists find it difficult to set realistic values, they are undervalued almost always in decision-making processes.

Putting value on nature

Ecosystems and the services they produce have been around and harnessed interactively by a variety of species long before humans.

The concept of ecosystem services has been created to try to measure and evaluate the benefits of nature's free services



Valuation of ecosystem services



To evaluate the ecosystem services economically, one must know:

1. How much the ecosystem produces of the service - such as tonnage purification or number of persons using an ecosystem for recreation
2. The value per unit of the service - how much tonnage of nitrogen a wetland cleanses and what it would cost to clean it otherwise, or how much people appreciate the value of being in nature

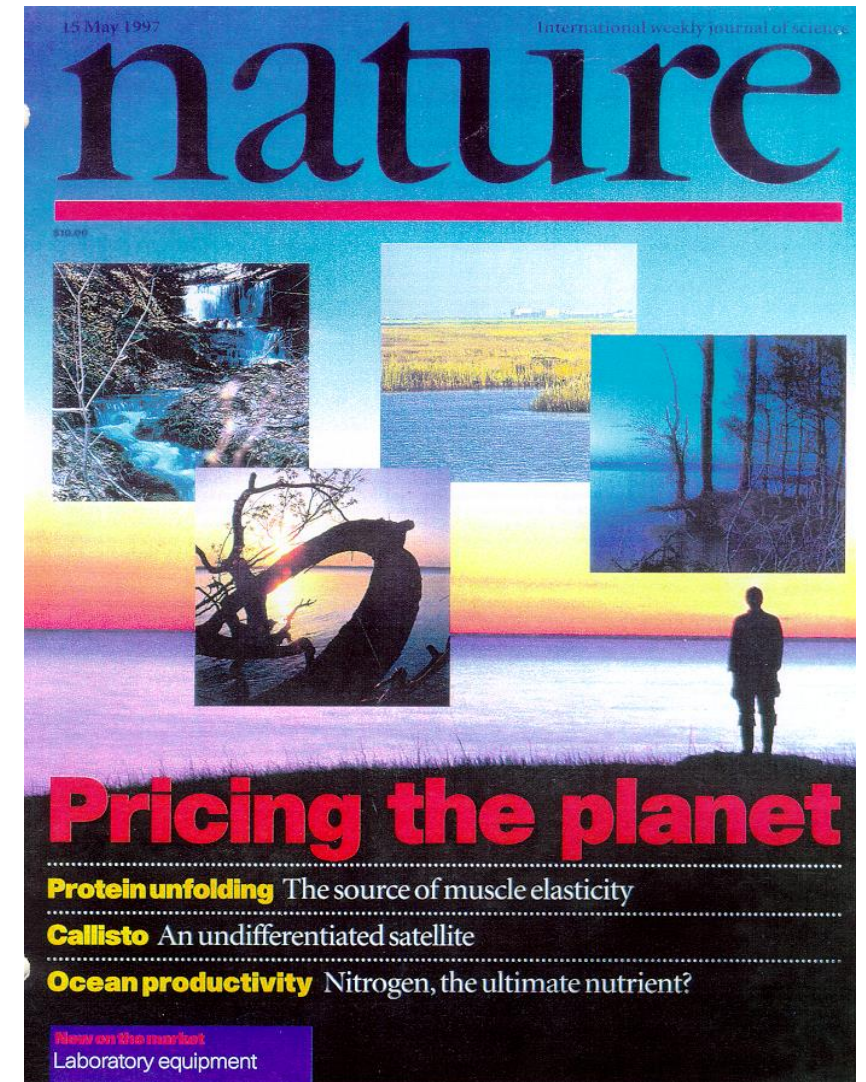
The theory is simple, but in practice it is enormously difficult

The value of ecosystem services and natural capital

NATURE VOL 387 15 MAY 1997

Robert Costanza, Ralph d'Arge, Rudolf de Groot, Stephen Farber, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Sutton & Marjan van den Belt

Nature's services from all of the world's ecosystems are worth about **38 trillion U.S. dollars per year**. 24 trillion comes from the oceans and 14 from land ecosystems. By comparison, the entire global GDP in 1997 was also 38 trillion



Other examples

- Pollination of the earth is considered to be worth 200 billion U.S. dollars per year. That's what it would cost if we were to try to pollinate all the crops by hand or bring up domestic bees to replace all wild pollinators.
- The global economy is losing more money because of forests disappearing than from the global banking crisis.
- Forest for the value corresponding to \$4,000 billion is lost every year through human mismanagement of ecosystems. Source: TEEB - The Economics of Ecosystems and Biodiversity
- China has invested heavily around the river Yang-tse to plant a variety of trees to protect against flooding and soil erosion. Source: Gretchen Daily, professor of environmental sciences at Stanford University in San Francisco
- A honey pot that is bought for \$6 is probably really worth \$600 as the bees have visited thousands of flowers and then brought home the nectar to produce honey. Source: MittBi

Research on ecosystem services and their value

- **In the UN's Millennium Ecosystem Assessment**, scientists are working from 95 countries on the largest study ever on the state of global ecosystems and their impact on society and the economy. The reports show that the state of ecosystems and their ability to produce ecosystem services has become increasingly worse over the past 50 years
- **Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)** is a UN entity with the task of calculating the value of biodiversity in ethical, social and economic terms.
- **The Economics of Ecosystems and Biodiversity (TEEB)** is a large study with about 200 economists and ecologists from 26 countries analysing the increasing costs to society due to the loss of ecosystems and biodiversity.
- **Ecosystem Services Partnership (ESP)**
- **The Natural Capital Project**
- **The Economics of Land Degradation (ELD)**
- **Ecosystem based Management (EBM)**



Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services



IPBES

[IPBES negotiations](#)[IUCN's support to the IPBES process](#)[News and Events](#)[Contacts](#)

[Home](#) • [About IUCN](#) • [How we work](#) • [Programmes](#) • [Ecosystem Management Programme](#) • [IPBES](#)

Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)

What is IPBES?

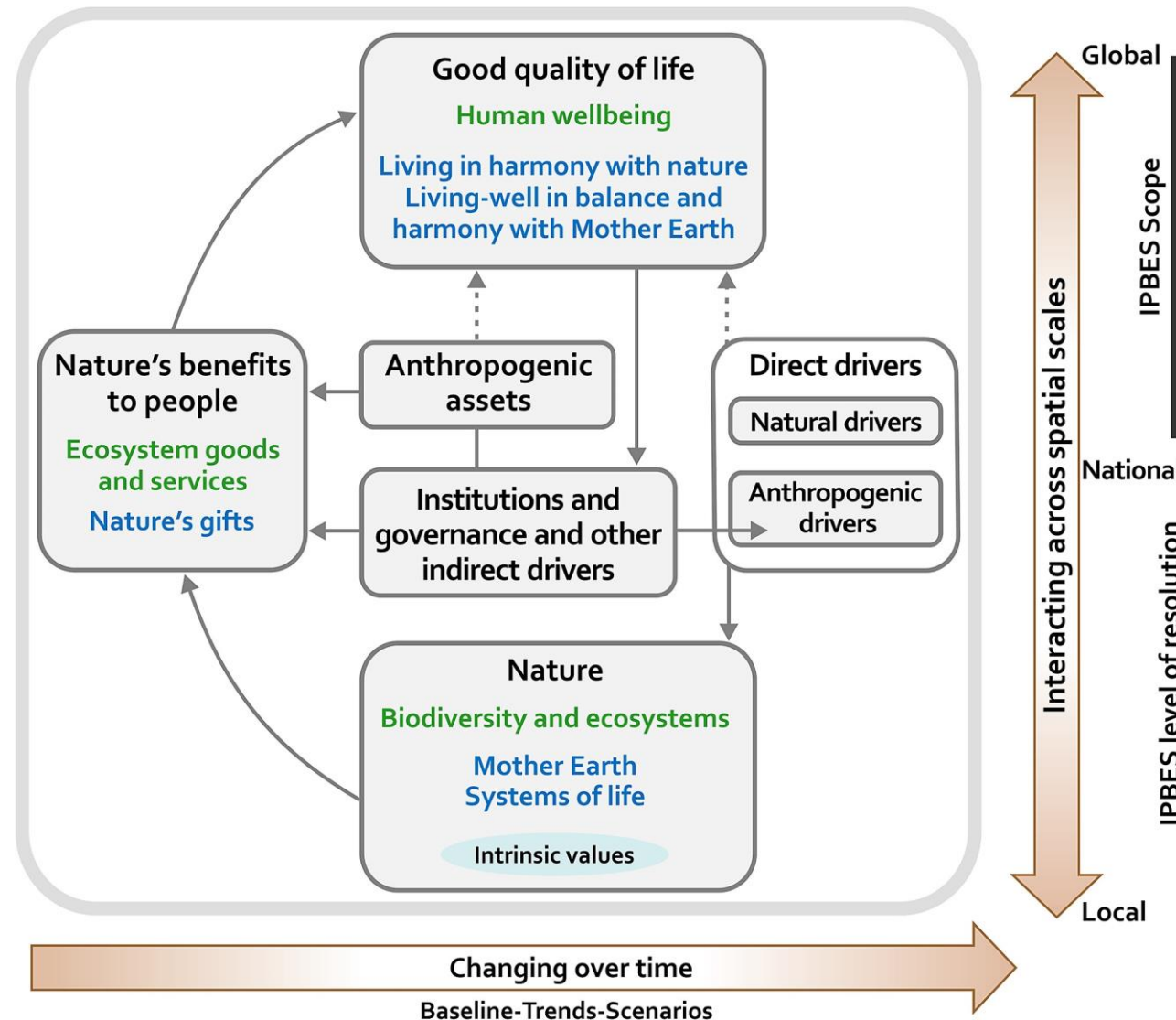
The "Intergovernmental Platform on Biodiversity and Ecosystem Services" is a mechanism proposed to further strengthen the science-policy interface on biodiversity and ecosystem services, and add to the contribution of existing processes that aim at ensuring that decisions are made on the basis of the best available scientific information on conservation and sustainable use of biodiversity and ecosystem services. IPBES is proposed as a broadly similar mechanism to the Intergovernmental Panel on Climate Change (IPCC).

What is the science-policy interface?

Science-policy interfaces are social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making at different scales. This includes 2 main requirements:

- a) that scientific information is relevant to policy demands and is formulated in a way that is accessible to policy and decision makers; and
- b) that policy and decision makers take into account available scientific information in their deliberations and that they formulate their demands or questions in a way that are accessible for scientists to provide the relevant information. [Click here for a graphic showing the cycle of](#)

IPBES Conceptual Framework



ESP

The Ecosystem Services Partnership

Worldwide Network to enhance the Science and practical Application of ecosystem services assessment



[> Homepage](#)

[Home](#)

[About the Partnership](#)

[Become a member](#)

[ESP Services](#)

[ESP Working groups](#)

[ESP Conferences 2012](#)

[Journals](#)

[News](#)

[Upcoming events](#)

[Vacancies](#)

[Links](#)

[Contact](#)

Welcome to the new ESP website

Several pages and functionalities are still under construction or are being updated. If you have any suggestions please contact [ESP Support Team](#).

ESP Services

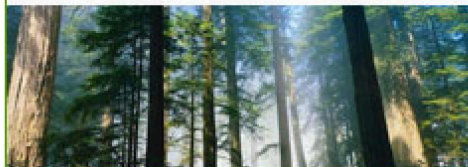
- | | | |
|---|--|--|
| <ul style="list-style-type: none">● Networking & Outreach● Case studies & Showcases● Data & Knowledge sharing | <ul style="list-style-type: none">● Training and Education● Guidelines & Toolkits● Funding/Cooperation calls | <ul style="list-style-type: none">– Contact– Support & FAQ– Members & Partners |
|---|--|--|
- [● Become a Member](#)

ESP Activities and Networks

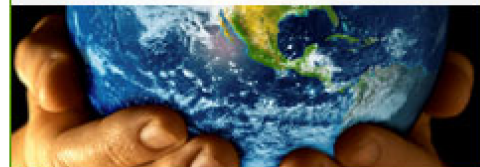
● [Thematic Working Groups](#)



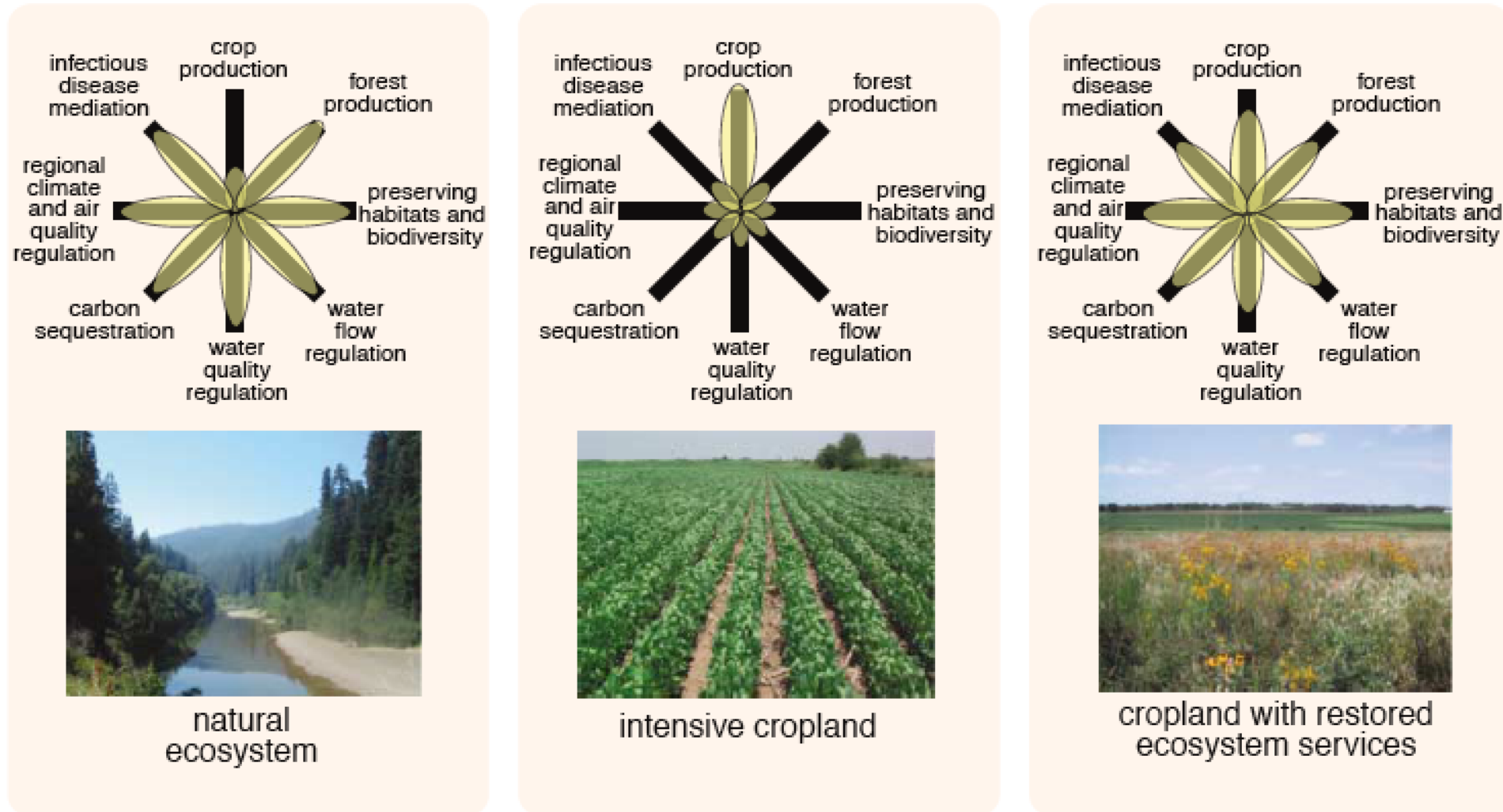
● [Biome Expert Groups](#)



● [National ESP Networks](#)

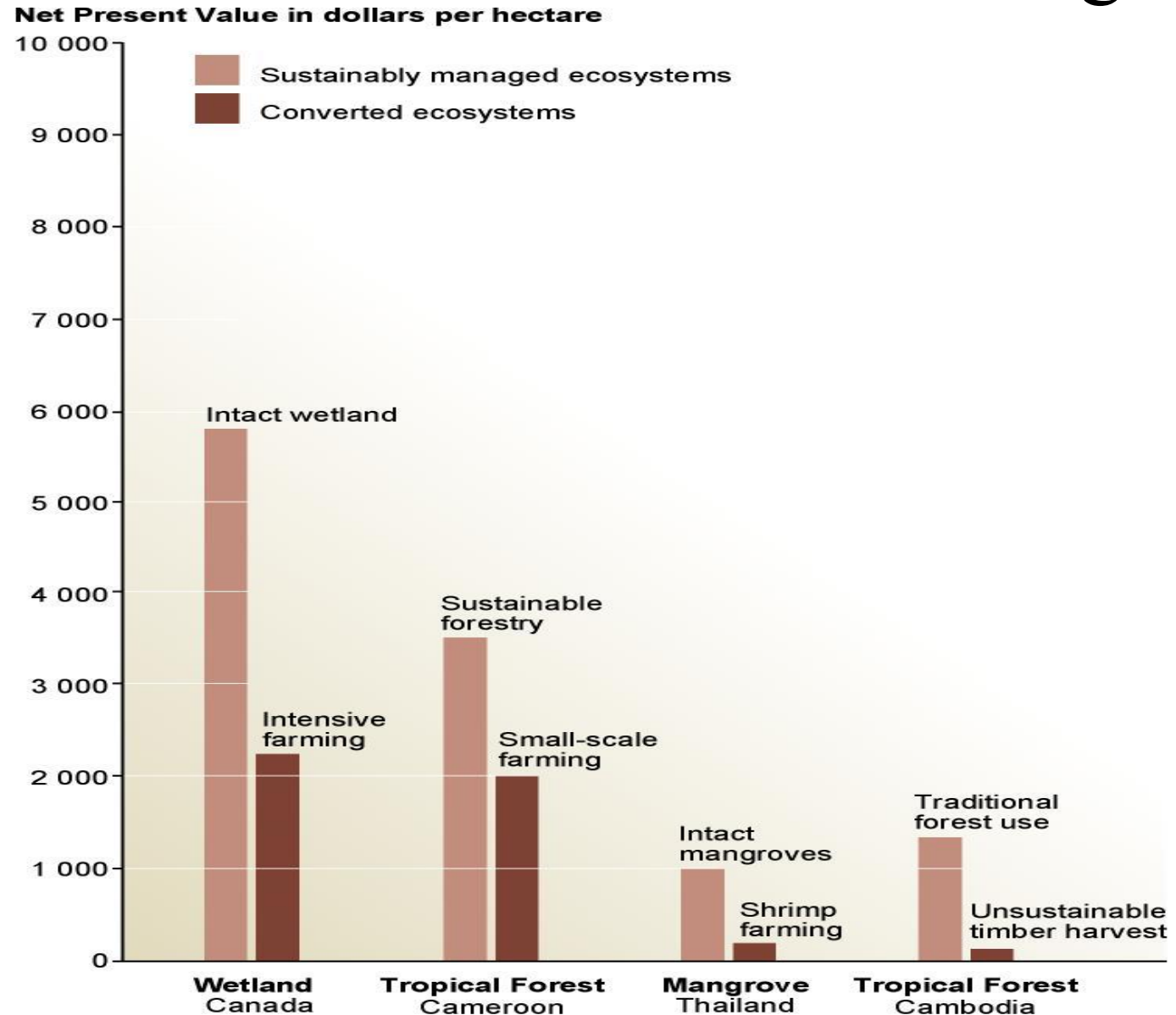


The importance and value of worlds ecosystem services and natural capital is gaining momentum

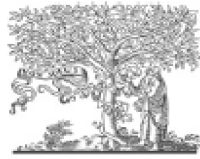


Degradation of ecosystem services often causes significant harm to human well-being

- The total economic value associated with managing ecosystems more sustainably is often higher than the value associated with conversion
- Conversion may still occur because private economic benefits are often greater for the converted system



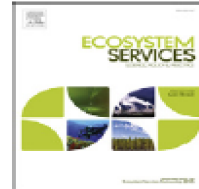
Source: Millennium Ecosystem Assessment



ELSEVIER

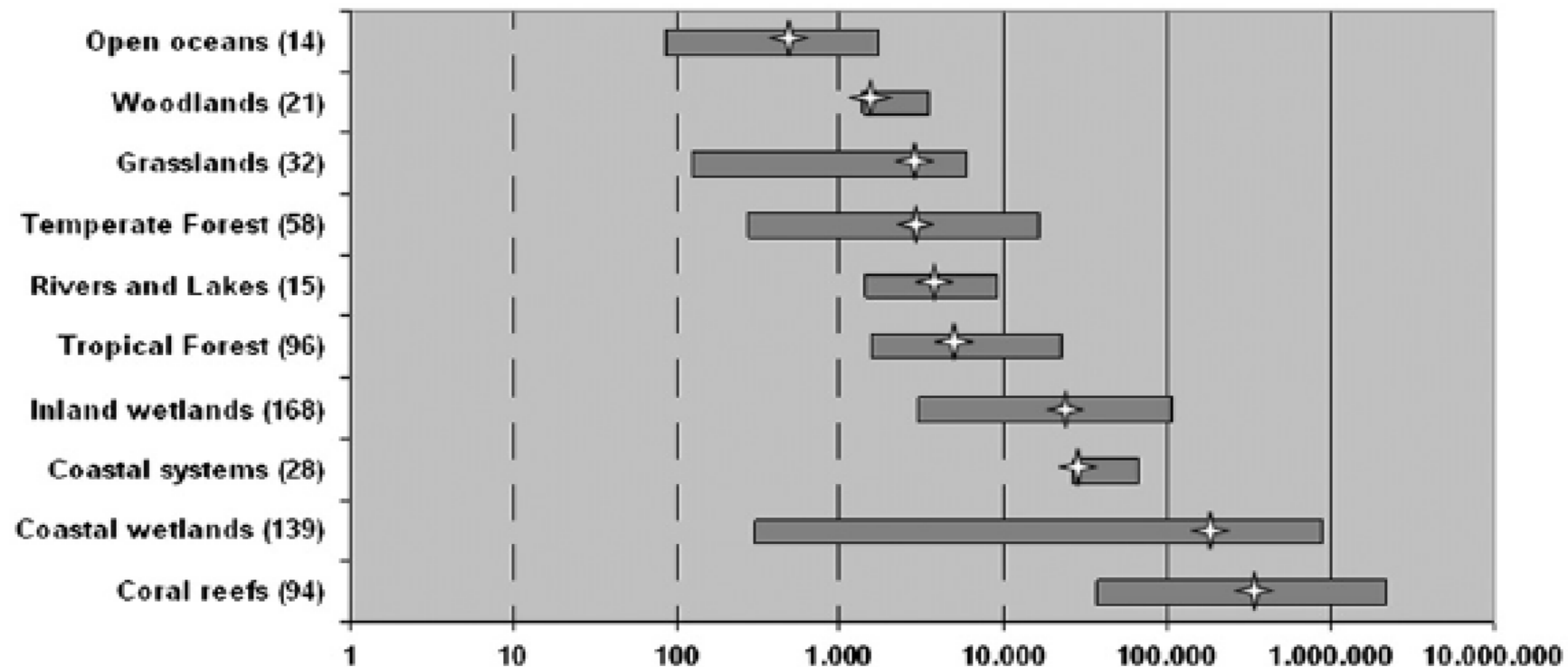
Contents lists available at [SciVerse ScienceDirect](http://www.sciencedirect.com)

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser

Global estimates of the value of ecosystems and their services in monetary units

Rudolf de Groot^{a,*}, Luke Brander^{b,1}, Sander van der Ploeg^a, Robert Costanza^c, Florence Bernard^d, Leon Braat^e, Mike Christie^f, Neville Crossman^{g,h}, Andrea Ghermandiⁱ, Lars Hein^a, Salman Hussain^j, Pushpam Kumar^k, Alistair McVittie^j, Rosimeiry Portela^l, Luis C. Rodriguez^{g,h}, Patrick ten Brink^m, Pieter van Beukering^b



Loss of Ecosystem Services from 1997 to 2011 due to land use change – between \$4.3 – 20.2 trillion/yr

Global Environmental Change 26 (2014) 152–158



ELSEVIER

Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha



Changes in the global value of ecosystem services

Robert Costanza^{a,*}, Rudolf de Groot^b, Paul Sutton^{c,d}, Sander van der Ploeg^b,
Sharolyn J. Anderson^d, Ida Kubiszewski^a, Stephen Farber^e, R. Kerry Turner^f

^a Crawford School of Public Policy, Australian National University, Canberra, Australia

^b Environmental Systems Analysis Group, Wageningen University, Wageningen, The Netherlands

^c Department of Geography, University of Denver, United States

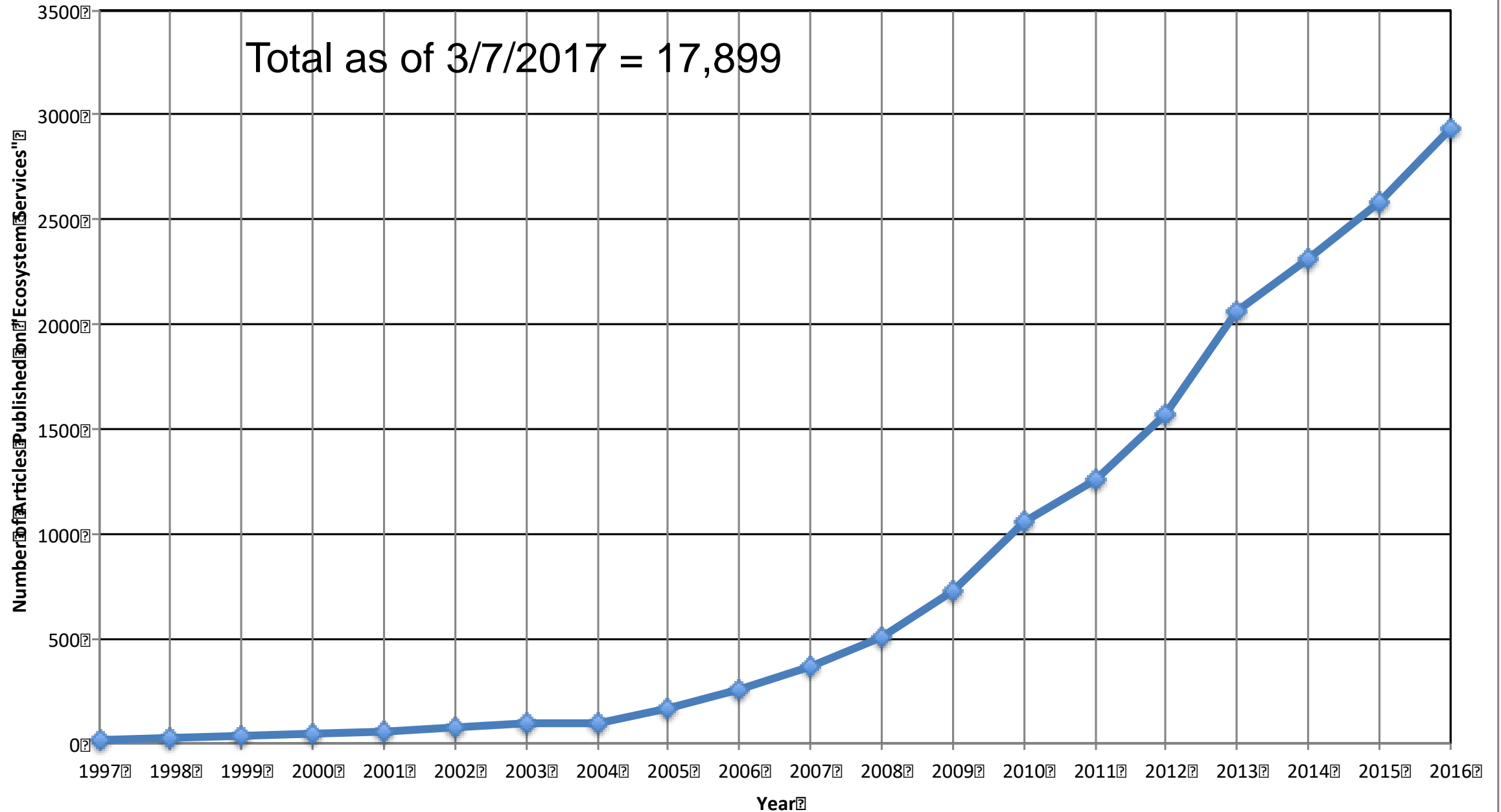
^d Barbara Hardy Institute and School of the Natural and Built Environments, University of South Australia, Australia

^e University of Pittsburgh, United States

^f University of East Anglia, Norwich, UK

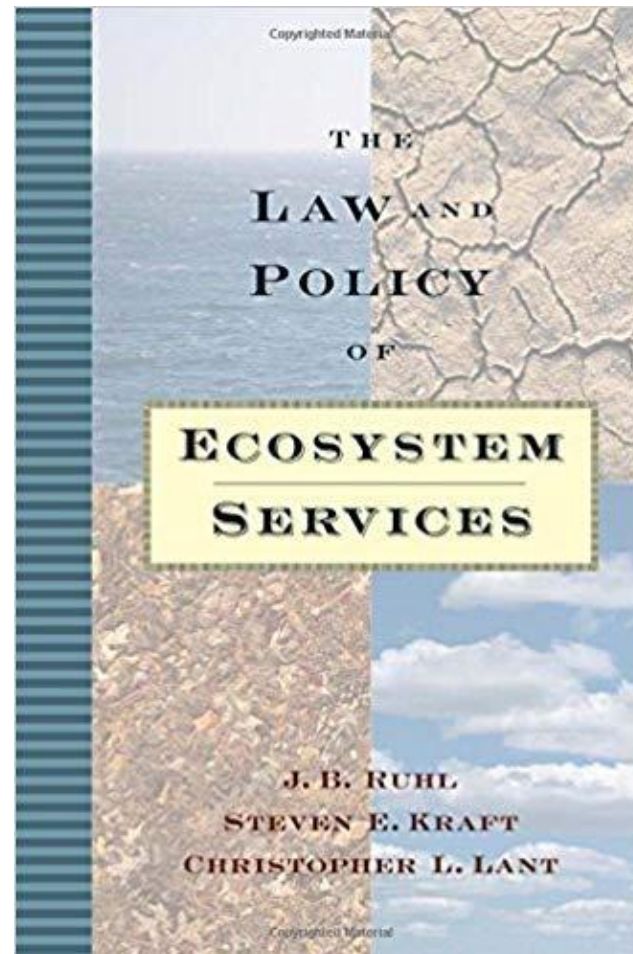


Number of Articles Published on "Ecosystem Services" in SCOPUS

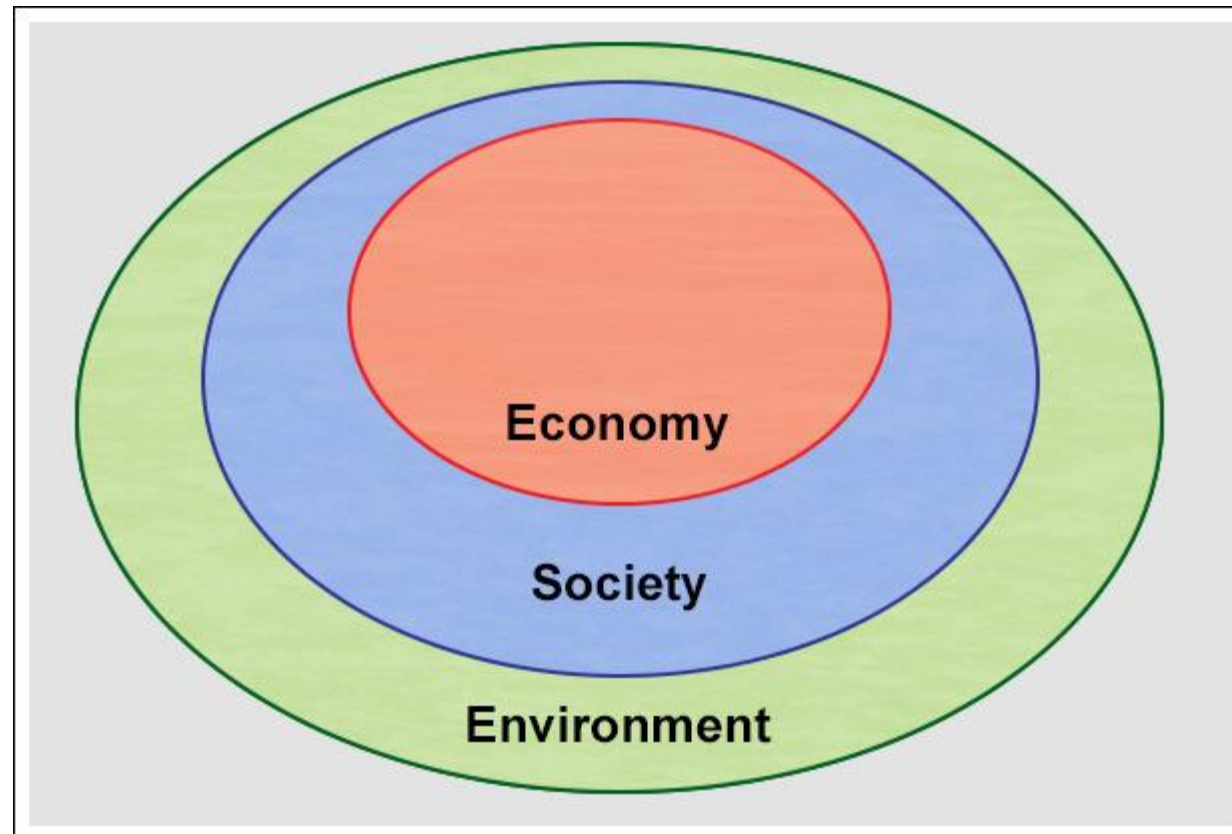


Ecological systems, though necessary to human society, are essentially without market value

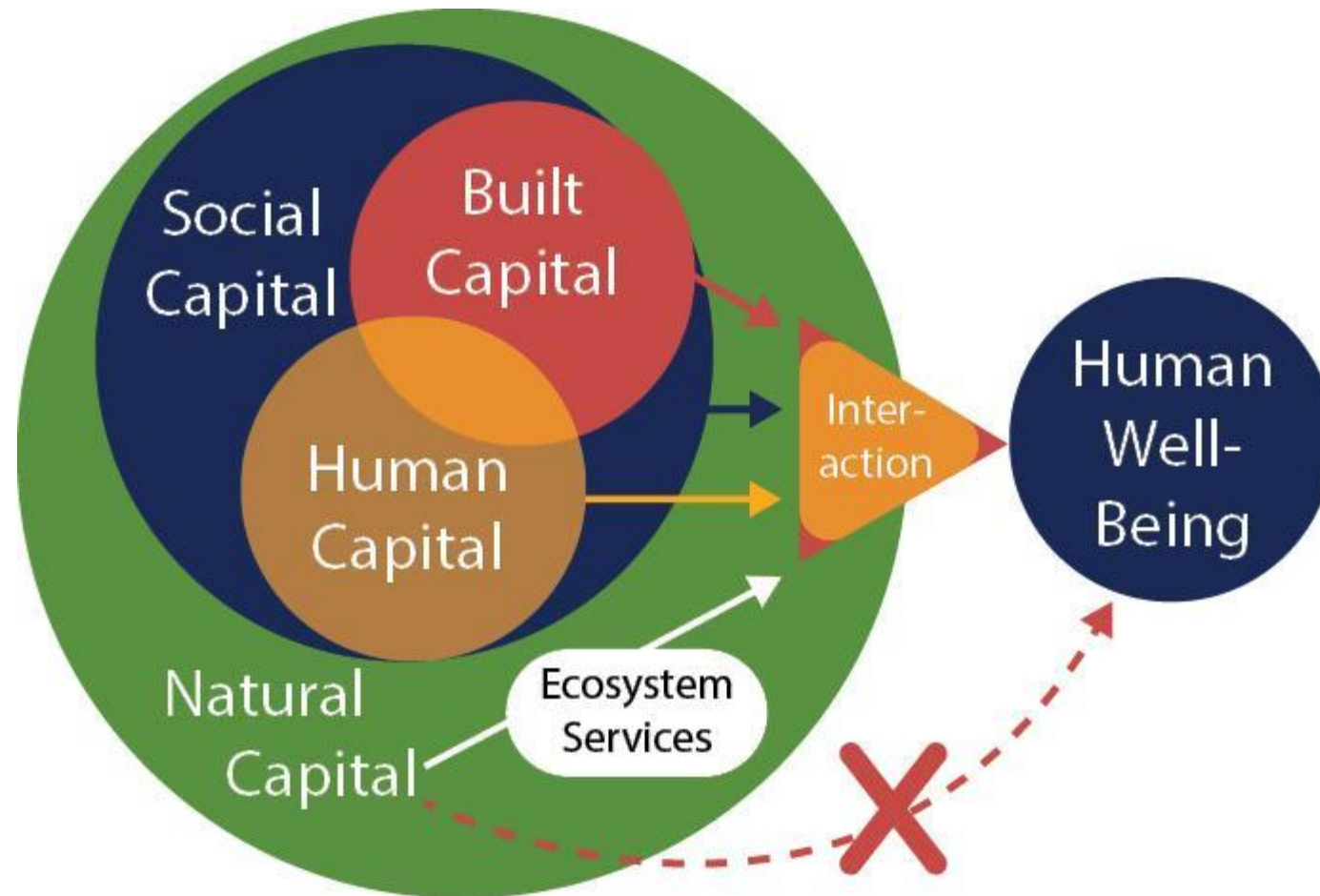
How can we fix our legal system to protect the environment?



Ecological economics emphasizes the economy as a subsystem of the ecosystem with its focus upon preserving natural capital



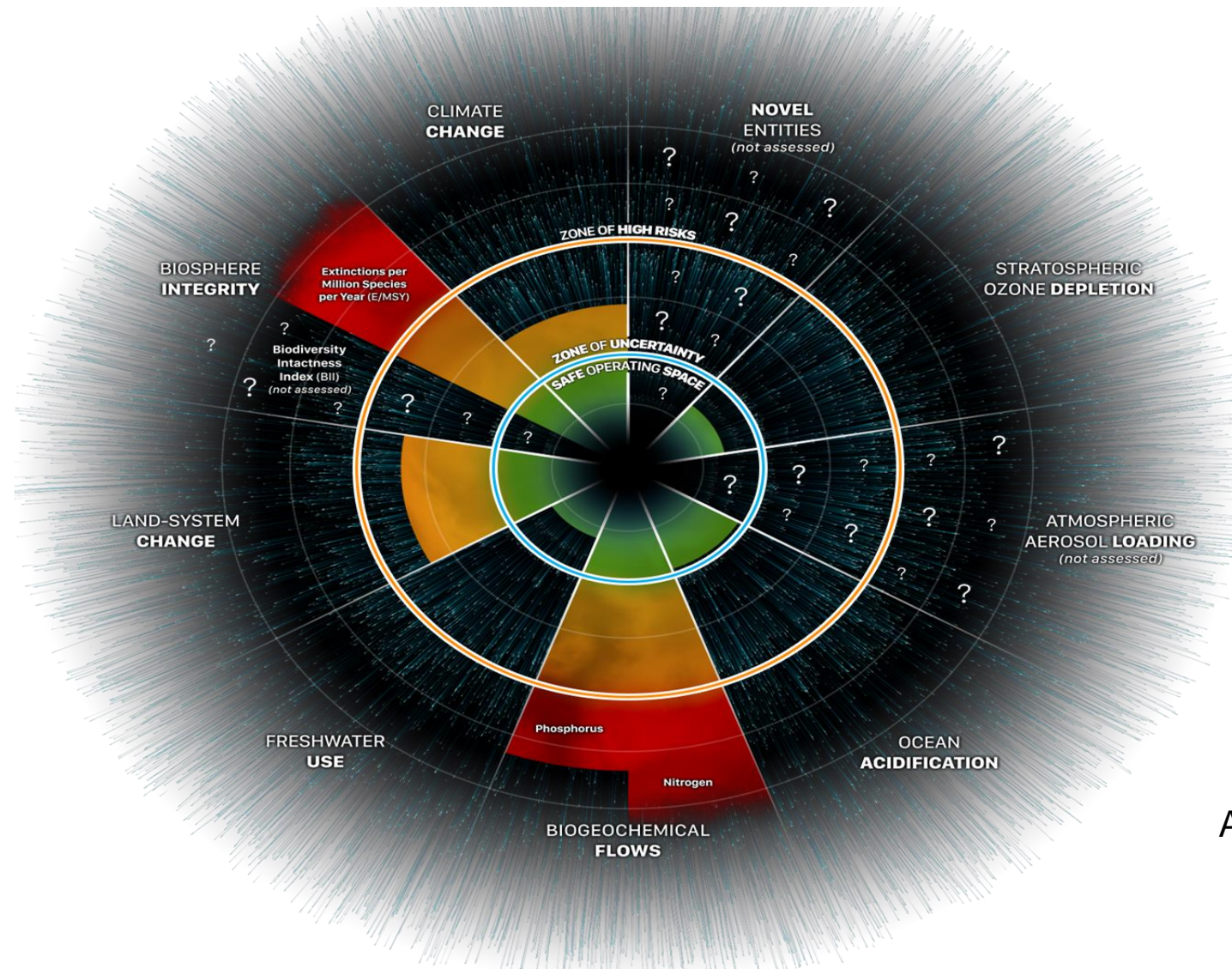
Four Capitals – which are not interchangeable



Helping to **inform decisions** on
conservation and
enterprise
development
attributing **explicit
economic value to
natural resources**

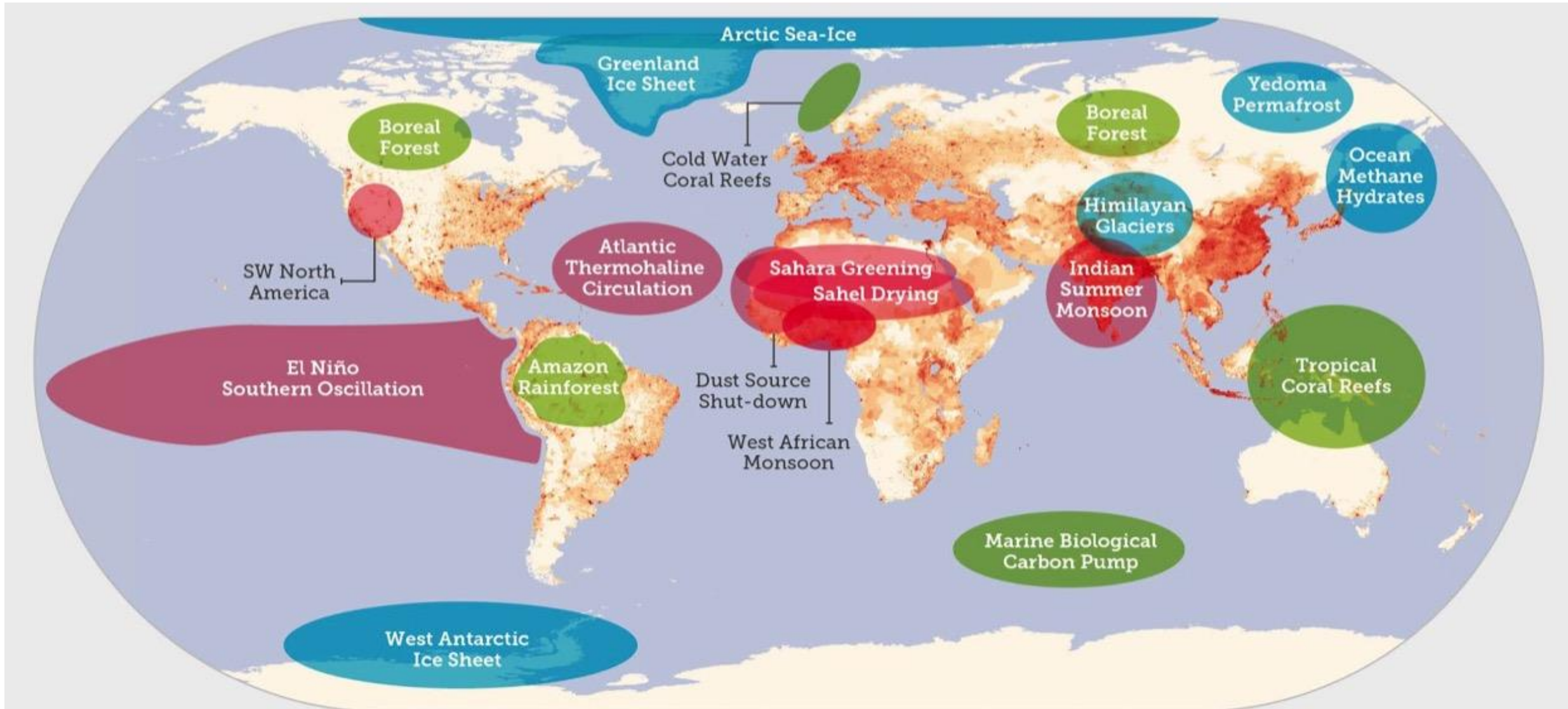
(Costanza et al. 2014)

Planetary Boundaries – fundamental ecological constraints

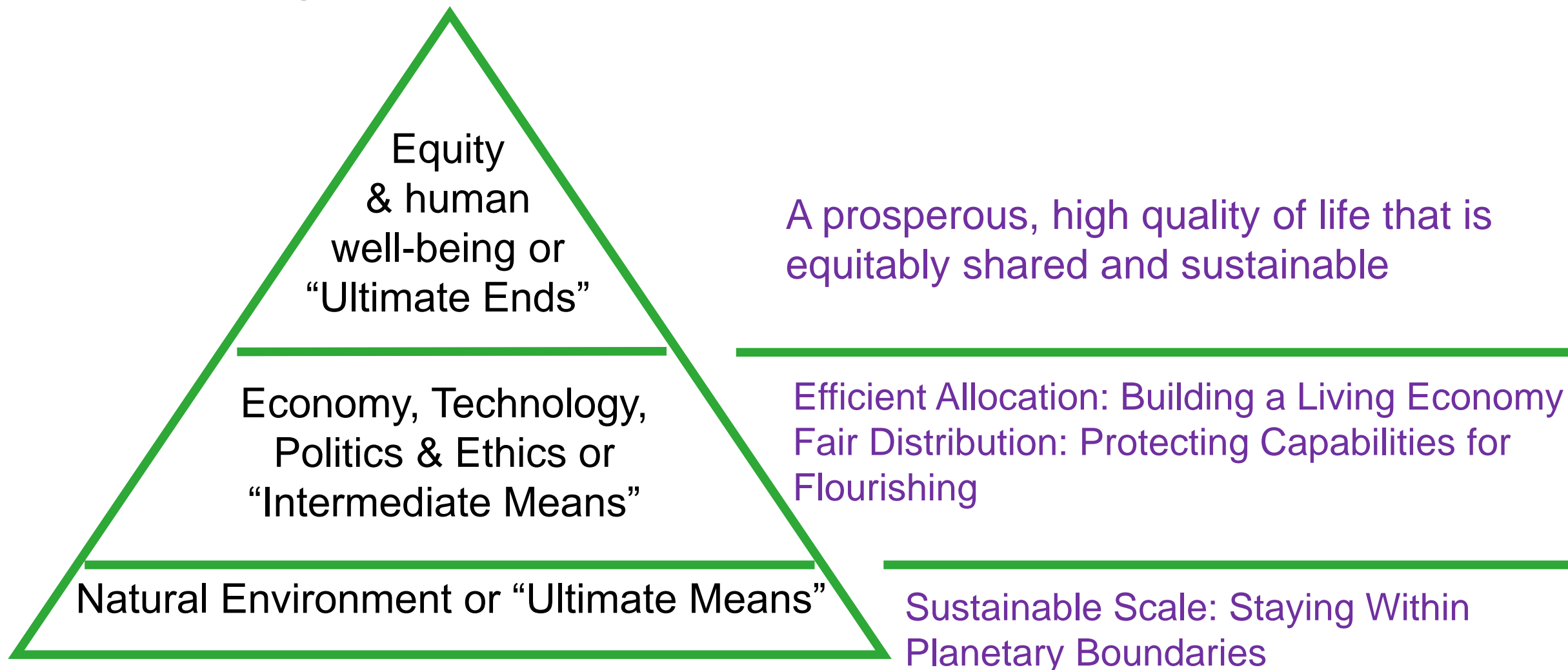


Adapted from Steffen et al. 2015

The world is complex, non-linear, adaptive system, with thresholds, tipping points, and surprises



Overarching Goals:



Costanza, R., J. McGlade, H. Lovins, and I. Kubiszewski. 2014. An Overarching Goal for the UN Sustainable Development Goals.

Overlapping ideas

Wellbeing Economy

Circular BioEconomy Ecological Economy

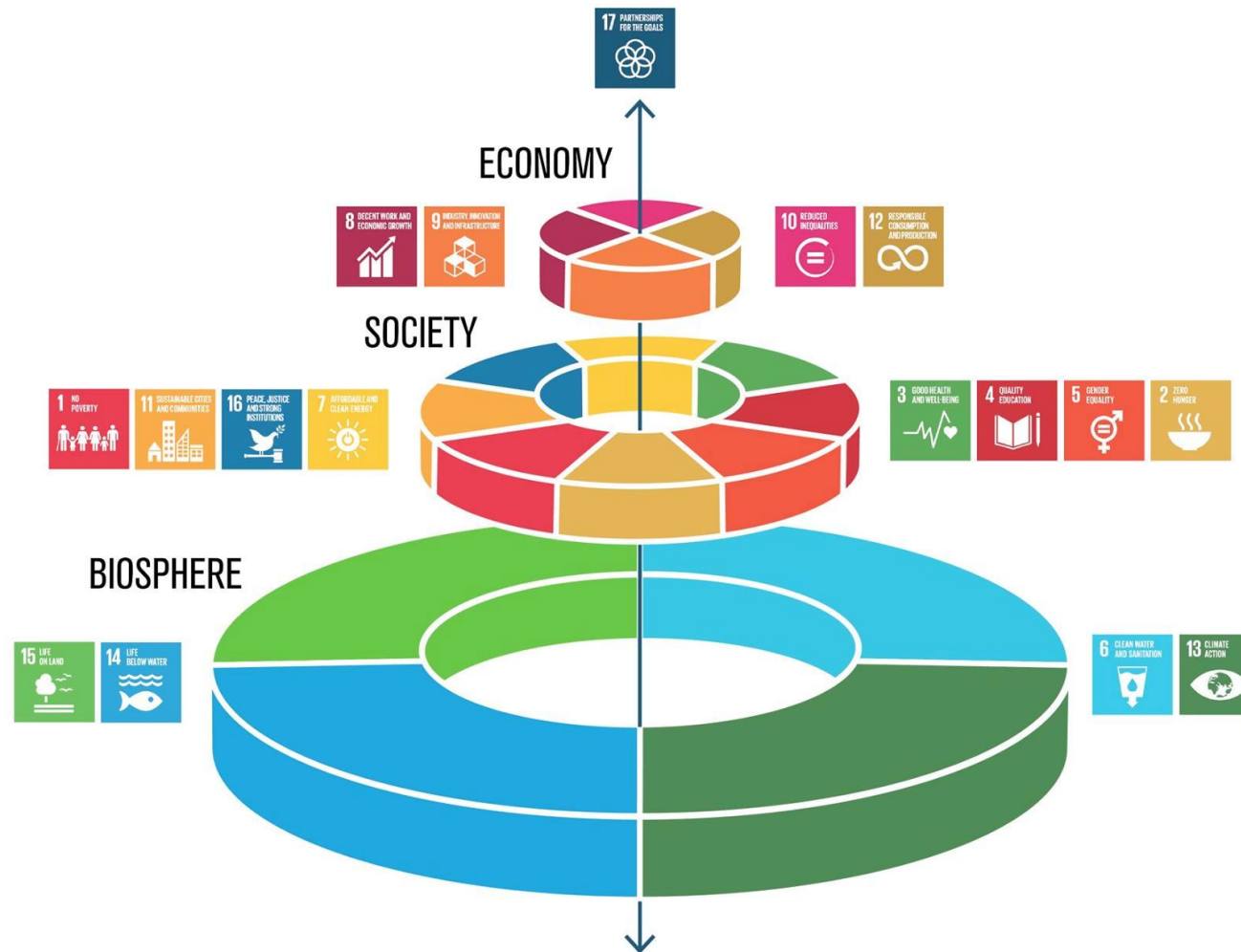
Regenerative Economy Ecological Civilization

Blue Economy

Doughnut Economy Steady State Economy

Lagom Economy

The sustainable and desirable doughnut



How can we support ecosystem services?

Appreciate the value of nature and avoid disturbing or destroying the natural ecosystem services that have evolved through millions or billions of years

- imitate nature's way of taking care of itself
- address population growth
- reduce the consumption of goods
- maximise resource efficiency
- improve environmental protection



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Thank you

Anna (Anya) Phelan

UQ Business School

a.phelan@business.uq.edu.au

