

*Ecosystem services and Biodiversity*

*Poverty and natural resources*

*European and Portuguese policy for Biodiversity*

Prof. Doutora Maria do Rosário Partidário

# Bibliography

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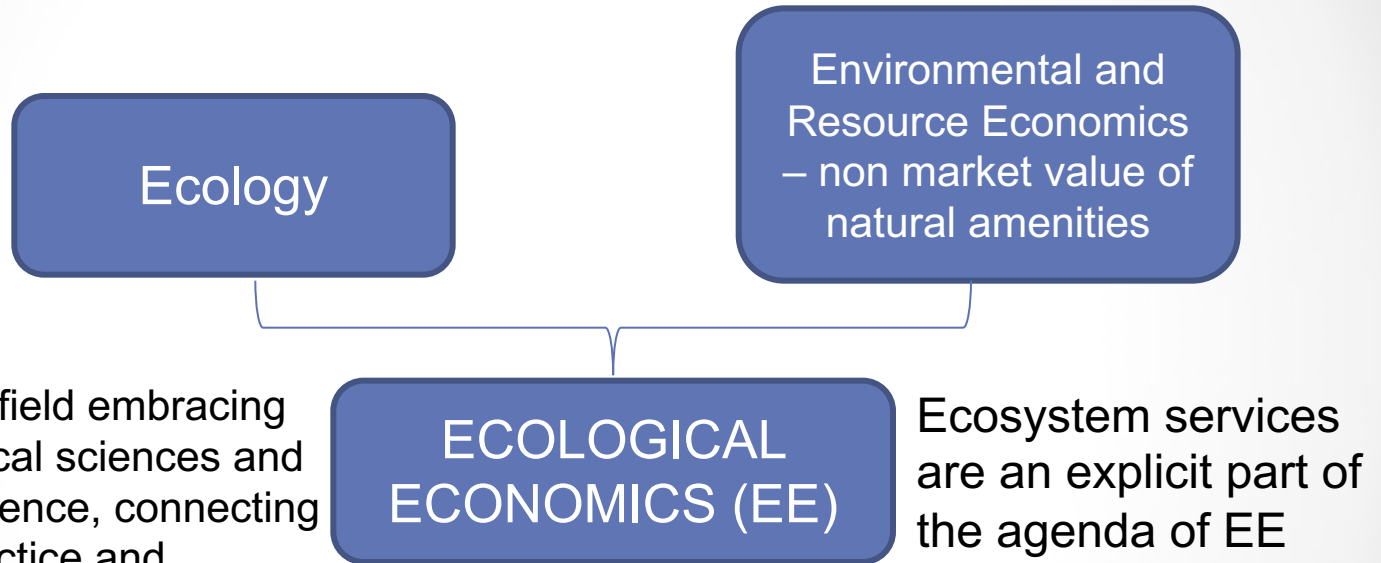
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# Origin of Ecosystem Services



## Pluralism

Transdisciplinary field embracing psychology, political sciences and earth systems science, connecting research with practice and traditional knowledge

Costanza et al, 2017

# Ecosystem services

‘Ecosystem services’ (ES) are the ecological characteristics, functions, or processes that **directly or indirectly** contribute to human wellbeing: that is, the benefits that people derive from functioning ecosystems (Costanza et al 2017)

*“Ecosystem services consist on flows of materials, energy and information from natural capital stock which combined with manufactured and human capitals services to produce human welfare.”* Constanza (1997)

# Ecosystems

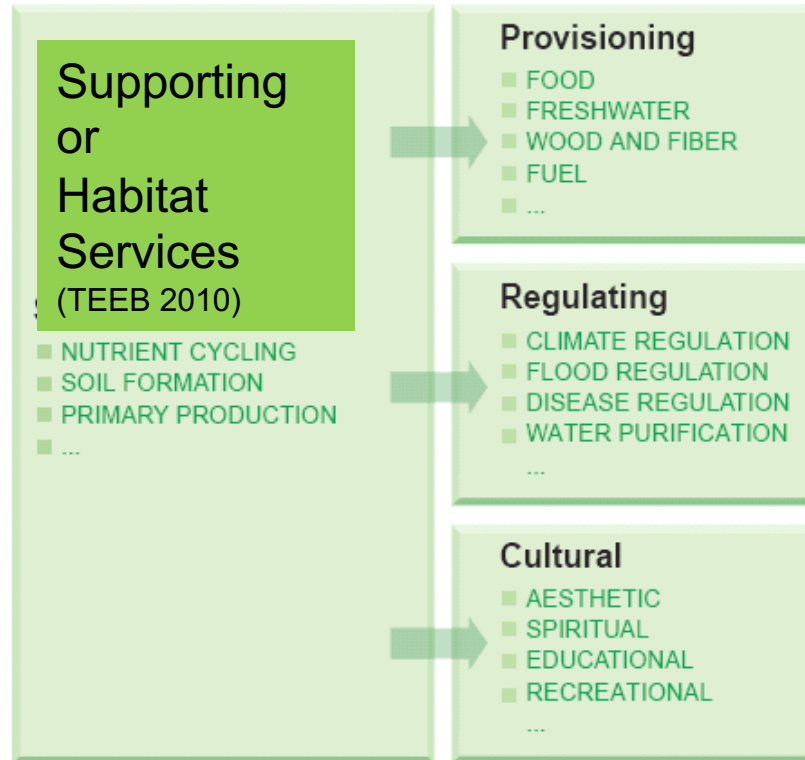
processes and functions



services and benefits

Ecosystem dis-services (eg pests, diseases, etc.)

# Categories of Ecosystem Services



Based on:

Millennium Ecosystem Assessment, 2005

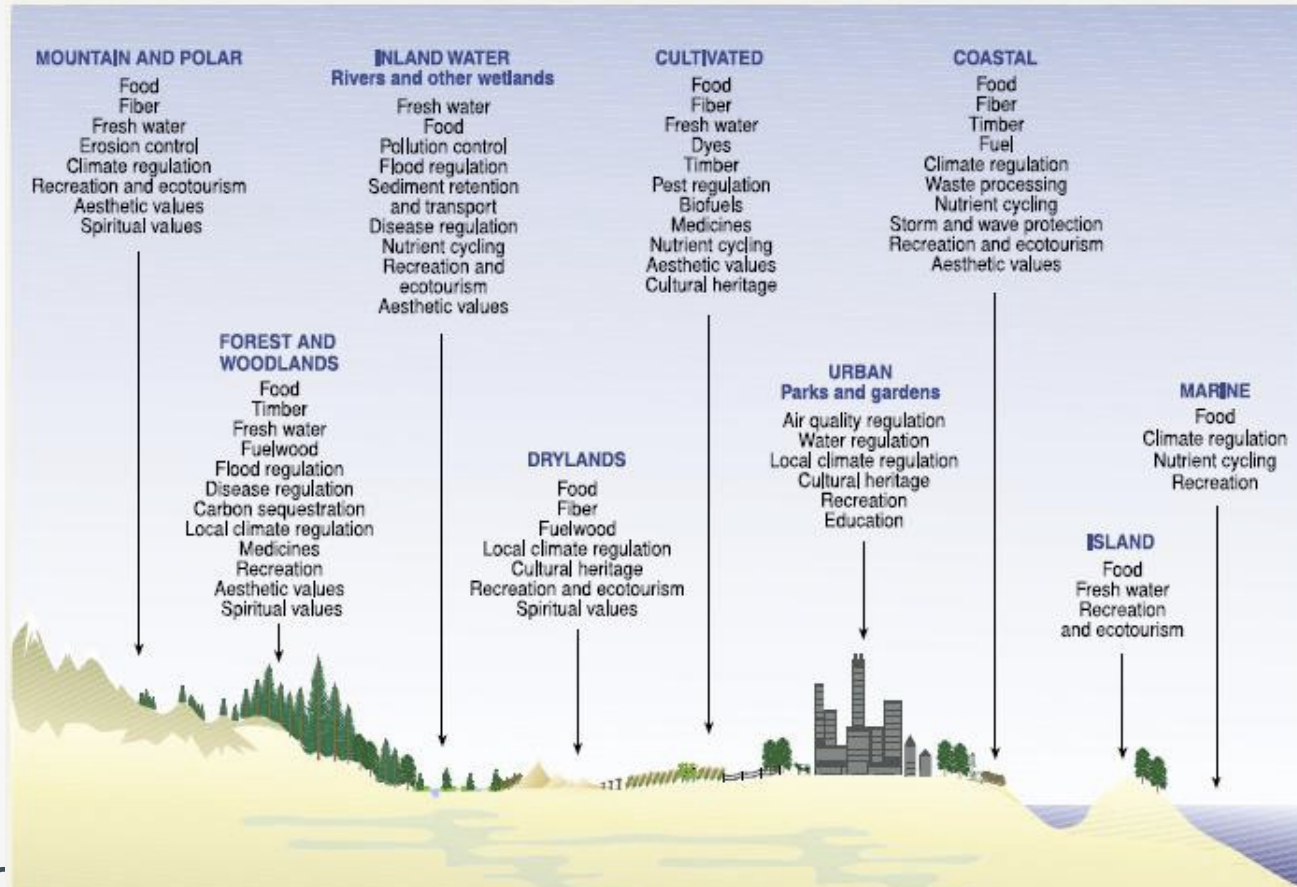
Revised by TEEB (2010)

**Table 1**  
Classification of ecosystem services and functions used in: (Costanza et al., 1997).

#	Ecosystem service*	Ecosystem functions	Examples
1	Gas regulation	Regulation of atmospheric chemical composition	CO <sub>2</sub> /O <sub>2</sub> balance, O <sub>3</sub> for UVB protection, and SO <sub>x</sub> levels
2	Climate regulation	Regulation of global temperature, precipitation, and other biologically mediated climatic processes at global or local levels	Green-house gas regulation, DMS production affecting cloud formation
3	Disturbance regulation	Capacitance, damping, and integrity of ecosystem response to environmental fluctuations	Storm protection, flood control, drought recovery, and other aspects of habitat response to environmental variability mainly controlled by vegetation structure
4	Water regulation	Regulation of hydrological flows	Provisioning of water for agricultural (e.g., irrigation) or industrial (e.g., milling) processes or transportation
5	Water supply	Storage and retention of water	Provisioning of water by watersheds, reservoirs, and aquifers
6	Erosion control and sediment retention	Retention of soil within an ecosystem	Prevention of loss of soil by wind, runoff, or other removal processes, storage of silt in lakes and wetlands
7	Soil formation	Soil formation processes	Weathering of rock and the accumulation of organic material
8	Nutrient cycling	Storage, internal cycling, processing, and acquisition of nutrients	Nitrogen fixation, N, P, and other elemental or nutrient cycles
9	Waste treatment	Recovery of mobile nutrients and removal or breakdown of excess or xenic nutrients and compounds	Waste treatment, pollution control, detoxification
10	Pollination	Movement of floral gametes	Provisioning of pollinators for the reproduction of plant populations
11	Biological control	Trophic-dynamic regulations of populations	Keystone predator control of prey species, reduction of herbivory by top predators
12	Refugia	Habitat for resident and transient populations	Nurseries, habitat for migratory species, regional habitats for locally harvested species, or over wintering grounds
13	Food production	That portion of gross primary production extractable as food	Production of fish, game, crops, nuts, fruits by hunting, gathering, subsistence farming, or fishing
14	Raw materials	That portion of gross primary production extractable as raw materials	The production of lumber, fuel, or fodder
15	Genetic resources	Sources of unique biological materials and products	Medicine, products for materials science, genes for resistance to plant pathogens and crop pests, ornamental species (pets and horticultural varieties of plants)
16	Recreation	Providing opportunities for recreational activities	Eco-tourism, sport fishing, and other outdoor recreational activities
17	Cultural	Providing opportunities for non-commercial uses	Aesthetic, artistic, educational, spiritual, and/or scientific values of ecosystems

\* We include ecosystem "goods" along with ecosystem services.

# ECOSYSTEM SERVICES

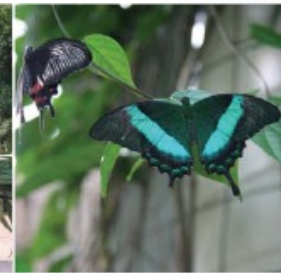




# BIODIVERSITY



**Biological diversity:** means the variability among living organisms from all sources, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems. *(Art 2 of the Convention on Biological Diversity)*



# Why are we losing biodiversity?

5 core pressures (drivers of change) on biodiversity are persistent:

- Habitat loss and degradation
- Climate change
- Excessive nutrient load and other forms of pollution
- Over-exploitation and unsustainable use
- Invasive alien species

# NATURAL CAPITAL

Capital is a stock that yields a flow of services over time

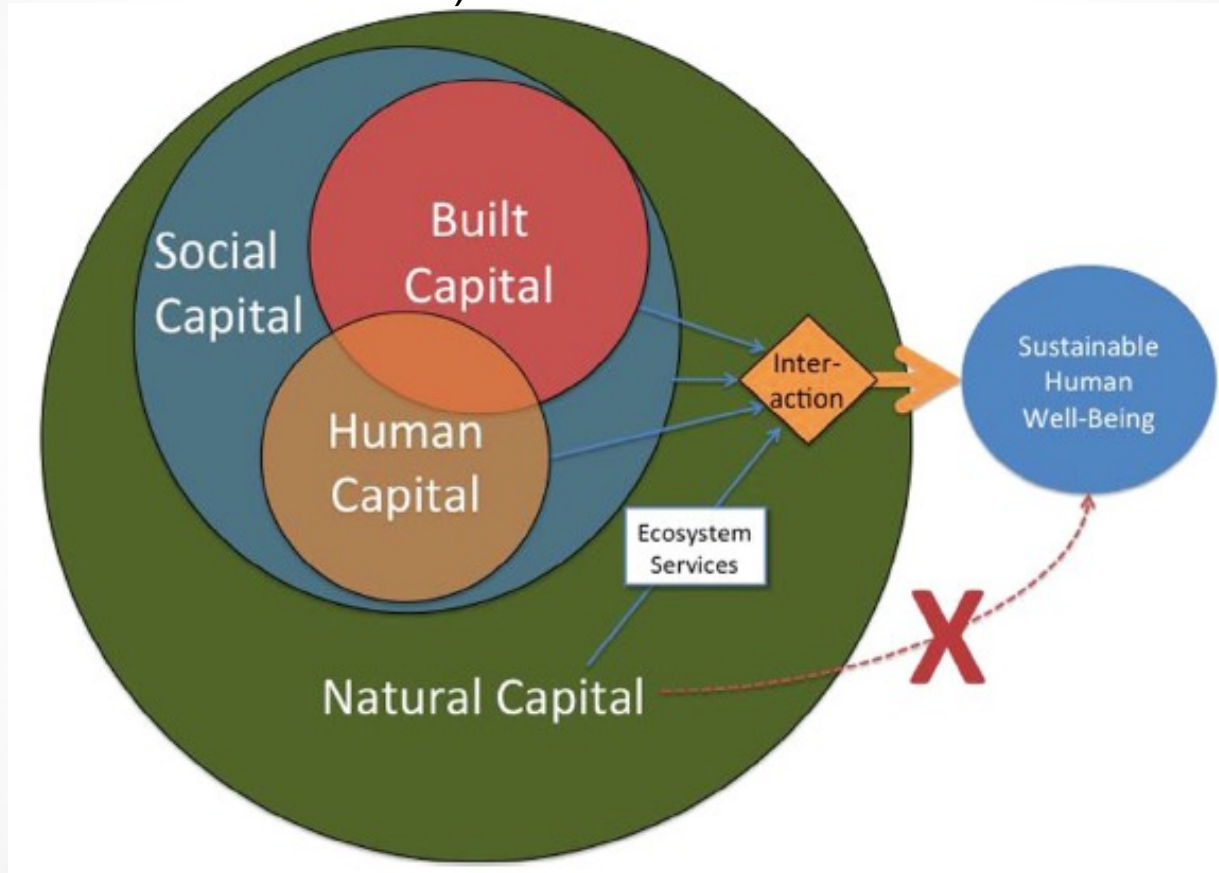
(source: Costanza et al 2017)

# NATURAL CAPITAL interact with other forms of capital

- **Natural capital** - water, forests, minerals, atmosphere, etc. does not require human activity to built or maintain
- **Build or Manufactured capital** - machines, roads, factories, reforestation, plantations, etc.
- **Human Capital** – people, skills, capacities, etc.
- **Social Cultural Capital** – world vision, ethics, knowledge, etc



Interaction between different forms of capital generate benefits to humans  
(source: Costanza et al 2017)



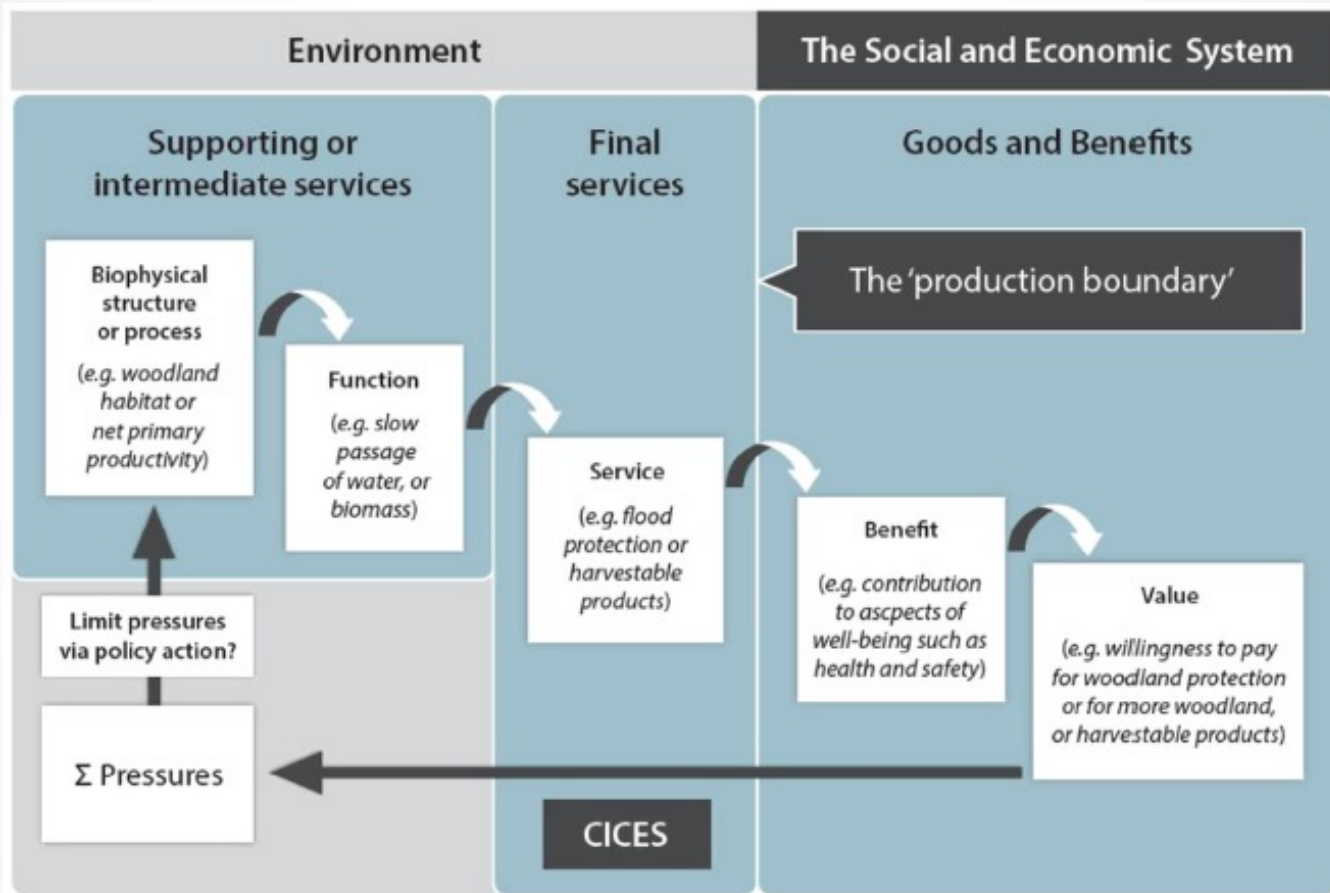


Fig. 2. Cascade diagram: from structure to functions, to services to benefits to value (Potschin and Haines-Young, 2017).

## CONSTITUENTS OF WELL-BEING

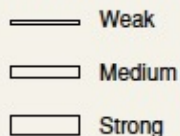


Source: Millennium Ecosystem Assessment

**ARROW'S COLOR**  
Potential for mediation by socioeconomic factors



**ARROW'S WIDTH**  
Intensity of linkages between ecosystem services and human well-being



# 3 levels of diversity

## 3 management objectives

ecosystems

species diversity

genetic diversity

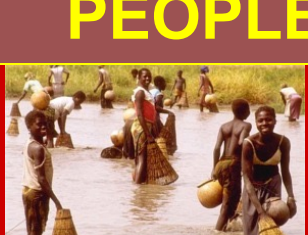
conservation



sustainable use



equitable sharing



**BIODIVERSITY IS ABOUT PEOPLE !**



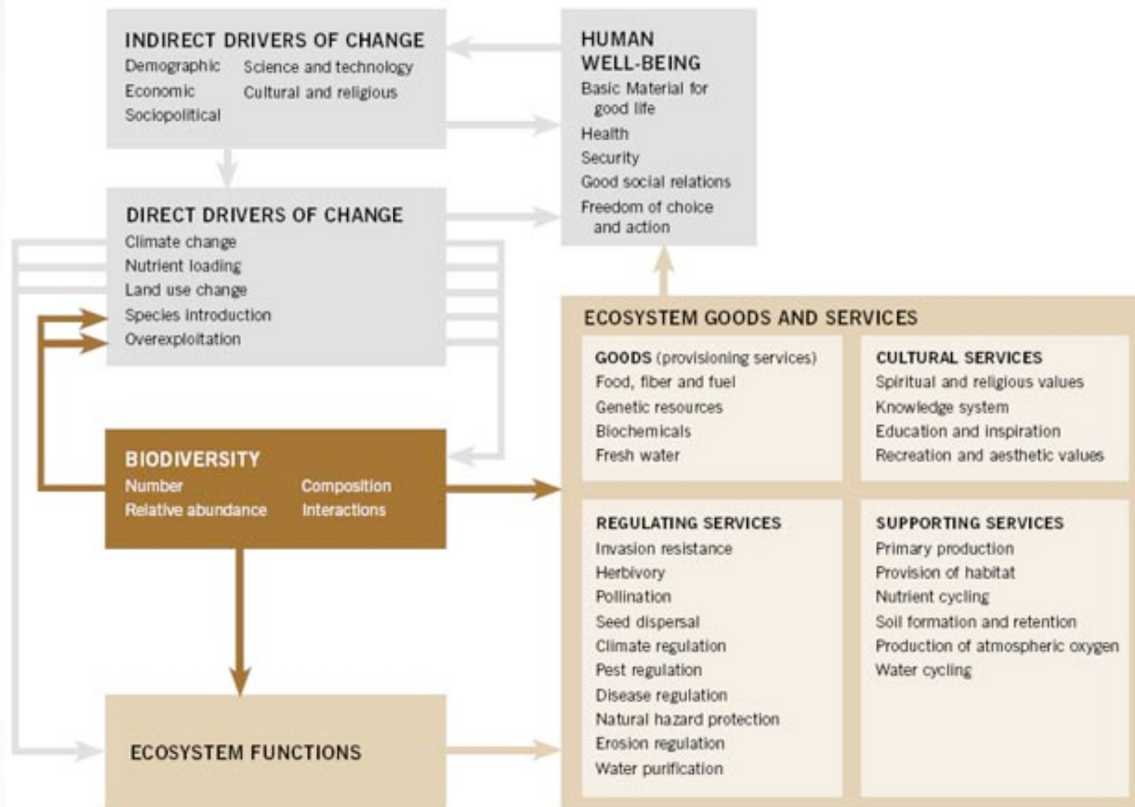
# Value / Payment for Ecosystem Services

Valuation is an estimation of worth of something  
Costanza et al, 2017



If a tree falls in the forest  
and there is no one around,  
does it still make a sound?

How do you value your happiness?



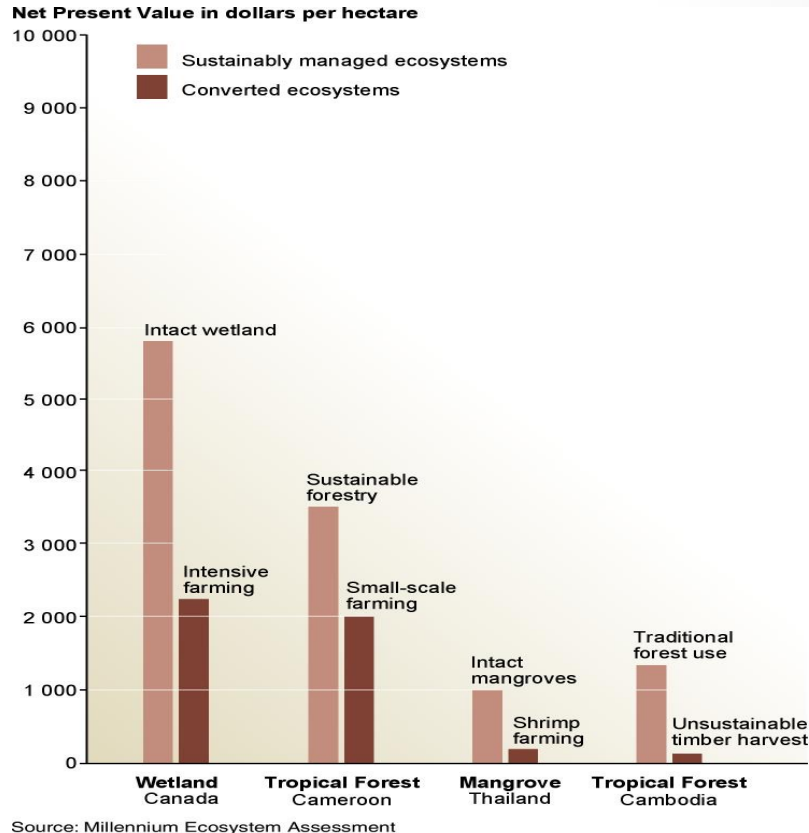
Biodiversity is affected by drivers of change and also is a factor modifying ecosystem function. It contributes directly and indirectly to the provision of ecosystem goods and services. These are divided into four main categories by the Millennium Ecosystem Assessment: goods (provisioning services) are the products obtained from ecosystems; and cultural services represent non-material benefits delivered by ecosystems. Both of these are directly related to human well-being. Regulating services are the benefits obtained from regulating ecosystem processes. Supporting services are those necessary for the production of all other ecosystem services.

# Degradation of ecosystem services causes harm to human well-being & economy

Further reading:

“Economic reasons for conserving wild nature”

Balmford et al,  
2002, Science's  
Compass



# Economic Reasons for Conserving Wild Nature

Andrew Balmford,<sup>1\*</sup> Aaron Bruner,<sup>2</sup> Philip Cooper,<sup>3</sup> Robert Costanza,<sup>4†</sup> Stephen Farber,<sup>5</sup> Rhys E. Green,<sup>1,6</sup> Martin Jenkins,<sup>7</sup> Paul Jefferiss,<sup>6</sup> Valma Jessamy,<sup>3</sup> Joah Madden,<sup>1</sup> Kat Munro,<sup>1</sup> Norman Myers,<sup>8</sup> Shahid Naeem,<sup>9</sup> Jouni Paavola,<sup>3</sup> Matthew Rayment,<sup>6</sup> Sergio Rosendo,<sup>3</sup> Joan Roughgarden,<sup>3</sup> Kate Trumper,<sup>1</sup> R. Kerry Turner<sup>3</sup>

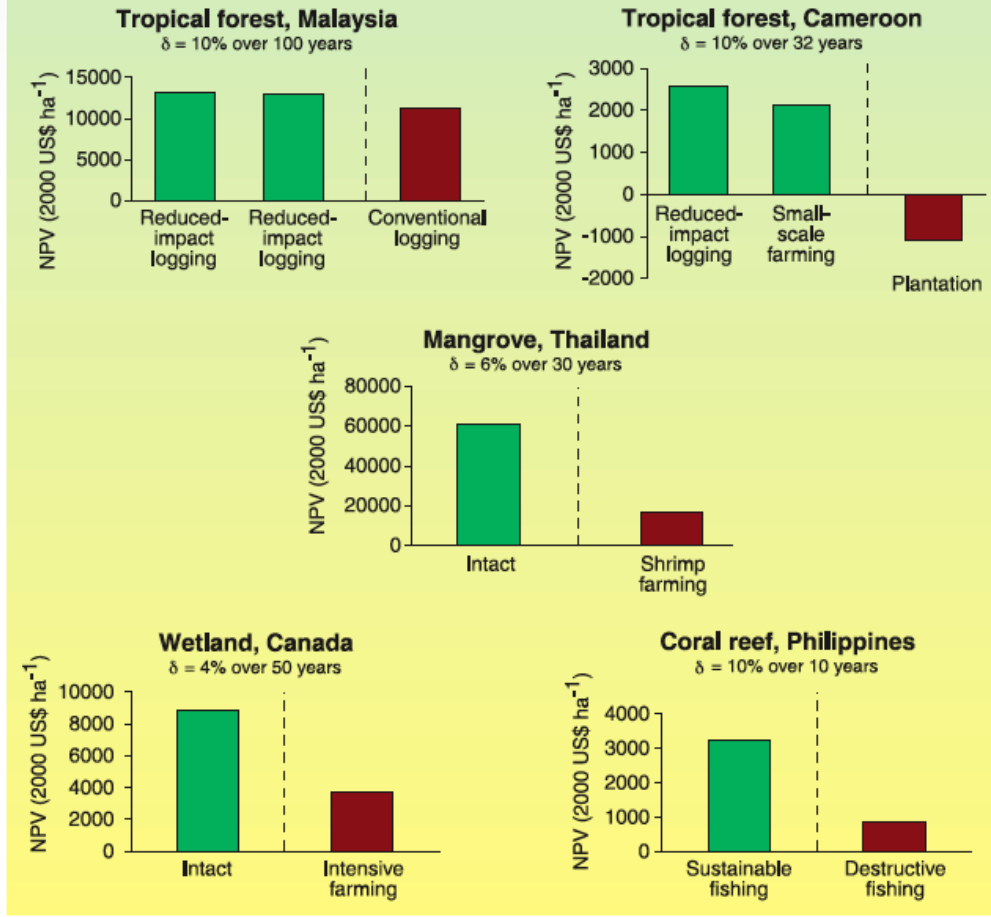
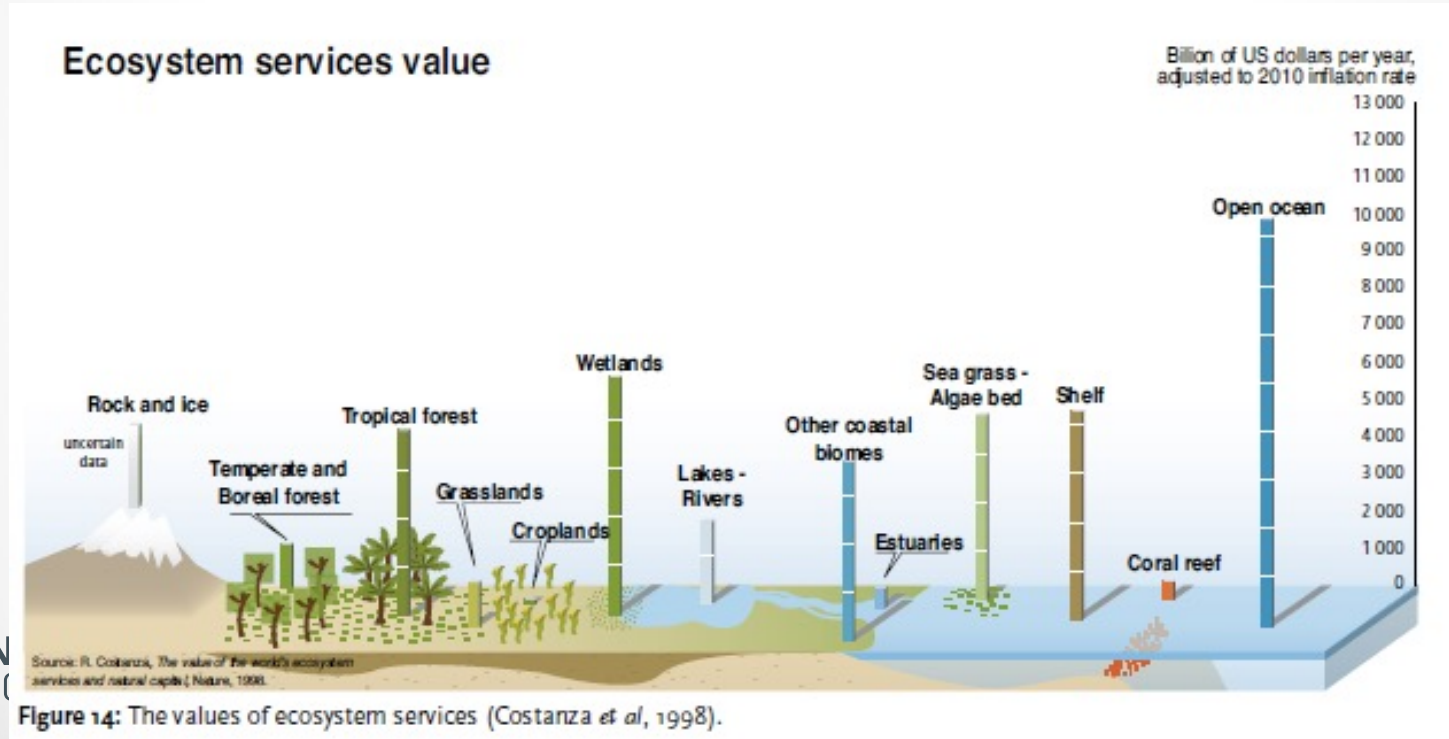


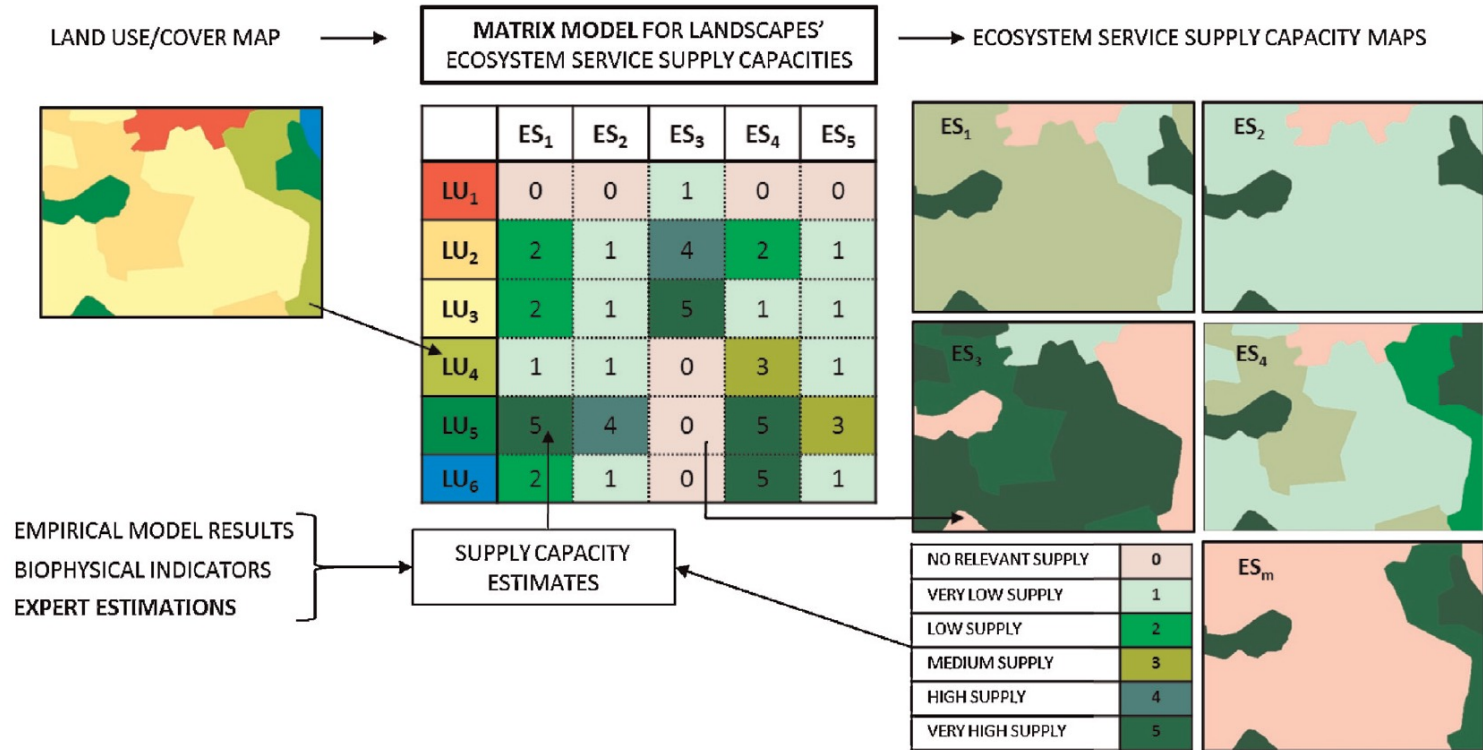
Fig. 1. The marginal benefits of retaining and converting natural habitats, expressed as NPV (in 2000 US\$ ha<sup>-1</sup>) calculated using the discount rates ( $\delta$ ) and time horizons presented. Values of measured goods and services delivered when habitats are relatively intact and when converted are plotted as green and black columns, respectively. [From (11–15); see (10) for further details.]

# VALUATION OF NATURAL CAPITAL AND ECOSYSTEM SERVICES



# Mapping ecosystem services

(based on Jacobs et al 2015; Burkhard et al 2009)



# Green infrastructures

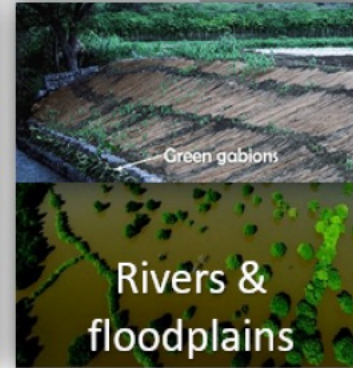
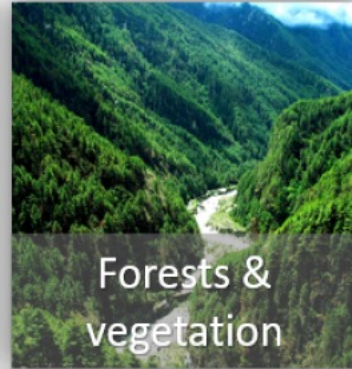


A strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services

It work as a tool for providing ecological, economic and social benefits through natural solutions

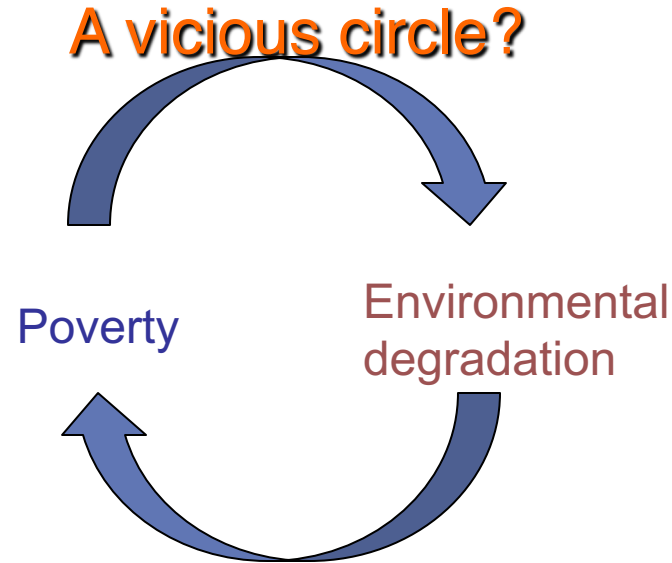
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0249:FIN:EN:PDF>

# Nature Based Solutions enable ECOSYSTEM SERVICES





# POVERTY AND THE ENVIRONMENT

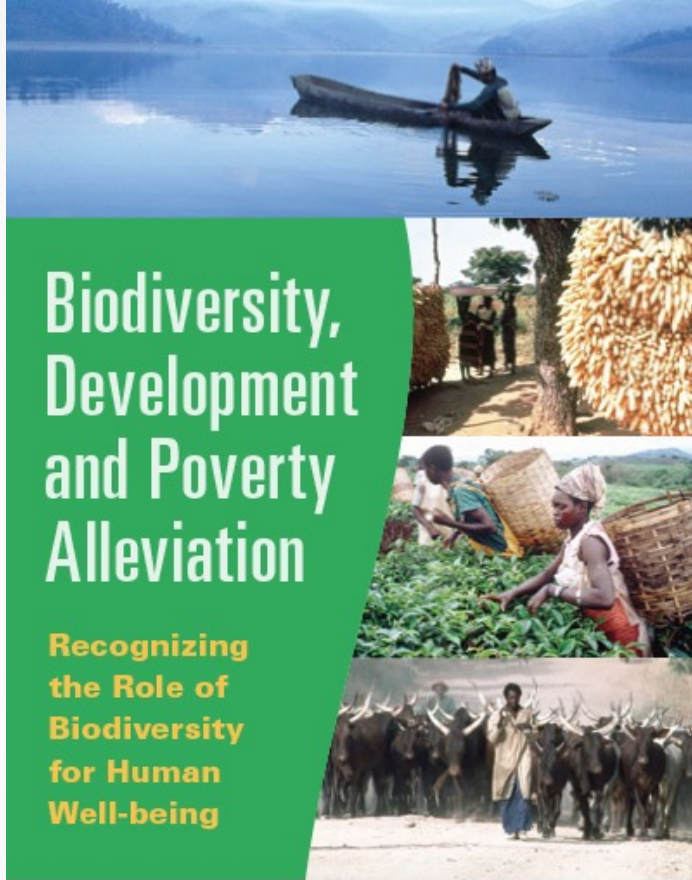


Brundtland Report 1987 - *poverty as a major **cause and effect of global environmental problems***

***Poverty is the worst kind of pollution – Mme. Indira Gandhi, the then Prime Minister of India***

# Poverty, development and the environment





# Biodiversity, Development and Poverty Alleviation

Recognizing  
the Role of  
Biodiversity  
for Human  
Well-being



Convention on  
Biological Diversity



INTERNATIONAL DAY for BIOLOGICAL DIVERSITY

In Burkina Faso, 92% of the active work force is employed in agriculture and fisheries; their well-being depends on sustainable agriculture and fisheries, which also provide opportunities to improve their livelihoods.



Hamed Saber  
www.flickr.com/photos/hamed/2146096314/size/72157664507022474

## THREE

# The Contribution of Biodiversity and its Ecosystem Services to Poverty Reduction and Economic Sector Development

The contribution of biodiversity to human and economic well-being is particularly important in major productive sectors like fisheries, agriculture, forestry, and in tourism. The adequate management and governance of these sectors, recognising biodiversity dependencies and the ecosystem services on which they rely, is crucial to ensure continued benefits to people and opportunities for poverty reduction and economic development.

# EU Biodiversity strategy for 2030

([https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/EU-biodiversity-strategy-2030\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/EU-biodiversity-strategy-2030_en))

## Key elements of the biodiversity strategy

- Establishing protected areas for at least 30% of land and 30% of sea
- Restoring degraded ecosystems at land and sea across
- Unlocking €20 billion per year for biodiversity

**Business case for biodiversity** (construction, agriculture, food and drink)



# Bringing nature back into our lives

EU 2030 Biodiversity strategy

May 2020  
#EUGreenDeal



*"Making nature healthy again is key to our physical and mental wellbeing and is an ally in the fight against climate change and disease outbreaks. It is at the heart of our growth strategy, the European Green Deal, and is part of a European recovery that gives more back to the planet than it takes away."*

Ursula von der Leyen, President of the European Commission



Climate change, the unprecedented loss of biodiversity, and the spread of devastating pandemics are sending a clear message: it is time to fix our broken relationship with nature.

The Biodiversity Strategy will put Europe's biodiversity on the path to recovery by 2030, for the benefit of people, climate and the planet.



## Why do we need to protect biodiversity?

- Biodiversity is **essential** for life. Our planet and the economy depend on it. When nature is healthy, it protects and provides.

Biodiversity and ecosystems provide us with food, health and medicines, materials, recreation, and wellbeing. They filter our air and water, help keep the climate in balance, convert waste back into resources, pollinate and fertilise crops and much more.

**Nature provides for businesses:**  
half of global GDP, €40 trillion, depends on nature.

- We are **losing nature** like never before because of unsustainable human activities.

The global population of wild species has fallen by **60% over the last 40 years.**

**1 million species are at risk** of extinction.

- Biodiversity loss and the **climate crisis** are interdependent and they exacerbate each other.

Restoring forests, soils and wetlands and creating green spaces in cities is essential to achieve the climate change mitigation needed by 2030.



## The new EU-wide Biodiversity Strategy will:

- Establish protected areas for at least:



**30%**  
of land in  
Europe



**30%**  
of sea in  
Europe

With stricter protection of remaining EU primary and old-growth forests legally binding nature restoration targets in 2021.

- Restore degraded ecosystems at land and sea across the whole of Europe by:



Increasing organic farming and biodiversity-rich landscape features on agricultural land



Halting and reversing the decline of pollinators



Restoring at least 25 000 km of EU rivers to a free-flowing state



Reducing the use and risk of pesticides by 50% by 2030



Planting 3 billion trees by 2030

- **Unlock 20 billion EUR/year for biodiversity** through various sources, including EU funds, national and private funding. Natural capital and biodiversity considerations will be integrated into business practices.

- Put the EU in a **leading position in the world** addressing the global biodiversity crisis. The Commission will mobilise all tools of external action and international partnerships for an ambitious new UN Global Biodiversity Framework at the Conference of the Parties to the Convention on Biological Diversity in 2021.

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# The business case for biodiversity

The European Green Deal

May 2020  
#EUGreenDeal

## More than half of global GDP – some €40 trillion – depends on nature

Nature restoration will be a central element of the EU's recovery plan from the coronavirus pandemic, providing immediate business and investment opportunities for restoring the EU's economy.



These sectors are all highly dependent on nature, and they generate **more than €7 trillion**.

### Six industries:



Chemicals and materials



Aviation, travel and tourism



Real estate



Mining and metals



Supply chain and transport



Retail, consumer goods and lifestyle

Depend through their supply chain on nature for more than 50% for their gross value added.



Benefits of the **EU Natura 2000 nature protection network** are valued at between **€200-300 billion** per year.



The **benefits** of biodiversity conservation for the economy:

- ✓ conserving marine stocks could increase annual profits of the seafood industry by more than **€49 billion**
- ✓ protecting coastal wetlands could save the insurance industry around **€50 billion annually** through reducing flood damage losses

## Economic and social costs of inaction



Biodiversity loss and ecosystem collapse is one of the biggest threats facing humanity in the next decade. **Economic and social costs of inaction** would be huge. The world already lost an estimated €3.5-18.5 trillion per year in ecosystem services from 1997 to 2011, and an estimated €5.5-10.5 trillion per year from land degradation. Biodiversity underpins EU and global food security. Biodiversity loss risks puts our food systems and nutrition at risk.

Biodiversity loss is intrinsically linked to and exacerbates climate change.



Biodiversity loss results in reduced crop yields and fish catches, increased economic losses from flooding and other disasters, and the loss of potential new sources of medicine.

More than **75% of global food** crop types rely on animal pollination.



On average, global mean crop yields of rice, maize and wheat are projected to decrease **between 3% and 10% per degree** of warming above historical levels.

## Creating jobs



Nature Restoration means direct and indirect local jobs that bring life back to local communities.



The **Natura 2000 network** has been estimated to **support 104,000 direct jobs** in protected areas management and conservation activities and 70,000 more indirect or induced jobs. This is based on annual investment of €6 billion for management and restoration of the network.

In the future, it is expected that biodiversity needs could generate up to **500,000 jobs**.



For **agriculture**, 1.3 million of the 9.6 million farming jobs in the EU are linked directly or indirectly to Natura 2000. **The tourism sector** employs 12 million people in Europe. Of these, 3.1 million have links to protected areas such as Natura 2000.



**Of the 25% of the EU budget** dedicated to **climate action**, a significant proportion will be invested in biodiversity and nature-based solutions.

# Estratégia Nacional de Conservação da Natureza e Biodiversidade para 2030

Publicada em Maio 2018

Três pilares:

- i) Melhorar o estado de conservação do património natural;
- ii) Promover o reconhecimento do valor do património natural; e
- iii) Fomentar a apropriação dos valores naturais e da biodiversidade pela sociedade.



# Estratégia Nacional de Conservação da Natureza e Biodiversidade para 2030

Publicada em Maio 2018

EXCLUSIVO

Oferecer artigo 6

AMBIENTE

## Reintroduzir a lontra e plantar teixos: Ministério do Ambiente quer que 2022 seja o ano da natureza

Proteger e, se necessário, reintroduzir espécies como a lontra, o cavalo-marinho ou as aves estepárias, bem como o teixo e o zimbro, criar charcas e combater as invasoras são algumas das acções previstas no “Missão Natureza 22”. Discussão arranca em Outubro.