The Author Team

145 experts:
  3 co-chairs
24 coordinating lead authors
87 lead authors
310 contributing authors
15 review editors
  16 fellows
From 51 countries

2 expert and Government reviews

Supported by:
The Global TSU
6 Chapter scientists
1 resource person

~156,000 Hours of Voluntary Hours = ~17 years

Other supporting TSUs:
Indigenous and local Knowledge, Scenarios, Values, Knowledge & Data, Capacity Building

Management Committee

~37.2% Women
~62.8% Men

58% Natural Scientists
9% interdisciplinary Scientists
33% Social Scientists
Nature underpins and sustains human quality of life.
More food, energy and materials than ever before are now being supplied to people across distant regions, but Nature and its vital regulating and non-material contributions to people are deteriorating worldwide.
## Global trends in nature’s contributions to people since 1970

<table>
<thead>
<tr>
<th>Nature’s contribution to people</th>
<th>50-year global trend</th>
<th>Directional trend across regions</th>
<th>Selected indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Habitat creation and maintenance</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Extent of suitable habitat</td>
</tr>
<tr>
<td>2 Pollination and dispersal of seeds and other propagules</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Pollinator diversity</td>
</tr>
<tr>
<td>3 Regulation of air quality</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Extent of natural habitat in agricultural areas</td>
</tr>
<tr>
<td>4 Regulation of climate</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Retention and prevented emissions of air pollutants by ecosystems</td>
</tr>
<tr>
<td>5 Regulation of ocean acidification</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Prevented emissions and uptake of greenhouse gases by ecosystems</td>
</tr>
<tr>
<td>6 Regulation of freshwater quantity, location and timing</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Capacity to sequester carbon by marine and terrestrial environments</td>
</tr>
<tr>
<td>7 Regulation of freshwater and coastal water quality</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Ecosystem impact on air-surface-ground water partitioning</td>
</tr>
<tr>
<td>8 Formation, protection and decontamination of soils and sediments</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Extent of ecosystems that filter or add constituent components to water</td>
</tr>
<tr>
<td>9 Regulation of hazards and extreme events</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Soil organic carbon</td>
</tr>
<tr>
<td>10 Regulation of detrimental organisms and biological processes</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Ability of ecosystems to absorb and buffer hazards</td>
</tr>
<tr>
<td>11 Energy</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Extent of natural habitat in agricultural areas</td>
</tr>
<tr>
<td>12 Food and feed</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Diversity of competent hosts of vector-borne diseases</td>
</tr>
<tr>
<td>13 Materials and assistance</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Extent of agricultural land—potential land for bioenergy production</td>
</tr>
<tr>
<td>14 Medicinal, biochemical and genetic resources</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Extent of agricultural land—potential land for food and feed</td>
</tr>
<tr>
<td>15 Learning and inspiration</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Abundance of marine fish stocks</td>
</tr>
<tr>
<td>16 Physical and psychological experiences</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Extent of agricultural land—potential land for material production</td>
</tr>
<tr>
<td>17 Supporting identities</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Extent of forested land</td>
</tr>
<tr>
<td>18 Maintenance of options</td>
<td>![ Down Arrow ]</td>
<td>![ Consistent ]</td>
<td>Fraction of species locally known and used medicinally</td>
</tr>
<tr>
<td><strong>Levels of certainty</strong></td>
<td>![ Well established ]</td>
<td>![ Established but incomplete ]</td>
<td>![ Unsolved ]</td>
</tr>
<tr>
<td><strong>Directional trend</strong></td>
<td>![ Decrease ]</td>
<td>![ Increase ]</td>
<td>![ Consistent ]</td>
</tr>
</tbody>
</table>

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**Note:** The table and diagram illustrate trends in various contributions of nature to people, with indicators for the extent of natural habitats, biological processes, ecosystem services, and biodiversity. The levels of certainty (well established, established but incomplete, unresolved) and directional trends (decrease, increase, consistent, variable) are color-coded for clarity.
The biosphere and atmosphere, upon which humanity as a whole depends, have been deeply reconfigured by people.

- 75% of the land area is very significantly altered
- By 2050 90% of land is projected to be significantly altered
- Land degradation negatively impacts the well-being of 3.2 billion people
- 66% of the ocean area is experiencing increasing cumulative impacts;
- >85% of wetland area has been lost
- By 2010, 34% of global biodiversity had been lost with a projected increase to 38-46% by 2050
Human activity has changed the surface of the planet in profound and far-reaching ways.
More species of plants and animals are threatened with extinction now than at any other time in human history. One million species (500,000 plants and animals and 500,000 insects) are at risk of extinction assuming a total of 8.1 million species (2.6 million plants and animal and 5 million insects), however, we are not in a 6th mass extinction.
Global extinction rate is at least tens to hundreds of times higher than it has been on average over the last 10 million years.
The number of local varieties and breeds of domesticated plants and animals has decreased sharply.

Proportion of the world’s mammal and bird breeds by risk status category

- AT RISK
- EXTINCT
- UNKNOWN RISK
- NOT AT RISK

Proportion of the world’s mammal and bird breeds by risk status category

Photocredit: Daniel M. Cáceres

Drivers of change have accelerated during the past 50 years to levels unprecedented in human history.
Underpinning the proximate causes of deterioration in nature are the root causes, or **indirect drivers of change**.
Contributions of Indigenous Peoples and Local Communities: knowledge, innovations, practices, and institutions

➢ 25% global land

➢ 35% highly conserved ecosystems and 35% of Protected Areas

➢ Agrobiodiversity

➢ Nature is declining less rapidly

➢ Yet, 72% of local indicators show decline

➢ Increasingly under pressure
While progress looks good for target 11 (protected areas) it hides the fact that important biodiversity is not within the current protected area system, many of the protected areas are not well managed, and the design of the protected areas does not take the implications of climate change into account.
Relationship between NCPs and SDGs

<table>
<thead>
<tr>
<th>Relationship between NCPs and SDGs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation of ocean acidification</td>
</tr>
<tr>
<td>Regulation of freshwater and coastal water quality</td>
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<tr>
<td>Regulation of freshwater quantity, flow and timing</td>
</tr>
<tr>
<td>Regulation of air quality</td>
</tr>
<tr>
<td>Regulation of hazards and extreme events</td>
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<tr>
<td>Regulation of climate</td>
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<tr>
<td>Energy</td>
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<tr>
<td>Physical and psychological experiences</td>
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<tr>
<td>Supporting identities</td>
</tr>
<tr>
<td>Maintenance of options</td>
</tr>
<tr>
<td>Learning and inspiration</td>
</tr>
<tr>
<td>Regulation of organisms detrimental to humans</td>
</tr>
<tr>
<td>Medicinal, biochemical and genetic resources</td>
</tr>
<tr>
<td>Formation, protection and decontamination of soils and sediments</td>
</tr>
<tr>
<td>Pollination and dispersal of seeds and other propagules</td>
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<td>Habitat creation and maintenance</td>
</tr>
<tr>
<td>Materials and assistance</td>
</tr>
<tr>
<td>Food and feed</td>
</tr>
</tbody>
</table>

**Sustainable Development Goals (SDG)**

| SDG 1: No poverty | SDG 10: Reduced inequalities |
| SDG 2: Zero hunger | SDG 11: Sustainable cities and communities |
| SDG 3: Good health and well-being | SDG 12: Responsible consumption and production |
| SDG 4: Quality education | SDG 13: Climate action |
| SDG 5: Gender equality | SDG 14: Life below water |
| SDG 6: Clean water and sanitation | SDG 15: Life on land |
| SDG 7: Affordable and clean energy | SDG 16: Peace, justice and strong institutions |
| SDG 8: Decent work and economic growth | SDG 17: Partnerships for the goals |
| SDG 9: Industry, innovation and infrastructure | |

**Level of Consensus**

- 26-40%
- 41-70%
- 71-100%

**Priority NCP/SDG Bundles**

- Food and Material Security
- Health
- Energy and Climate
- Water Quality and Quantity
- Relational Values Affecting Quality of Life

*The Delphi method is a structured and iterative evaluation process that uses expert panels to establish consensus regarding the assessment of a specific topic. For more information on the method, see section 2.7. Source: Data collected by C.B. Anderson, C.S. Seixas & O. Barbosa from >13 of the experts actively contributing to the Americas Assessment in all the chapters. Analysis by J. Diaz in R software package.*
# Progress towards the UN Sustainable Development Goals

<table>
<thead>
<tr>
<th>Selected Sustainable Development Goals</th>
<th>Recent status and trends in aspects of nature and nature’s contributions to people that support progress towards target *</th>
<th>Uncertain relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. NO POVERTY</strong> No poverty</td>
<td><img src="image1" alt="Poor/Declining support" /> <img src="image2" alt="Poor/Declining support" /></td>
<td><img src="image3" alt="Uncertain relationship" /> <img src="image4" alt="Uncertain relationship" /></td>
</tr>
<tr>
<td><strong>2. ZERO HUNGER</strong> Zero hunger</td>
<td><img src="image5" alt="Poor/Declining support" /> <img src="image6" alt="Poor/Declining support" /> <img src="image7" alt="Poor/Declining support" /> <img src="image8" alt="Partial support" /> <img src="image9" alt="Partial support" /> <img src="image10" alt="Partial support" /></td>
<td><img src="image11" alt="Uncertain relationship" /> <img src="image12" alt="Uncertain relationship" /></td>
</tr>
<tr>
<td><strong>3. GOOD HEALTH AND WELL-BEING</strong> Good health and well-being</td>
<td><img src="image13" alt="Unknown" /> <img src="image14" alt="Unknown" /></td>
<td><img src="image15" alt="Uncertain relationship" /> <img src="image16" alt="Uncertain relationship" /></td>
</tr>
<tr>
<td><strong>6. CLEAN WATER AND SANITATION</strong> Clean water and sanitation</td>
<td><img src="image17" alt="Poor/Declining support" /> <img src="image18" alt="Poor/Declining support" /> <img src="image19" alt="Poor/Declining support" /> <img src="image20" alt="Partial support" /></td>
<td><img src="image21" alt="Uncertain relationship" /> <img src="image22" alt="Uncertain relationship" /></td>
</tr>
<tr>
<td><strong>11. SUSTAINABLE AND COMMUNITY</strong> Sustainable cities and communities</td>
<td><img src="image23" alt="Poor/Declining support" /> <img src="image24" alt="Poor/Declining support" /> <img src="image25" alt="Poor/Declining support" /> <img src="image26" alt="Partial support" /></td>
<td><img src="image27" alt="Uncertain relationship" /> <img src="image28" alt="Uncertain relationship" /></td>
</tr>
<tr>
<td><strong>13. CLIMATE ACTION</strong> Climate action</td>
<td><img src="image29" alt="Poor/Declining support" /> <img src="image30" alt="Partial support" /> <img src="image31" alt="Unknown" /> <img src="image32" alt="Unknown" /> <img src="image33" alt="Unknown" /></td>
<td><img src="image34" alt="Uncertain relationship" /> <img src="image35" alt="Uncertain relationship" /> <img src="image36" alt="Uncertain relationship" /></td>
</tr>
<tr>
<td><strong>14. LIFE BELOW WATER</strong> Life below water</td>
<td><img src="image37" alt="Poor/Declining support" /> <img src="image38" alt="Poor/Declining support" /> <img src="image39" alt="Poor/Declining support" /> <img src="image40" alt="Partial support" /> <img src="image41" alt="Partial support" /> <img src="image42" alt="Partial support" /></td>
<td><img src="image43" alt="Uncertain relationship" /> <img src="image44" alt="Uncertain relationship" /> <img src="image45" alt="Uncertain relationship" /></td>
</tr>
<tr>
<td><strong>15. LIFE ON LAND</strong> Life on land</td>
<td><img src="image46" alt="Poor/Declining support" /> <img src="image47" alt="Poor/Declining support" /> <img src="image48" alt="Partial support" /> <img src="image49" alt="Partial support" /> <img src="image50" alt="Partial support" /> <img src="image51" alt="Unknown" /></td>
<td><img src="image52" alt="Uncertain relationship" /> <img src="image53" alt="Uncertain relationship" /> <img src="image54" alt="Uncertain relationship" /></td>
</tr>
</tbody>
</table>

* * There were no targets that were scored as good/positive status and trends
Successfully addressing the Sustainable Development Goals requires simultaneously halting and reversing land degradation.

Goal 15 also goals on water, consumption, climate, hunger, poverty and cities.
Shared Socio-economic Pathways (SSPs)

SSP1: Global Sustainability
- Rapid technology development
- High demand
- High economic growth
- Low energy demand
- Medium-high economic growth
- Low population

SSP2: Middle of the Road

SSP3: Regional competition
- Slow technology development
- Barriers to trade
- Very slow economic growth
- Very high population

SSP4: Inequality
- Slow technology development
- High inequality
- Low energy demand
- Slow economic growth
- High population

SSP5: Economic optimism
- Rapid technology development
- High demand
- High economic growth
- Low population
BES-SIM results

Global scale

Biodiversity

% Change between 2015 and 2050

Scenario
- SSP5xRCP8.5 = Economic optimism
- SSP3xRCP6.0 = Regional competition
- SSP1xRCP2.6 = Global sustainability

Chapter 4
BES-SIM Results
Global Scale

**Ecosystem Services**
\((\approx \text{Nature’s Contributions to People} = \text{NCP})\)

### Scenario
- Economic optimism
- Regional competition
- Global sustainability

% Change between 2015 and 2050
Plausible scenarios, which include transformative change, are compatible with the 2030 sustainability objectives and the 2050 Vision for Biodiversity.

Changes in production and consumption of energy and food
Low to moderate population growth
Nature-friendly and socially fair climate adaptation and mitigation

Photocredit: Daniel M. Cáceres
Options for the futures we want

Need for rapid implementation of existing instruments and bold decisions for transformative change

Knowledge and tools available, they simply need better deployment and implementation

Many societal responses and successful examples of rapid transformative change are already happening in many sectors, but just not at the scale needed to match that of the crisis.
Multi Actor Governance Interventions (Levers)

- Incentives and capacity building
- Cross-sectoral cooperation
- Pre-emptive action
- Decision-making in the context of resilience and uncertainty
- Environmental law and implementation

Leverage Points

- Embrace diverse visions of a good life
- Reduce total consumption and waste
- Unleash values and action
- Reduce inequalities
- Practice justice and inclusion in conservation
- Internalize externalities and telecouplings
- Ensure technology, innovation and investment
- Promote education and knowledge generation and sharing

Indirect Drivers

- Demographic and sociocultural
- Economic and technological
- Institutions and governance
- Conflicts and epidemics
- Human activities

Direct Drivers

- Land/sea-use change
- Direct exploitation
- Climate change
- Pollution
- Invasive species
- Others

Iterative learning loop

Integrative, adaptive, informed and inclusive governance approaches including smart policy mixes, applied especially at leverage points.
Challenges related to climate change, nature deterioration and achieving a good quality of life for all are interconnected. Therefore they need to be addressed synergistically, from local to global levels, but also recognizing that there may be trade-offs

- Nature-based solutions, e.g., reforestation with native vegetation and restoration can have multiple benefits

- Large scale afforestation and bioenergy will lead to the loss of biodiversity and undermine food and water security if native vegetation is replaced by monoculture crops
Land degradation is a major contributor to climate change. Climate change can exacerbate the effects of land degradation.

- Between 2000-2009, land degradation was responsible for annual global emissions of up to 4.4 billion tonnes of CO$_2$.
- Deforestation alone equals 10% of all human-induced greenhouse gas emissions.
- Halting and reversing land degradation can provide more than 1/3 of the most cost-effective greenhouse gas mitigation activities to keep global warming under 2°C.
- The combination of land degradation and climate change projected to reduce global crop yields by 10% (up to 50% in some regions) by 2050, forcing up to 700 million people to migrate.
Meeting global societal goals through urgent and concerted efforts addressing the direct drivers and especially the root causes (indirect drivers) of nature deterioration:

- Governance – inclusive (inc IPLCs)
- Economic systems – an evolution and complementary to GDP
- Equity
- Cross-sectoral planning
- Incentives
- Social narrative and values
Cross-Sectoral, Integrated Management at Multiple Levels

→ Food production and conservation goals: complementary and interdependent (e.g., use agro-ecological practices, reduce food waste)

→ Sustainable fisheries: integrated management on land, in freshwater and oceans

→ Land-based climate change mitigation: attention to trade-offs (especially with large-scale afforestation and bioenergy)

→ Nature-based solutions in cities: crucial for global sustainability
A key constituent of sustainable pathways is the evolution of global financial and economic systems to build a global sustainable economy

One that steers away from the current limited paradigm of economic growth

- Incorporate natural capital into national accounting systems
- Recognize both market, non-market and social values in decision-making
- Eliminate harmful agricultural, energy and transportation subsidies
- Incentives for sustainable production and consumption
- Internalize extranalities
In Conclusion

• Trends worrying (loss of species, degradation of ecosystems, loss of ecosystem services) and business-as-usual clearly unsustainable

• A call for action – transformational change:
  • Tackle the direct and indirect drivers of biodiversity loss
  • Address climate change and loss of biodiversity together
  • Replicate and scale successful policies and projects
  • Coordinate and integrate cross sectoral actions
  • Evolve economic and financial systems
    • Eliminate harmful agriculture, energy and transportation subsidies
    • Incorporate natural capital into decision-making
    • Provide incentives to stimulate sustainable production and consumption
    • Embrace circular economy

• Ensure inclusive governance structures (inc Governments, private sector, civil society and IPLCs)
Diversified valuations
<table>
<thead>
<tr>
<th>FOCI OF VALUE</th>
<th>TYPES OF VALUE</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NATURE</td>
<td>Non-anthropocentric</td>
<td>Animal welfare/rights</td>
</tr>
<tr>
<td></td>
<td>(Intrinsic)</td>
<td>Gaia, Mother Earth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evolutionary and ecological processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Genetic diversity, species diversity</td>
</tr>
<tr>
<td>NATURE’S</td>
<td>Instrumental</td>
<td>Habitat creation and maintenance,</td>
</tr>
<tr>
<td>CONTRIBUTIONS</td>
<td></td>
<td>pollination and propagule dispersal,</td>
</tr>
<tr>
<td>TO PEOPLE (NCP)</td>
<td></td>
<td>regulation of climate</td>
</tr>
<tr>
<td>GOOD QUALITY</td>
<td>Anthropic</td>
<td>Food and feed, energy, materials</td>
</tr>
<tr>
<td>OF LIFE</td>
<td>Relational</td>
<td>Physical and experiential interactions with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nature, symbolic meaning, inspiration</td>
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<td></td>
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<td>Physical, mental, emotional health</td>
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<td></td>
<td>Way of life</td>
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<tr>
<td></td>
<td></td>
<td>Cultural identity, sense of place</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social cohesion</td>
</tr>
</tbody>
</table>

Current Opinion in Environmental Sustainability
Evolution of nature’s contributions to people
Mapping of the 18 NCP reporting categories used in IPBES assessments onto three broad groups distinguished within the generalizing perspective.
Africa’s natural assets are unique

NORTH AFRICA
- Fishery value added: $0.6 billion/year
- Timber production: $2,000/Km²/year
- Fishery value added: $0.5 billion/year
- Carbon sequestration: $500/Km²/year (average)

WEST AFRICA
- Mangrove coastal protection: $4500/Km²/year
- Water purification: $40,000/Km²/year
- Fishery value added: $4 billion/year
- Carbon sequestration: $2800/Km²/year

CENTRAL AFRICA
- Mangrove coastal protection: $3,500/Km²/year
- Fishery value added: $0.8 billion/year
- Carbon sequestration: $14,000/Km²/year (average)
- Timber value added: $3,000/Km²/year
- Fishery value added: $2 billion/year

SOUTHERN AFRICA
- Fishery value added: $1.2 billion/year
- Timber value added: $3,000/Km²/year
- Fishery value added: $0.5 billion/year
- Recreation value: $11,000/Km²/year

EAST AFRICA AND ADJACENT ISLANDS
- Mangrove Coastal protection: $5,000/Km²/year
- Fishery value added: $1.2 billion/year
- Erosion protection: $11,000/Km²/year (average)
- Carbon sequestration: $12,000/Km²/year
- Bioprospecting: $7,900/Km²/year
- Carbon sequestration: $2,200/Km²/year
- Fishery value added: $2.5 billion/year
- Food production: $16,000/Km²/year

The Intergovernmental Platform on Biodiversity and Ecosystem Services
www.ipbes.net
Nature’s Contributions to People (NCP) in the Americas

Estimated economic values of ecosystem services in the Americas.

- Caribbean
- Mesoamerica
- North America
- South America

- MONETARY VALUE per hectare per year for the subregion
- PER CAPITA MONETARY VALUE per year for the subregion
- TOTAL MONETARY VALUE per year is shown in black for the subregion with minimum and maximum country-level values indicated below.

SPM 6

- 24,951 USD per capita per year
- 8,915 Billion USD per year (MIN 3,584 | 5,331 MAX)
- 14,013 Billion USD per year (MIN 1,25 | 6,768 MAX)
- 1,182 Billion USD per year (MIN 11 | 848 MAX)
- 155 Billion USD per year (MIN 0.2 | 68 MAX)

7,872 USD per capita per year
4,090 USD per capita per year
6,844 USD per capita per year
7,081 USD per capita per year
4,056 USD per ha per year
4,754 USD per ha per year

Valuation of goods and ecosystem services

Primary & intermediate processes
- Weathering
- Primary production
- Decomposition
- Soil formation
- Nutrient cycling
- Water cycling
- Climate regulation
- Pollination
- Evolutionary processes
- Ecological interactions

Final ecosystem services
- Crops, livestock, fish
- Water availability
- Trees
- Peat
- Wild species diversity
- Waste breakdown
- Detoxification
- Purified water
- Local climate
- Stabilising vegetation
- Natural enemies
- Meaningful places
- Wild species diversity

Goods
- Food
- Drinking water
- Fibre
- Energy
- Natural medicine
- Pollution control
- Equable climate
- Flood control
- Erosion control
- Disease control
- Good health

Value of goods...

...ES value

Health and Well-being

People

Other capital inputs
merci !