Degradation and Restoration of Land and Ecosystems

A Global Overview
By WRI commissioned by the SCBD

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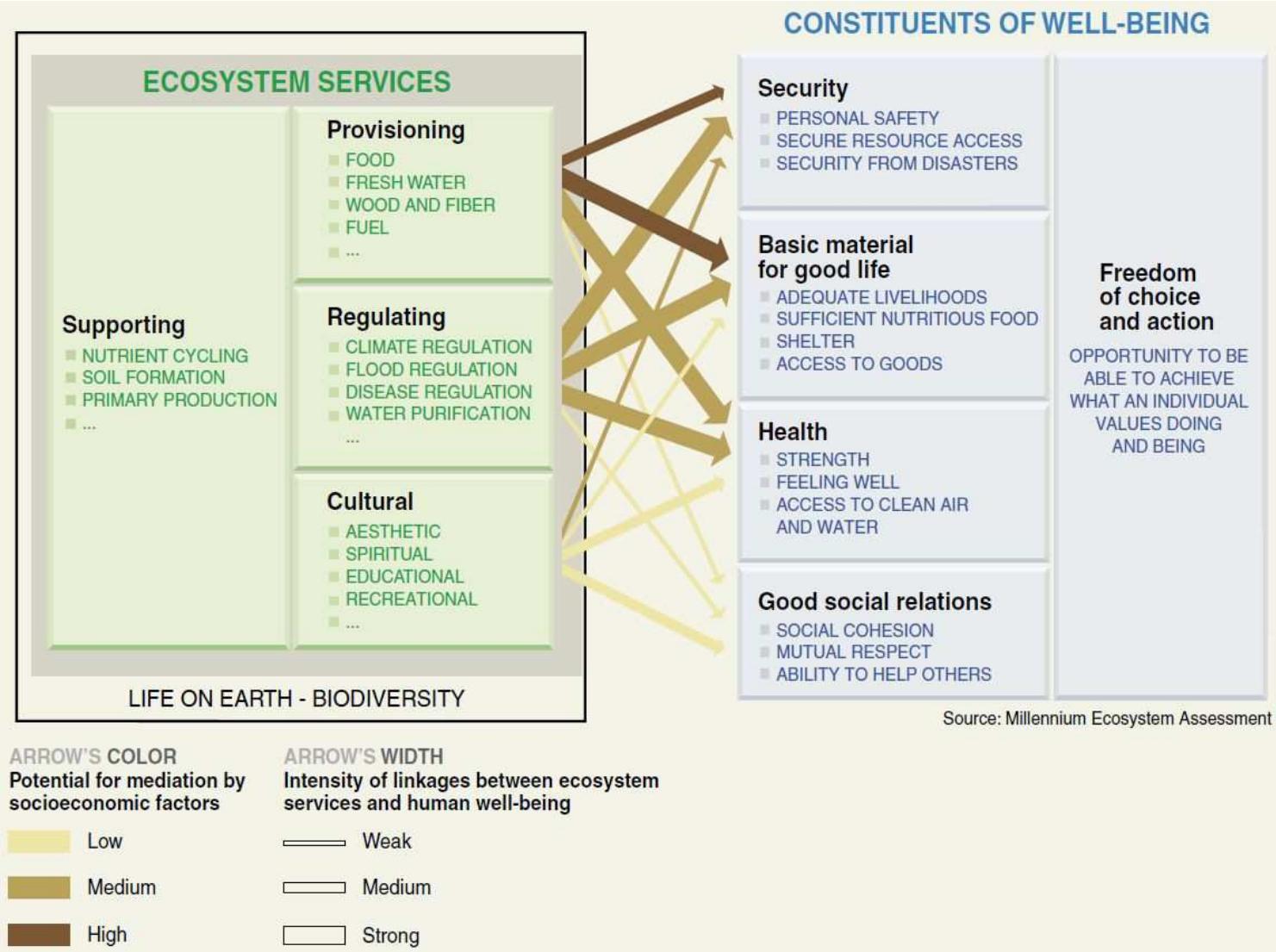
Objectives

For ecosystems and landscapes …

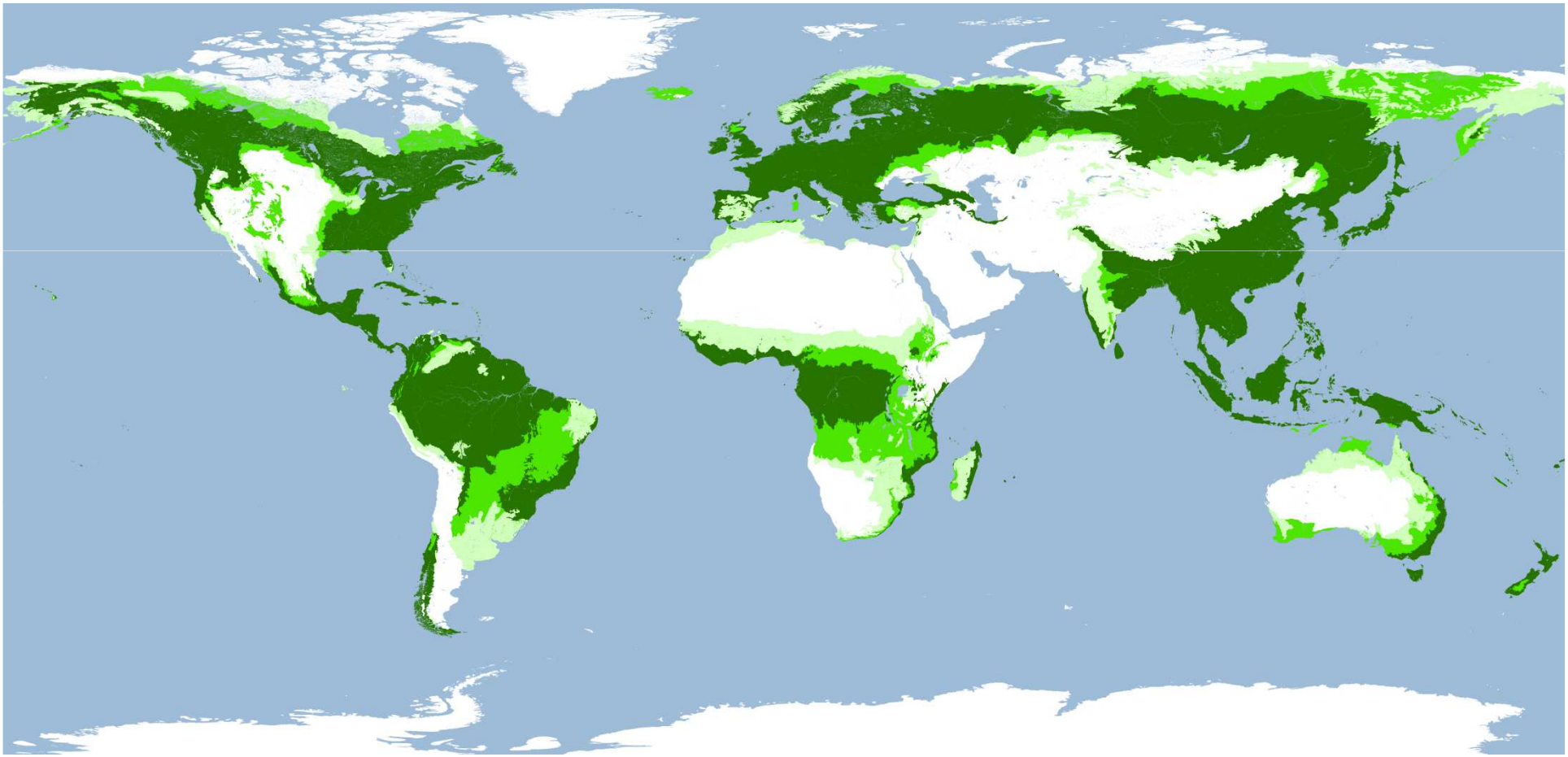
- Provide a clear conceptual framework
- Review global and selected sub-global estimates
- Assess global area of degradation and restoration potential (“reasonable estimates”)
- Identify and quantify expected benefits of restoration

Biodiversity, Ecosystem Services, Well-being



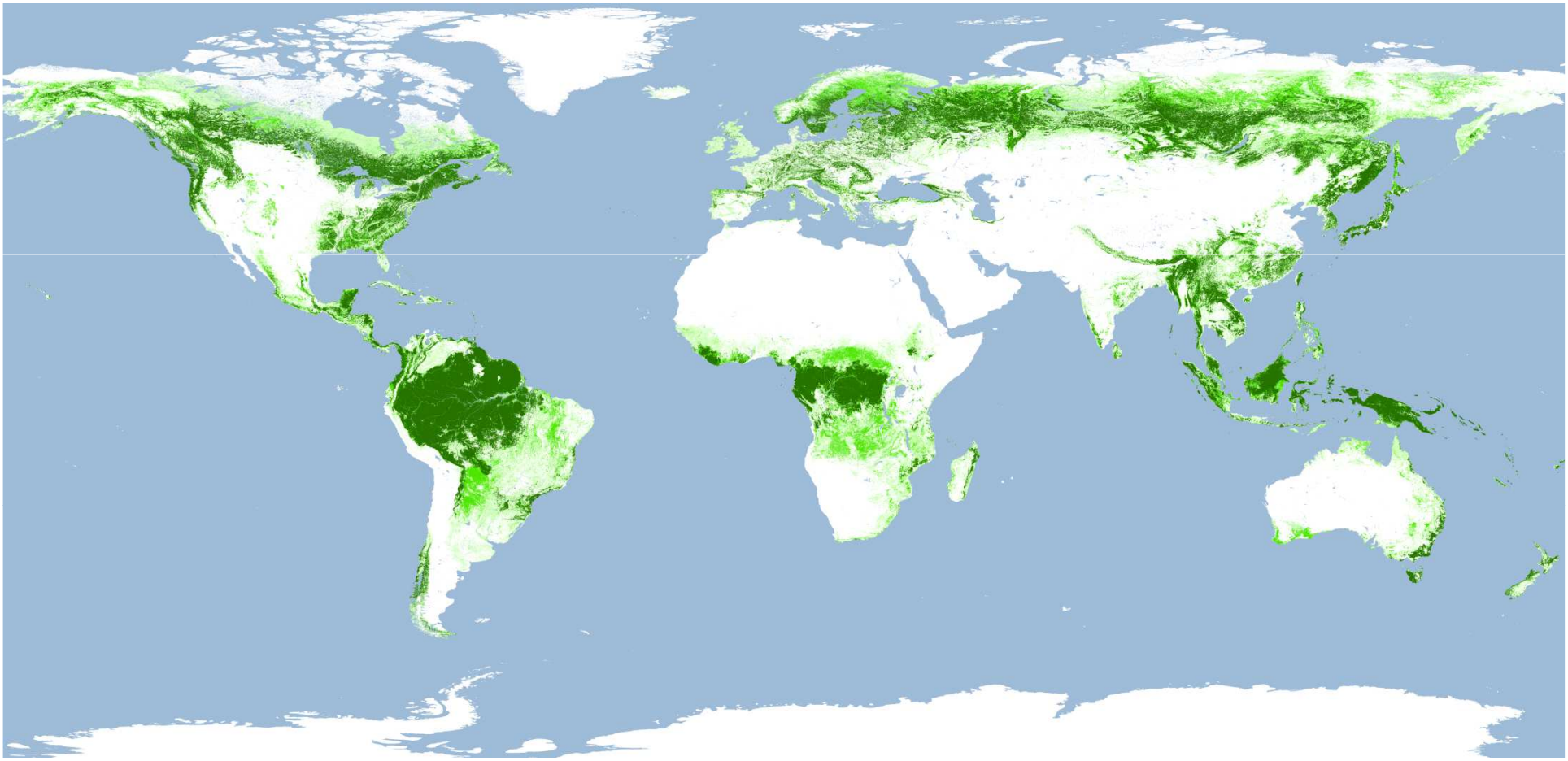
The Potential Forest

Where forests and woodlands would be if only climate and soils decided



Today's Forest

Where forests and woodlands are today



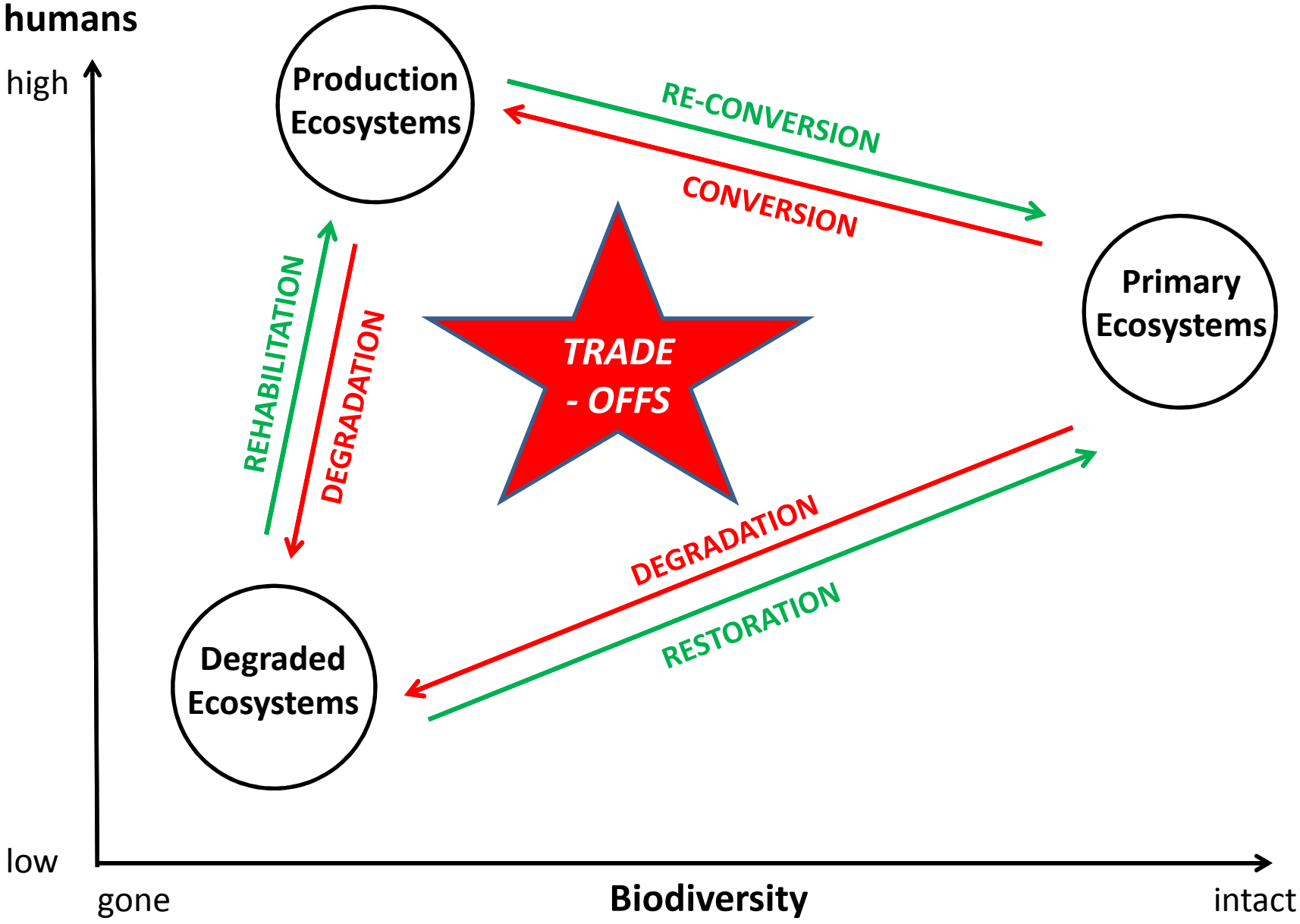
Degradation

- A loss or reduction in ecological or economic productivity
- Has several dimensions
  - a persistent reduction in the productive capacity of land (e.g. loss of soil nutrients, vegetative cover, and productivity),
  - a loss of biodiversity (e.g. species or ecosystem complexity), and
  - decreased resilience (e.g. increased vulnerability of ecosystems and communities).
- Can refer to
  - An on-going process of loss
  - A state of accumulated loss
- Is value-laden. Degradation for one stakeholder may be a source of income or livelihood for another.

Restoration

- The process of reversing the effects of degradation and conversion
- Can pertain to sites, ecosystems, and entire landscapes
- Has several dimensions
  - Ecological restoration. The process of intentional recovery of the structure, function and composition of a degraded ecosystem
  - Rehabilitation. The process of increasing the flow of benefits from a degraded production or multi-use landscape
  - Reconversion. The process of reversing the effects of ecosystem conversion.

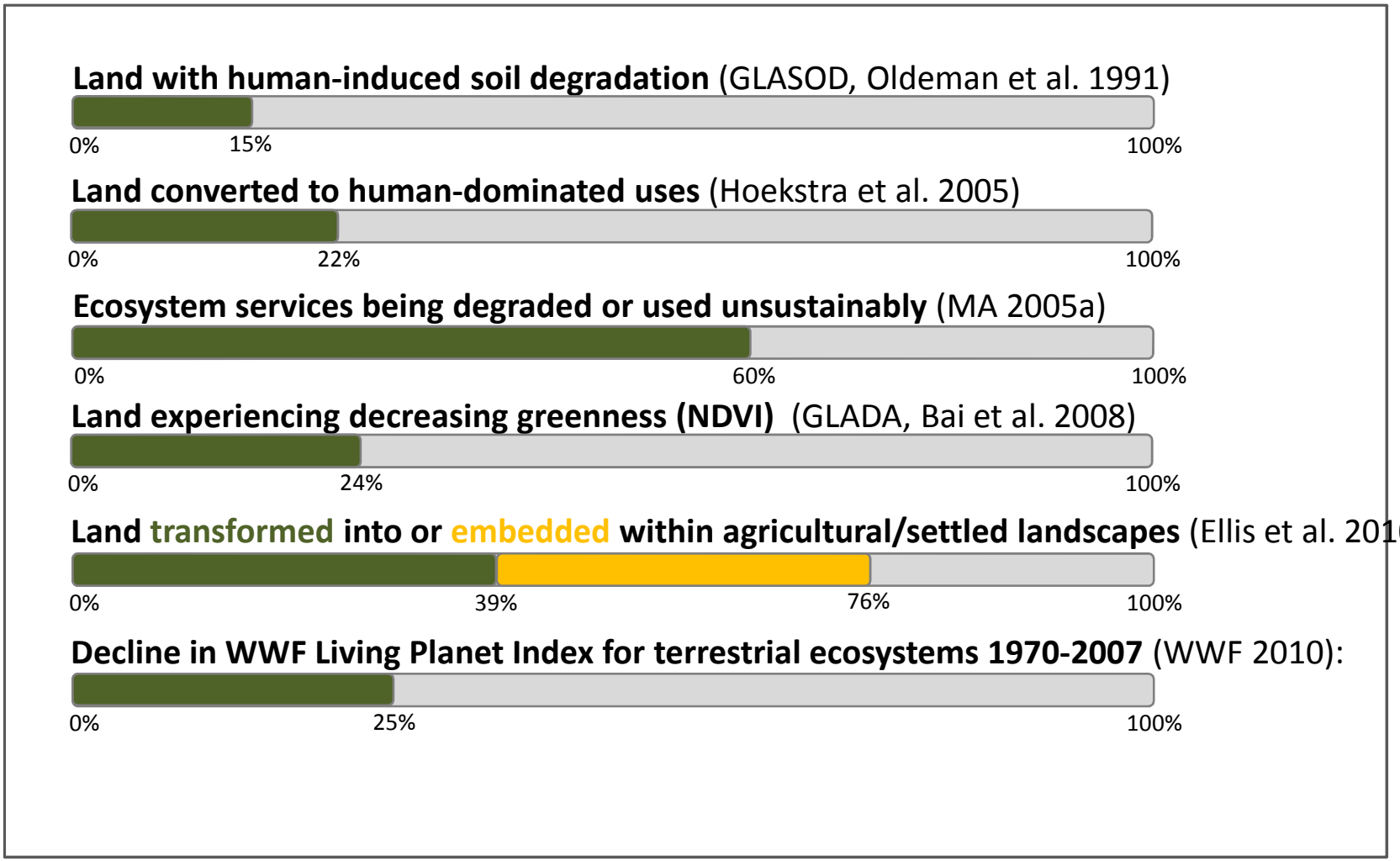
Conceptual model



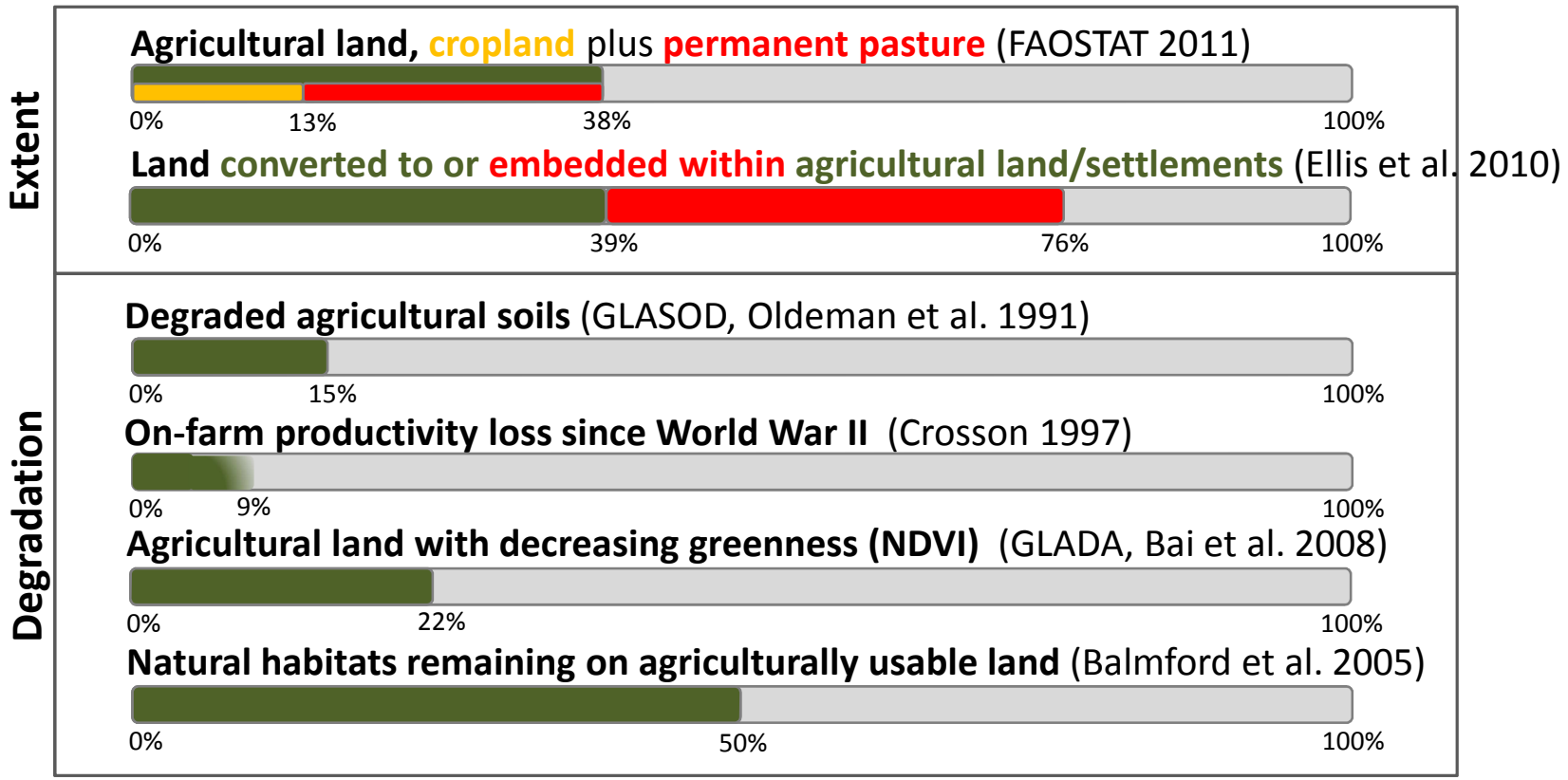
Six global ecosystems were assessed

- **Agroecosystems:** irrigated and rainfed cropland; pasture
- **Grasslands ecosystems**: natural grasslands incl. savannah, shrubland, and tundra; pasture
- **Forest ecosystems:** all ecosystems with a tree crown cover of >10%
- **Dryland ecosystems**: all areas under water stress, partly also deserts
- **Wetland ecosystems**: inland freshwater habitats, including peatlands
- **Coastal ecosystems**: terrestrial fraction only, mainly mangroves.

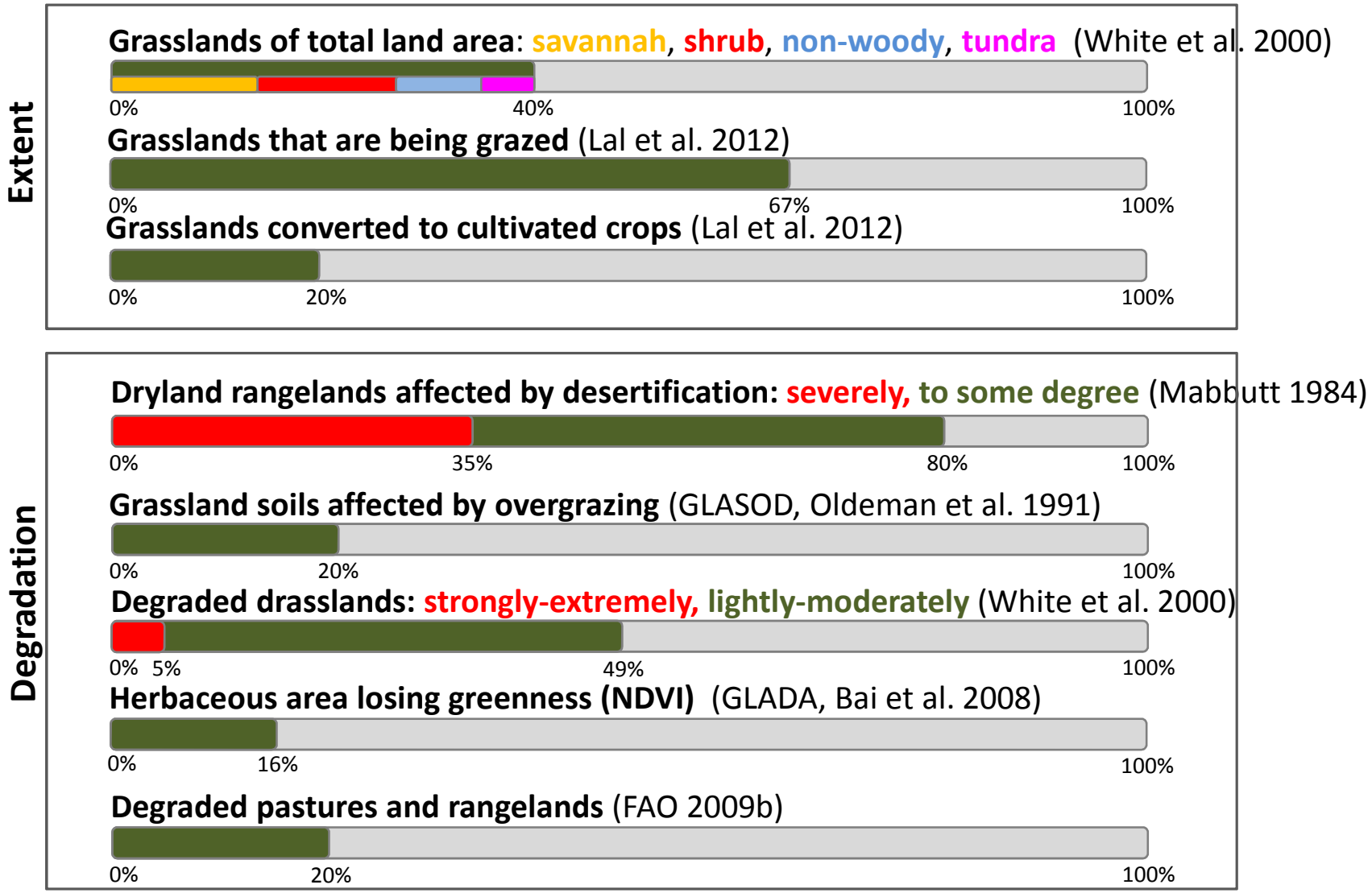
Global


Land with human-induced soil degradation (GLASOD, Oldeman et al. 1991)
0%
15%
100%
Land converted to human-dominated uses (Hoekstra et al. 2005)
0%
22%
100%
Ecosystem services being degraded or used unsustainably (MA 2005a)
0%
60%
100%
Land experiencing decreasing greenness (NDVI) (GLADA, Bai et al. 2008)
0%
24%
100%
Land transformed into or embedded within agricultural/settled landscapes (Ellis et al. 2010)
0%
39%
76%
100%
Decline in WWF Living Planet Index for terrestrial ecosystems 1970-2007 (WWF 2010):
0%
25%
100%

Agroecosystems

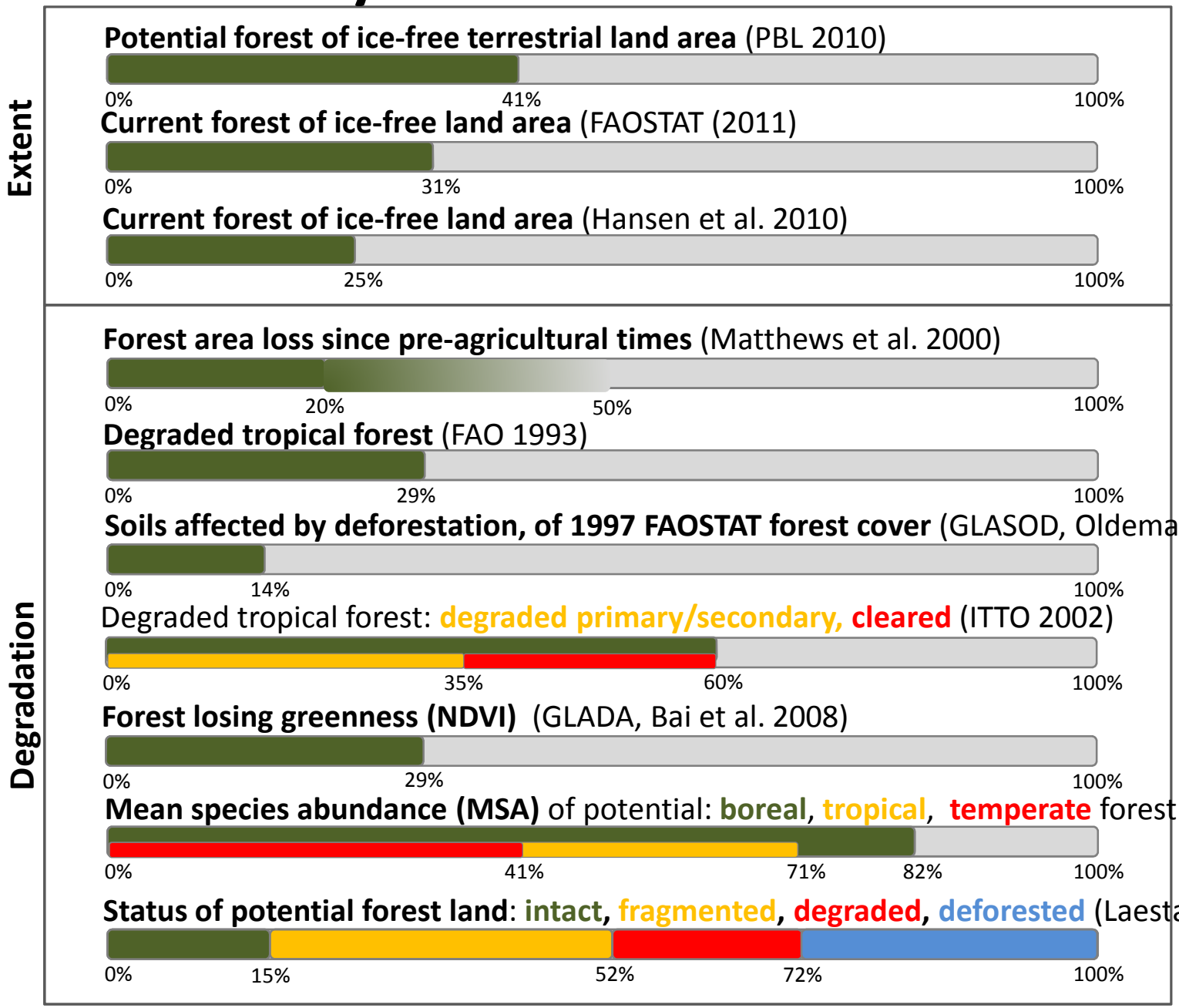


Grassland Ecosystems

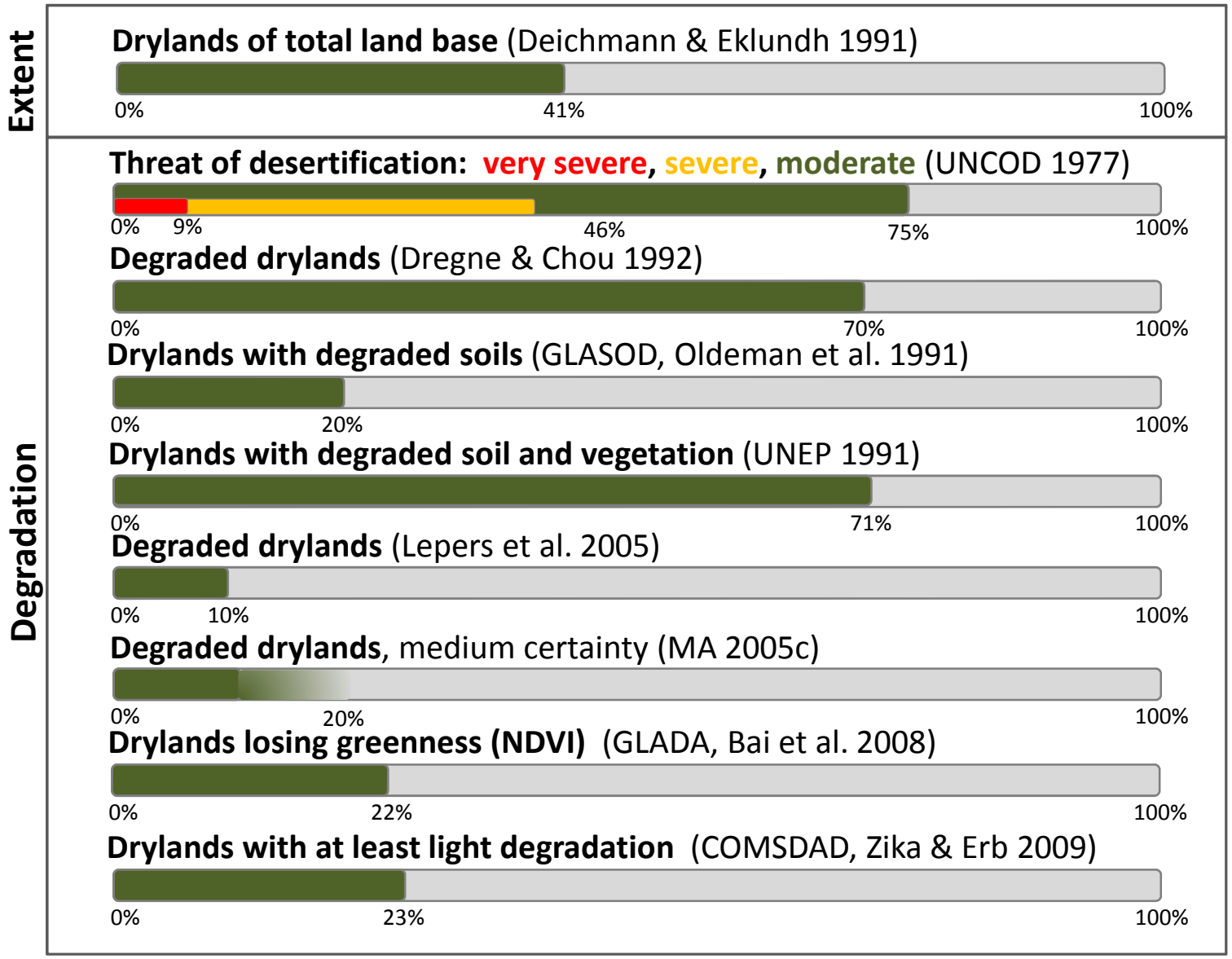


Forest Ecosystems

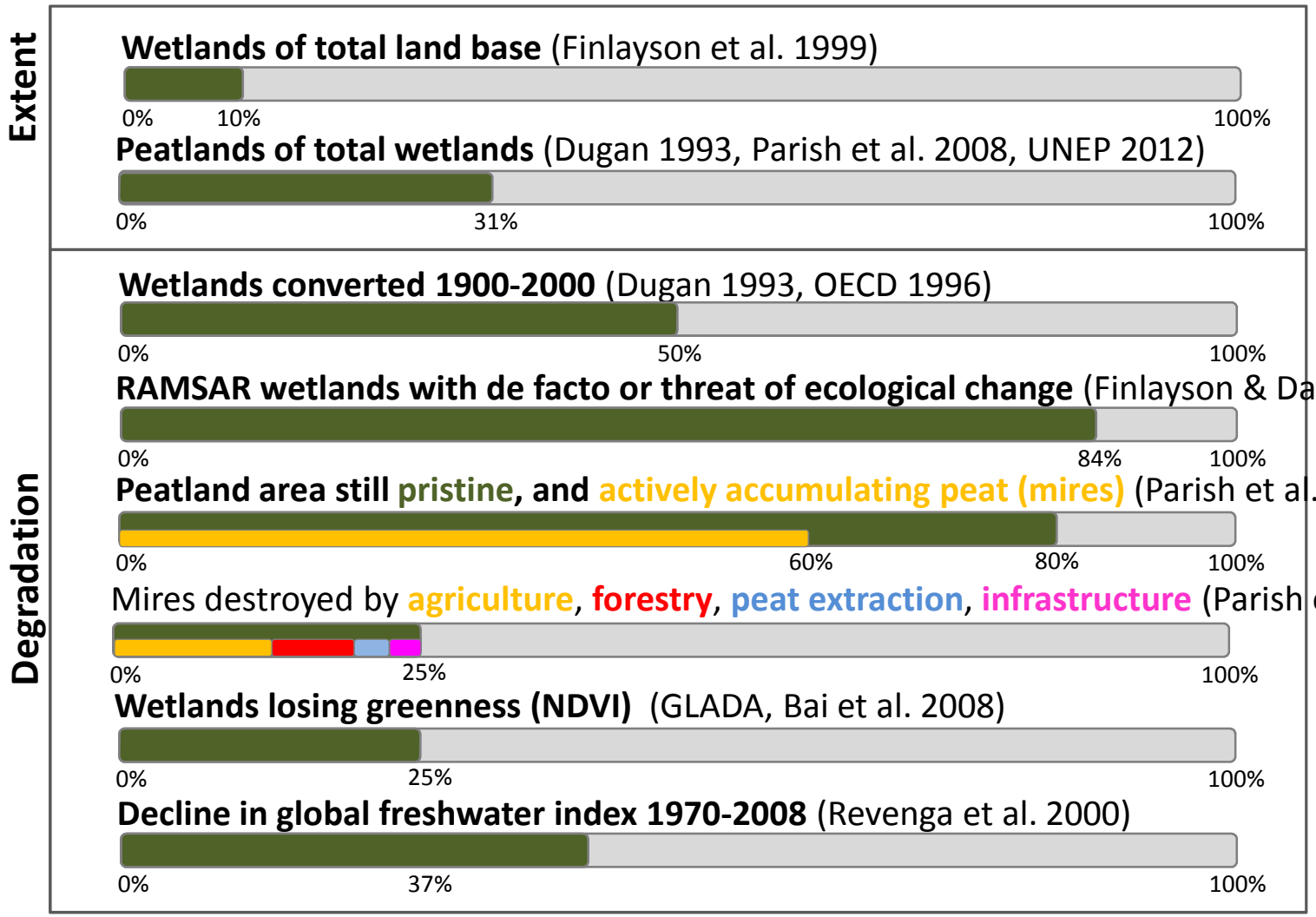
16 September 2013



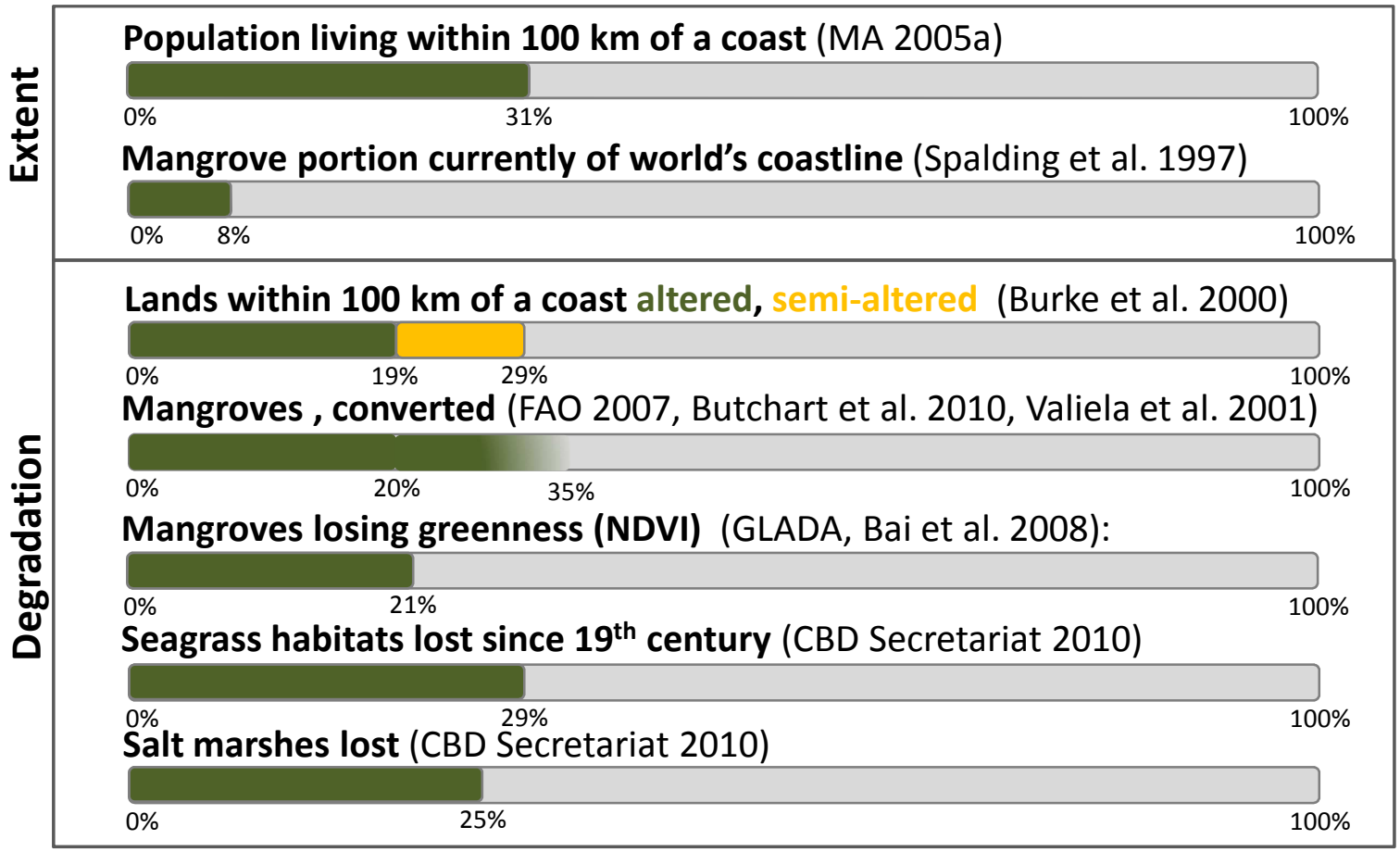
Dryland Ecosystems



Wetland Ecosystems



Coastal Ecosystems



Issues

- **Conceptual framework**
  - Great complexity
  - Many possible ways but no agreement
  - Partly a political issue
- **Data Sources**
  - Satellites give different perspective than ground observations
- **Data quality**
  - General lack of data. Many datasets do not exist.
  - Many existing datasets are of poor quality
  - Most assessments therefore focus on ecosystem extent rather than on ecosystem quaility

”Best guess” global estimates

$$Former\ area\ -Lost\ area\ -Intact\ area\ =Degraded\ area$$

For each ecosystem except agroecosystems

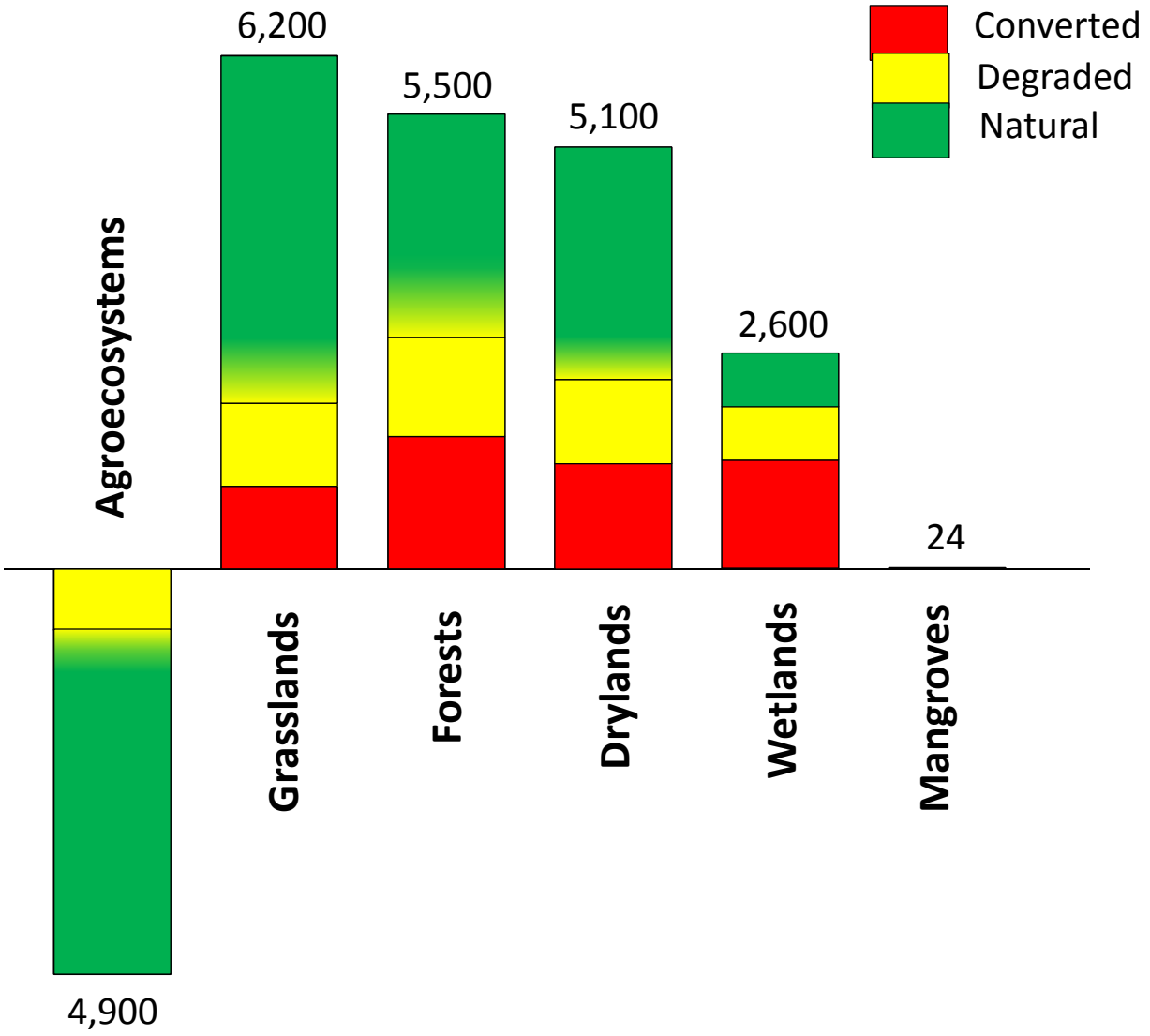
1. Establish a reference area (”former” or ”original” extent)
2. Remove the converted portion (”loss”)
3. Remove the intact (”primary type”) portion
4. The balance is the degraded portion

For agroecosystems

1. Establish a reference area
2. Determine the degraded portion

Global ecosystem status

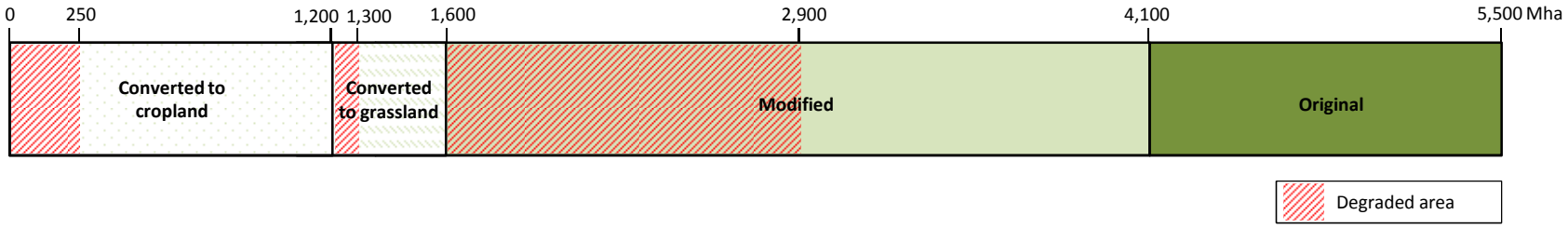
(million ha)



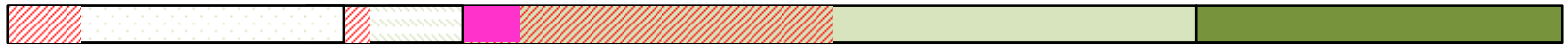
Forest restoration potential (example)

Assumptions:

1. Current forest cover: 3,900 Mha
2. Fraction of historic forest cover converted: 30%
3. → Total historic forest cover: 5,500 Mha
4. Fraction of primary forest: one third of current forest cover
5. Forest conversion ratio into cropland/grassland: 3/1
6. Fraction of cropland degraded: 20%
7. Fraction of grasslands degraded: 25%



Scenario A: Restoring 15% of degraded forests



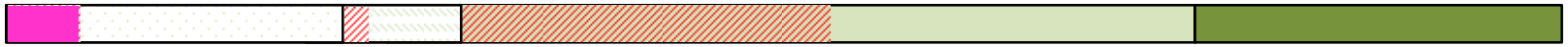
15% * 1,300 Mha ≈ **195 Mha**

Area to be restored

Scenario B: Restoring 15% of degraded forests PLUS 15% of degraded converted forest land

195 Mha + 15% * 240 Mha + 15% * 100 Mha ≈ **246 Mha**

Scenario C: Restoring 15% of converted former forest land (agriculture + pasture)

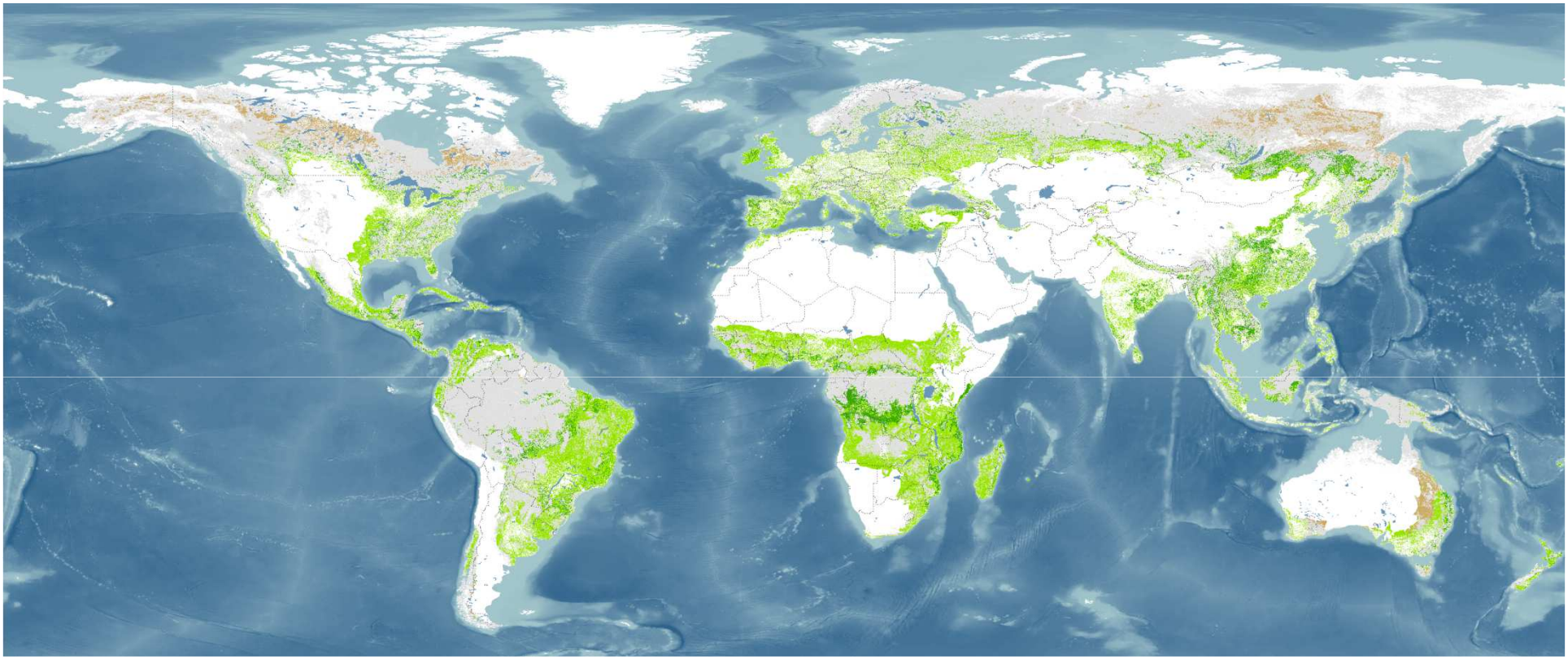


15% * 1,600 Mha ≈ **240 Mha**

Scenario D: Restoring 15% of converted former forest land PLUS 15% of degraded forest

240 Mha + 195 Mha ≈ **435 Mha**

Forest and Landscape Restoration Opportunity



FOREST AND LANDSCAPE RESTORATION OPPORTUNITIES

- Wide-scale restoration
- Mosaic restoration
- Remote restoration

Current forest

THE GLOBAL PARTNERSHIP ON FOREST LANDSCAPE RESTORATION

WORLD RESOURCES INSTITUTE

South Dakota State University

IUCN

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

PROFOR

Forestry Commission