



**SAPIENZA**  
UNIVERSITÀ DI ROMA

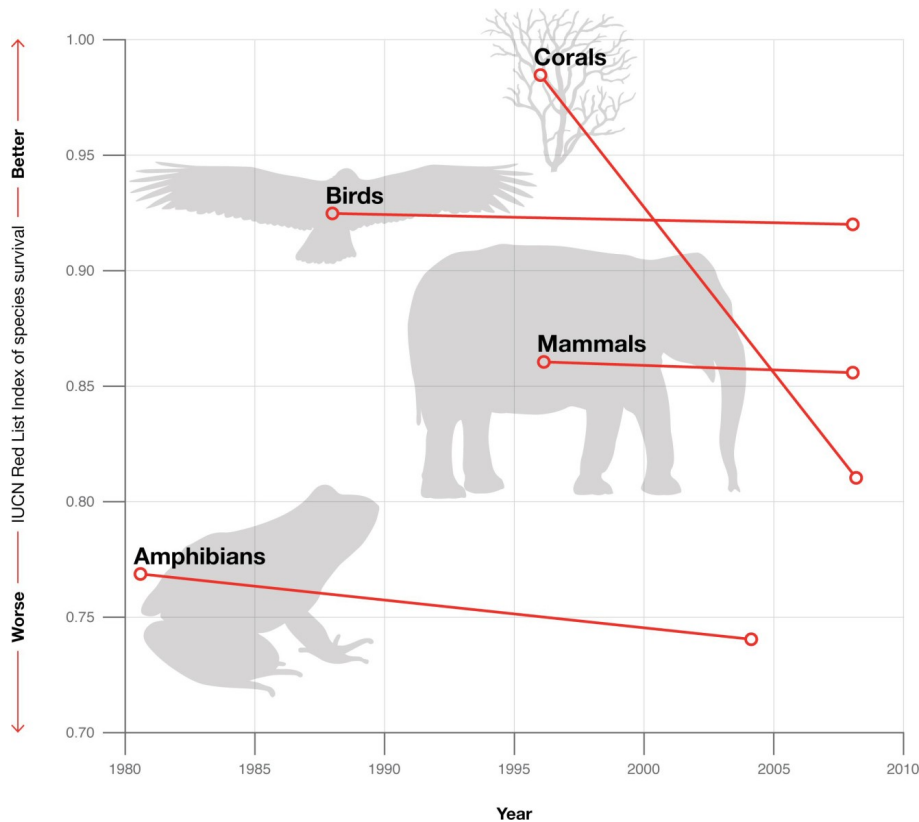


**Carlo Rondinini, Piero Visconti**

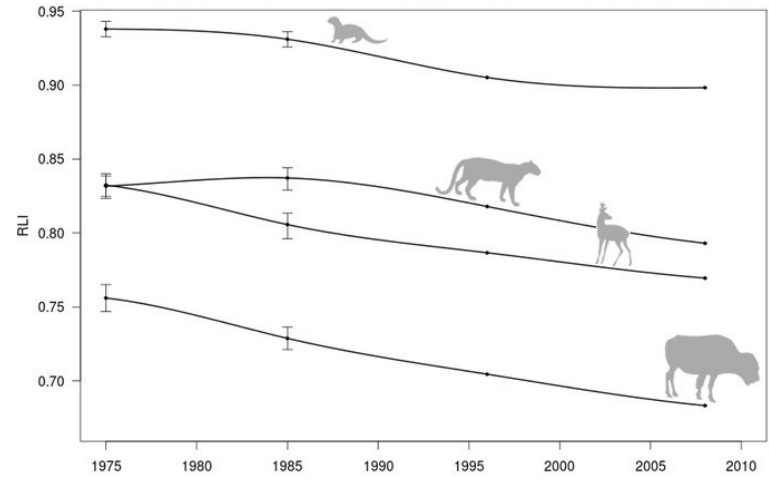
With contributions from Rob Alkemade, Michael Bakkenes, Florian Humpenöder, Alexander Popp

**Projected impacts of climate change and land-based mitigation on mammal abundance and extinction risk**

# Biodiversity is declining



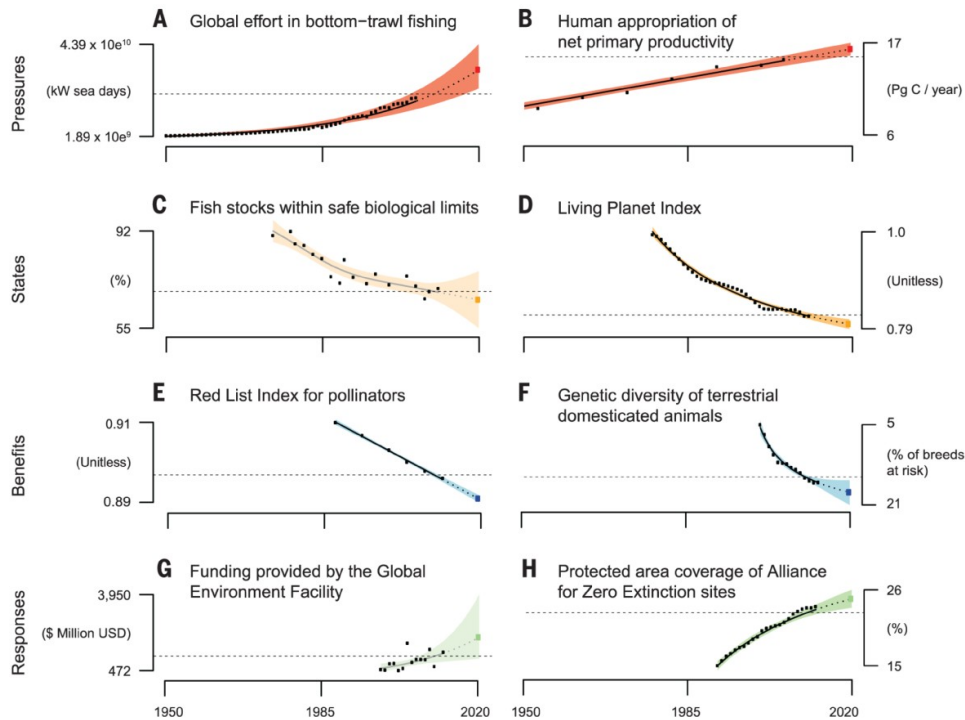
Hoffman et al. 2010 Science



Di Marco et al. 2014 Conservation Biology

**Approximately 25% of the world flora and fauna species are threatened with extinction, and the situation has worsened over the last decades**

# Short-term biodiversity projections



Increasing pressure

Declining biodiversity

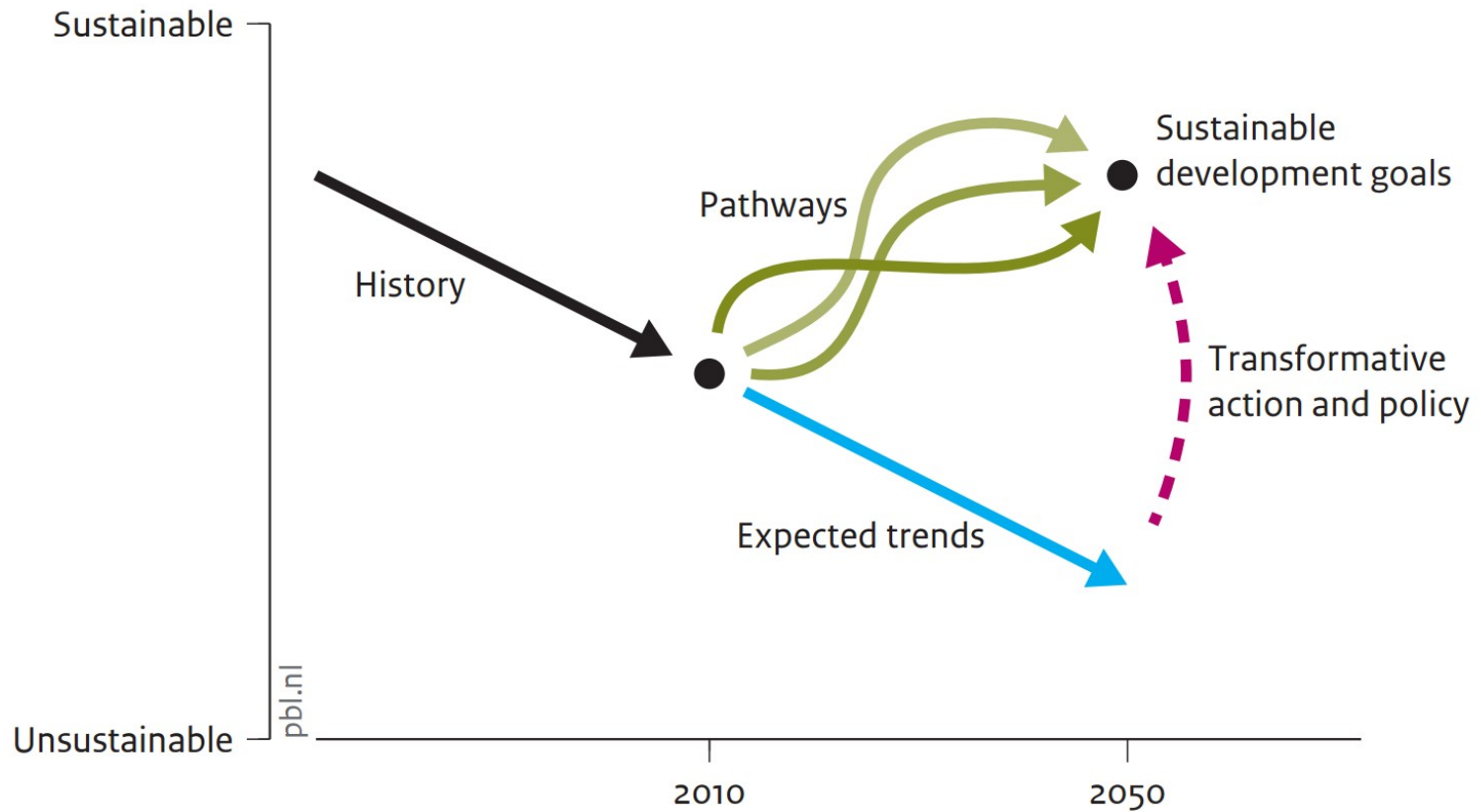
Declining ecosystem services

Stepped-up conservation

*Tittensor et al. 2014 Science*

**Trends projected to 2020 predict further declines in biodiversity and ecosystem services, despite stepped-up conservation response**

# What would be the effect of mitigation policies on biodiversity?



*PBL 2012 Roads from Rio+20*

# Scenarios of land-based mitigation

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POTSDAM INSTITUTE FOR CLIMATE IMPACT RESEARCH

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**RESEARCH**

- Earth System Analysis
- Climate Impacts & Vulnerabilities
- Sustainable Solutions
- Transdisciplinary Concepts & Methods
- Projects & Joint Activities
  - PIK research structure

## MAGPIE – Model of Agricultural Production and its Impact on the Environment

**Description of the global land use allocation model MAGPIE**

The Model of Agricultural Production and its Impact on the Environment (MAGPIE) is a global land use allocation model, which is coupled to the grid-based dynamic vegetation model LPJmL, with a spatial resolution of 0.5°x0.5°. It takes regional economic conditions such as demand for agricultural commodities, technological development and production costs as well as spatially explicit data on potential crop yields, land and water constraints (from LPJmL) into account. Based on these, the model derives specific land use patterns, yields and total costs of agriculture. The main function of the land use model is to minimize total cost of production for a given demand. Regional food energy demand is defined for an exogenously given scenario. Future trends in food demand are derived from a cross-sectoral analysis of different scenarios on GDP and population growth.

## MAGPIE Alternative pathways to achieve RCP 2.6

## GLOBIO/IMAGE Alternative pathways to achieve multiple objectives (2°C, SDG)

**GLOBIO**  
Modelling human impacts on biodiversity

What can GLOBIO be used for? | What is GLOBIO? | Assessments with GLOBIO | How can I use GLOBIO?

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### Highlights

**GLOBIO used in PNAS special issue**  
October 2015 - In a PNAS special issue on measuring the difference made by protected areas results from GLOBIO have been used in an article that analyses the socio-economic and ecological impacts of global protected area expansion strategies to achieve Aichi target 12. The analysis estimates extent of suitable habitat available for all terrestrial mammals, with and without additional protection.

**Biodiversity: further decline or bending the trend? A new animated film**  
June 2015 - What is happening to life on earth? What are the pressures affecting biological diversity globally, and what can be done to stop its decline? This short animated film brings you to the year 2050 and shows you the future is not fixed; the choices that we as a society make today will determine what the world will look like decades from now. The animation uses information derived from the GLOBIO model.

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Assessments  
Featured publications with GLOBIO contribution

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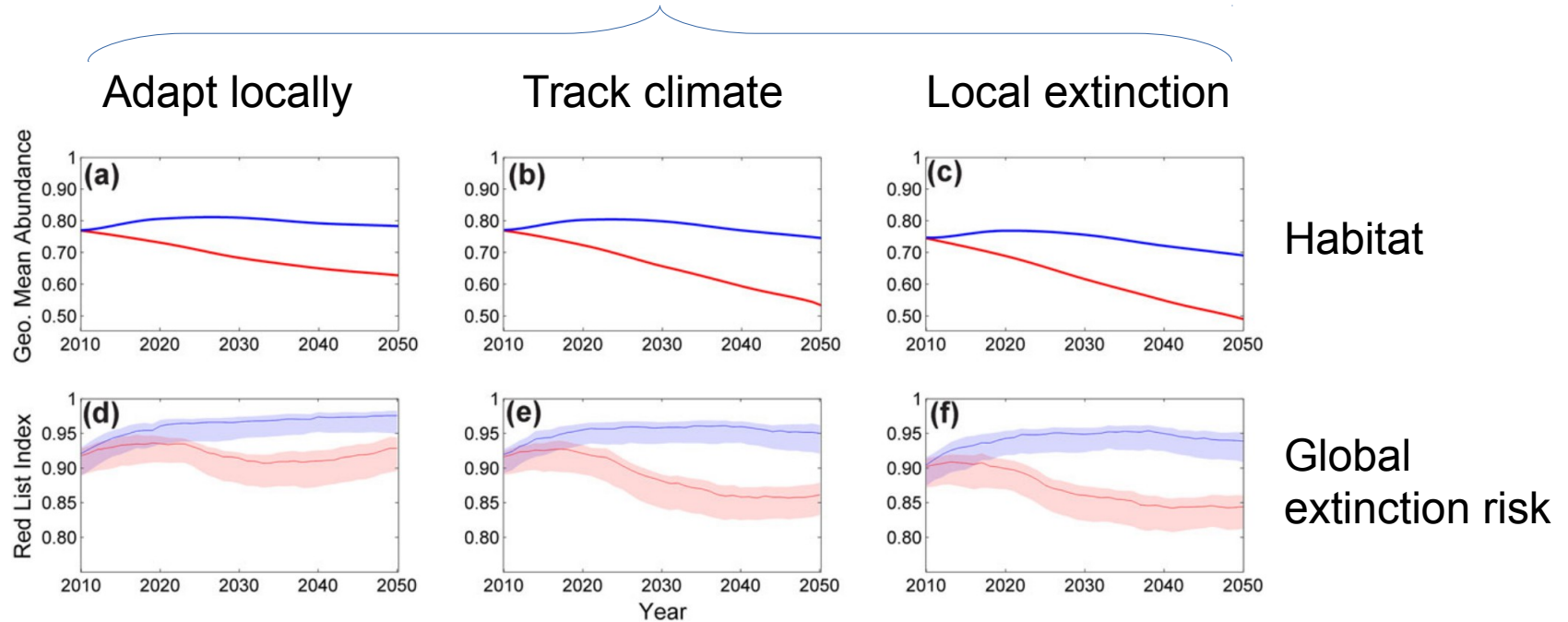
Welcome to the website of GLOBIO, the Global Biodiversity model for policy support

GLOBIO is a tool to assess past, present and future impacts of human activities on biodiversity. Since 2002 the model has been extensively used for environmental assessments on the global to national scale.

PBL Netherlands Environmental Assessment Agency  
UNEP GLOBIO ARENDAL

# Effect of land-based mitigation on habitat and extinction risk of large mammals globally

## Species' response to climate



Visconti et al. 2015 Conservation Letters

— Consumption change

— Business as usual

# Consumption change vs. Business as usual pathways

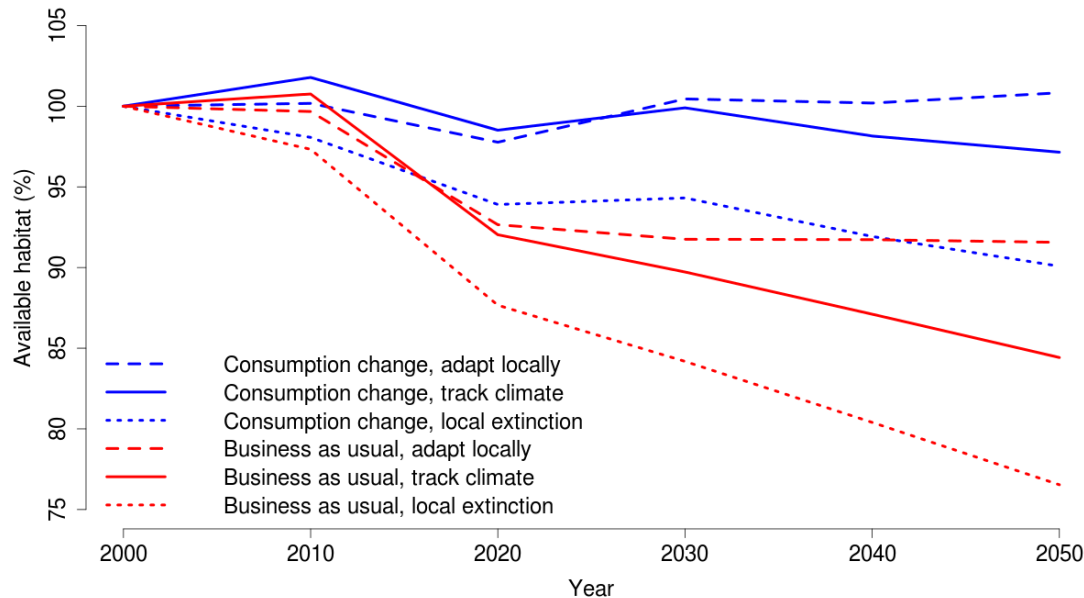
## Business as usual

- no new policies
- expanding agriculture, fisheries, aquaculture
- increased use of fossil energy, water, wood products
- climate scenario A1b

## Consumption change

- achieves sustainable development goals
- meat consumption reduced to 25% of current level in the Americas, Europe, and parts of Asia
- food waste halved
- reduced impact logging
- climate scenario B1

# Effect of land-based mitigation on the habitat of European mammals



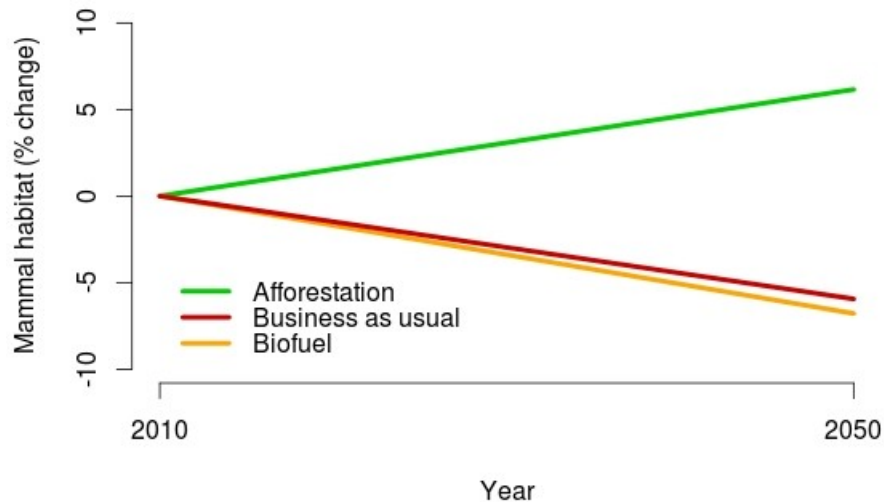
**In Europe, a change in lifestyle and consumption patterns may halt the loss of habitat for large mammals**

*Rondinini & Visconti 2015 Conservation Biology*

A lifestyle change not so dramatic, as *per capita* meat consumption in the simulation is still twice the amount recommended for a healthy diet



# The same effect of land-based mitigation can be achieved at very different costs for biodiversity



Based on MAgPIE scenarios, climate mitigation through bioenergy with carbon capture and storage would slightly increase the already negative human impacts on mammals

**Achieving the same through afforestation would generate a win-win solution for biodiversity too**

## **In conclusion...**

**Halting the current trend of biodiversity loss AND strong land-based mitigation are compatible**

**The current trends demonstrate that longer we wait to take action, the less room for recovery there will be**

**Some, BUT NOT ALL land-based mitigation strategies can fulfil multiple objectives and achieve climate targets as well as Sustainable Development Goals**