International Institute for Applied Systems Analysis
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Bending the curve of terrestrial biodiversity needs an integrated strategy

D. Leclère

Integrated Biosphere Futures group
IIASA | Austria

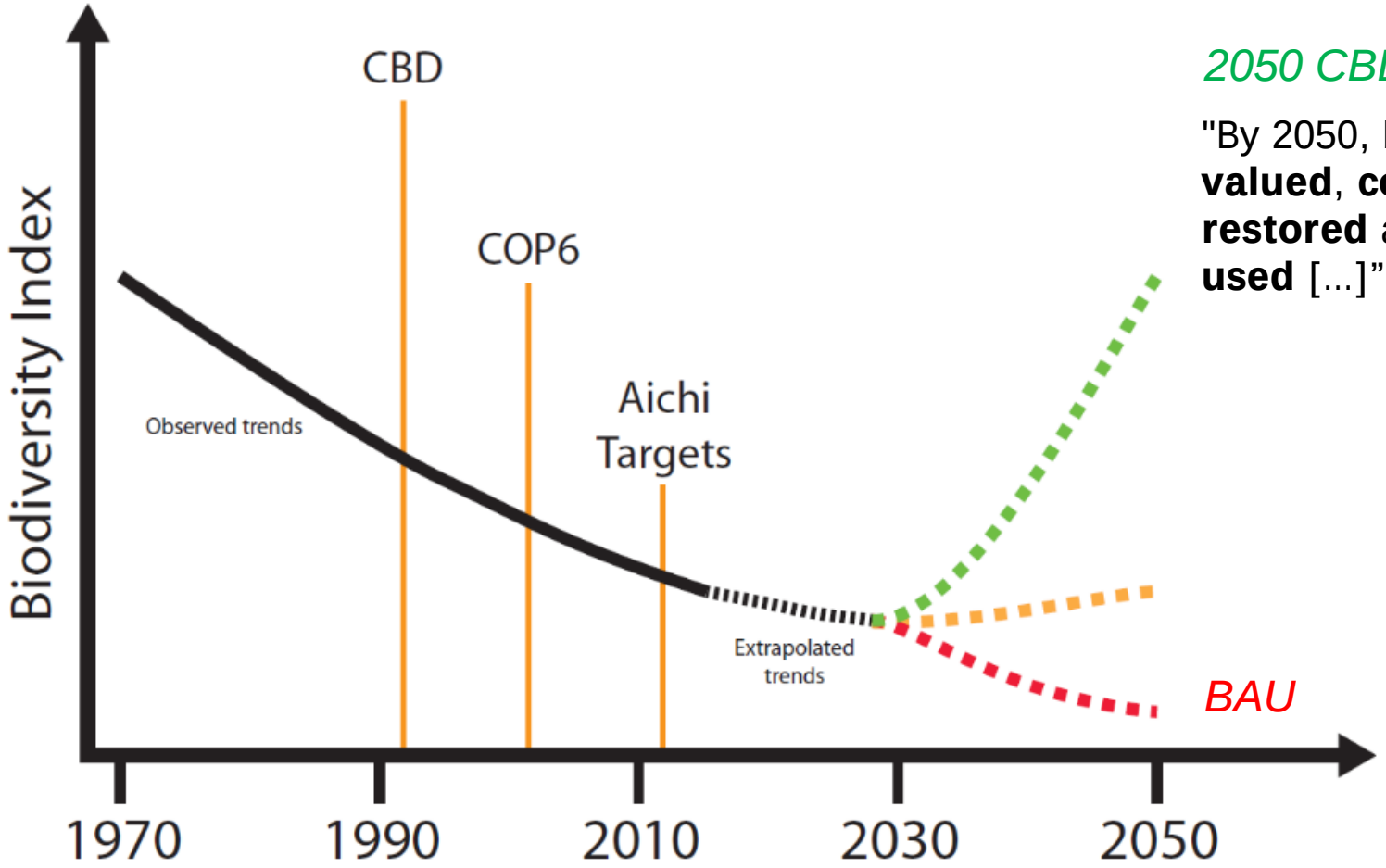
Keynote talk

Oct. 19th 2022 | Vytautas Magnus University Agriculture Academy, Lithuania

12th ICA Rectors and Deans forum

Introduction

Need for ambitious & well-coordinated action



2050 CBD vision

"By 2050, biodiversity is **valued**, **conserved**, **restored** and **wisely used** [...]"

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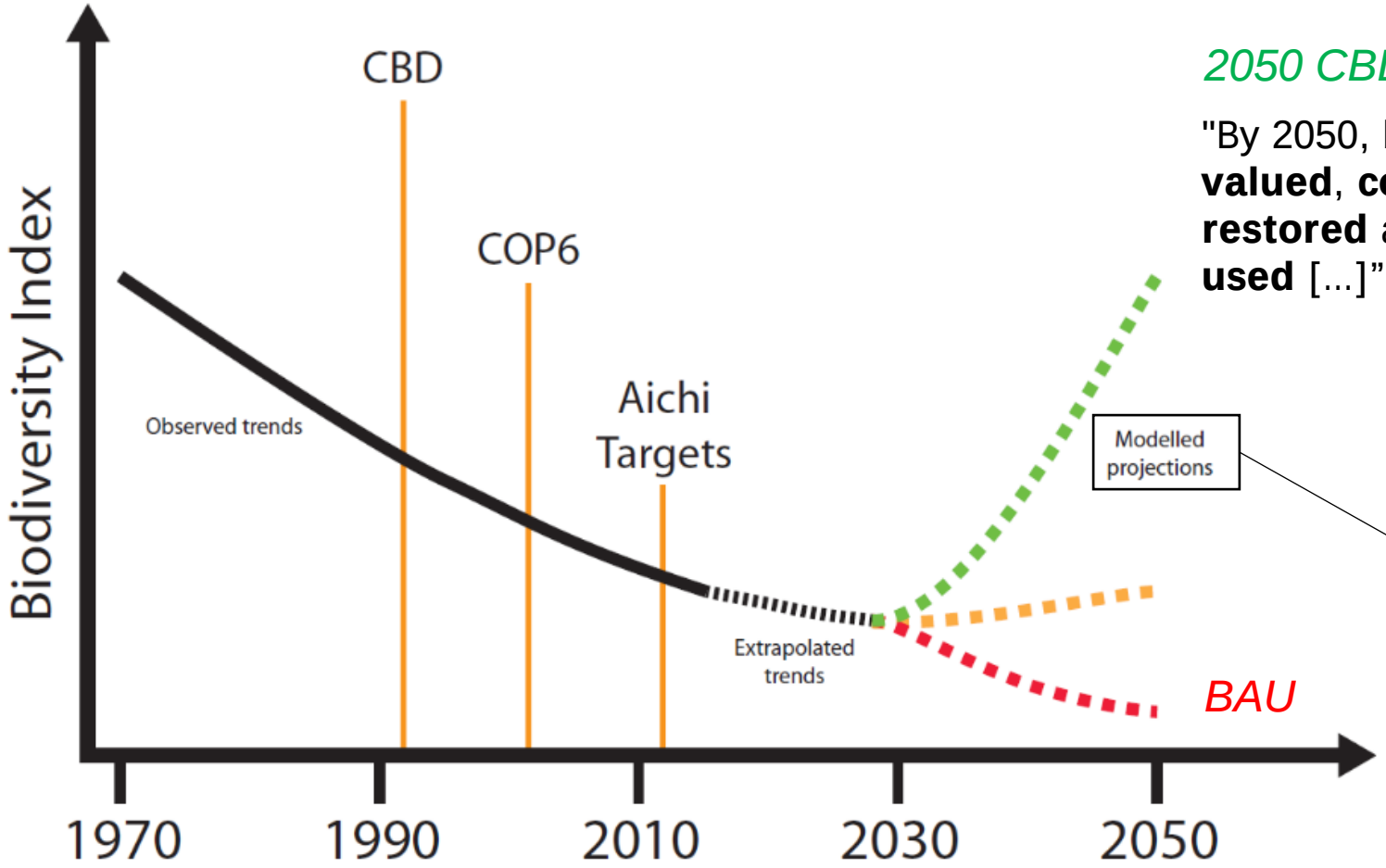
Mace et al. (Nat. Sus., 2018)

Models and scenarios to the task



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2050 CBD vision

"By 2050, biodiversity is **valued**, **conserved**, **restored** and **wisely used** [...]"

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The methodological assessment report on
SCENARIOS AND MODELS OF BIODIVERSITY AND ECOSYSTEM SERVICES
SUMMARY FOR POLICYMAKERS

Ferrier et al. (2016)

ipbes

Bending the curve: the research article

The bending the curve initiative

- Combining current data, models & scenarios from land-use & biodiversity modelling communities

- Fast track analysis on bending trends from habitat loss:

Bending the curve of terrestrial biodiversity needs an integrated strategy

D. Leclère; M. Obersteiner; Barrett, M.; Butchart, S. H. M.; Chaudhary, A.; De Palma, A.; DeClerck, F. A. J.; Di Marco, M.; Doelman, J. C.; Durauer, M.; Freeman, R.; Harfoot, M.; Hasegawa, T.; Hellweg, S.; Hilbers, J. P.; Hill, S. L. L.; Humpenöder, F.; Jennings, N.; Krisztin, T.; Mace, G. M.; Ohashi, H.; Popp, A.; Purvis, A.; Schipper, A. M.; Tabeau, A.; Valin, H.; van Meijl, H.; van Zeist, W. J.; Visconti, P.; Alkemade, R.; Almond, R.; Bunting, G.; Burgess, N. D.; Cornell, S.; Di Fulvio, F.; Ferrier, S.; Fritz, S.; Fujimori , S.; Grooten, M.; Harwood, T.; Havlík, P.; Herrero, M.; Hoskins, A. J.; Jung, M.; Kram, T.; Lotze-Campen, H.; Matsui, T.; Meyer, C.; Nel, D.; Newbold, T.; Schmidt-Traub, G.; Stehfest, E.; Strassburg, B.; van Vuuren, D. P.; Ware, C.; Watson, J. E. M.; Wu, W. & Young, L.

Leclère et al. 2020

The bending the curve initiative

- Combining current data, models & scenarios from land-use & biodiversity modelling communities

- Fast track analysis on bending trends from habitat loss:

Can we bend the curve of biodiversity loss without jeopardizing other SDGs?

If yes, what can we robustly say about how to get there?

> New global scenarios exploring the action space

> New multi-model assessment of these scenarios

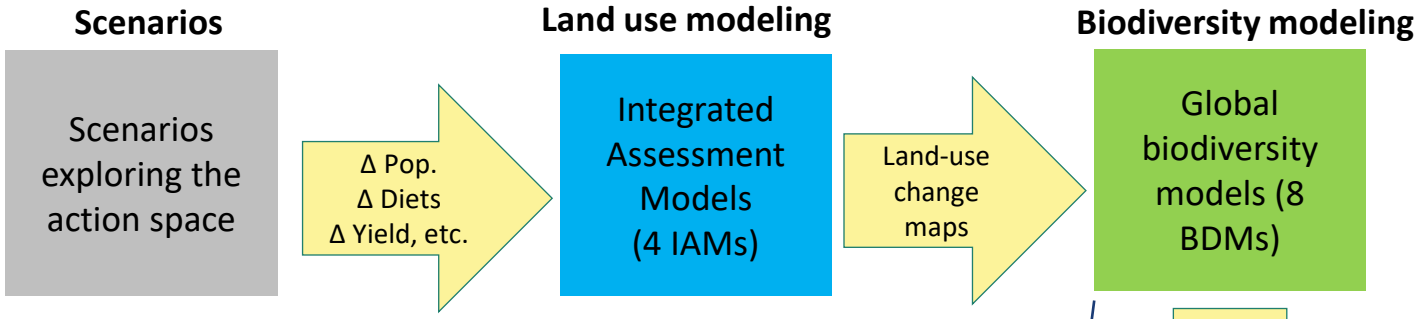
Leclère et al. 2020; https://doi.org/10.1038/s41586-020-2705-y

Scenarios exploring the actions space

scenarios	Baseline assumptions	Additional efforts towards reversing trends in biodiversity					
	SSP2 (Middle of the Road)	Yield increases	Trade increases	Reduced waste	Diet shifts	Expansion of PAs	Increased restoration
a) baseline scenario							
Baseline (BASE)	x	-	-	-	-	-	-
b) single bundble of action scenarios							
Supply-side efforts (SS)	x	x	x	-	-	-	-
Demand-side efforts (DS)	x	-	-	x	x	-	-
Increased conservation efforts (C)	x	-	-	-	-	x	x
c) combined action scenarios							
Inc. conservation & supply-side efforts (C+SS)	x	x	x	-	-	x	x
Inc. conservation & demand-side efforts (C+DS)	x	-	-	x	x	x	x
Integrated action portfolio (IAP)	x	x	x	x	x	x	x

Leclère et al. 2020; https://doi.org/10.1038/s41586-020-2705-y

Multi-model assessment



Biodiversity model (BDM)	Metric	Biodiversity aspect
LPI model	Living Planet Index	Population trends (birds and mammals)
INSIGHTS model	Extent of Suitable Habitat (ESH) Index	Habitat size (mammals)
AIM-biodiversity	Extent of Suitable Habitat (ESH) Index	Habitat size (vascular plants, amphibians, reptiles, birds & mammals)
PREDICTS model	Biodiversity Intactness Index (BII)	Compositional intactness of ecological assemblages
GLOBIO model	Mean Species Abundance (MSA) Index	Compositional intactness of ecological assemblages
cSAR models (cSAR_US16 & cSAR_CB17)	Fraction of {globally/regionally} remaining species (F{R/G}RS) Index	Regional and global extinction species (vascular plants, amphibians, reptiles, birds & mammals)
BILBI model	Fraction of remaining species (FGRS)	Global extinction of vascular plants

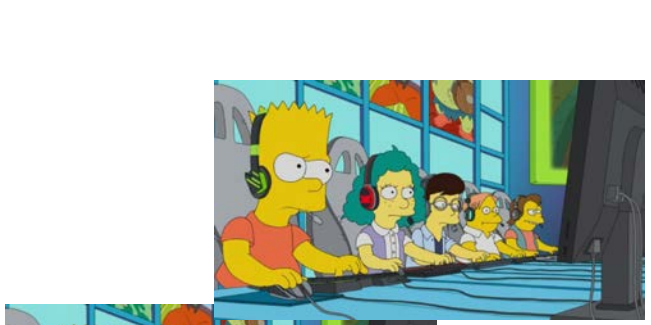
Δ Habitat
Δ Intactness
Δ Population
Δ Reg. extinctions
Δ Glo. extinctions

Spatially (17 IPBES subregions) **& temporally explicit** (10 years, 2010-2100) **maps of biodiversity indices** (10 indices over 6 metrics & 8 BDMs)

(10 indices x 4 IAM) per scenario

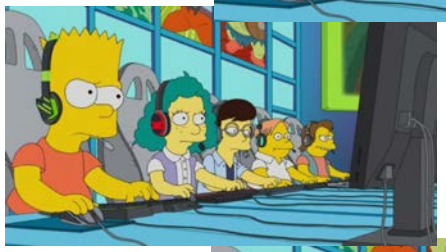
Leclère et al. 2020; https://doi.org/10.1038/s41586-020-2705-y

Multi-model assessment – don't do this at home!

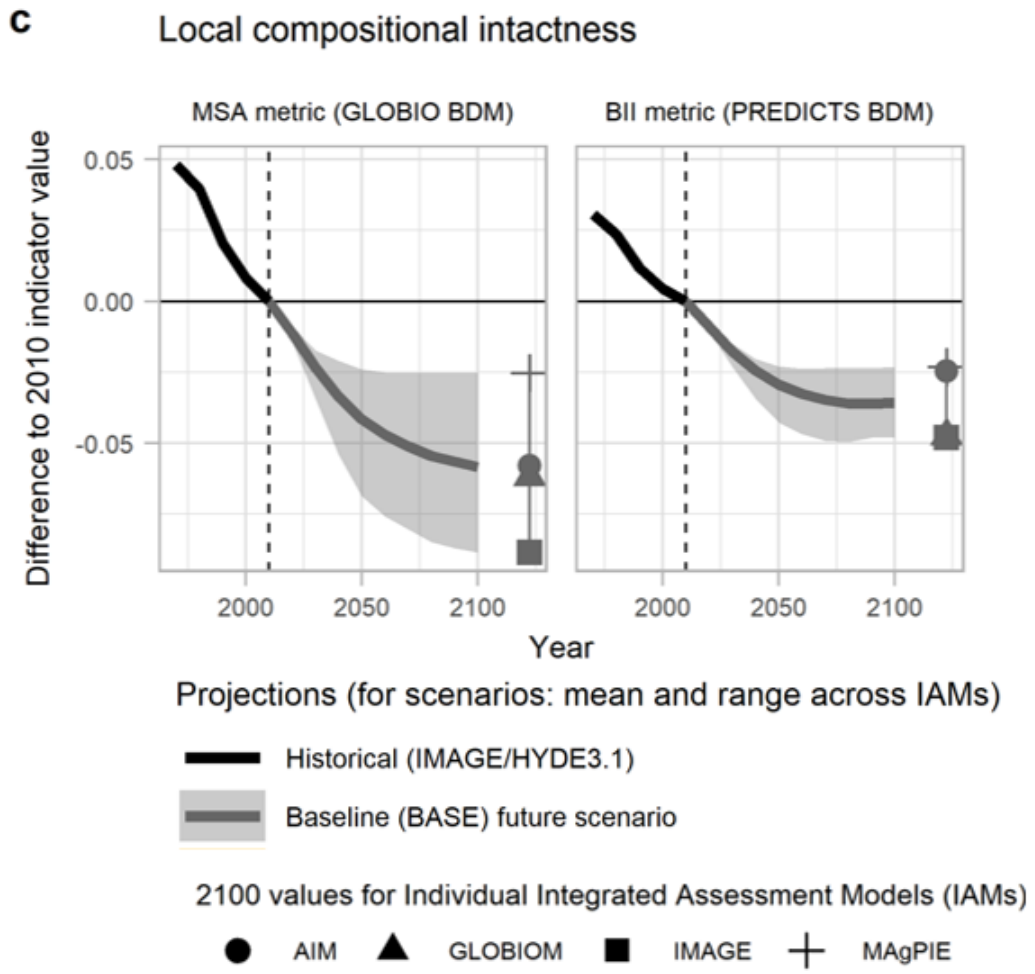


12 teams of modelers in action

me



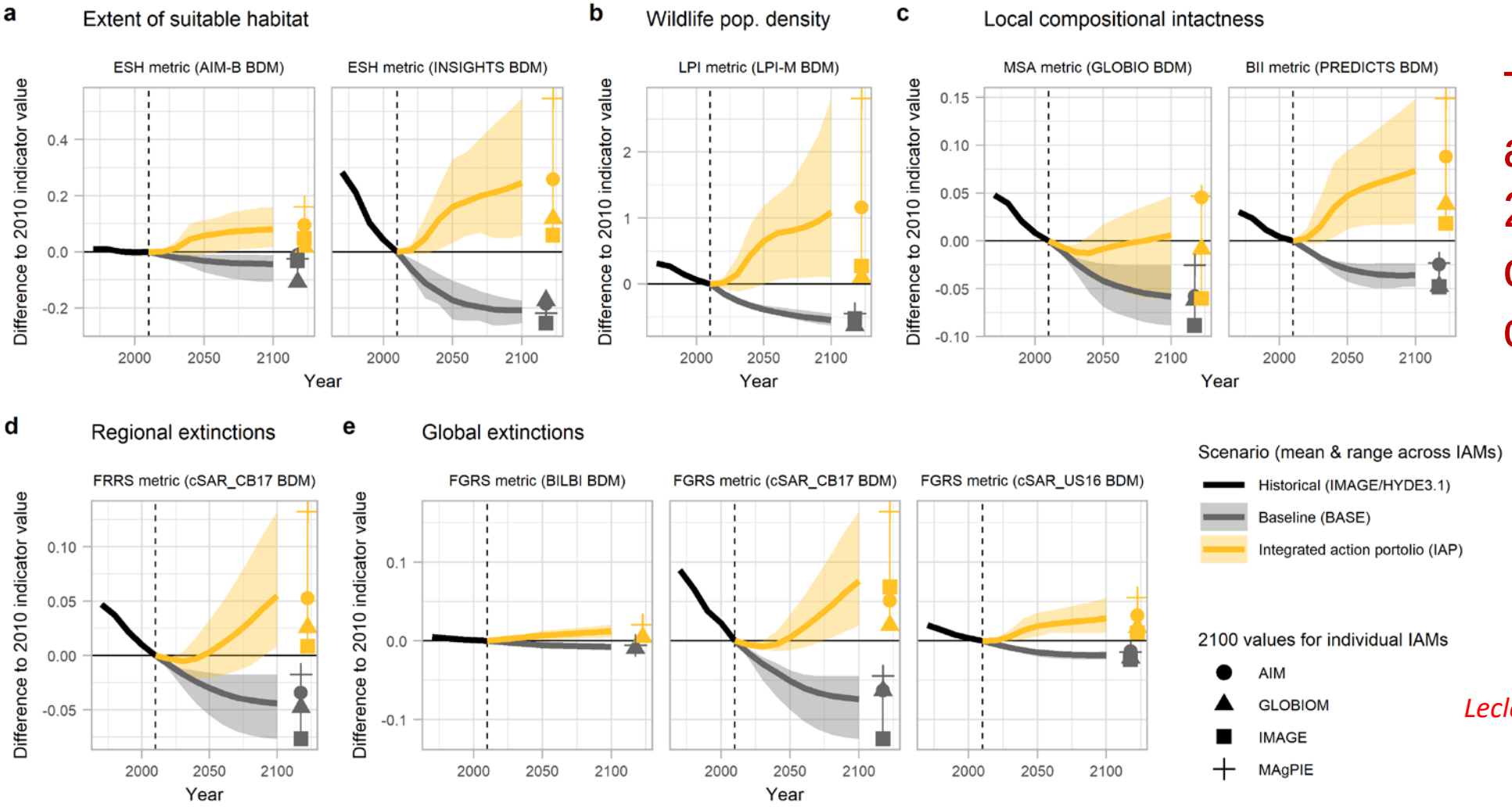
Continued global trends without ambitious action



Continued decline
until second half of 21st century

Leclère et al. (Nature, 2020)

Yes, we can?



Trend reversal achieved by 2050 for 33 out of 34 IAM x BDI combinations

Leclère et al. (Nature, 2020)

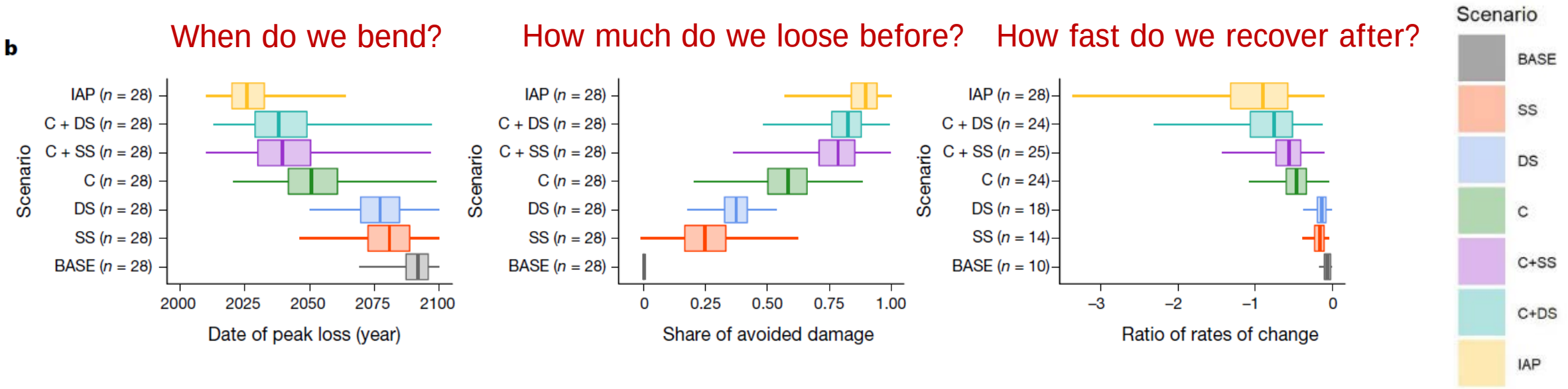
How do we get there?

How do scenarios play out for biodiversity?

When do we bend?

How much do we loose before?

How fast do we recover after?



What about other SDG indicators (food prices, GHGs, water use etc.)?

Leclère et al. (Nature, 2020)

How do we get there?

Increased conservation efforts are key …

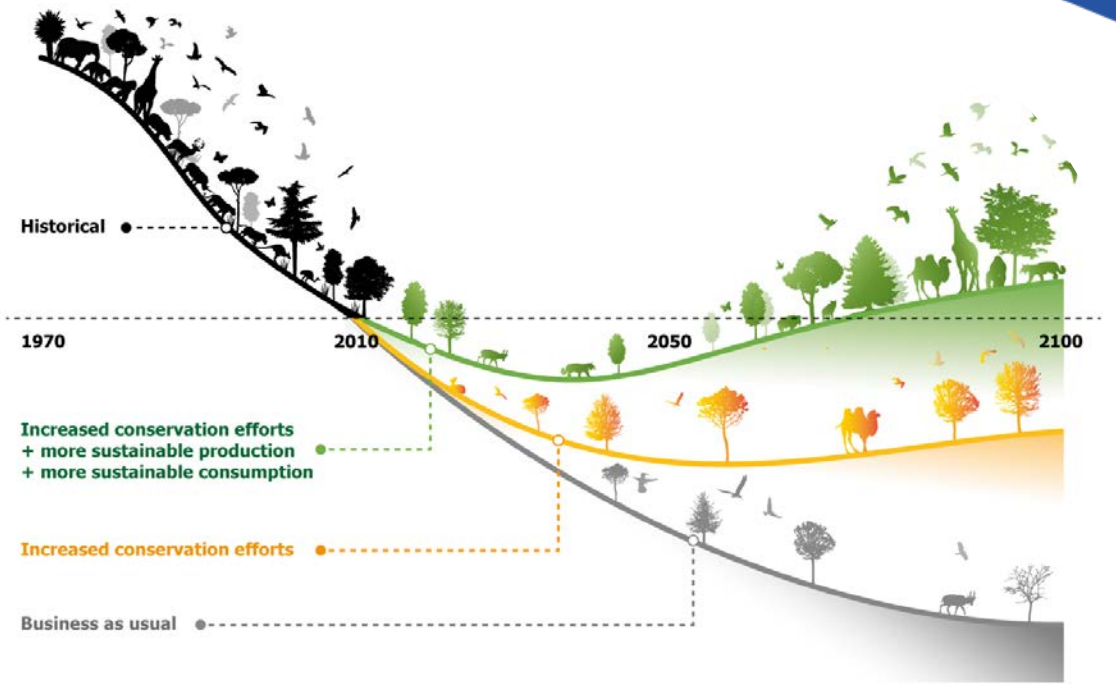
More and better managed PAs **AND** restoration **AND** landscape-level conservation planning:

- o Advances the date at which we reach peak biodiversity loss by several decades
- o Allows to set biodiversity on a recovery track

How do we get there?

Increased conservation efforts are key …

but are not enough!



Only by **additionally** tackling the drivers of habitat loss (via **diet shift, reduced waste, sustainable increases in trade and crop yields**) will we robustly:

- o Allow avoiding further habitat losses in the near-term
- o Secure bending by 2050
- o Keep food prices under control & generates large synergies with health, GHG emissions, water use, fertilizer application etc.

Conclusions

Reversing terrestrial biodiversity declines from habitat loss by 2050 might be feasible

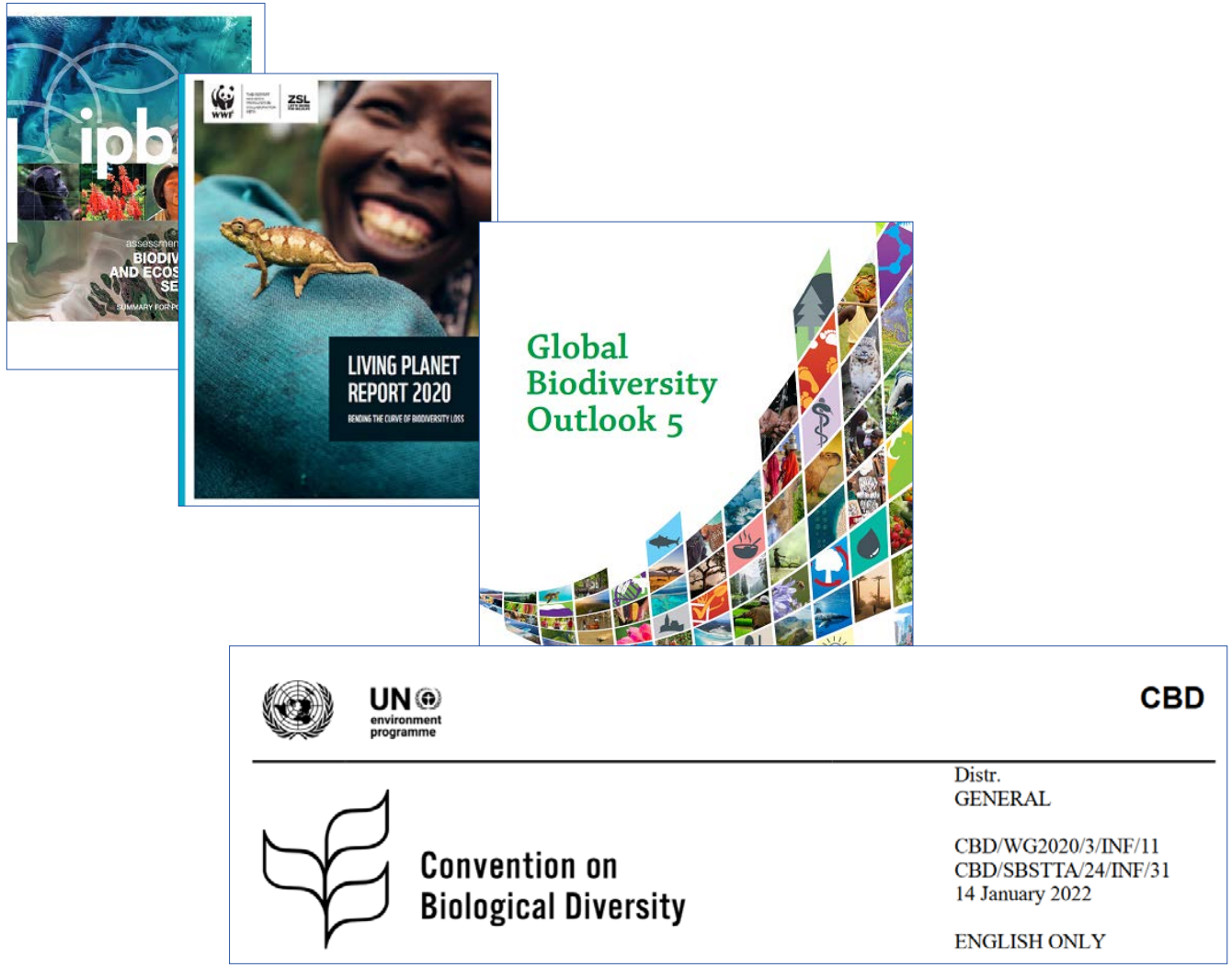
But not without ambitious and integrated action

Post-2020 strategy needs both bold conservation & tackling drivers of land use change

Other threats to biodiversity need to be addressed to fully bend the curve

Impact at science policy-interface

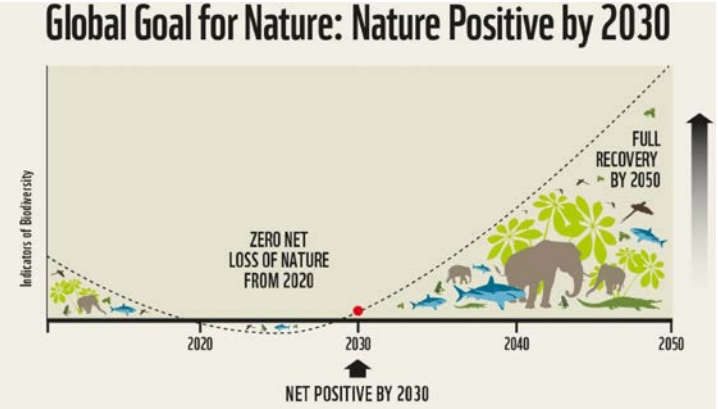
A large media and science-policy coverage



- Joint launch with WWF's 2020 Living Planet Report
- Featured in IPBES's Global Assessment Report & UN-CBD's Global Biodiversity Outlook 5
- Core material to CBD documents in support of post-2020 GBF:
  - Evidence to support review of goals and targets (CBD/SBSTTA/24/3/Add.2/Rev.1)
  - Evidence on the link action targets and goals, and the need for transformative change (CBD/WG2020/3/INF/11)
  - Recommendations on draft one (Leadley et al 2022, policy briefs)

Bending the curve: a widely adopted goal

NGOs



Post-2020 global biodiversity framework

Business

Academia

Association for European Life Science Universities
Rectors and Deans Forum 2022

COMMUNIQUÉ
LIFE SCIENCES UNIVERSITIES ADDRESSING THE URGENT NEED TO BEND THE CURVE OF BIODIVERSITY LOSS

Governments

European Commission

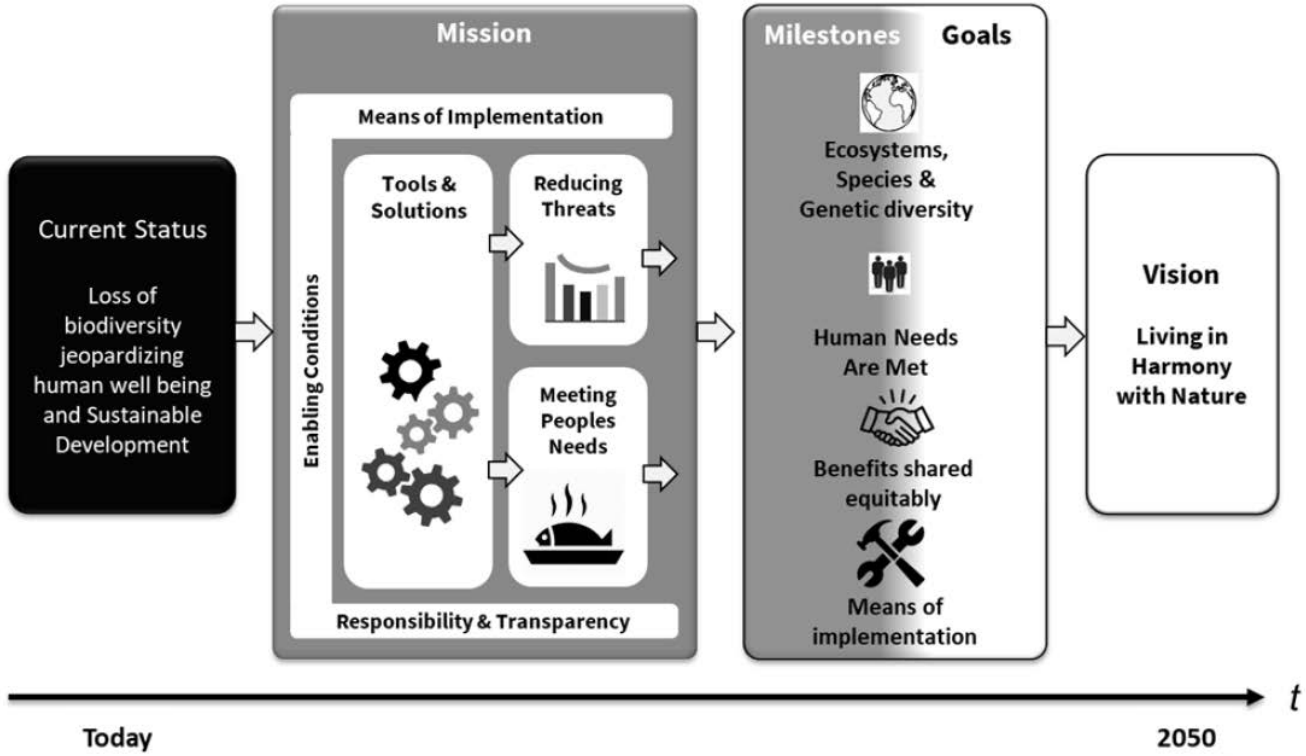
Environment

Home > Strategy > Biodiversity strategy for 2030

Biodiversity strategy for 2030

Post-2020 Global Biodiversity Framework

- Bending the curve as the overarching goal
- Coherent structure linking biodiversity outcomes to actions covering direct & indirect drivers
- Formulation/numerical values for goals, milestones and action targets informed by latest research

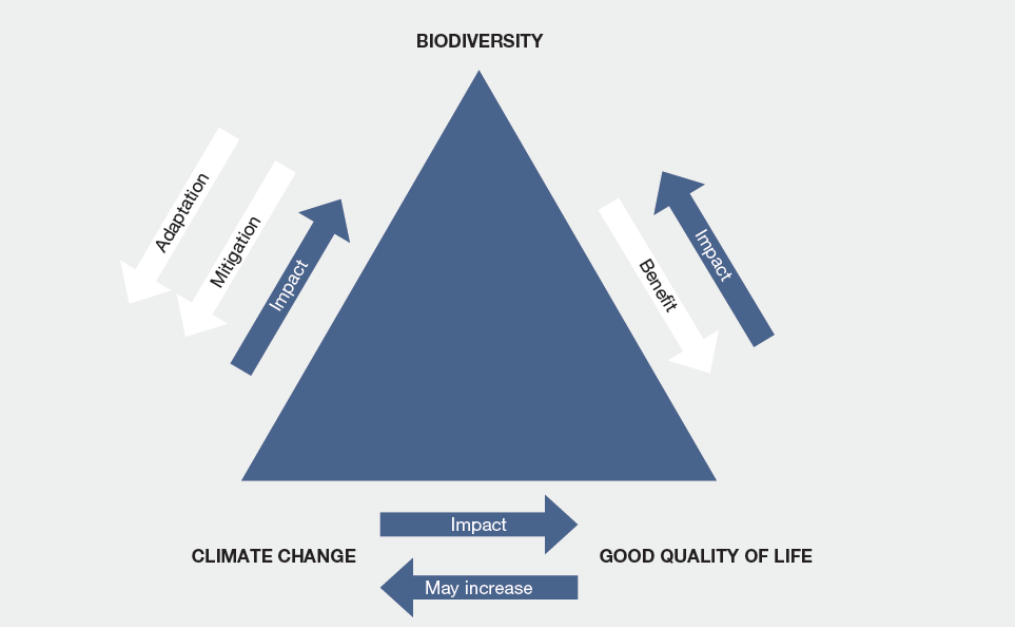


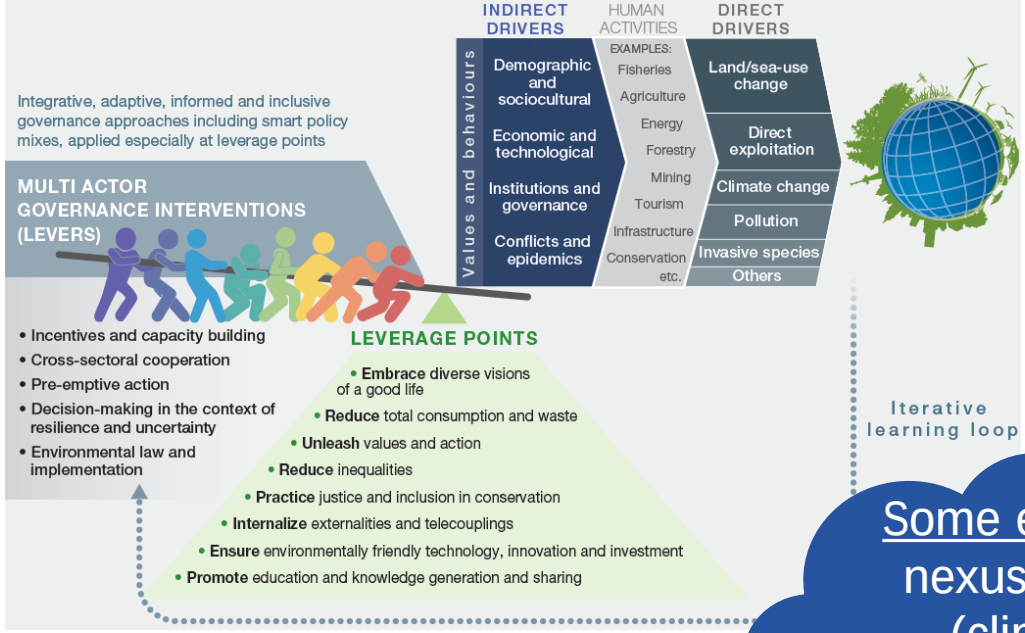
Based on draft 1, see GEOBON/Biodiscovery policy briefs for additional elements

Towards a just transition for people, climate & nature

A broad agenda to research from pathways to policies

A just transition for people, climate and nature ... that requires transformative change



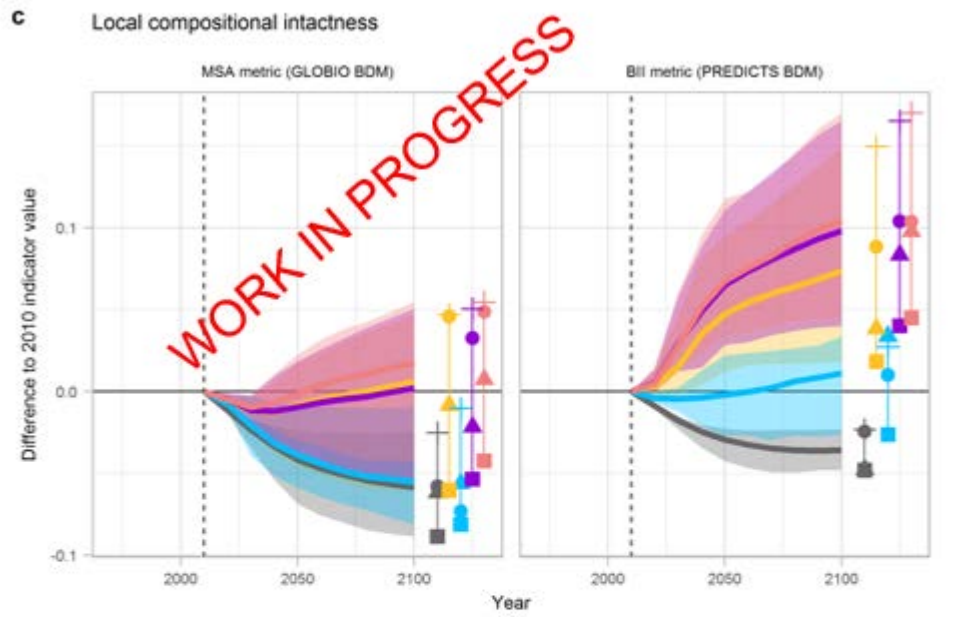


IPBES-IPCC co-sponsored workshop (Pörtner et al 2021)

Some examples: nexus thinking (climate & biodiversity), equity, teleconnections

Linking to global climate mitigation pathways

- **Same modeling framework**
- **What about impact of climate mitigation? What are synergistic actions?**



Leclère et al (unpublished)

Preliminary insights

Uncertainties do not get smaller (modeling challenge)

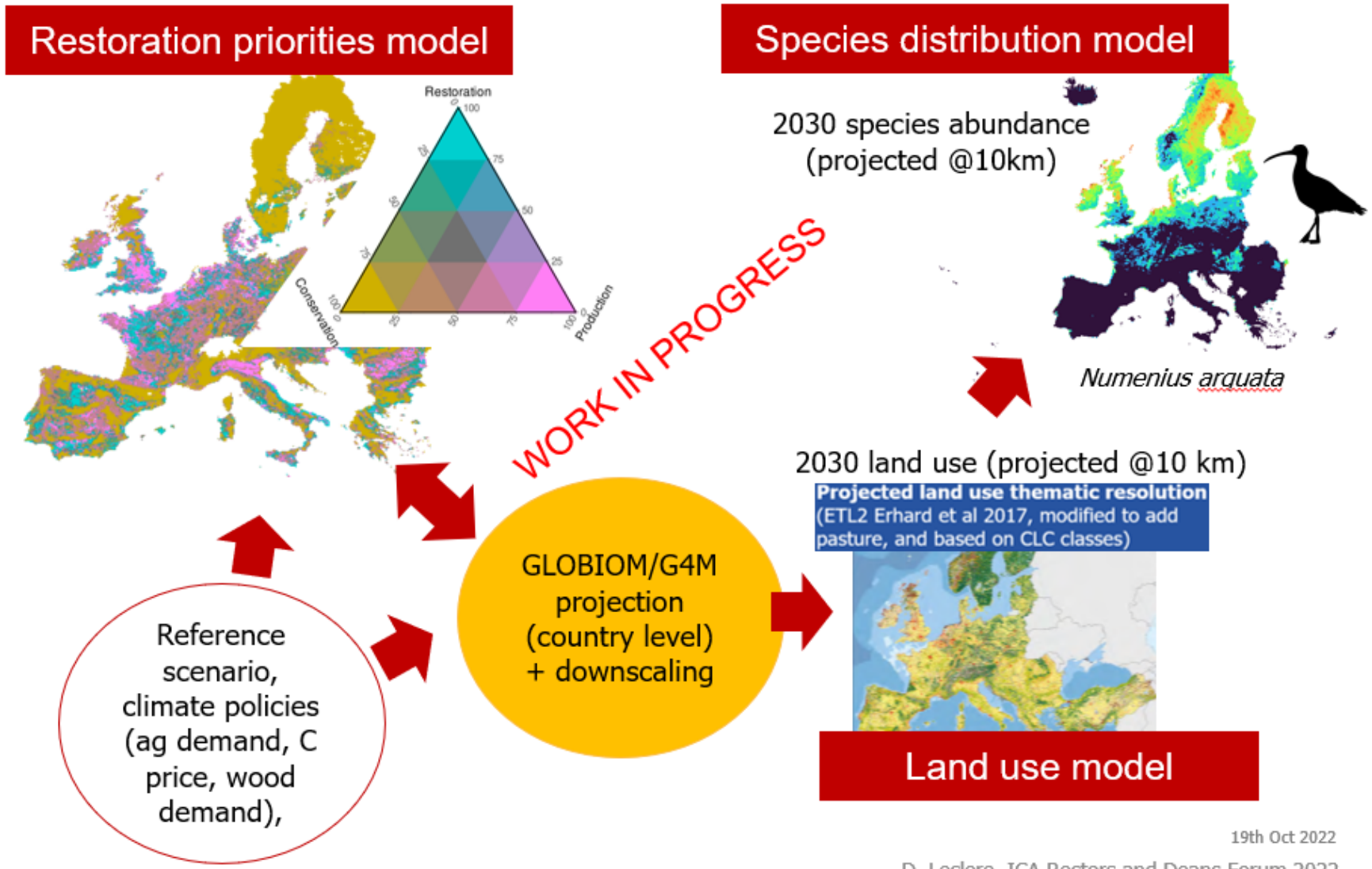
Synergistic interventions:

- Protect carbon- & biodiversity-rich ecosystems
- Align removal options associated to restoration & re/afforestation
- Sustainable production & consumption

Support EU climate & biodiversity action alignment

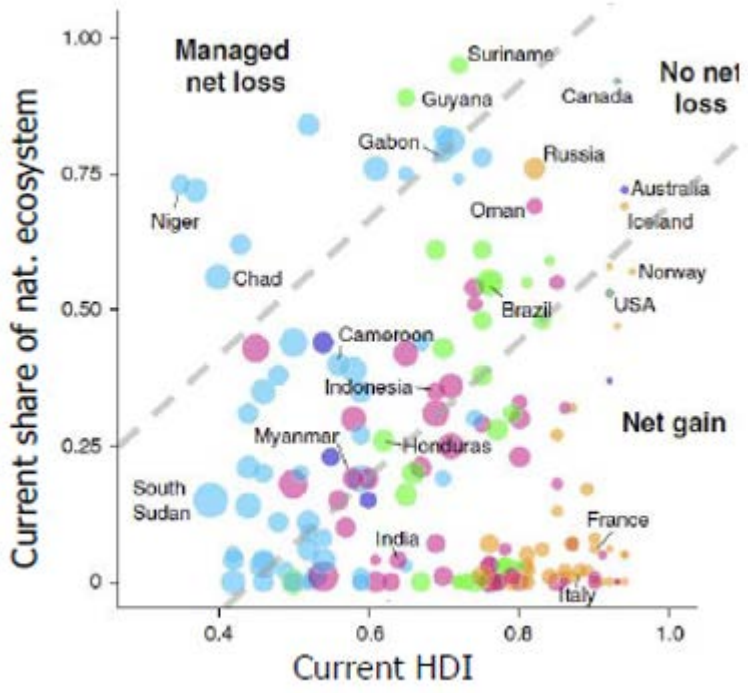
BIOCLIMA project

- Models & scenarios to explore synergies and trade-offs across interventions for climate (e.g., Fit for 55, AFOLU neutrality, etc.) and biodiversity (e.g., Nature restoration Law, protection law, etc.)
- Improving on existing modeling framework already in use to support the EC in design of climate action (EUCLIMIT projects)

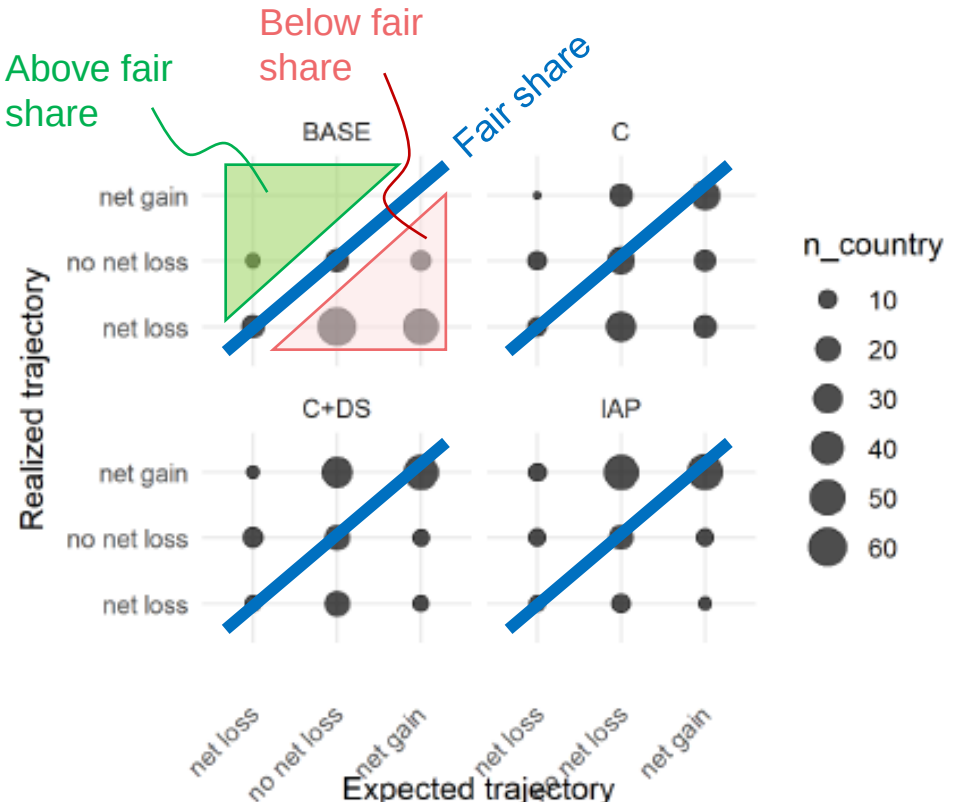


Don’t do this at home

Framing equity considerations: effort sharing



WORK IN PROGRESS



GBF Goal A: net gain in area of natural ecosystems globally
National contributions might differ, including for equity considerations

Maron et al (NEE, 2021)

Distribution of country efforts from Leclère et al (2020) can be assessed through equity principles

Harfoot et al (in prep.)

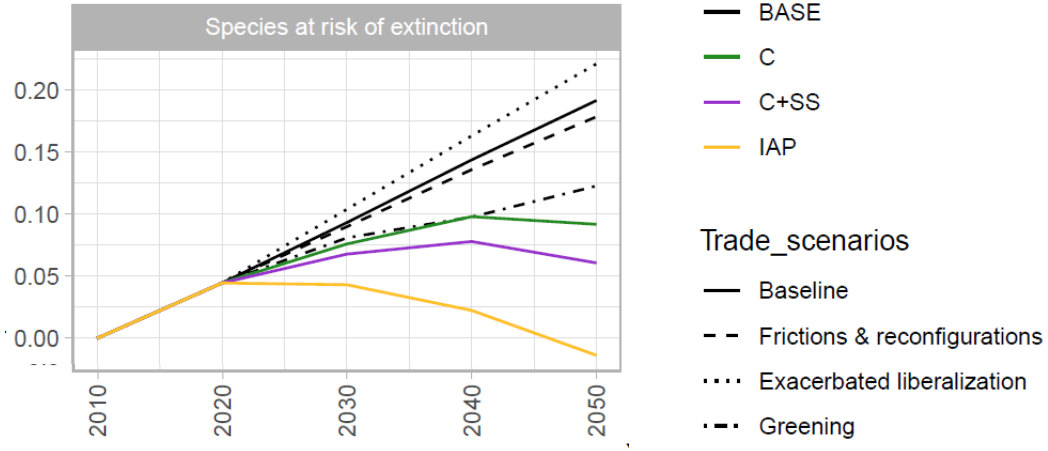
Looking a teleconnections governance: trade

Trade and biodiversity

- Increasing but complex role in biodiversity loss (land sparing vs new demand, scale- and commodity-specific net effects)

- Mediating impacts of domestic policies (spillovers & leakage)
- High transformative change potential (telecoupling regulation)

WORK IN PROGRESS



Expand pathway analysis with alternative trade futures (Leclere et al., in prep.)

Next step: bridge with new data sources (e.g., TRASE) and explore intervention options (trade agreements, EU deforestation-free supply chain initiative)

Take away messages

Models & scenarios as a tool to bend curves

- Powerful tools, allowing foresight and policy ex-ante evaluation analysis
- From post-2020 Global Biodiversity Framework to national policies, bending the curve needs ambitious & integrated action
- A lot more work towards a just transition for people, nature and climate

What research teams & researcher profiles?

Interdisciplinary teams:

- across life and social sciences,
- quantitative & qualitative skills
- good understanding of actors beyond academia (government, business, NGO)

Individuals dedicated to working in interdisciplinary teams & comfortable with:

- taking other people's perspectives
- not understanding all the details entering the challenge at hand from another discipline
- communicating constructively and effectively with other team members & decision makers

IIASA's approach

Focused on system analysis:

- developing innovative system analysis methods
- applying at the science-policy interface
- acting an international hub for system analysis research

Opportunities to engage:

- 3 months summer program for PhD students
  (YSSP program, call open)
- 50th Anniversary events: conference Nov 16-17th
  (Vienna, hybrid, call for poster & registration open)
- Regular job announcements
  (from research assistant to senior management)
- Large alumni network
- Reach out if you want to work on a curriculum with us!

Thank you!

Questions?

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International Institute for Applied System Analysis (IIASA)