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BELMONT FORUM

# BiodivScen – Final conference of the funded projects

Online – 16 and 17 May 2023

# Welcome to the Final conference of the BiodivScen funded projects!

- To facilitate the organisation, please add the project and/or organisation you represent in your zoom name

- This conference will be recorded

# Welcome words and presentation of the agenda for the 16 and 17 May

*Osman Tikansak – Project manager, Formas*

# Agenda

## 16 MAY

**Introduction**

- **14:00 – 14:05** | Welcome and presentation of the agenda for the final conference – Osman Tikansak, Formas
- **14:05 – 14:15** | Presentation of Biodiversa+ – Magnus Tannerfeldt, Formas
- **14:15 – 14:25 |** Belmont Forum on Biodiversity Scenarios and Models – Nicole Arbour, Belmont Forum
- **14:25 – 14:40 |** BiodivScen Action and Call Overview –Frédéric Lemaître, Biodiversa+ Secretariat
- **14:40 – 14:50 |** Q&A session

**14:50 – 15:10 Break (20 min)**

## Session 1| 15:10 – 16:30

**Theme 1: Dissensus, controversies, representations and values of biodiversity: towards compromises to initiate transformative change**

**Projects in the group**

- **ENVISION**
- **SECBIVIT**
- **OBServ**
- **FARMS4BIODIVERSITY**
- **FATE**

***16:30 – 16:40 Break (10 min)***

## Session 2| 16:40 – 18:00

**Theme 2: Harnessing the full potential of early-warning systems and predictive scenarios builds on innovative approaches to biodiversity monitoring**

- **GLOBAM**
- **BONDS**
- **REEF-FUTURES**
- **ACCESS**
- **ARCTIC-BIODIVER**

**End of the day – 18:00**

## 17 MAY

## Session 3| 09:00 – 10:40

**Theme 3: Scenarios of fate of ecosystem services or disservices**

- **LimnoScenES**
- **BioDiv-Support**
- **AlienScenarios**
- **InvasibES**
- **Land2Sea**
- **SOMBEE**

## 17 MAY

### Session 4| 11:00 – 12:20

**Theme 4: Scenarios as tools for territorial ecological planning: where, when, how to protect biodiversity?**

- **Future Web**
- **SALBES**
- **WILDHEALTH**
- **Future Birds Scenarios**
- **BIOESSHEALTH**

### Closure to the meeting | 12:20 – 12:30

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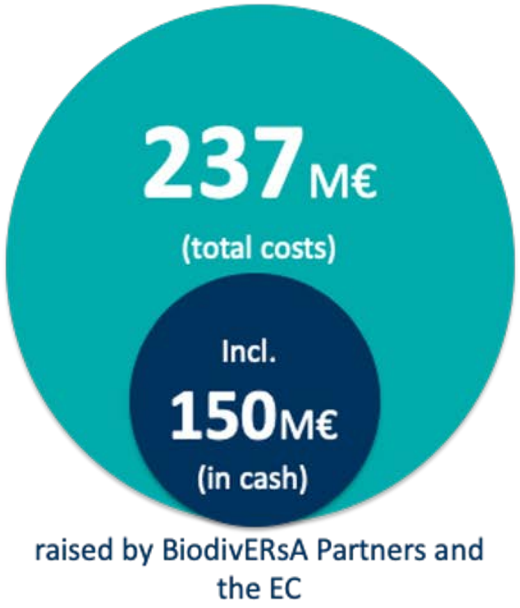
# Presentation of Biodiversa+

## The European Biodiversity Partnership

*By **Magnus Tannerfeldt**, Biodiversa+ Vice Chair, Formas, Sweden*

# What is Biodiversa+?

- The **European biodiversity Partnership** co-funded by the European Commission under Horizon Europe
- **Supporting excellent research on biodiversity with an impact for policy and society**
- Officially launched on 1 October 2021 for a 7 years duration
- Jointly developed by BiodivERsA and the European Commission (DG Research & Innovation and DG Environment) – **building on the BiodivERsA experience** (2008-2021)


**Over 2008-2020:**



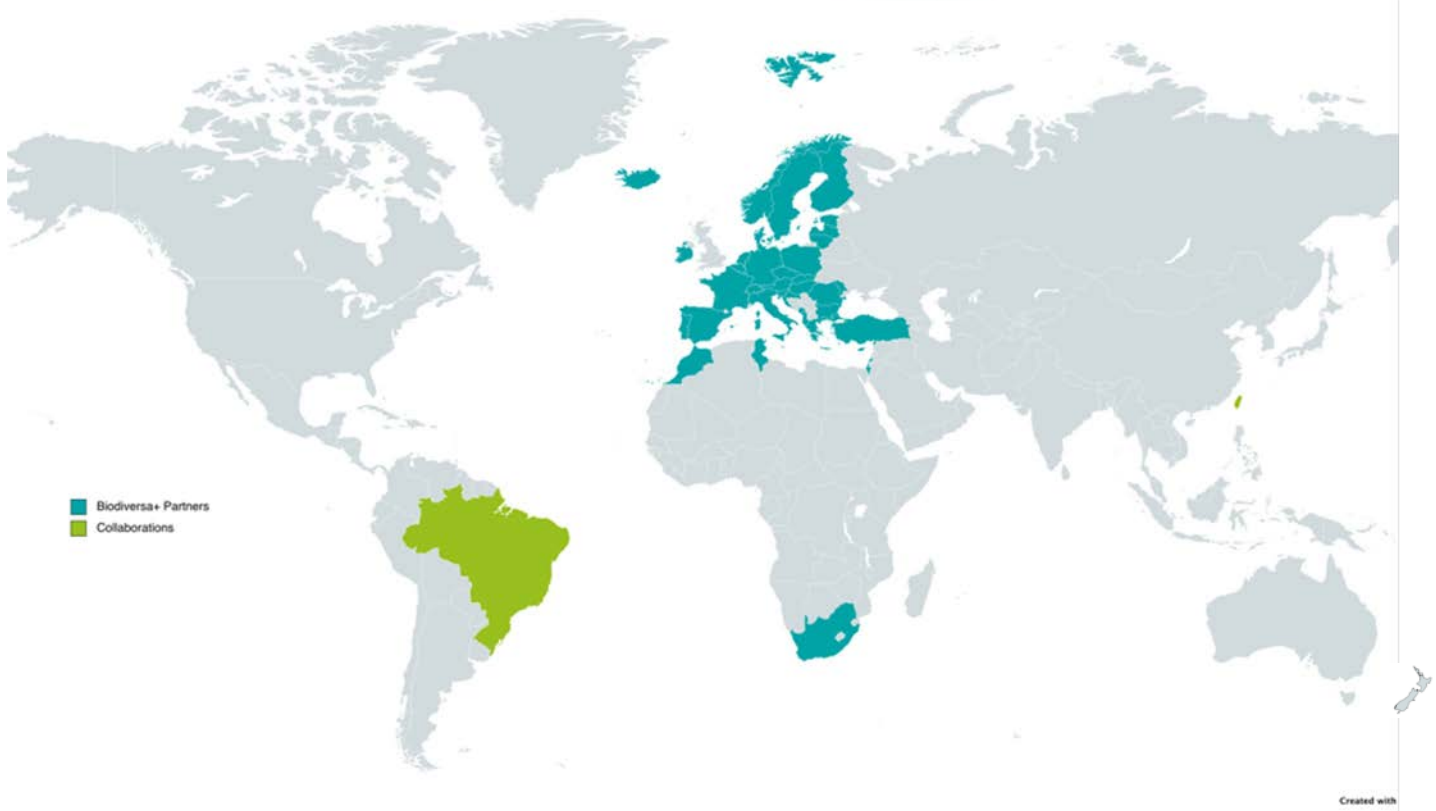
# The Biodiversa+ membership

**40**
Countries

**80**
Partners

**Research actors**
- → Ministries in charge of research
- → Research funding organisations

**Policy actors**
- → Ministries in charge of environment
- → Environment protection agencies

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# Portfolio of activities


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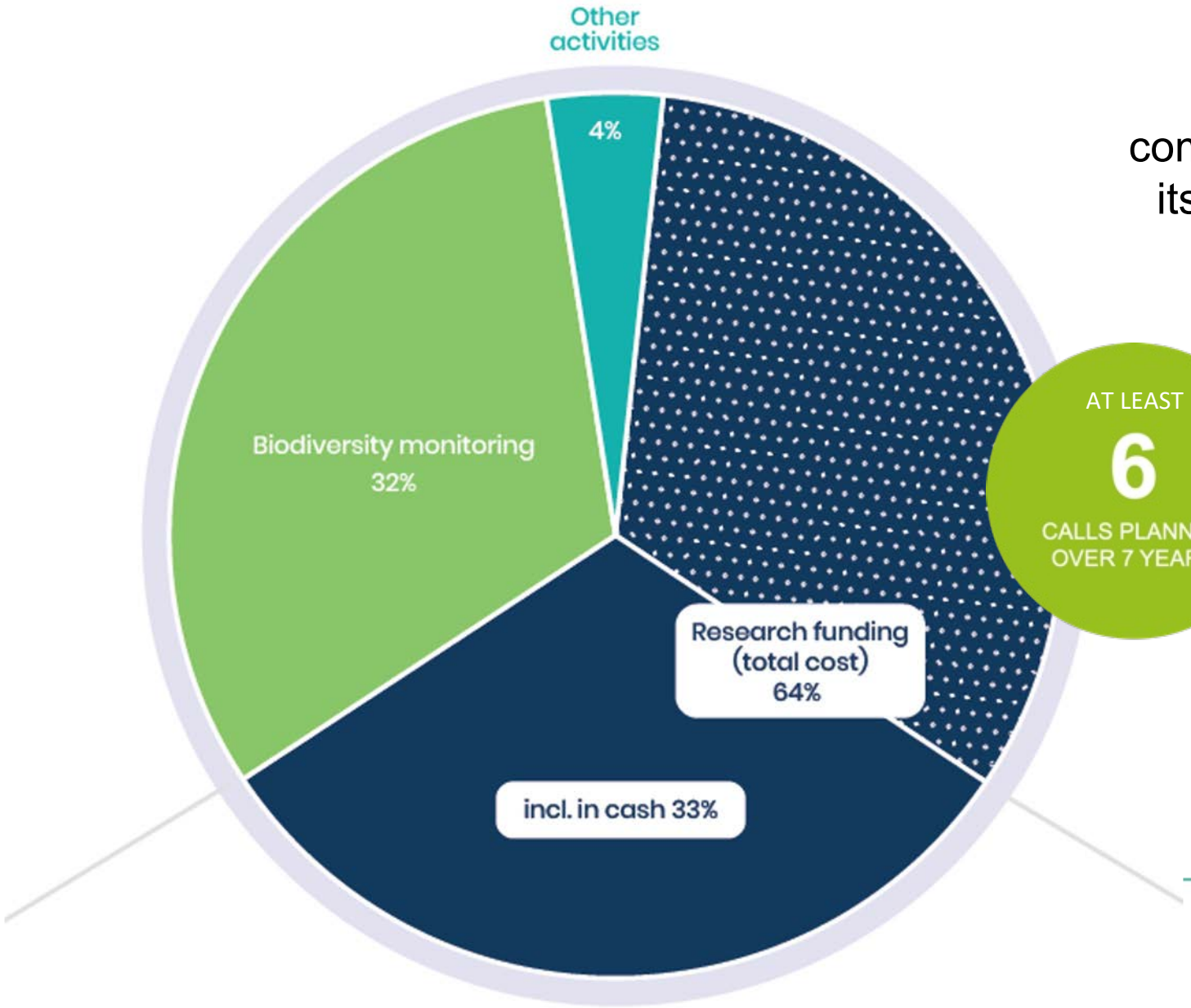
# Budget amplitude




Budget of **>800 Mio€ over 7 years**, combining in-cash and in-kind resources from its Partners and including 165 Mio € by the European Commission

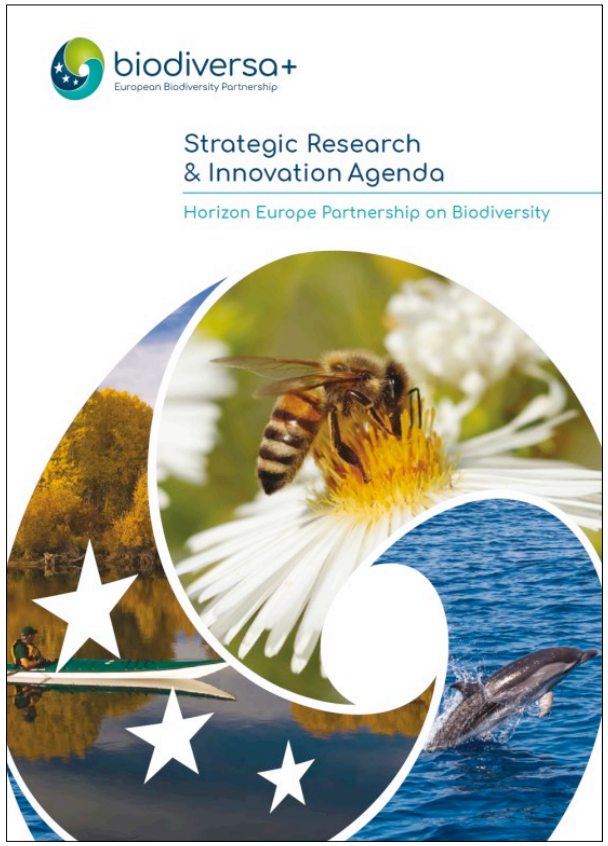
AT LEAST **6** CALLS PLANNED OVER 7 YEARS

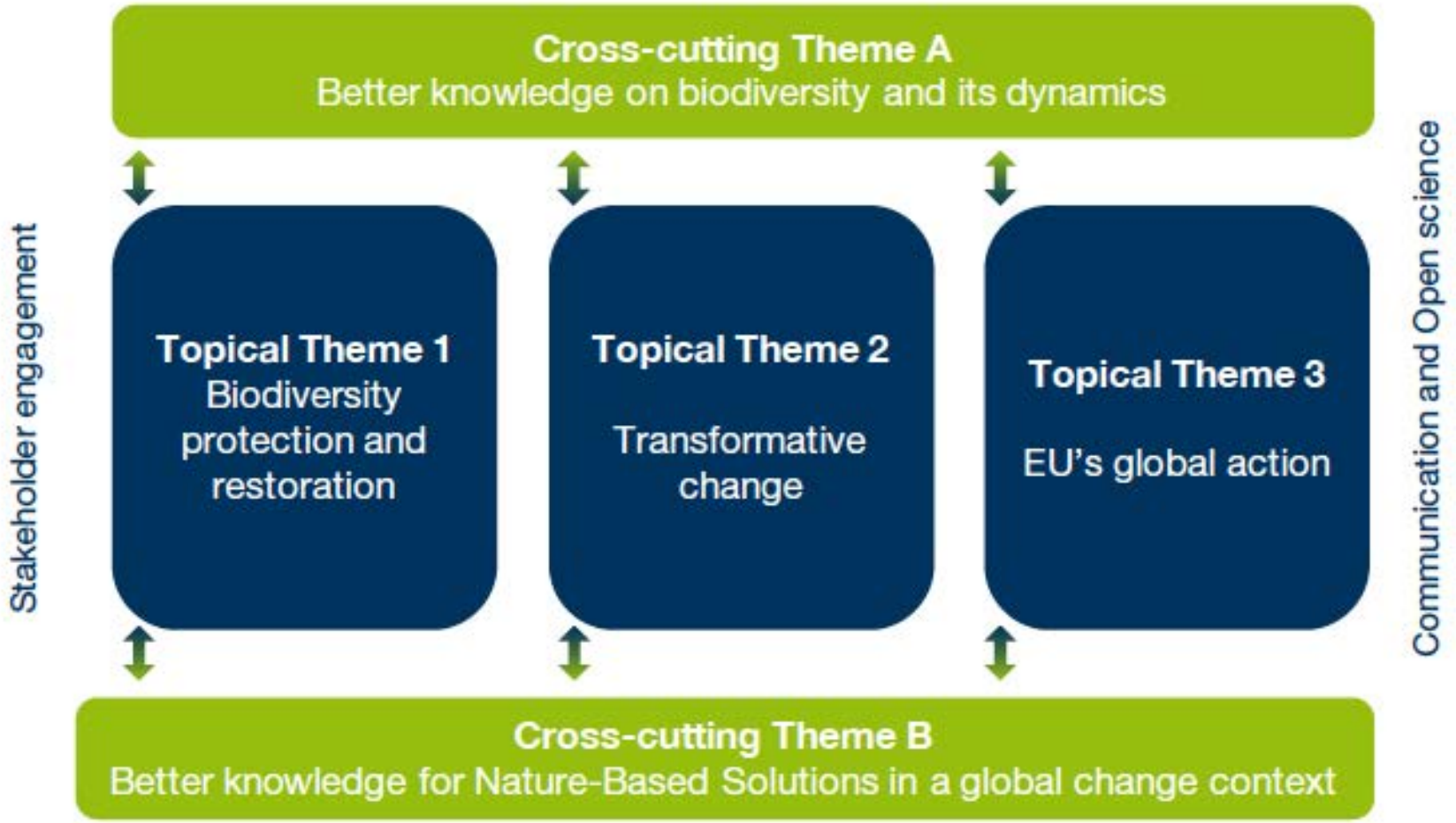
**>40** MIO€ EACH

CA. **30** PROJECTS FUNDED PER CALL

Co-funded by the European Union

# Strategic Research & Innovation Agenda (SRIA)

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Eggermont H., Le Roux X., Tannerfeldt M. Enfedaque, J., Zaunberger, K. & Biodiversa+ partners (2021). Strategic Research & Innovation Agenda. Biodiversa+, 108 pp.

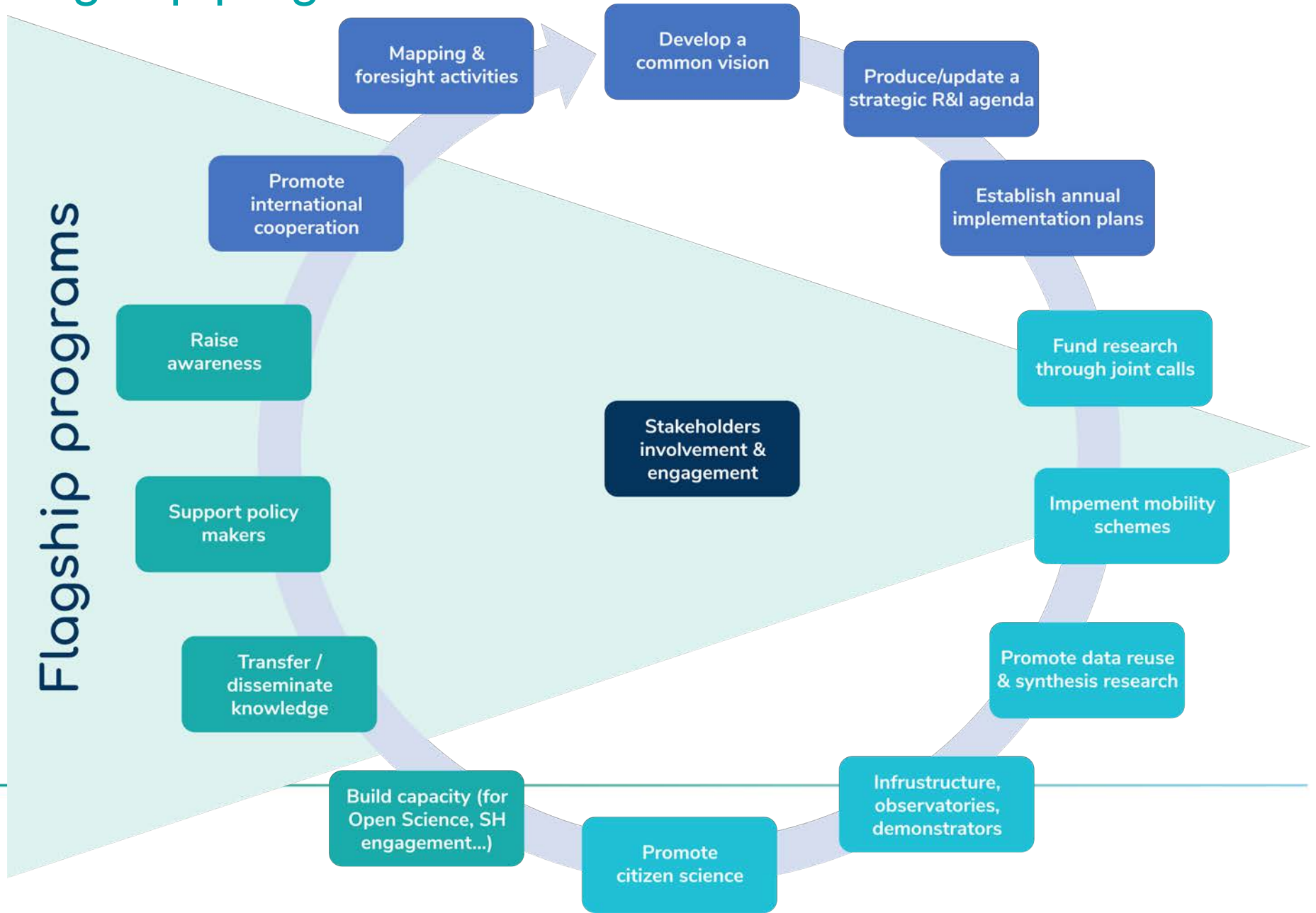
# The Biodiversa+ flagship programmes

## 2021

- Protection
  → *Sept. 2021 | Call*
- Biodiversity monitoring
  → *Sept. 2022 | Call*

## 2022

- Nature-based solutions
  → *Sept. 2023 | Call*
- Societal Transformation
  → *Sept. 2024 | Call*

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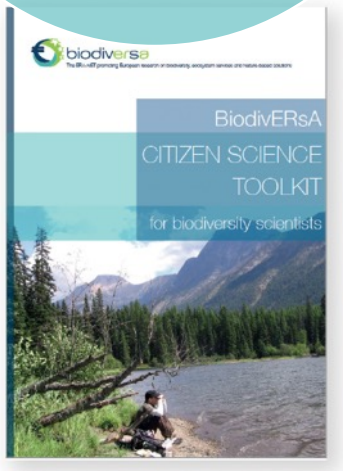
# Working with existing and new initiatives

... and many more!

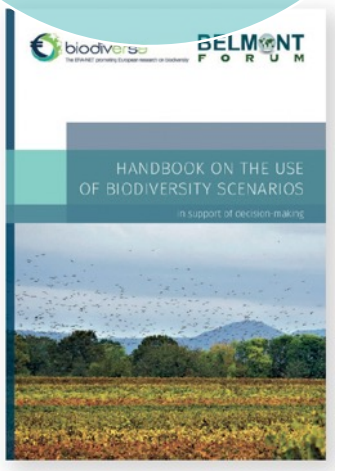
# Support to capacity building

Guides on **stakeholder engagement** & **policy relevance** of research


Toolkit on **citizen science**

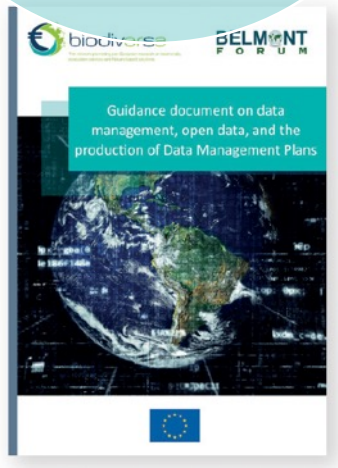



Handbook on the use of **biodiversity scenarios**




Guide on **data management**

**&** data management **workshop**




**Webinars**

→ on **communication**

→ on **science-policy-society** interfacing

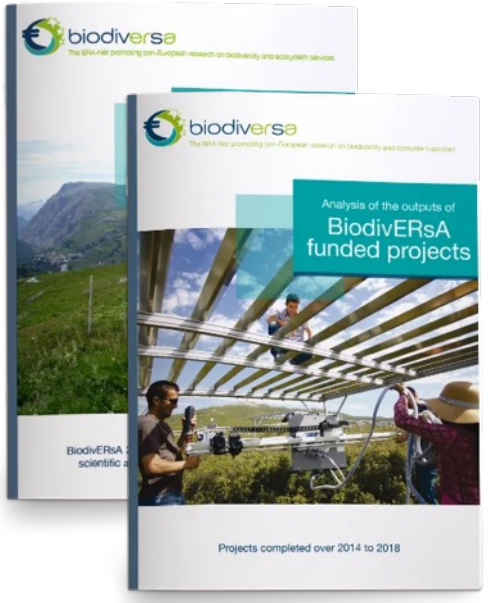
→ on participation in **IPBES / CBD processes**

# Supporting in demonstrating your projects' impact

## Policy briefs


## The Biodiversa prize for excellence and impact


## Projects' outputs valorisation




**+ success stories**

# Upcoming opportunities

## 2023 | Call on Nature-based Solutions

Two stage process with pre-proposals and full proposals
→ June 2023 | Call pre-announcement
→ September 2023 | Official announcement
→ End 2024 | funding decision

## 2024 | Call on societal transformations

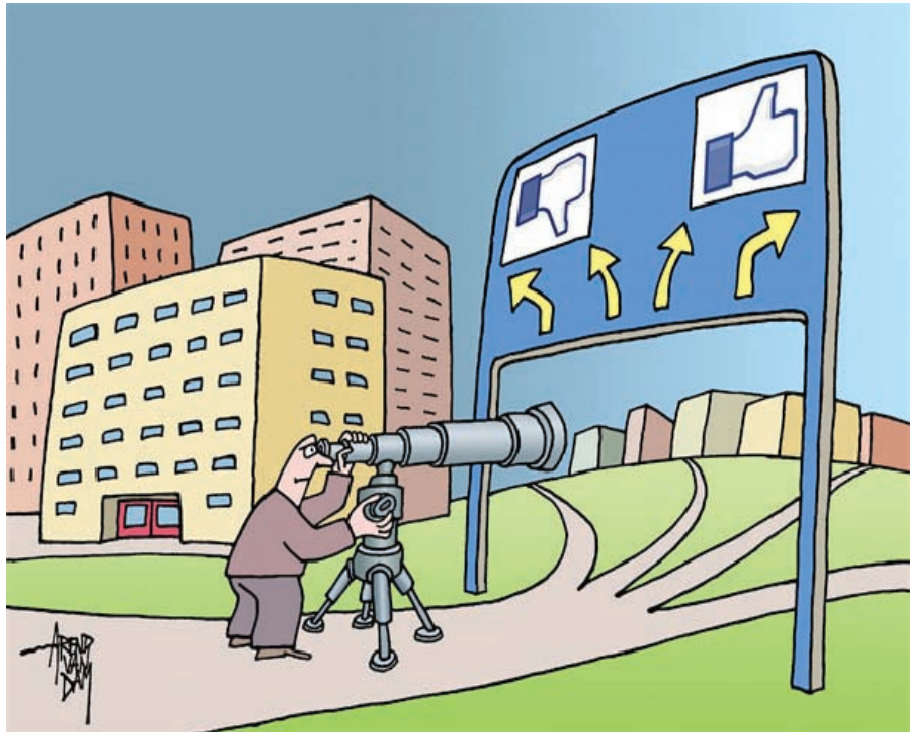
Two stage process with pre-proposals and full proposals
→ June 2024 | Call pre-announcement
→ September 2024 | Official announcement
→ End 2025 | funding decision

# Belmont Forum on Biodiversity Scenarios and Models

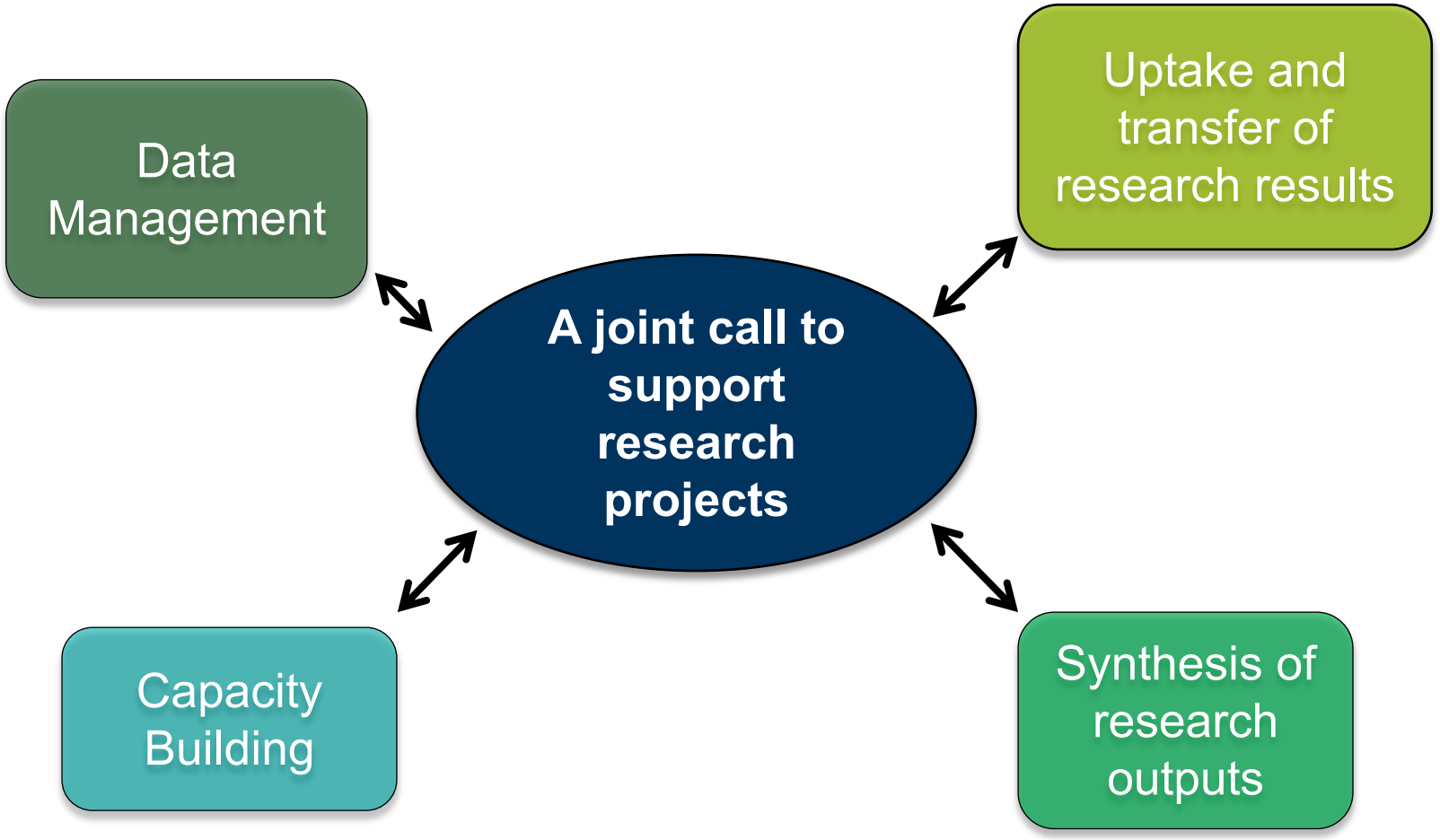
Nicole Arbour, Belmont Forum

# BiodivScen Action and Call Overview

Frédéric Lemaître, Biodiversa+ Senior SSI/SPI officer



# The BiodivScen Programme – joint call and additional activities

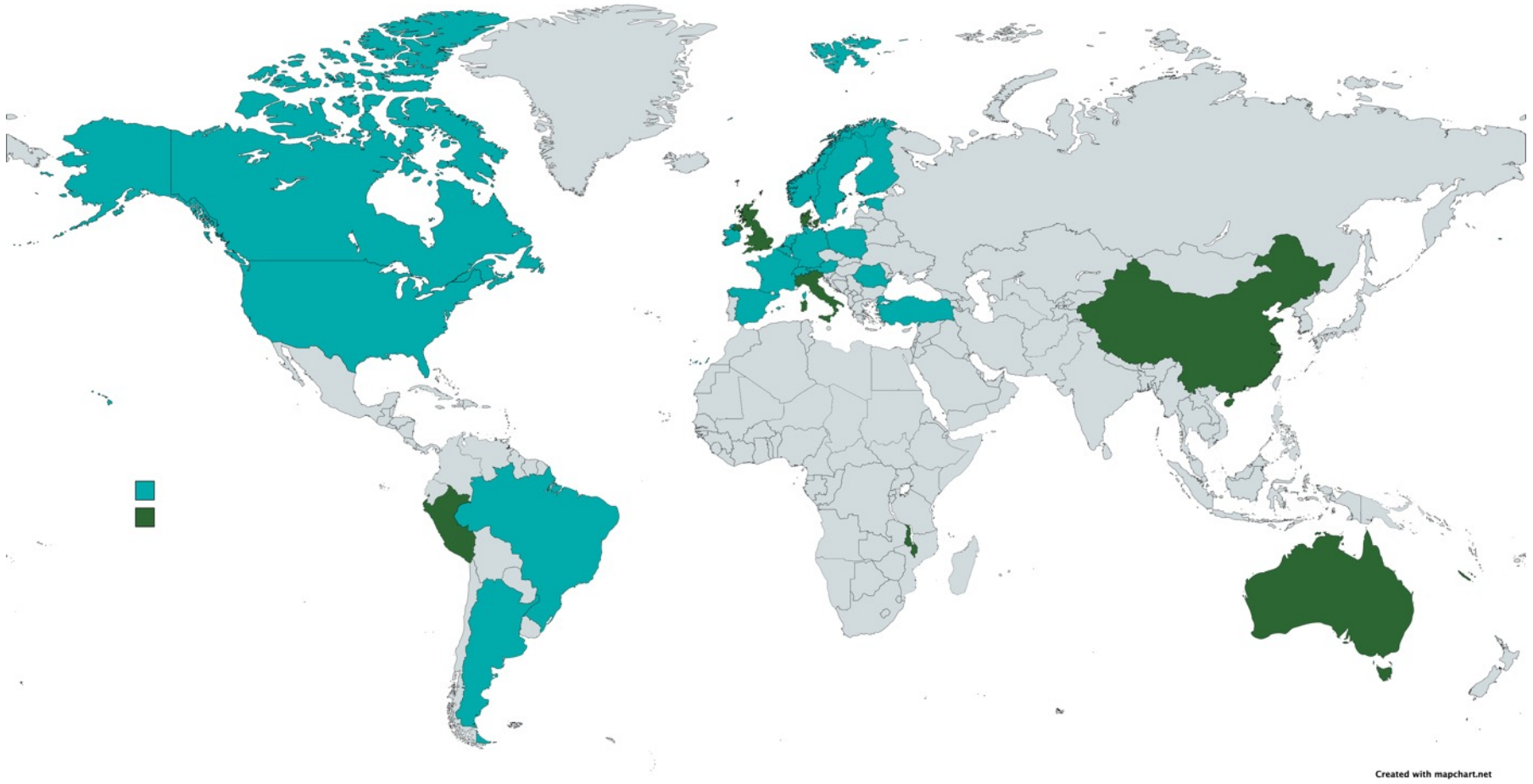


# BiodivScen – joint call profile

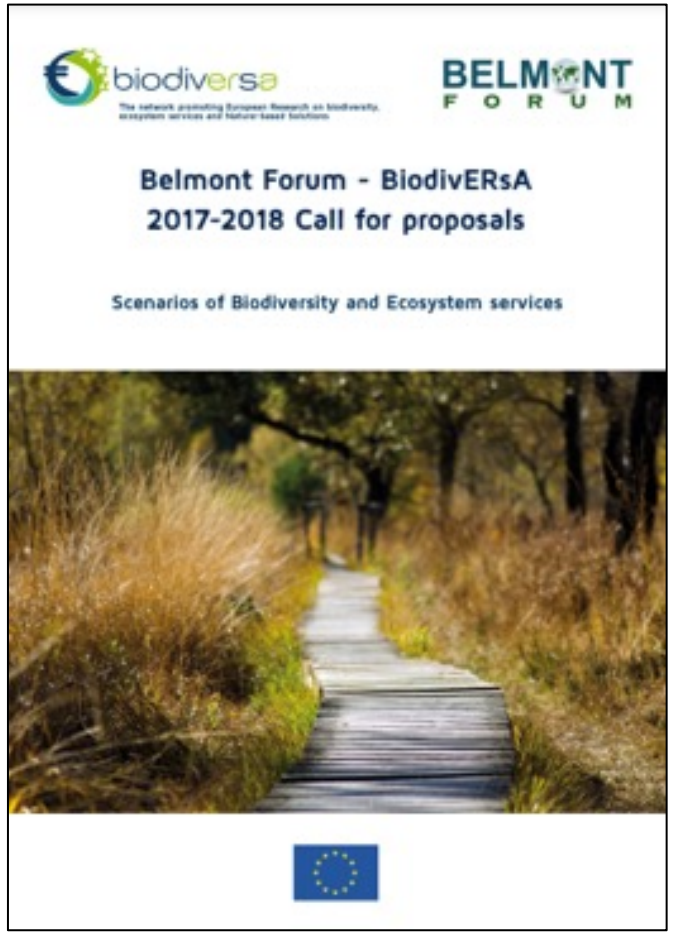
- 135 full proposals submitted
→ 21 projects selected for funding (over 28M€)

- 21 funding agencies in 19 countries

- Research teams on the 6 continents



# BiodivScen – joint call profile




- BiodivERsA – Belmont Forum co-funding, with top-up from the EC
- 21 projects selected for their **scientific excellence**, quality of plans for **implementation** and expected **societal/policy impact**
- Focus on the **international added value** of the funded projects
- Projects between late 2018 & early 2023

# Selected projects – some general observations

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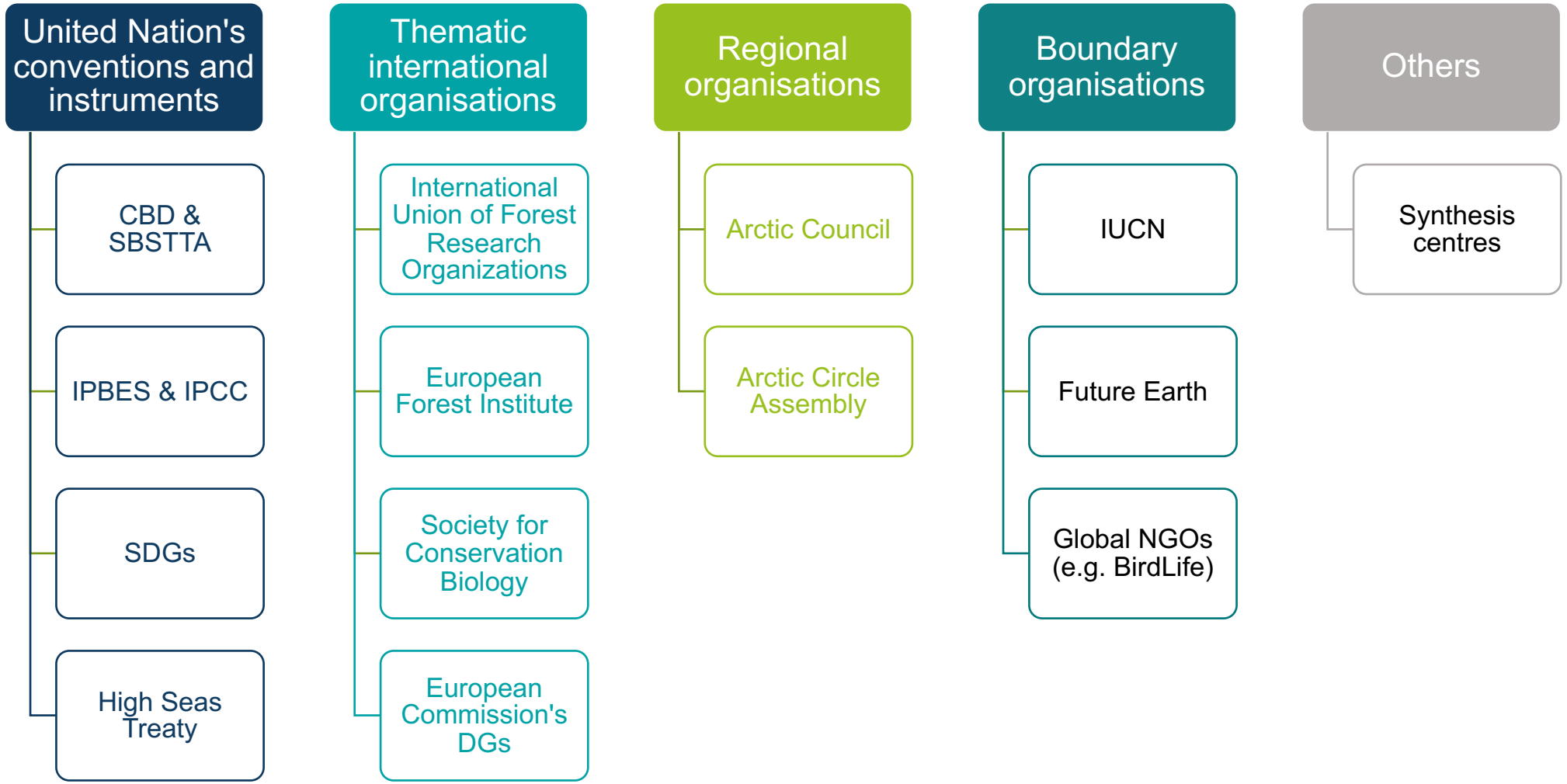
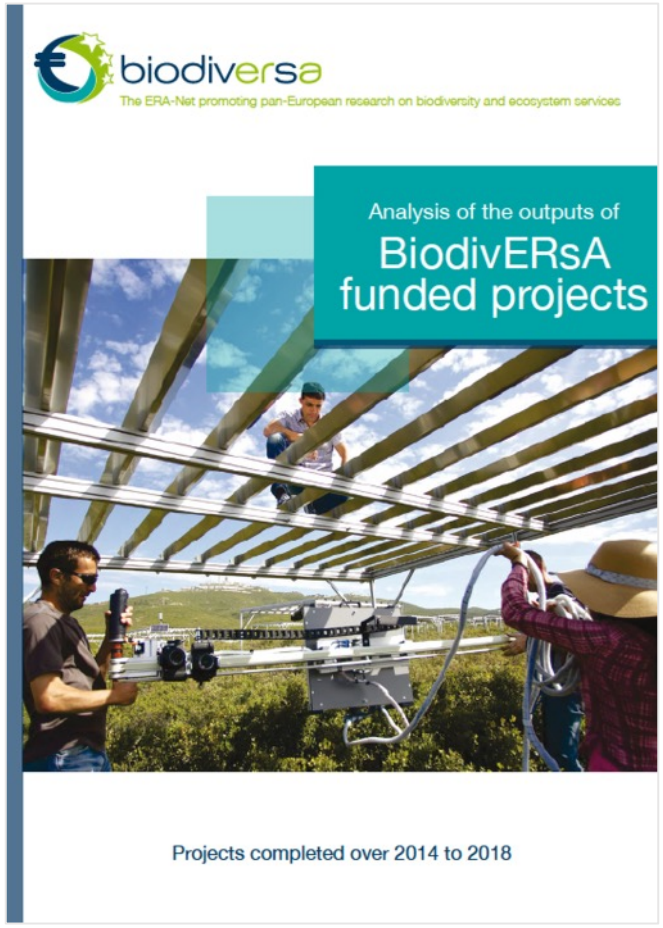
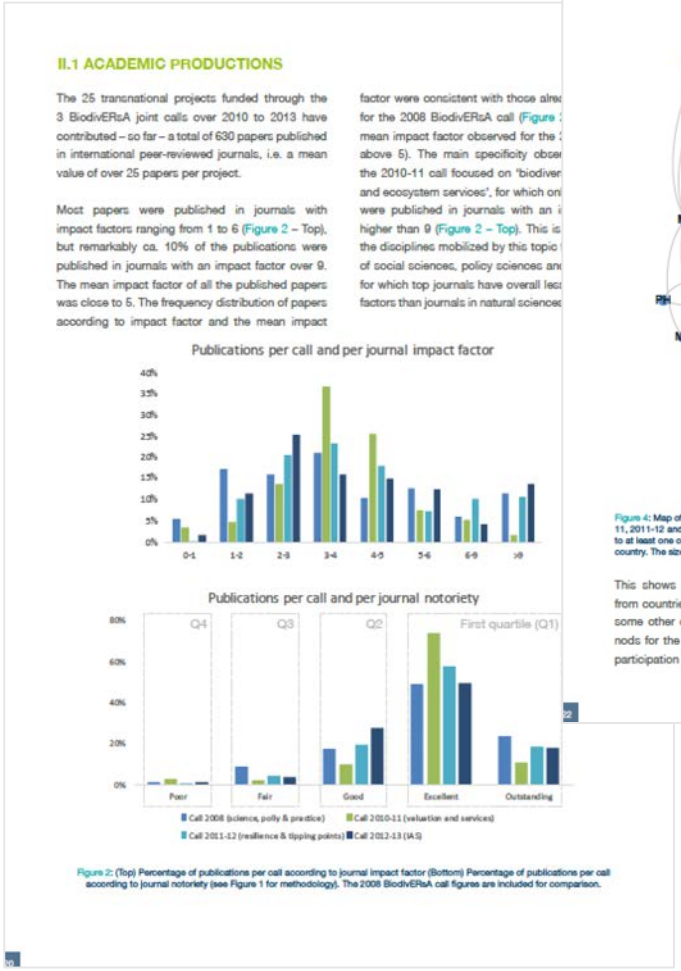
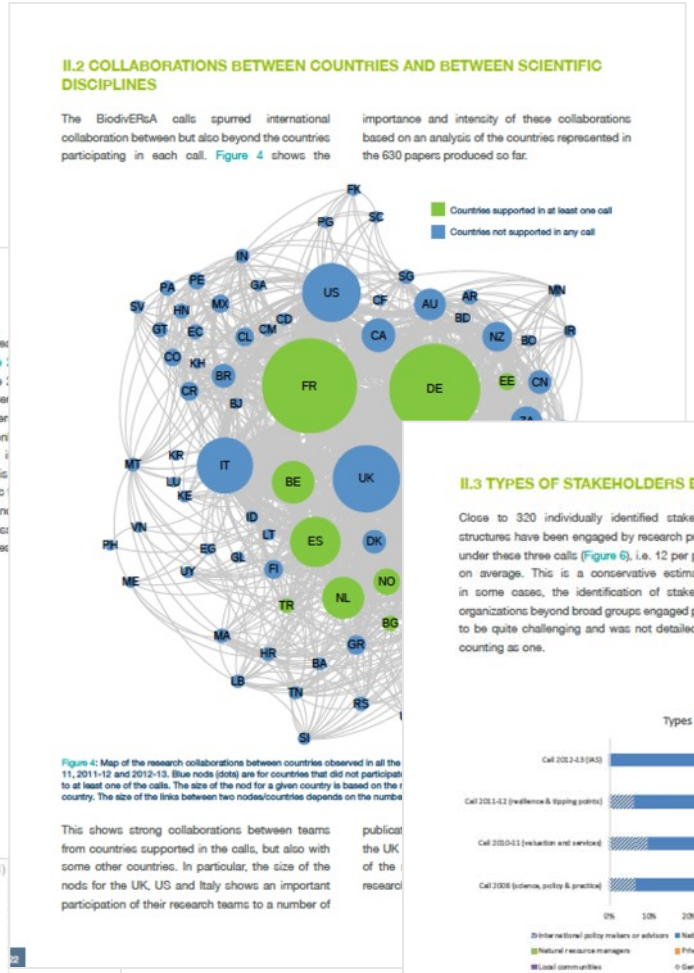
**Main international organisations cited by BiodivScen projects**

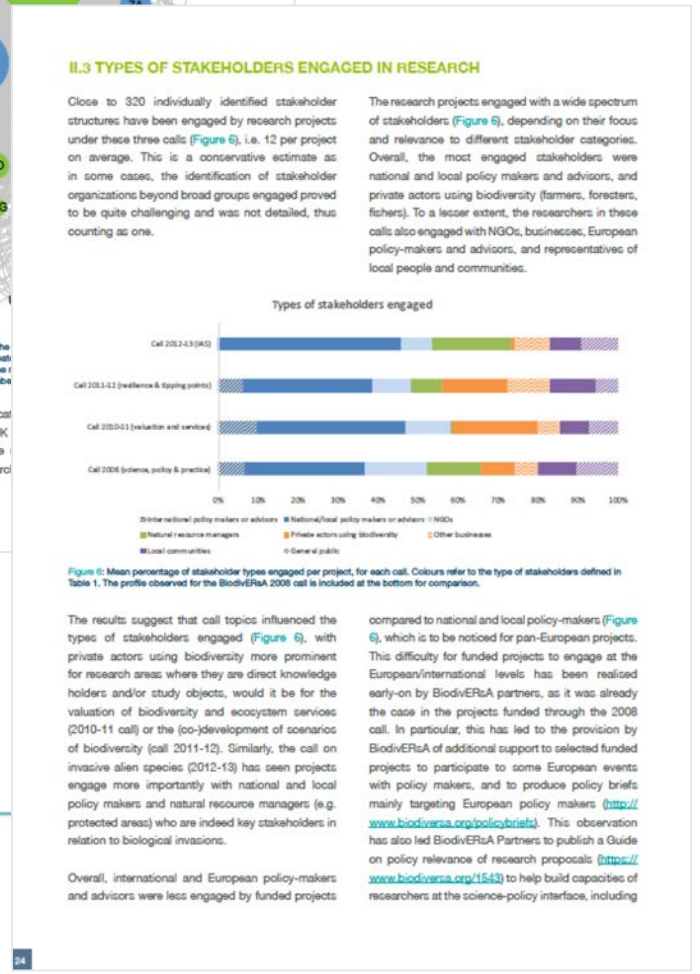


# Selected projects – follow up on project outcomes

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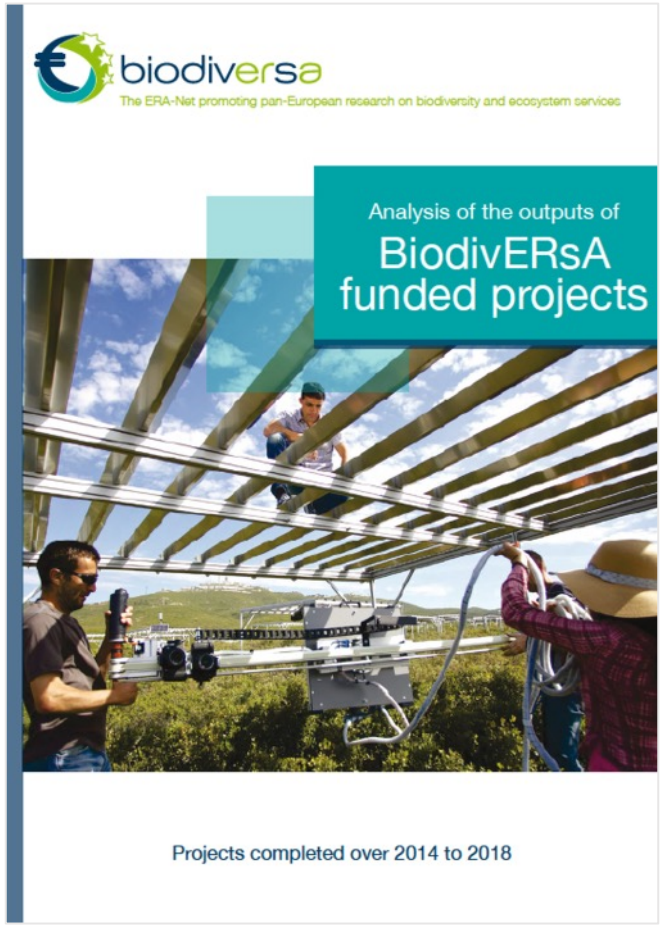
https://www.biodiversa.eu/actionable-knowledge/funded-projects-outcomes/

# Selected projects – follow up on project outcomes





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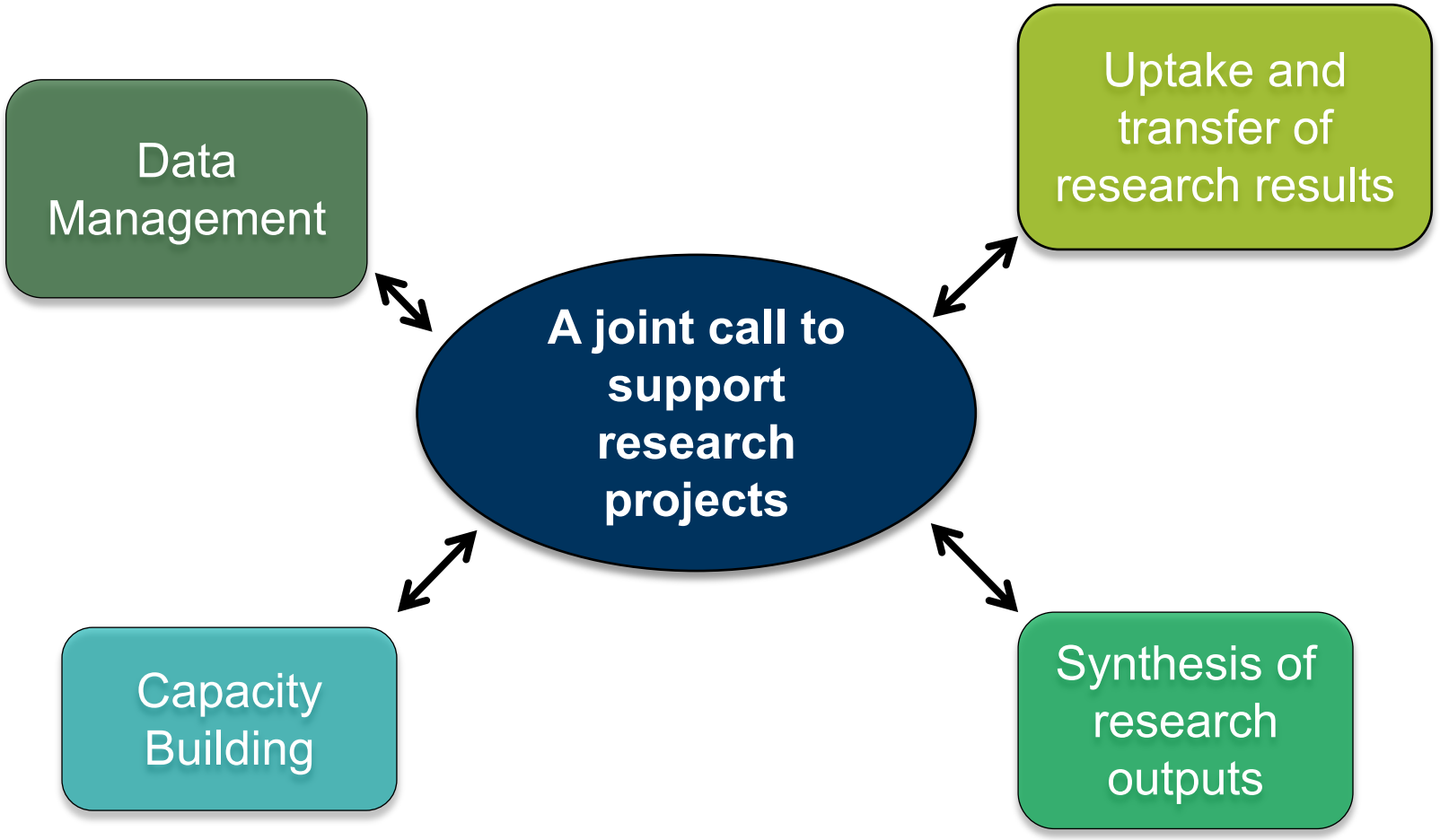
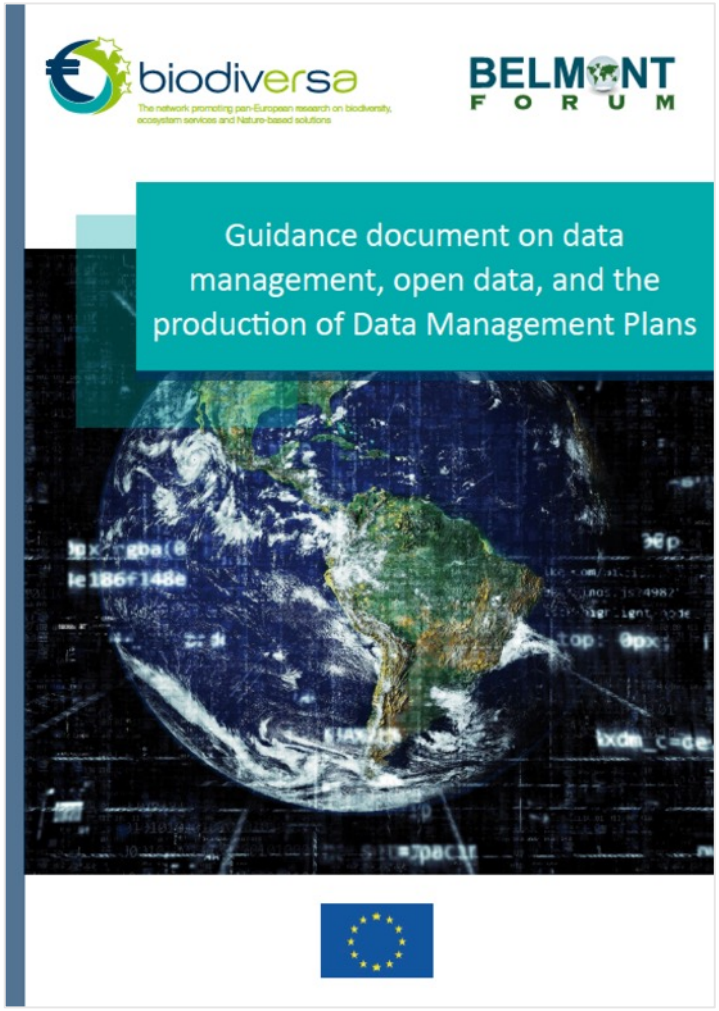
# The BiodivScen Programme – joint call and additional activities



# Additional activities – Promoting open science




## 2. MAIN PRINCIPLES & POLICIES FOR DATA MANAGEMENT

### 2.1. WHAT ARE OPEN DATA & OPEN SCIENCE ?

The holistic concept of Open Science refers to a movement which sets out a broader vision of having all scientific outputs open and endeavours to make science freely and easily accessible to everyone. This movement also particularly supports science in its integration into the digital era.

**"Open** means anyone can freely access, use, modify, and share for any purpose (subject, at most, to requirements that preserve provenance and openness)." (source: The Open definition)

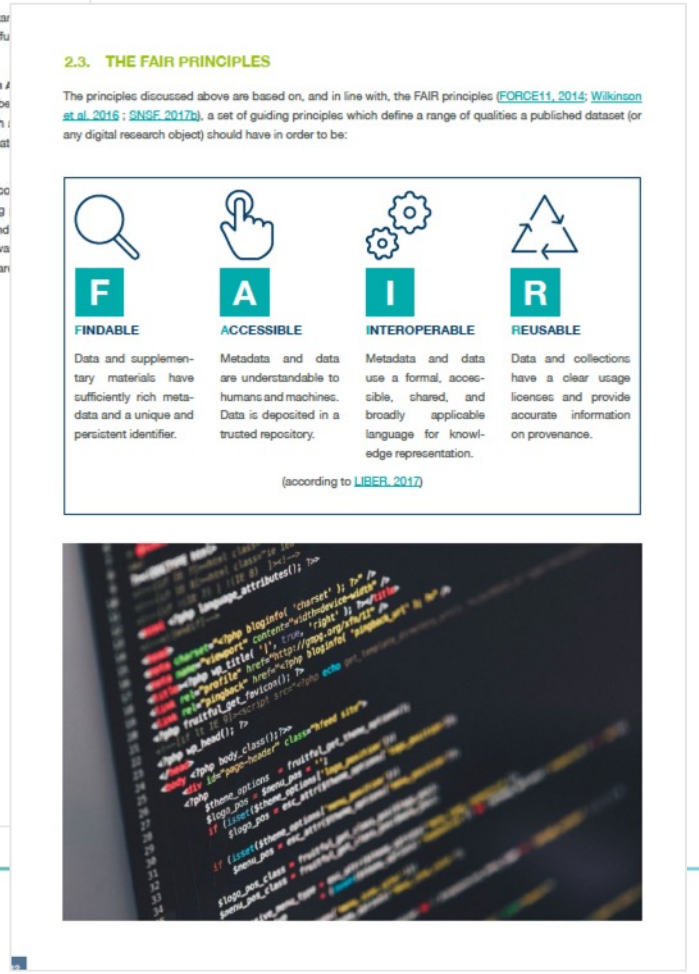
**Science** is characterized by the collection, analysis, interpretation, publication of data and its integration to existing knowledge. Therefore, Open Science encompasses many aspects, including the concepts of Open Access, Open Data, Open Star Open Education, etc. that facilitate the diffu scientific knowledge.

**Open Data** (sometimes referred to as **Open A to Data**) is the idea that data should be available to everyone to use and re-publish wish, without restrictions from copyright, pat other mechanisms of control.

It has to be distinguished from related co such as **Open Access** (referring to having published in free and open journals), and **Open Source** (referring to programmes or softwa publicly accessible code that can be shar modified) (see Fig. 3).




Figure 3: Graphical representation of the different aspects of Open Science (after Jomier, 2017)



### 2.3. THE FAIR PRINCIPLES

The principles discussed above are based on, and in line with, the FAIR principles (FORCE11, 2014; Wilkinson et al. 2016 ; SNSF 2017b), a set of guiding principles which define a range of qualities a published dataset (or any digital research object) should have in order to be:

| F | A | I | R |
|---|---|---|---|
| **FINDABLE** | **ACCESSIBLE** | **INTEROPERABLE** | **REUSABLE** |
| Data and supplementary materials have sufficiently rich metadata and a unique and persistent identifier. | Metadata and data are understandable to humans and machines. Data is deposited in a trusted repository. | Metadata and data use a formal, accessible, shared, and broadly applicable language for knowledge representation. | Data and collections have a clear usage licenses and provide accurate information on provenance. |

(according to LIBER, 2017)



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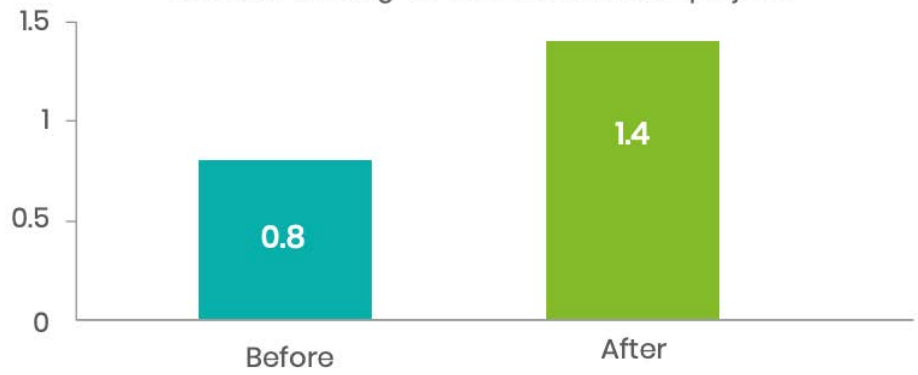
https://www.biodiversa.org/1677/download

# Additional activities – Building data management capacities


**Biodiversa trainings on data management, contribute to improve funded projects' data management plans**

Score for quality of data management plans before and after training for BiodivERsA funded projects




*Scoring based on the Data Curation Profile approach*

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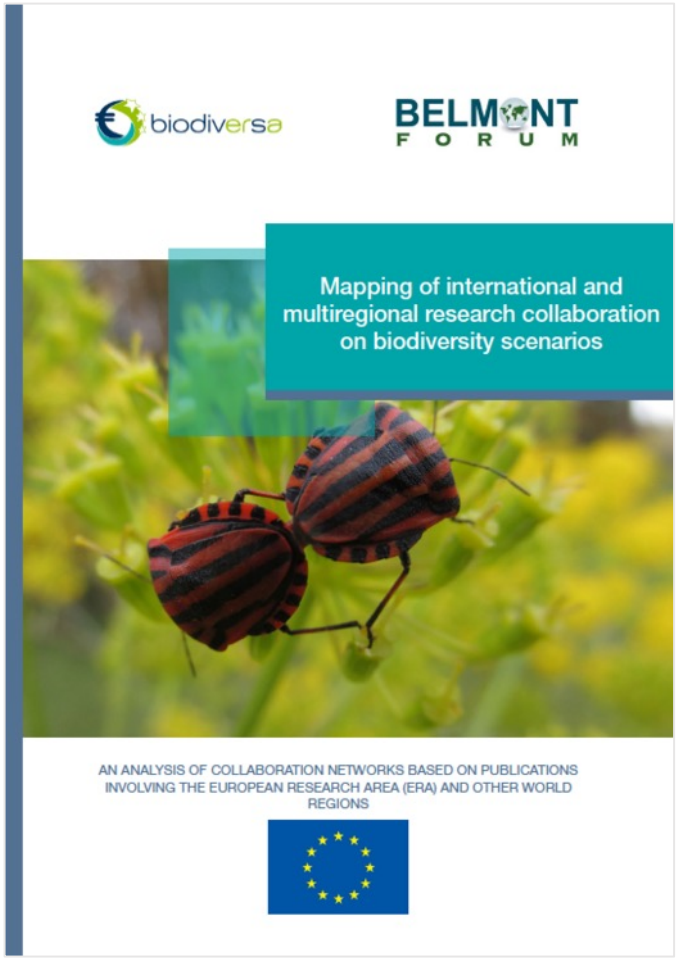
# Additional activities – Mapping research collaborations




https://www.biodiversa.org/1857/download

# Additional activities – Mapping research collaborations

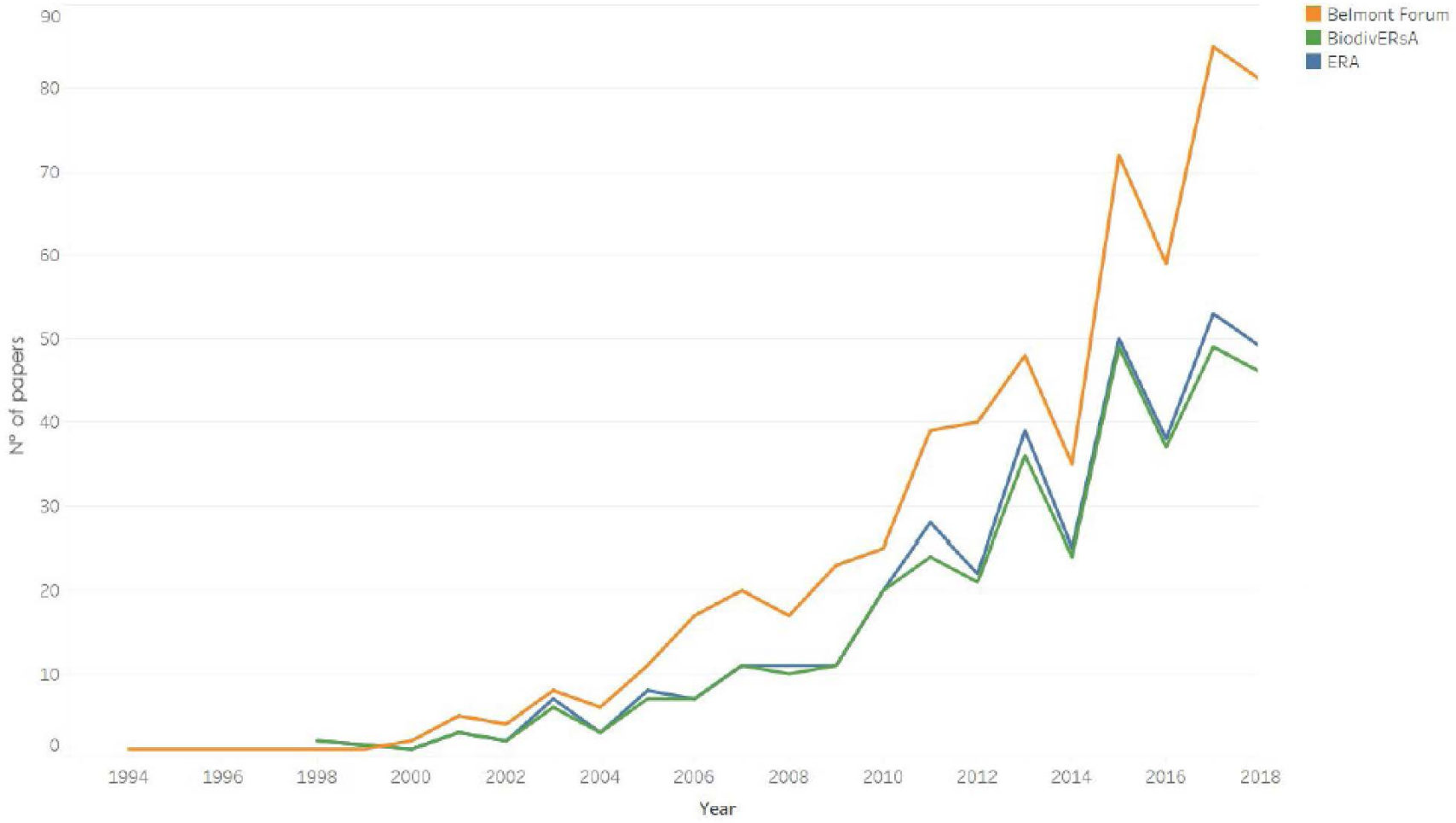



Figure 4. Temporal evolution of the number of papers on biodiversity scenarios with at least one author from BiodivERsA (green line), the ERA (blue line) and the Belmont Forum (orange line), from 1994 to 2018.

# Additional activities – Mapping research collaborations

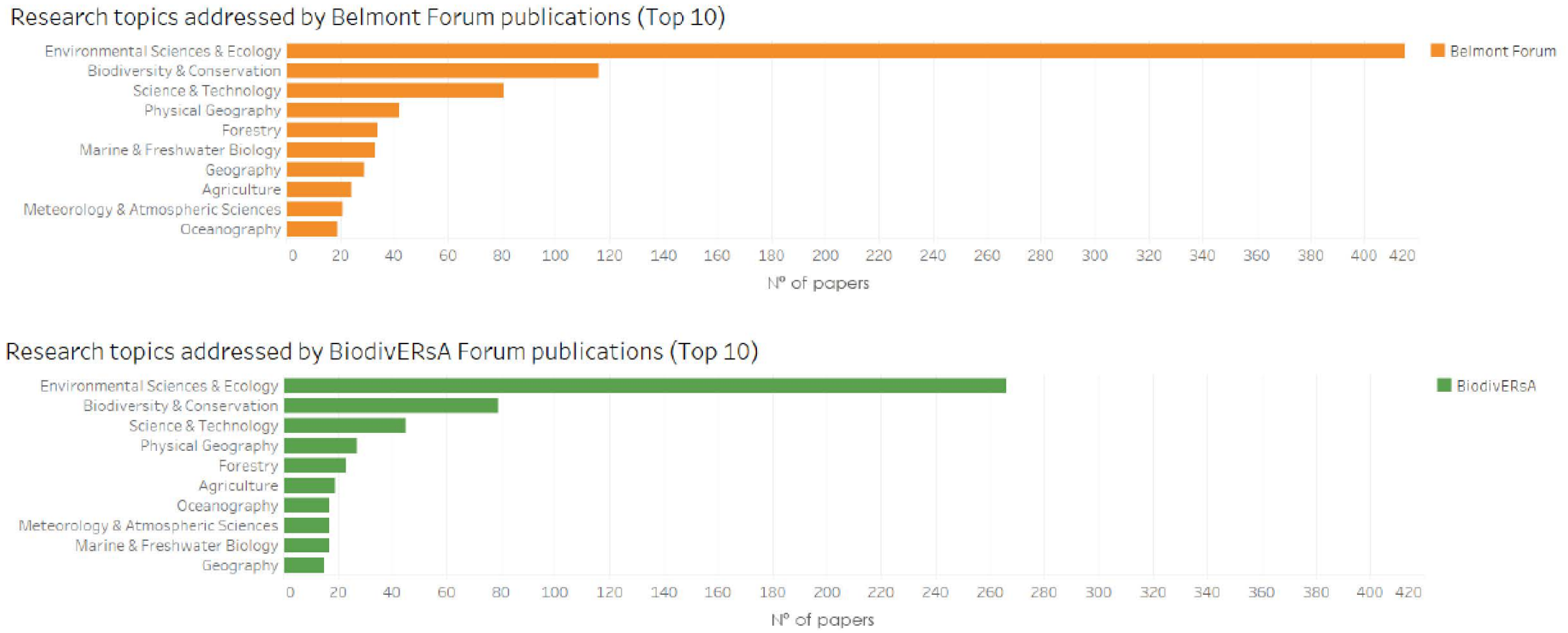



Figure 6. Ranking of the top-ten disciplines in terms of number of papers with at least one author from a country represented in the Belmont Forum (orange bars), the ERA (blue bars) and BiodivERsA (green bars).

# Additional activities – Mapping research collaborations

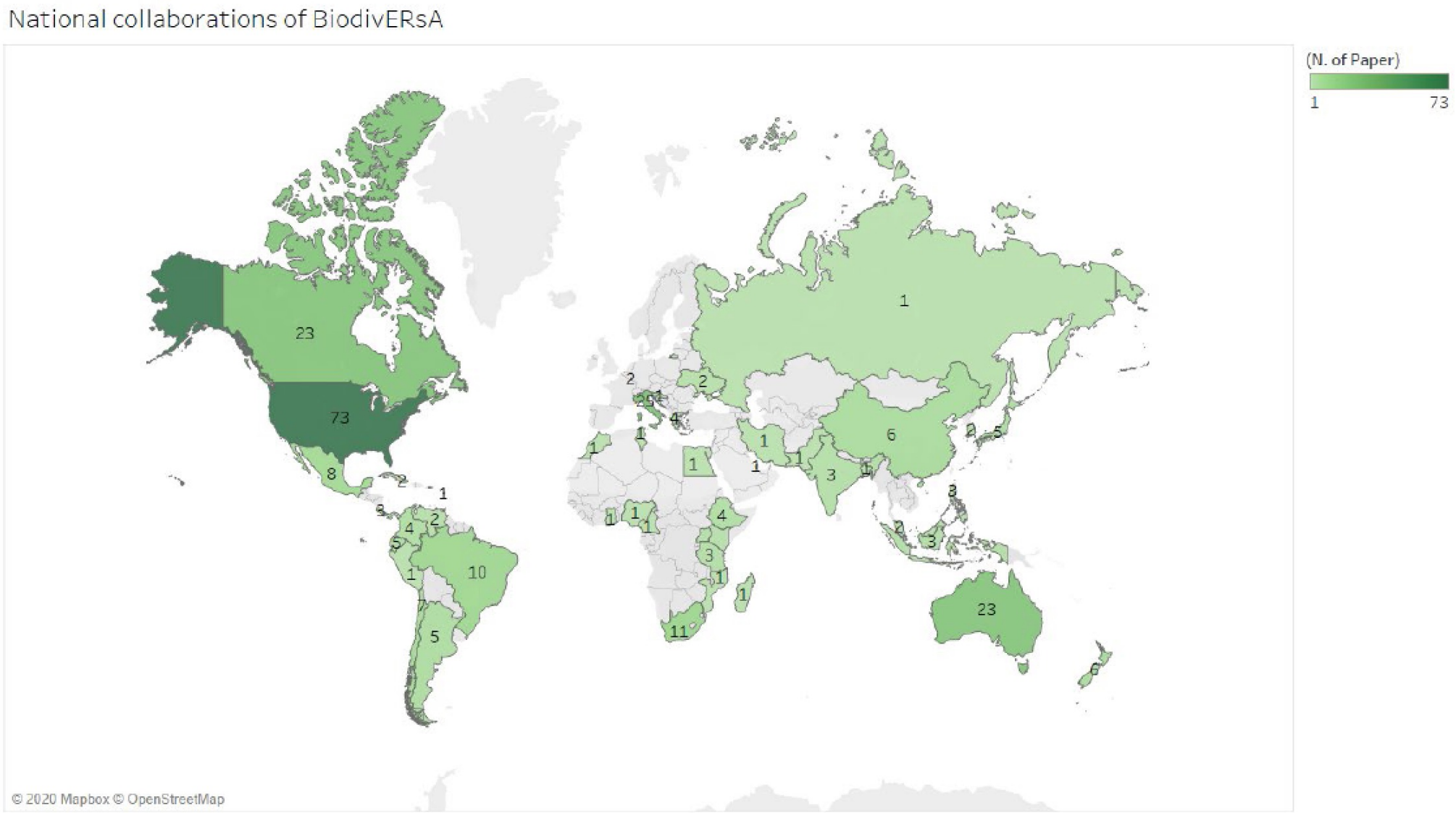



Figure 10.Distribution of papers with at least one author from a BiodivERsA country and at least one author from each country in the world. Data corresponds to the query results from the WOS Core Collection without temporal restrictions.

# Additional activities – Promoting uptake

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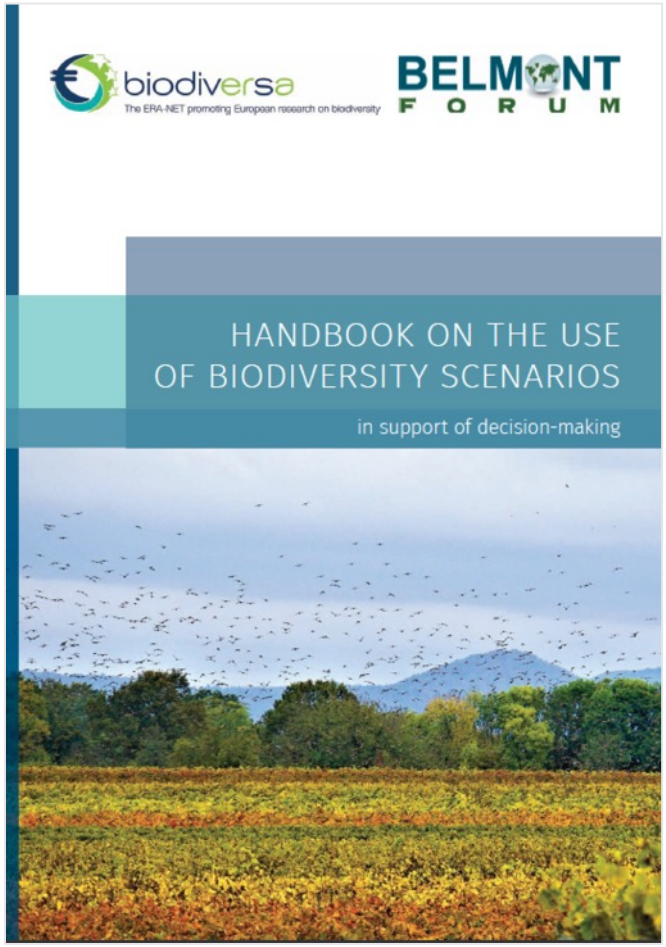


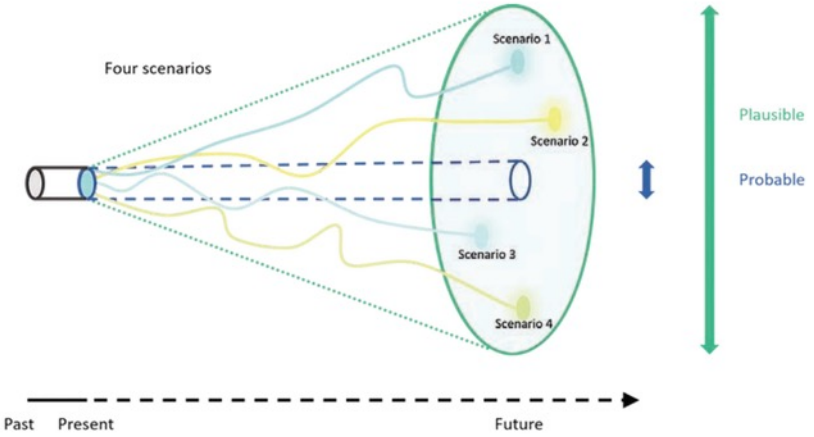
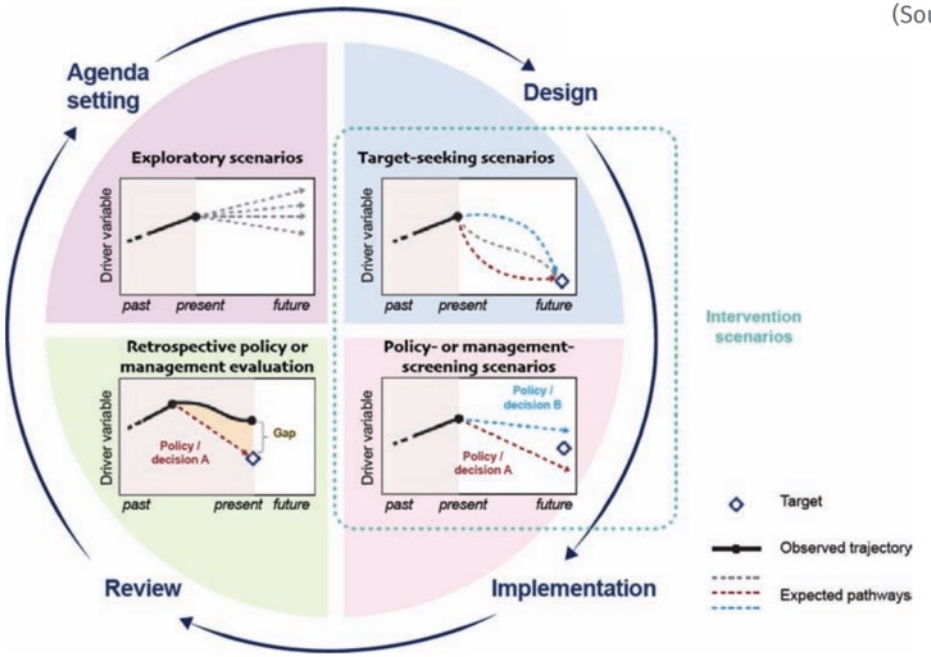




**Figure 2.** Schematic representation of how scenarios explore plausible future trajectories (Source: Biosphere Futures, 2019)

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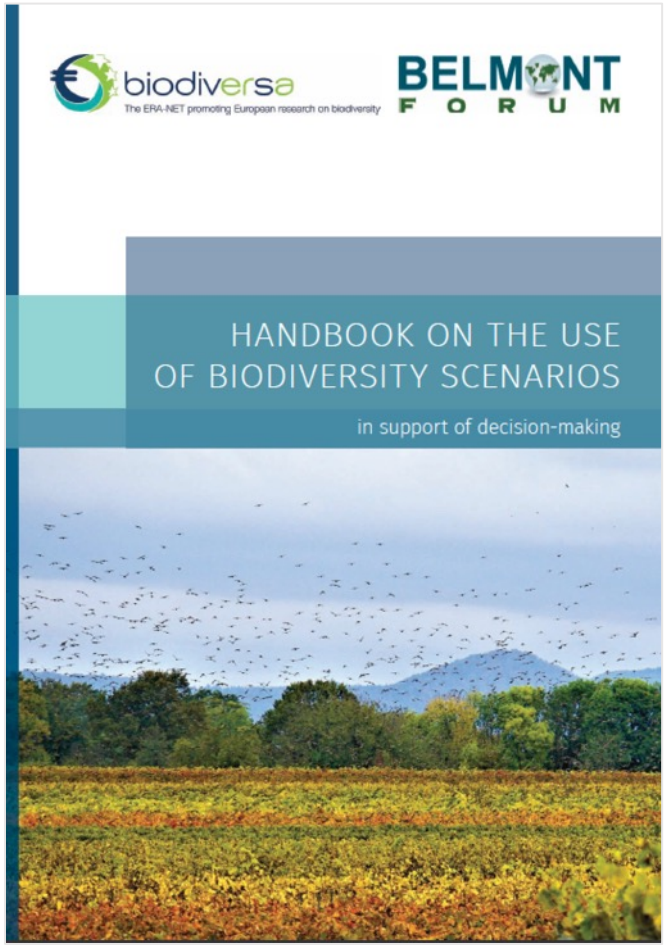
https://www.biodiversa.org/1823/download

# Additional activities – Promoting uptake




## I. The CoForTips project

*Type: exploratory scenarios.*

**From serious games to real-life changes**

***"By allowing decision-makers to directly play around with models and collectively build scenarios, they gain first-hand experience of socio-ecological transformations. This provides meaning to knowledge they might already have. Gaining exposure to the realities experienced by others can also inspire epiphanies, and dramatically alter their behaviour"*** explains Claude Garcia, ecologist at the CIRAD and coordinator of the BiodivERsA-funded CoForTips project.

### OBJECTIVES

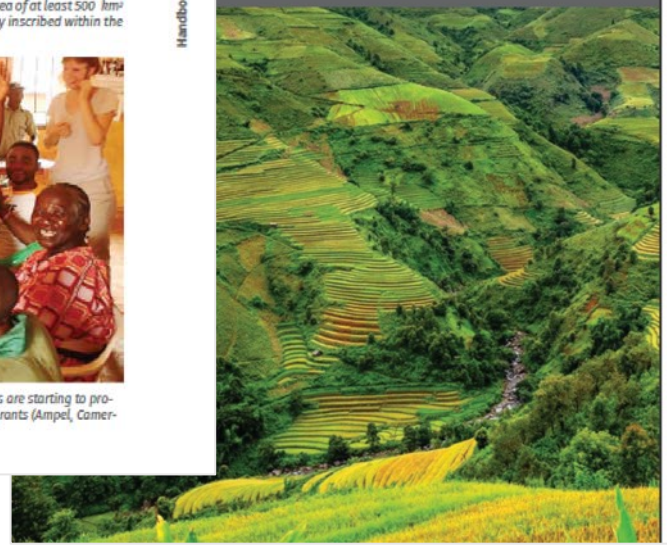
The future of the forests of the Congo Basin is constrained by two processes: climate change and the drivers of land use change - agriculture conversion, infrastructure development and logging. The CoForTips project and its twin project CoForSet identified ecological transitions between forest types allowing managers to better anticipate the ecological impacts of future interventions. It explored the synergies between landscape transformation and stakeholders' strategies. It helped decision-makers take a step back and look at the larger picture. CoForTips' starting point was the question of the resilience of the forests of the Congo Basin in the next decades. Burning topics were the development of mining, the sustainability of logging operations, the existence of poverty traps and power asymmetries, bushmeat hunting and poaching, and the conservation of High Conservation Value Forests including Intact Forest Landscapes in and out of the geographical scope of FSC certified concession[1].

[1] An Intact Forest Landscape (IFL) is defined as "a territory within today's global extent of forest cover which contains forest and non-forest ecosystems minimally influenced by human economic activity, with an area of at least 500 km² (50,000 ha) and a minimal width of 10 km (measured as the diameter of a circle that is entirely inscribed within the boundaries of the territory)" (http://intactforests.org)

*A game of AgriForest in progress. The players have just completed the first session. Cocoa plantations are starting to produce, and the future looks bright. Tomorrow, they will have to face the unexpected: the arrival of migrants (Ampel, Cameroun, 2016). Credit: Claude Garcia*



## Resource directory



This third part contains a selection of key resources and

A directory of helpful resources on scenarios and mod
*website.*

**I. Key resources**

**The BiodivERsA Stakeholder Engagement Handbook.** Bio

*The BiodivERsA Stakeholder Engagement Handbook is a researchers planning and carrying out research project teams identify relevant stakeholders to engage with in o work. The Handbook draws upon exiting literature and clear, simple guidance, which considers 'why', 'who', 'whe*

*https://www.biodiversa.org/706/download*

**The BiodivERsA guide on policy relevance of research an interfacing in research proposals.** BiodivERsA (2018).

*The objective of the present guide is to help researchers relevance of research and be able to more efficiently ide policy-making bodies for a given research project. It comp Engagement Handbook to help researchers increase the in terms of policy relevance and may be used more gene ence-policy interface on biodiversity and ecosystem servi*

*https://www.biodiversa.org/1543*

**Biosphere Futures (2019).**

*Biosphere Futures is an online database that offers a glob ecological scenario case studies. It provides a collection can be explored by selecting the ecosystem type, region, relate. The aim is to facilitate assessment, synthesis an case studies.*

*www.biospherefutures.net*

**Global Biodiversity Outlook 5.** CBD, Convention on Biolo

*The Global Biodiversity Outlook (GBO) is the flagship pul logical Diversity. It is a periodic report that summarizes trends of biodiversity and draws conclusions relevant to Convention. The fifth edition of the Global Biodiversity September 2020 and draws on various sources of inform progress towards the implementation of the Strategic Pla*

*https://www.cbd.int/gbo/gbo5/publication/gbo-5-en.pdf*

**Scenarios For The 2050 Vision For Biodiversity.** CBD, Conve

*This present note has been prepared by the CBD Executive mation concerning biodiversity-related scenarios and rel*

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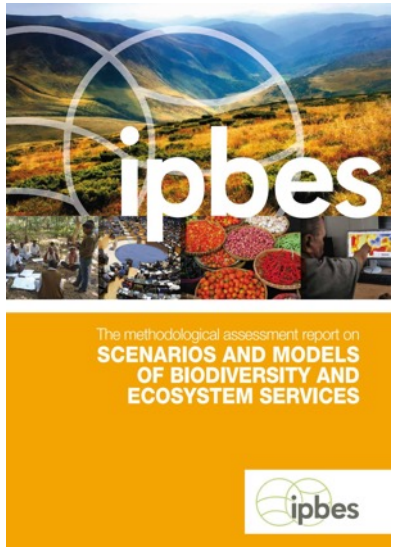
# Additional activities – Interaction with IPBES

**Support to IPBES knowledge generation catalysis at the science-policy interface**




→ Process set up building on successful BiodivScen example of how to work together under this function

→ Biodiversa formally hosting the TSU & facilitating TF on knowledge generation

→ Support for gaps' identification process in assessments and transfer to research programmers and funders worldwide

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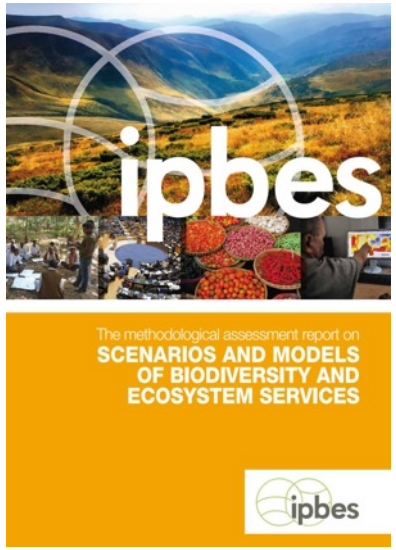


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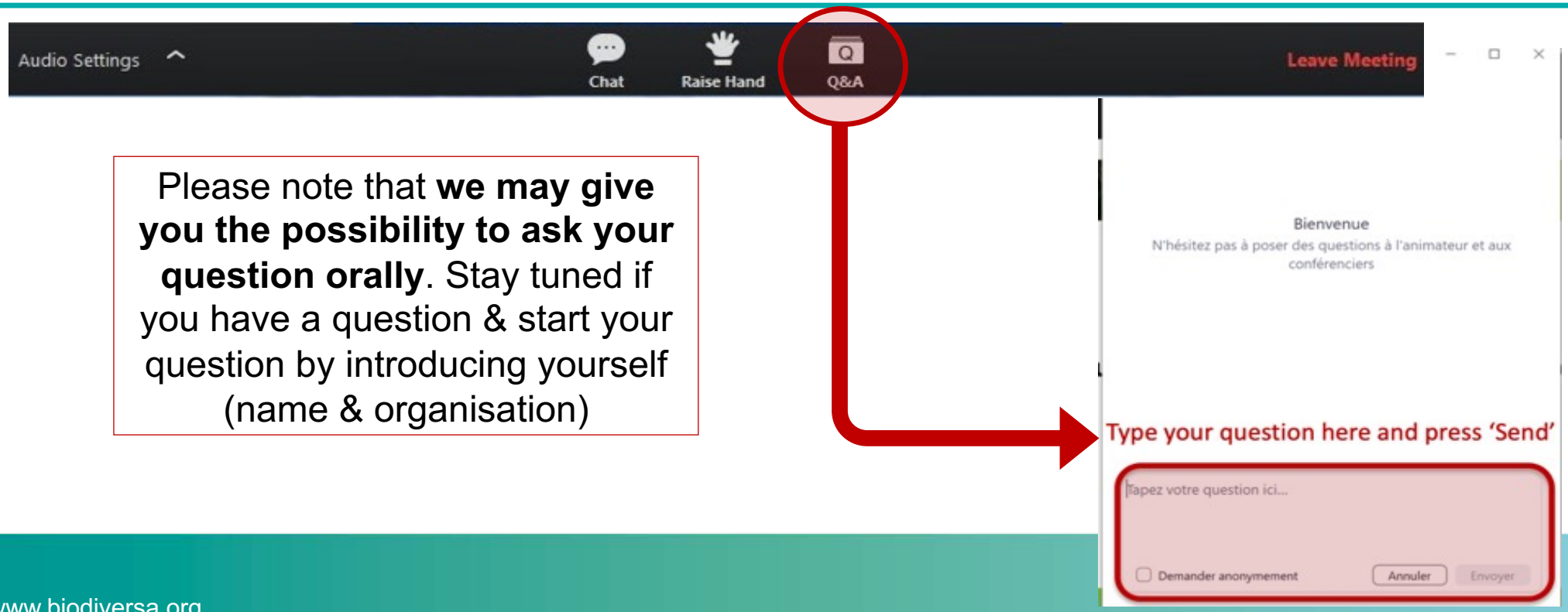
**+ Tomorrow's foresight WS**

# Any question?

**For any question: USE "Q&A" FUNCTION**




Please note that **we may give you the possibility to ask your question orally**. Stay tuned if you have a question & start your question by introducing yourself (name & organisation)

# Session 1:  Dissensus, controversies, representations and values of biodiversity: towards compromises to initiate transformative change

**15:10 – 16:30 –** ***Theme leader : Juana Mariño, architect and land use planner***

# Presentation of the projects' results

- **ENVISION – *Christopher Raymond***

*Considering different visions for protected areas management will help to achieve socially relevant, economically productive and environmentally sustainable outcomes while enhancing the conservation status of protected areas*

- **SECBIVIT – *Silvia Winter***

*Biodiversity and agriculture: measures to increase biodiversity in vineyard without affecting grape yield*

- **OBServ – *Ignasi Bartomeus***

*Resolving the tension between pollinator conservation and pollination ecosystem service delivery to crops*

- **FARMS4BIODIVERSITY – *Rachel Bezner Kerr***

*Agroecology can slow deforestation and restore degraded agricultural land*

- **FATE – *Laura Epp***

*Future ArcTic Ecosystems: drivers of diversity and future scenarios from ethno-ecology, contemporary ecology and ancient DNA*

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# ENVISION

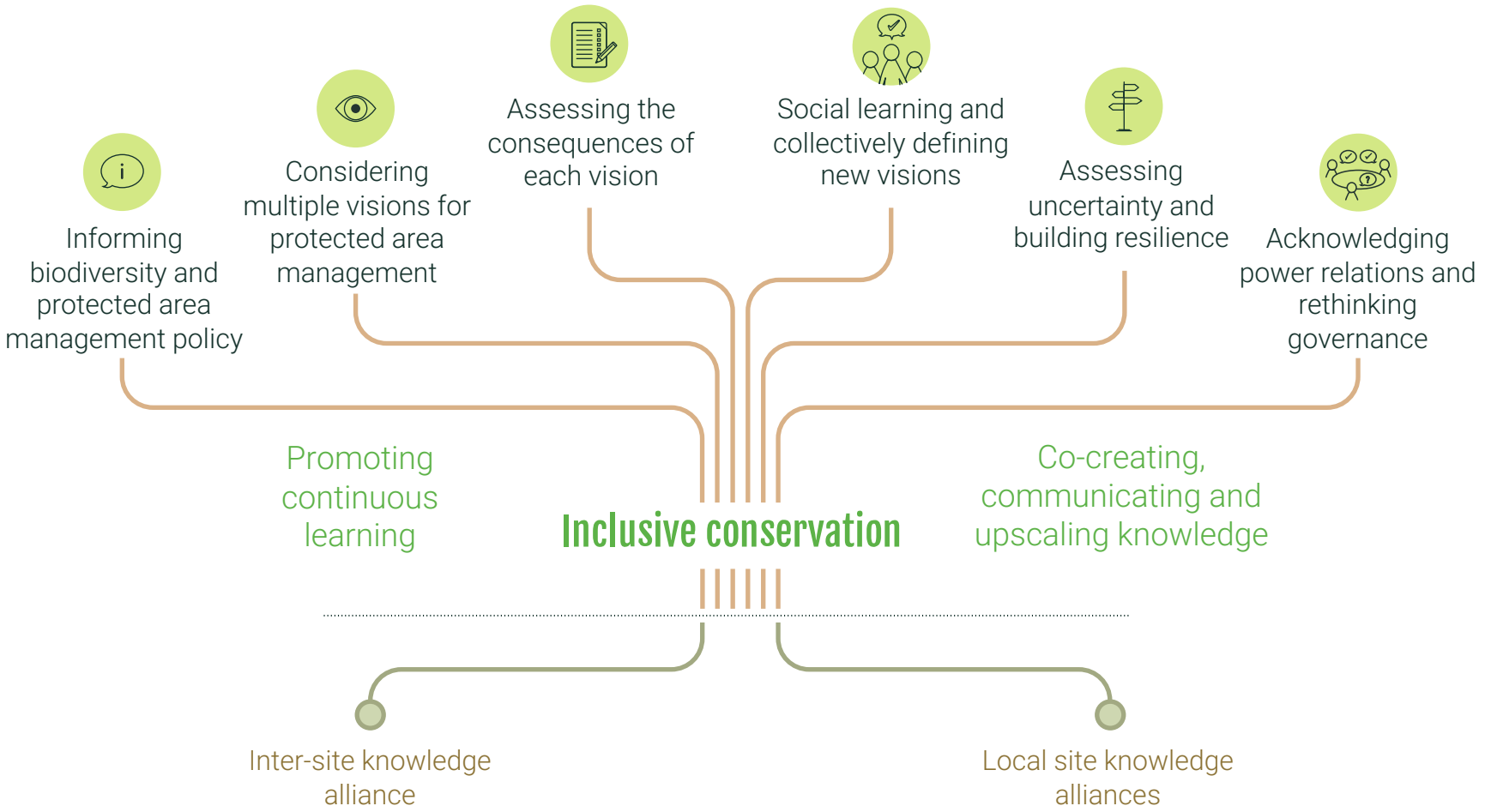
## Improving biodiversity and human well-being through inclusive conservation

**Prof. Christopher Raymond (Coordinator, SLU) and Veronica Lo (SLU)**

Erik Andersson (SU), Isabel Ruiz Mallen (UoC), Marc Metzger (EDIN), Tobias Plieninger (UGOE), Carena van Riper (Illinois), Alberto Arroyo (IUCN), Peter Verburg (VU) and teams

# Our inclusive approach to conservation

Transforming visions into integrated protected area management strategies; improving biodiversity and human well-being

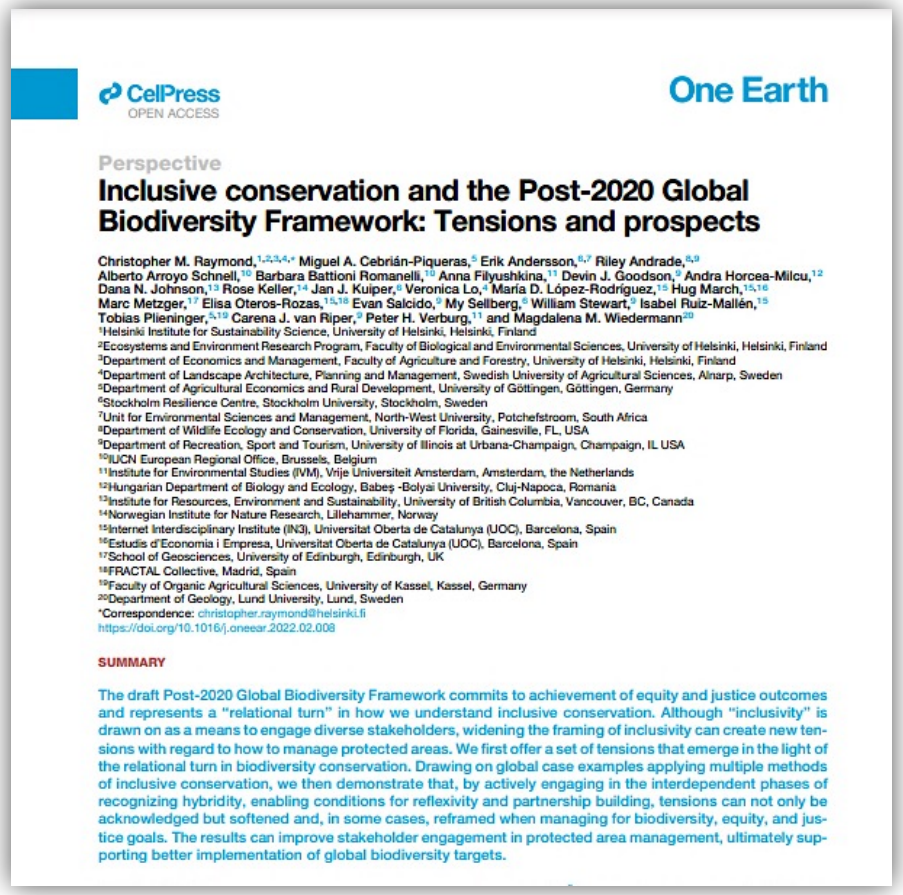



**Case areas:**
Denali National Park (U.S.), Västra Harg (Sweden), Sierra de Guadarrama (Spain), Kromme Rijn (Netherlands)

**Methods:**

- STREAMLINE, an open-source cartoon visualization tool
- Participatory mapping
- Mental, emotional and power maps
- An analytical matrix to characterize governance arrangements and delineate participatory mechanisms
- Deliberative processes based on social learning and knowledge co-production

**15 published journal articles**
**Further 12 articles under review**



CellPress
OPEN ACCESS

One Earth

Perspective

## Inclusive conservation and the Post-2020 Global Biodiversity Framework: Tensions and prospects

Christopher M. Raymond,[1,2,3,4,*] Miguel A. Cebrián-Piqueras,[5] Erik Andersson,[6,7] Riley Andrade,[8,9] Alberto Arroyo Schnell,[10] Barbara Battioni Romanelli,[10] Anna Filyushkina,[11] Devin J. Goodson,[9] Andra Horcea-Milcu,[12] Dana N. Johnson,[13] Rose Keller,[14] Jan J. Kuiper,[6] Veronica Lo,[4] María D. López-Rodríguez,[15] Hug March,[15,16] Marc Metzger,[17] Elisa Oteros-Rozas,[15,18] Evan Salcido,[9] My Sellberg,[6] William Stewart,[9] Isabel Ruiz-Mallén,[15] Tobias Plieninger,[5,19] Carena J. van Riper,[9] Peter H. Verburg,[11] and Magdalena M. Wiedermann[20]
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[2]Ecosystems and Environment Research Program, Faculty of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland
[3]Department of Economics and Management, Faculty of Agriculture and Forestry, University of Helsinki, Helsinki, Finland
[4]Department of Landscape Architecture, Planning and Management, Swedish University of Agricultural Sciences, Alnarp, Sweden
[5]Department of Agricultural Economics and Rural Development, University of Göttingen, Göttingen, Germany
[6]Stockholm Resilience Centre, Stockholm University, Stockholm, Sweden
[7]Unit for Environmental Sciences and Management, North-West University, Potchefstroom, South Africa
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[9]Department of Recreation, Sport and Tourism, University of Illinois at Urbana-Champaign, Champaign, IL USA
[10]IUCN European Regional Office, Brussels, Belgium
[11]Institute for Environmental Studies (IVM), Vrije Universiteit Amsterdam, Amsterdam, the Netherlands
[12]Hungarian Department of Biology and Ecology, Babeş -Bolyai University, Cluj-Napoca, Romania
[13]Institute for Resources, Environment and Sustainability, University of British Columbia, Vancouver, BC, Canada
[14]Norwegian Institute for Nature Research, Lillehammer, Norway
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[16]Estudis d'Economia i Empresa, Universitat Oberta de Catalunya (UOC), Barcelona, Spain
[17]School of Geosciences, University of Edinburgh, Edinburgh, UK
[18]FRACTAL Collective, Madrid, Spain
[19]Faculty of Organic Agricultural Sciences, University of Kassel, Kassel, Germany
[20]Department of Geology, Lund University, Lund, Sweden
*Correspondence: christopher.raymond@helsinki.fi
https://doi.org/10.1016/j.oneear.2022.02.008

SUMMARY

The draft Post-2020 Global Biodiversity Framework commits to achievement of equity and justice outcomes and represents a "relational turn" in how we understand inclusive conservation. Although "inclusivity" is drawn on as a means to engage diverse stakeholders, widening the framing of inclusivity can create new tensions with regard to how to manage protected areas. We first offer a set of tensions that emerge in the light of the relational turn in biodiversity conservation. Drawing on global case examples applying multiple methods of inclusive conservation, we then demonstrate that, by actively engaging in the interdependent phases of recognizing hybridity, enabling conditions for reflexivity and partnership building, tensions can not only be acknowledged but softened and, in some cases, reframed when managing for biodiversity, equity, and justice goals. The results can improve stakeholder engagement in protected area management, ultimately supporting better implementation of global biodiversity targets.

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# Examples of research papers

Andrade et al. (2023) **Values shift in response to social learning through deliberation about protected areas**. *Global Environmental Change.*

Cebrian-Piqueras et al. (2020) **Scientific and local ecological knowledge, shaping perceptions towards protected areas and related ecosystem services**. *Landscape Ecology.*

Goodson et al. (2022) **Perceived inclusivity and trust in protected area management decisions among stakeholders in Alaska**. *People and Nature.*

Lo et al. (2022) **How stable are visions for protected area management? Stakeholder perspectives before and during a pandemic**. *People and Nature.*

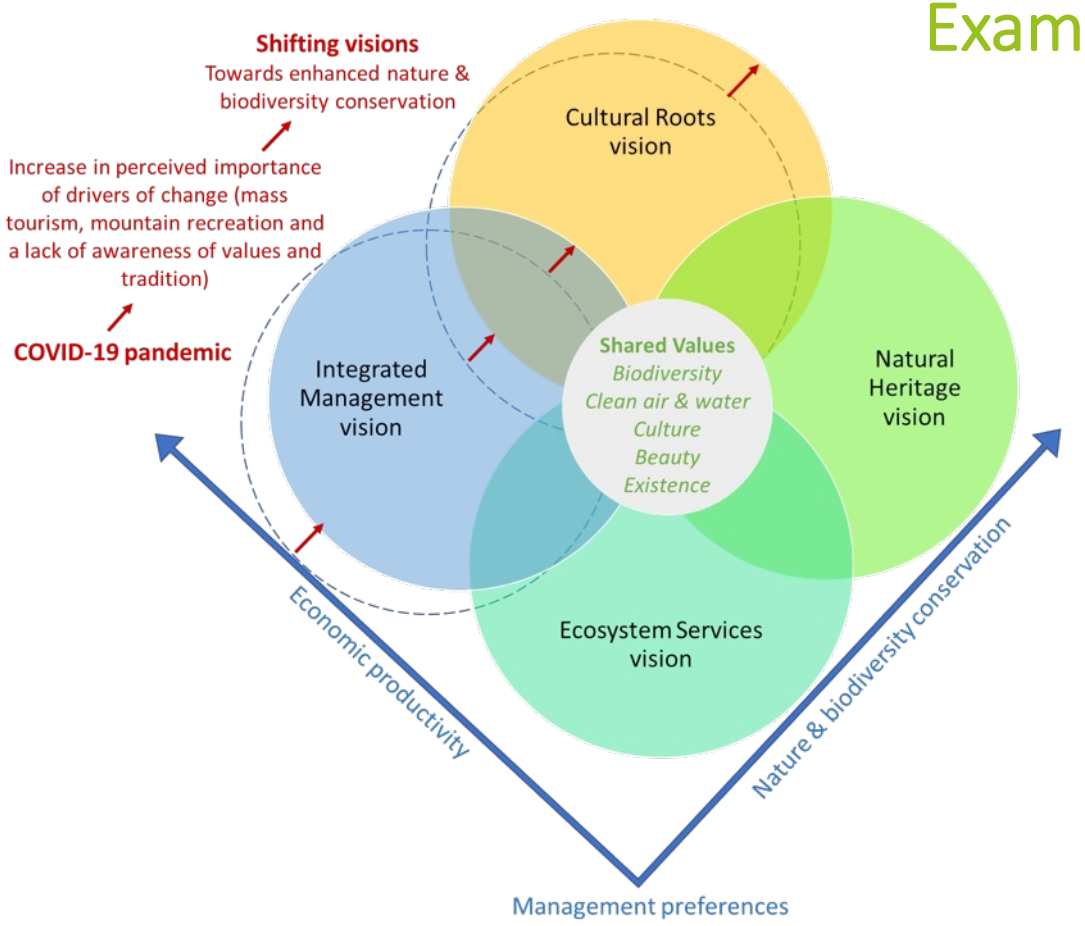
López-Rodríguez et al. (2023) **Visualizing stakeholders' willingness for collective action in participatory scenario planning**. *Ecology & Society*

Lopez-Rodriguez et al. (2020) **Delineating participation in conservation governance: Insights from the Sierra de Guadarrama National Park (Spain)**. *Environmental Science & Policy.*

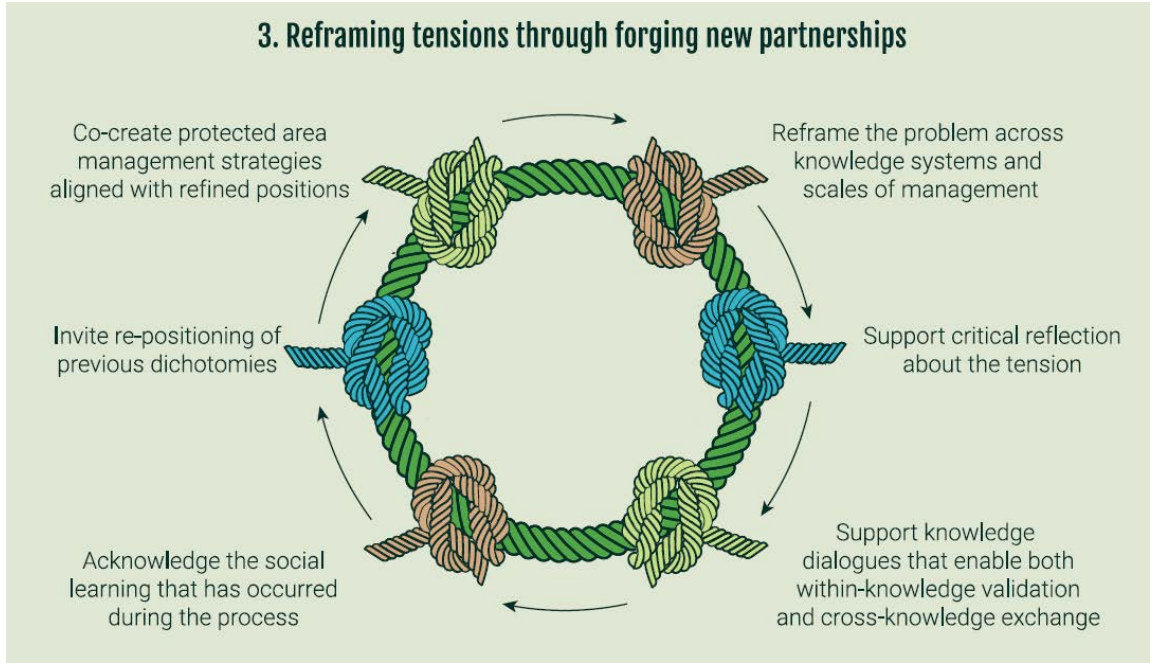
Raymond et al. (2022) **Inclusive conservation and the Post-2020 Global Biodiversity Framework: Tensions and prospects.** *One Earth*

Zaman et al. (2022) **Associations between landscape values, self-reported knowledge, and land-use: a public participation GIS assessment**. *Ecosystems & People*

# Examples of results




Lo, V.B.P.G., et al. 2022. 'How stable are visions for protected area management? Stakeholder perspectives before and during a pandemic'. *People and Nature* **4** (2): 445–461.




Raymond, C. M., et al. (2022). Inclusive conservation and the Post-2020 Global Biodiversity Framework: Tensions and prospects. *One Earth*, *5*(3), 252–264.

# ENVISION policy-relevant publications


8 Fact Sheets, 3 Policy Briefs, several reports, 4 case studies on Panorama Solutions.

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https://inclusive-conservation.org/

PANORAMA
SOLUTIONS FOR A HEALTHY PLANET

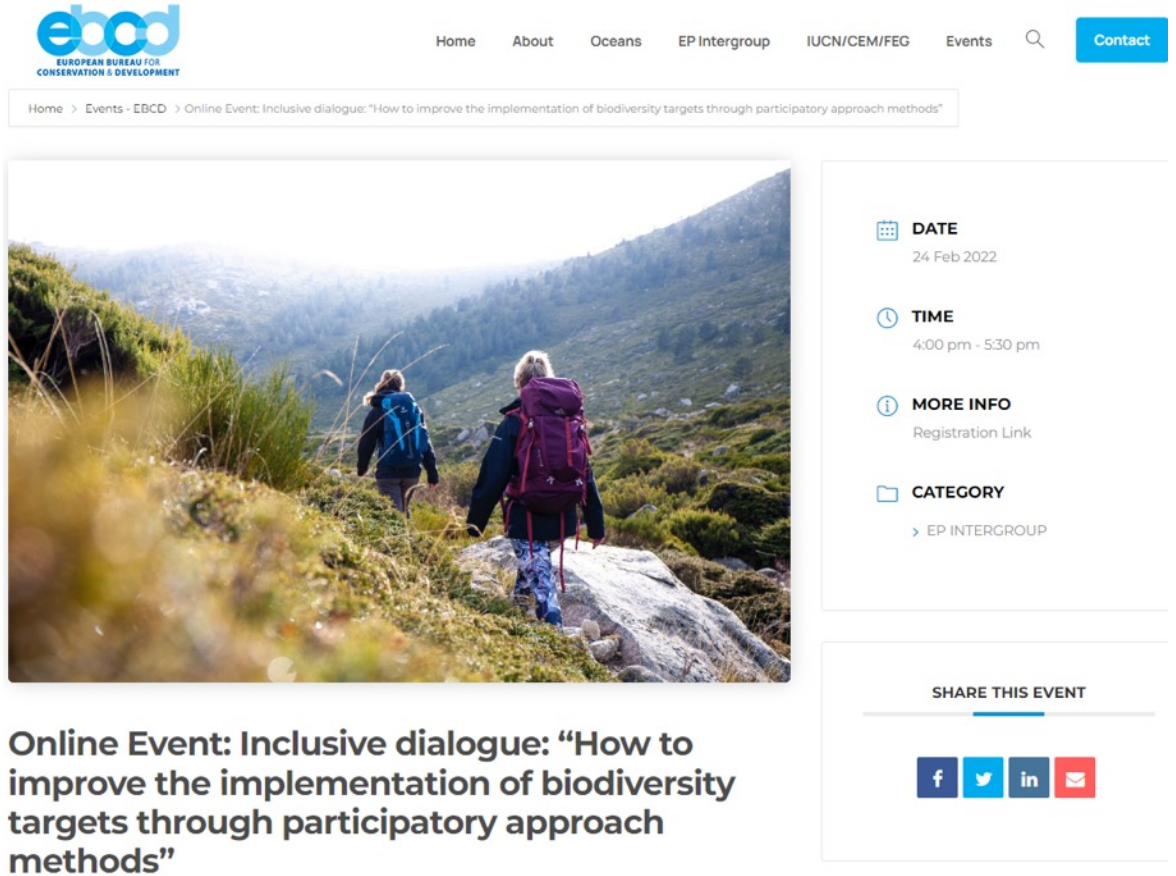
# *Examples of societal and policy impacts*

Site meetings with decision-makers and local knowledge alliances across all four study areas

Input into the public participation program of Sierra de Guadarrama NP, County Green Infrastructure strategy, Sweden and UNESCO Biosphere Reserve Planning in the United States

In October 2020, over **130 participants** followed the **webinar** about "Inclusive Conservation of Protected Areas: Balancing stakeholders' visions" …. **How inclusive conservation can be integrated into the Post-2020 GBF and the EU Biodiversity Strategy for 2030**.

The **European Parliament Intergroup** on Climate Change, Biodiversity and Sustainable Development, 24 February 2022.: "**How to improve the implementation of biodiversity targets through participatory methods**"



# Lessons for policy and practice

The need to effectively involve local communities, indigenous people, government, business and NGOs in the management and in the designation process of protected areas

Creating space for dialogue and social learning

Understanding and recognizing visions of different groups of stakeholders

Promoting the use of creative engagement tools to inform conservation decision-making

Policy Brief

Decision-making toolbox for inclusive conservation in protected areas

By López-Rodríguez, M.D.; Oteros-Rozas, E.; March, H; Lo, V.B.P.G.; Cebrián-Piqueras, M.A.; Battioni Romanelli, B.; Arroyo Schnell, A.; Ruíz-Mallén, I.

January 2022

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ENVISION

# Acknowledgements

This research was funded through the 2017-2018 Belmont Forum and BiodivERsA joint call for research proposals, under the BiodivScen ERA-Net COFUND programme, and with funding from the governments of Sweden, Germany, the Netherlands, Spain and the United States.

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BELMONT FORUM

SECBIVIT

# SECBIVIT - Scenarios for providing multiple ecosystem services and biodiversity in viticultural landscapes


BOKU

Silvia Winter, University of Natural Resources and Life Sciences Vienna

Representing the team:
Stefan MÖTH[1], Andreas WALZER[1], Markus REDL[1], Johann G. ZALLER[2], Edith GRUBER[2], Christoph HOFFMANN[3], Martin ENTLING[4], Jo M. REIFF[4], Sebastian KOLB[4], Daniela POPESCU[5], Mignon SANDOR[5], Rafael ALCALÁ HERRERA[6], Emilio BENITEZ[6], Adrien RUSCH[7], Pauline TOLLE[7], Sylvie RICHART CERVERA[7], Nina SCHWARZ[8], Yang CHEN[8], Holger BERGMANN[9], Juliane HÄNSCH[9], Elke Plaas[9,10], Daniel KARP[11], Daniel PAREDES[11]


BOKU CSIC Consejo Superior de Investigaciones Científicas USAMV INRA Science & Impact University of Twente. ITC JKI Julius Kühn-Institut Universität Koblenz · Landau UCDAVIS

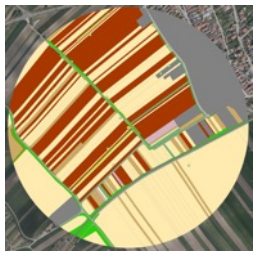
# SECBIVIT goals

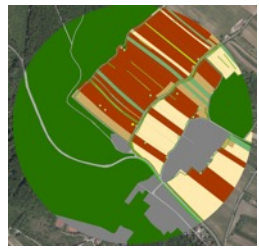
- investigate the effects of inter-row management, pesticide use and landscape complexity on biodiversity & ecosystem service provision

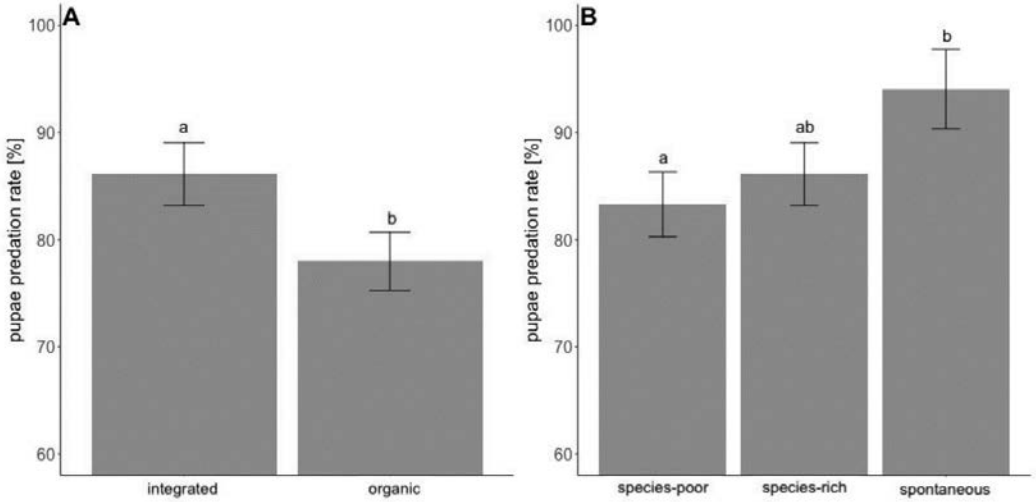
- develop agent-based models for winegrowers as agents in the social-ecological viticultural system

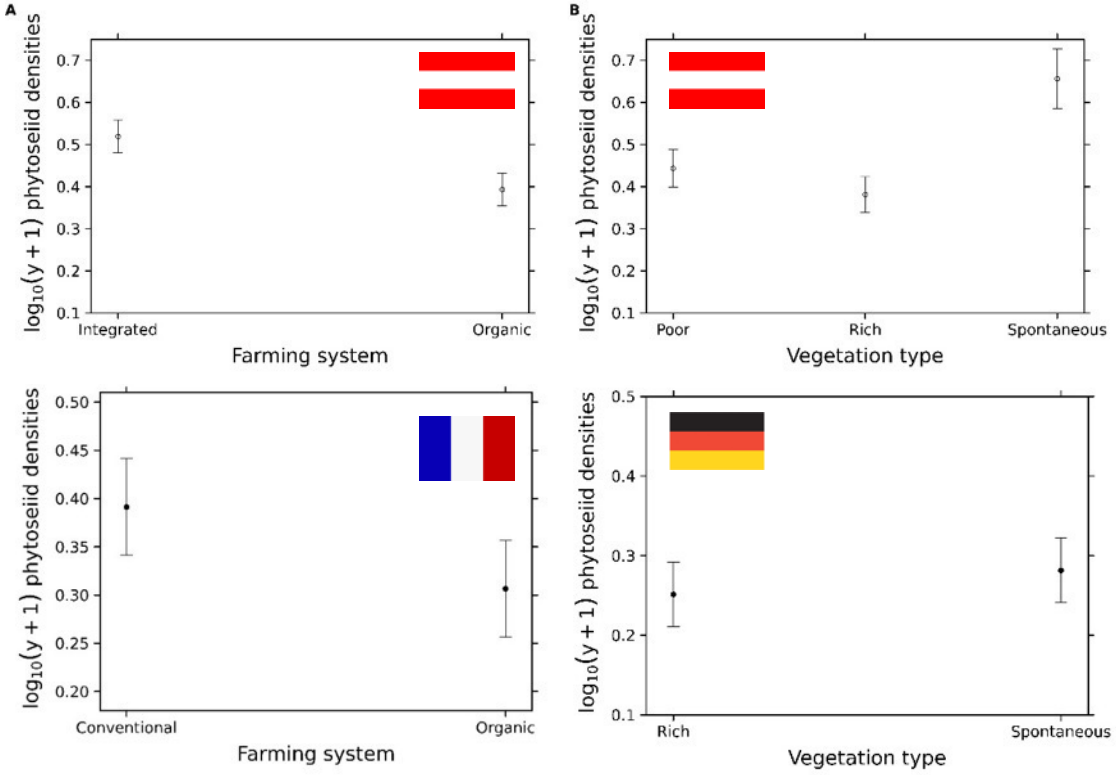
# Ecosystem service natural pest control - Results








- Positive effect of integrated/conventional farming
- Negative effects of high pesticide use (Sulphur/ copper)
- Positive effect of spontaneous vegetation

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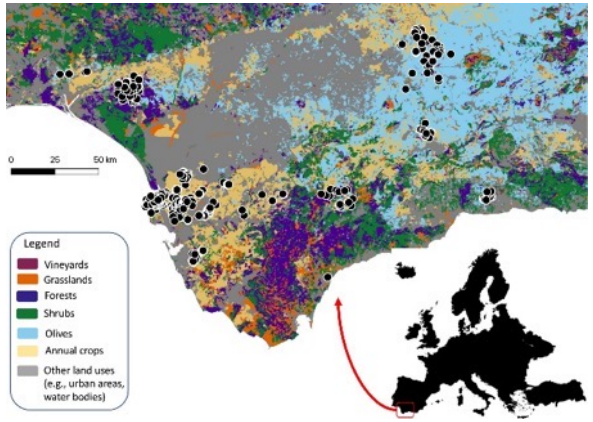
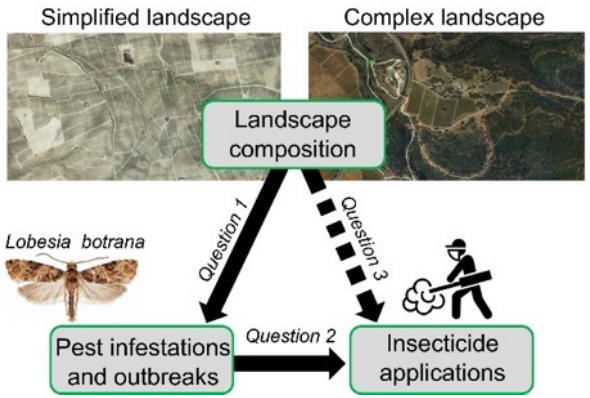
www.secbivit.boku.ac.at

Moeth et al. 2021, 2023; Reiff et al. 2021

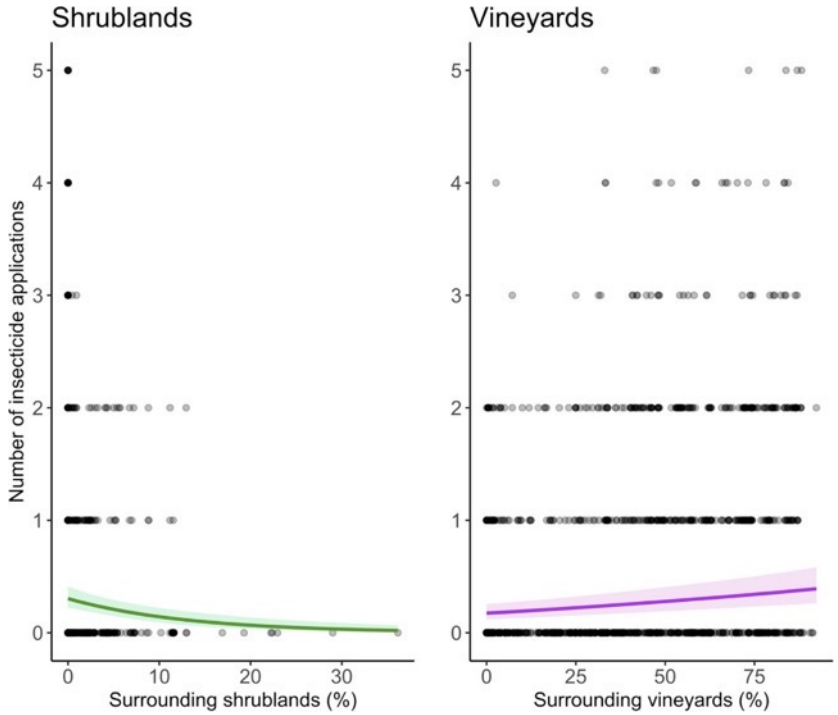
www.biodiversa.org

# Grape berry moth outbreaks, insecticide use & landscape composition




governmental DB southern Spain: > 400 vineyards 13 years



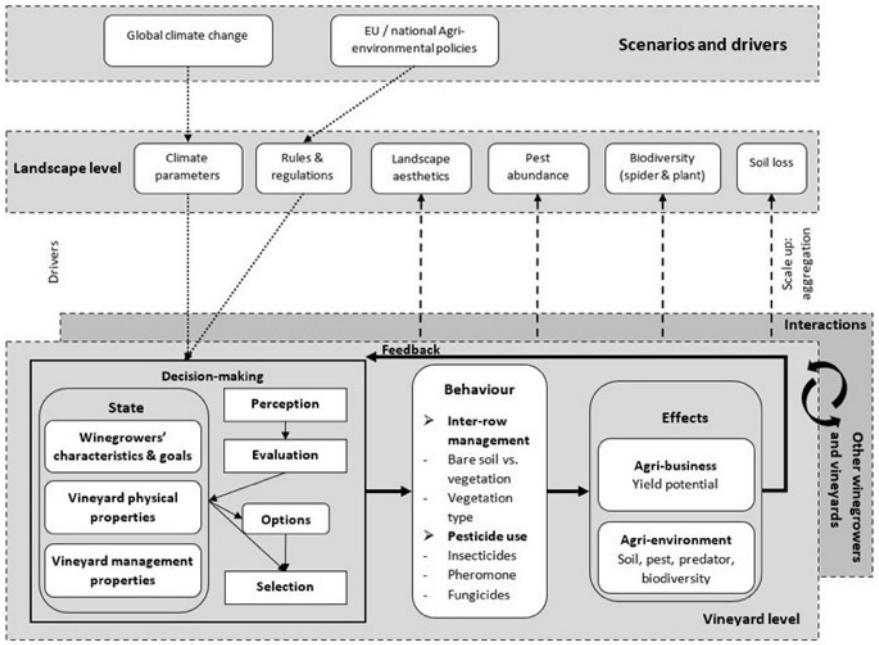

Highlights:

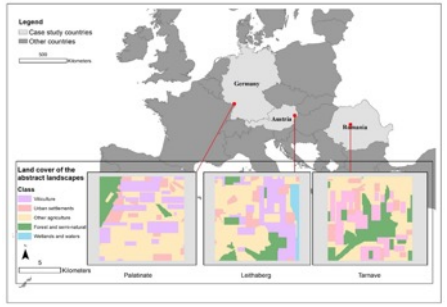
- Pest outbreaks increased 4x simplified, vineyard-dominated landscapes
- insecticide applications increased 2x vineyard-dominated landscapes but declined landscapes with shrubland

Paredes et al. 202 ECOL LETT

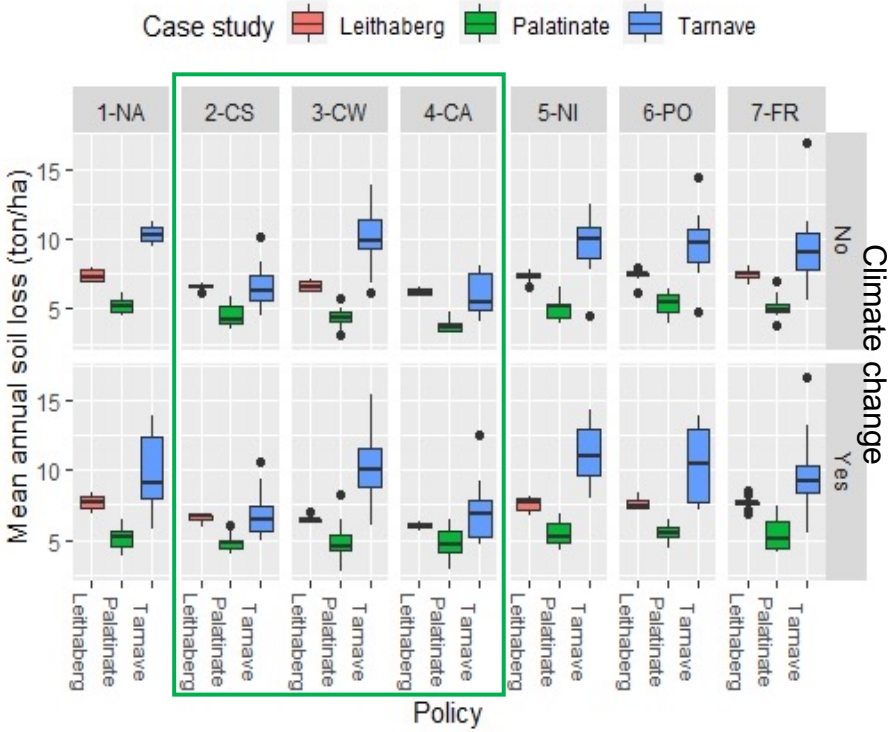
# Agent-based modelling of vineyard management


UNIVERSITY OF TWENTE.



1-NA: none; 2-CS: vegetation cover >10 %, 3-CW: vegetation cover avail. water, 4-CA: veg. cover all, 5-NI: insecticide ban, 6-PO: pheromone dispenser obligatory, 7-FR: fungicide reduction




Decisions based on wine grower survey -> decision trees
Ecological processes based on field data and literature

- farmers' attitudes and beliefs drive behaviours and management
- Climate change drives decision-making: temp & prec -> pesticide use
- Locally-adapted policies for greener inter-rows & less pesticide use

Chen et al. 2022; Chen et al. in prep.

# Policy and societal results

2030 goal to reduce pesticide use by 50 %: increase natural pest control in vineyards in ORG and CONV

- Need for national policies targeting and supporting:
  - lower pesticide use via planting PIWI varities
  - semi-natural landscape elements -> ↓ likelihood of pest outbreaks -> ↓ major yield losses and insecticide use, ↑ natural pest control and biodiversity, crop production, human & environmental health
  - vegetation cover in inter-rows by compensation payments: RO and ES
  - spontaneous vegetation or locally-adapted, species-rich seed mixtures







# Acknowledgements

Thanks to:

- all partners, students and colleagues from SECBIVIT!

  Thomas, Daniela, Martin, Ahmad, Lisa, Lina, Jakob, Vincenzo, Katharina, Božana, Argyroula, Beatriz, María Luisa, …

- winegrowers and other stakeholder

Thanks for financial support from the biodiversa call and the national funding agencies:

# OBServ: Open library of pollinator Biodiversity and ecosystem Services scenarios.

Ignasi Bartomeus

# Scientific results

**11 published articles + 9 in preparation or submitted**

ECOLOGY

ECOLOGICAL SOCIETY OF AMERICA

Ecology homepage

DATA PAPER | Free Access

## CropPol: A dynamic, open and global database on crop pollination

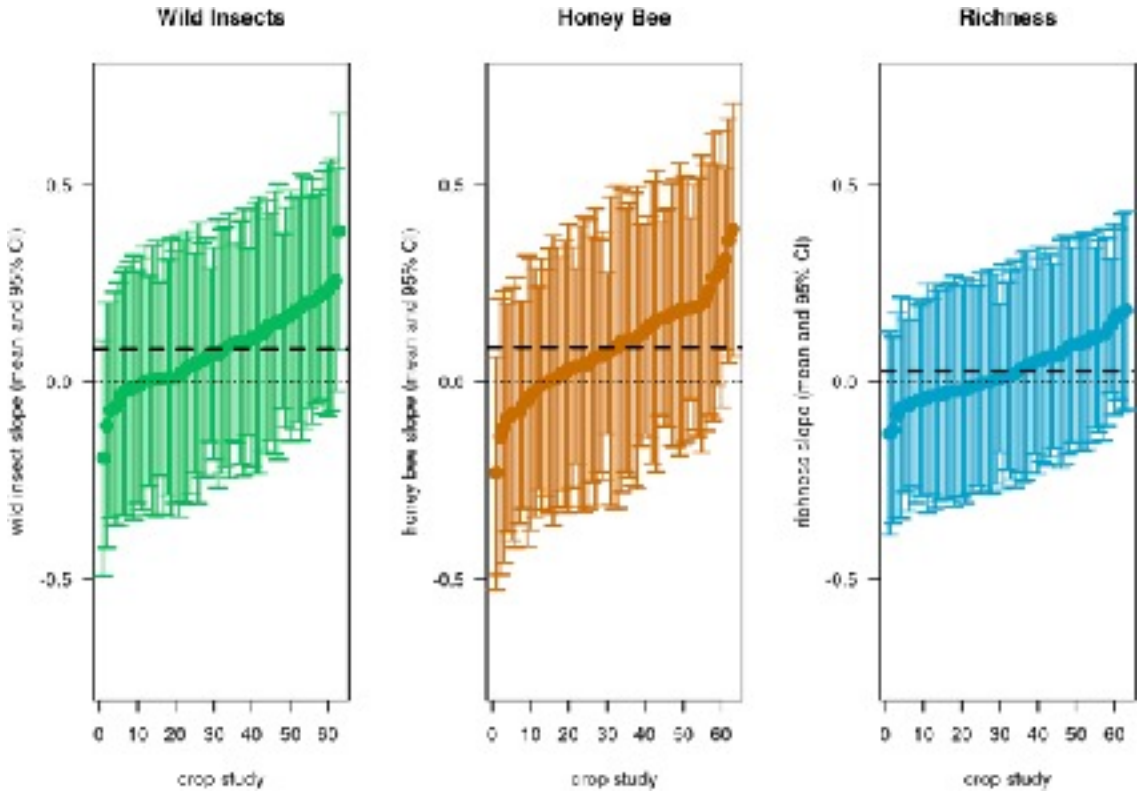
Alfonso Allen-Perkins, Ainhoa Magrach, Matteo Dainese, Lucas A. Garibaldi, David Kleijn, Romina Rader, James R. Reilly, Rachael Winfree, Ola Lundin ... See all authors

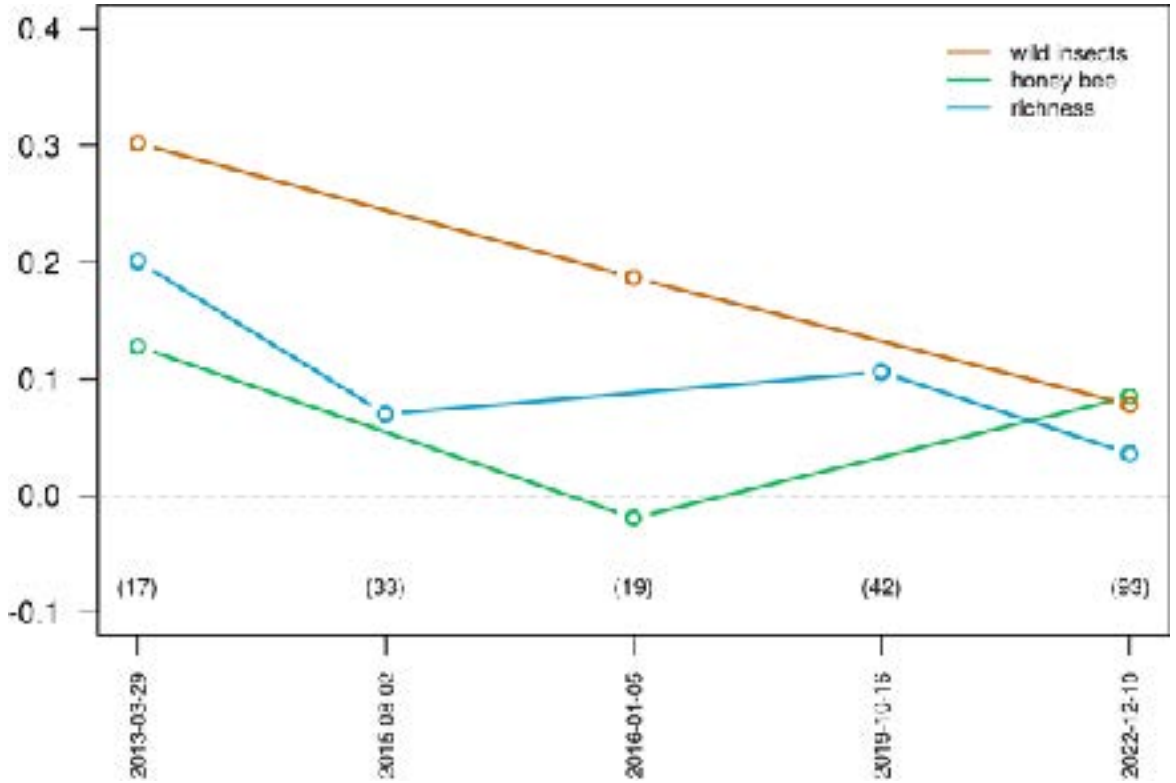
**Pollination supply models from local to global scale. Submitted (Giménez-García et al.)**

# Scientific results

## Pollinator contribution to crop yield

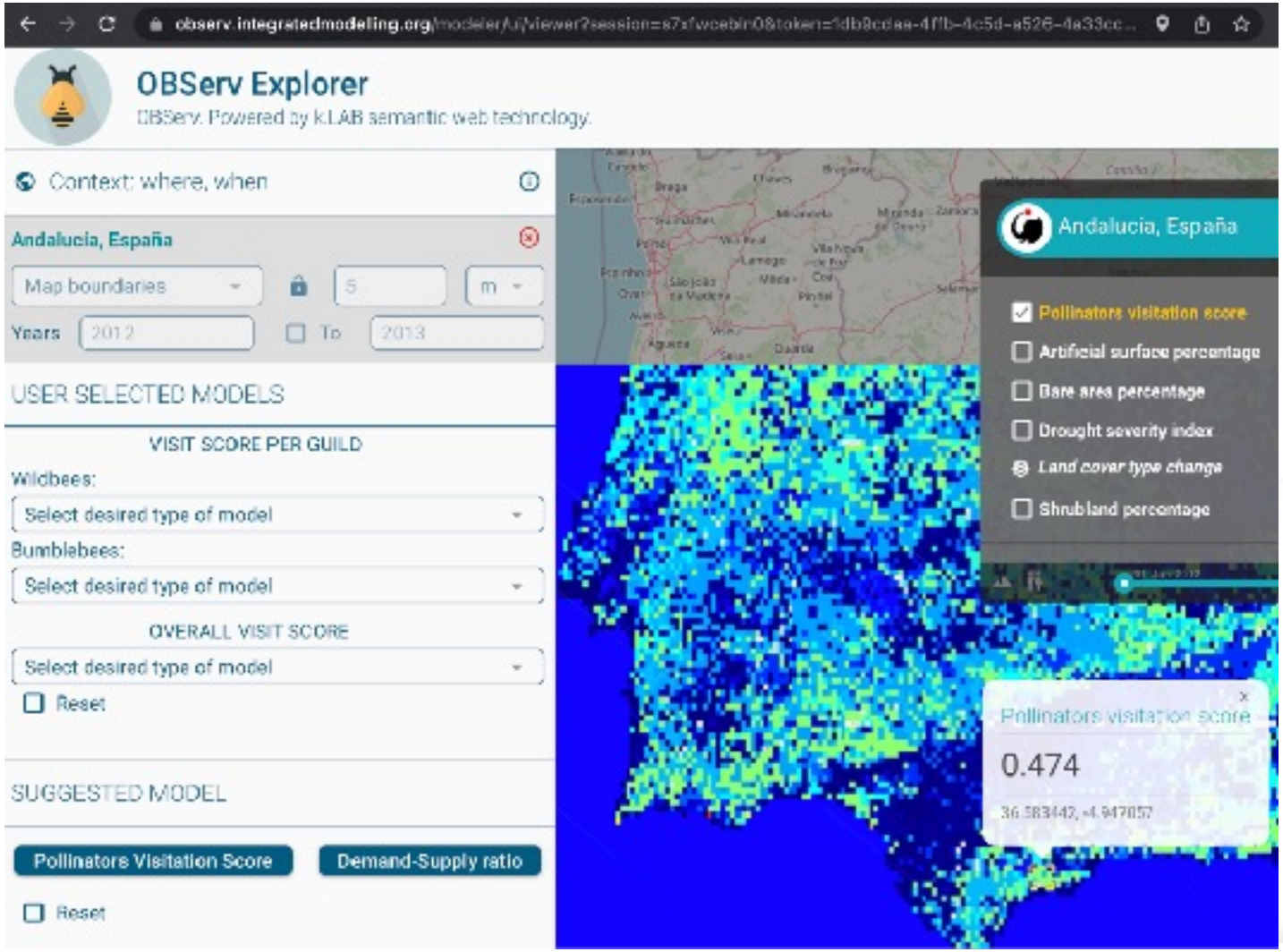
James Reilly, Alfonso Allen-Perkins, Rachael Winfree, Ignasi Bartomeus. Submitted




https://ibartomeus.github.io/CropPollinationModels/results.html

# Policy and societal impacts / results



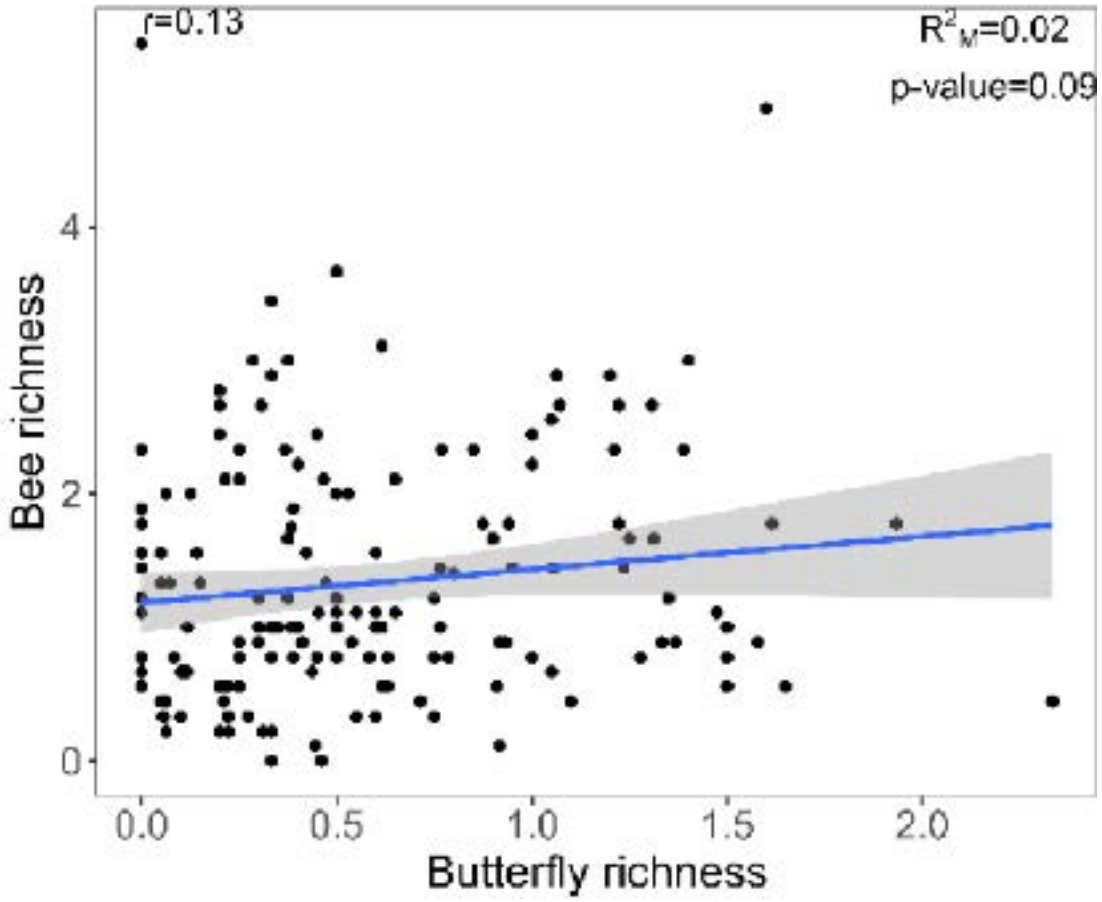

Junta de Andalucía

https://observ.integratedmodelling.org/modeler/#/login

# Policy and societal impacts / results

Dutch ButterflyConservation

(a)

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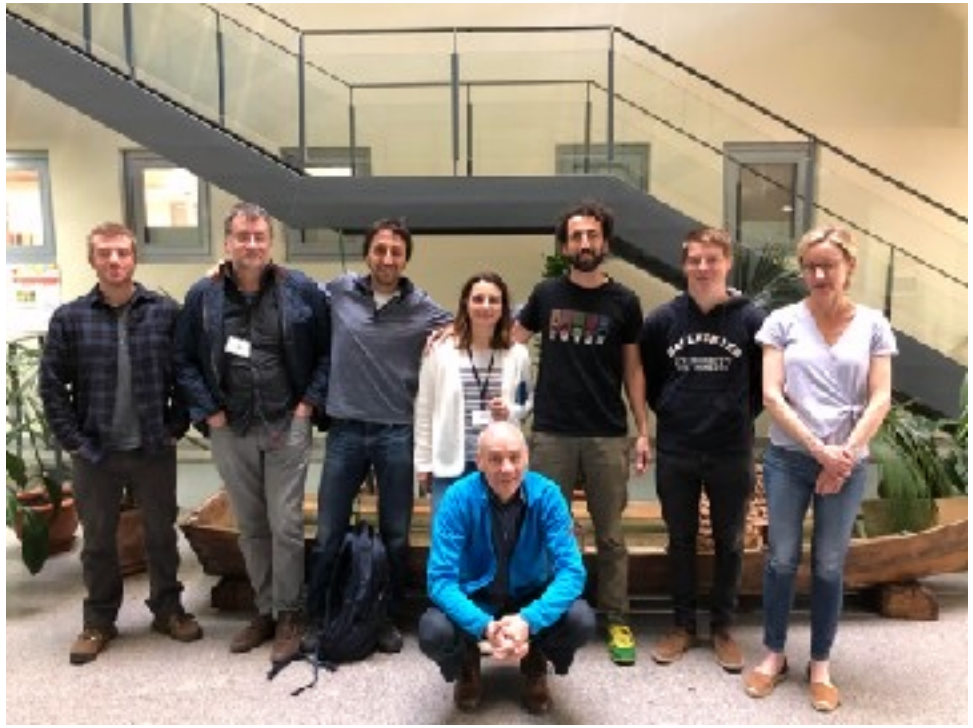
# Acknowledgements



AGENCIA ESTATAL DE INVESTIGACIÓN

NSF

Ministerio de Educación, Cultura, Ciencia y Tecnología
Presidencia de la Nación

NWO
Netherlands Organisation for Scientific Research

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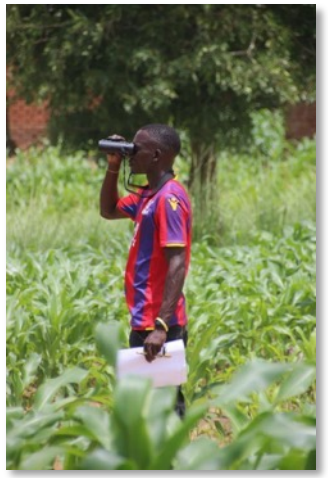
BELMONT FORUM



# Farmer-led Agroecological Research in Malawi using Scenarios for Biodiversity & Ecosystem Services

## FARMS for Biodiversity

Prof. Rachel Bezner Kerr

Cornell University

# Project description

*Research question: Can agroecological practices at a landscape scale support biodiversity and other ecosystem services?*

- 24 villages with a gradient of agroecological practices and forest cover.
- 63 agricultural fields, measuring pest damage, presence of pollinators and birds.
- Farmer researchers doing ecological data collection and experimental research
- Participatory scenario planning
- Multi-stakeholder platforms with govt, farmers unions, conservation groups

*Data collection:*

- Biodiversity: birds, carabids, ants, spiders, parasitoids, bees and soil micro-organisms
- Ecosystem services: pest damage during growth and harvest, seed production
- Participatory geospatial data, remote sensing
- Survey of agroecology, social outcomes (n=240)

# Scientific results

**Key finding 1: Agroecological practices enhanced biodiversity conservation and ecosystem services.** Specific practices:

- Planting a late-flowering crop (like pigeon pea), maintains abundances of bees in agricultural dominated landscapes.
- Intercropping/crop rotations with legumes increased butterfly populations.
- Legume intercropping and rotation supported crop pollination services and biological pest control;
- Increasing diversification of agroecological practices improved soil organism diversity.
- Planting of beans increased activity of natural enemies (parasitoid wasps and spiders), particularly fields located in areas with low semi-natural habitat.
- Semi-natural habitats increased flower availability on farmlands which can be used as food sources for pollinating bees and butterfly species.
- Maintaining semi-natural habitat is important to maintain diversity of bees and carabid beetles.

Vogel, C. et al. 2023. The effects of crop type, landscape composition and agroecological practices on biodiversity and ecosystem services in tropical smallholder farms. *Journal of Applied Ecology* 60 (5):859-874 Vogel, C. et al. 2021. Higher bee densities, but not pest densities, in landscapes with more agriculture on a late-flowering legume crop in tropical smallholder farms. *PeerJ;* Vogel,C. et al. 2023. Local and landscape scale woodland cover and diversification of agroecological practices shape butterfly communities in tropical smallholder landscapes. (forthcoming). *Journal of Applied Ecology* (forthcoming).

# Scientific results part II

**Key finding 2: Farmers' knowledge on agroecology and social networks supported biodiversity and food security.**

- Farmers' agroecological practices and knowledge contributed to functional agrobiodiversity and ecosystem services.
- Farmers using agroecological practices valued ecosystem services in forest landscapes and agrobiodiversity more than those farmers who did not use agroecological practices.
- Farmers who practiced agroecology were more likely to fallow cropland for forest regeneration;
- Communities have a strong interest in seeing a future where there is increased tree plantings and forest regeneration alongside an agroecology market for farmers with surplus produce.

Kpienbaareh, D. et al. 2022. Assessing Local Perceptions of Deforestation, Forest Restoration, and the Role of Agroecology for Agroecosystem Restoration in northern Malawi. *Land Degradation and Development* 33(7): 1088-1100; Kpienbaareh, D. et al. 2020. Spatial and Ecological Farmer Knowledge and Decision-Making about Ecosystem Services and Biodiversity. *Land 9 (10)*

# Policy and societal impacts / results

**Key findings 3 and 4:**

- Communities have a strong interest in seeing a future where there is increased tree plantings and forest regeneration alongside an agroecology market for farmers with surplus produce.
- Several policy initiatives and instruments are already in place that could support agroecological practices and biodiversity. For example, the National Biodiversity Strategy of Malawi calls for reduced usage of pesticides to prevent damage on terrestrial and aquatic biodiversity.

Impacts:

- Developed 5 farmer pamphlets to support agroecological practices;
- Held community feedback workshop to share results with 100 people including farmers, village leaders, extension workers.
- Held policy workshop in Lilongwe, established linkage with researchers and policy-makers.
- Initiated a 2-year project with 10 communities, to assess forest quality and carry out natural forest regeneration and reforestation.

# Acknowledgements

This research was funded through the 2017-2018 Belmont Forum and BiodivERsA joint call for research proposals, under the BiodivScen ERA-NetCOFUND program, and funded by the Natural Sciences and Engineering Research Council of Canada (NSERC Grant #523660-2018), National Science Foundation (NSF Grant #1852587), German Federal Ministry of Education and Research (BMBF #01LC11804A) and the Research Council of Norway (#295442).






# FATE – Future ArcTic Ecosystems

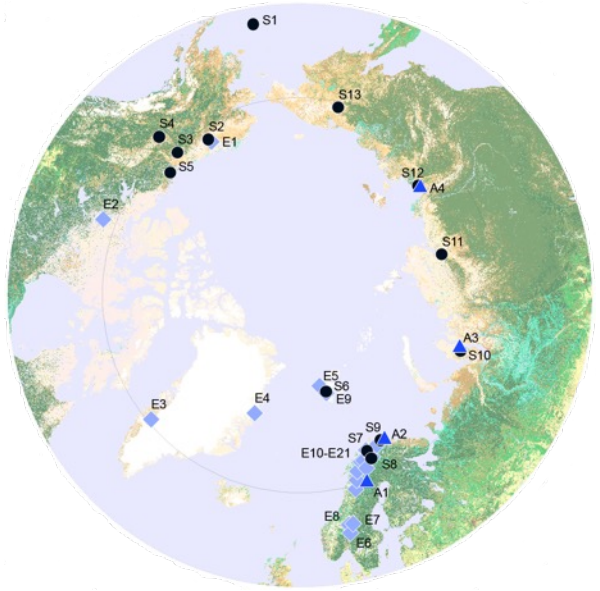
Laura S. Epp,

Peter A. Seeber, Ulrike Herzschuh, Inger G. Alsos, Anastasia Poliakova, Hendrik Poinar, Tyler Murchie, Beth Shapiro, Duane Froese, Michael Pisaric, Johan Olofsson, Juan I. Ramirez, Samuel Roturier, Simon Maraud, Vera H. Hausner, Douglas Nakashima, Marie Roué, Florian Stammler

# The Arctic

## Changing ecosystem services in the future – What can we expect and how can people adapt?

**Climate**




**Herbivory**

We wanted:
- Large scale, long-term data on vegetation, climate and herbivory
- Understanding of drivers and processes
- Indigenous and local knowledge of changes and how people cope

# FATE – Future ArcTic Ecosystems

**WP1: Biodiversity change through time**

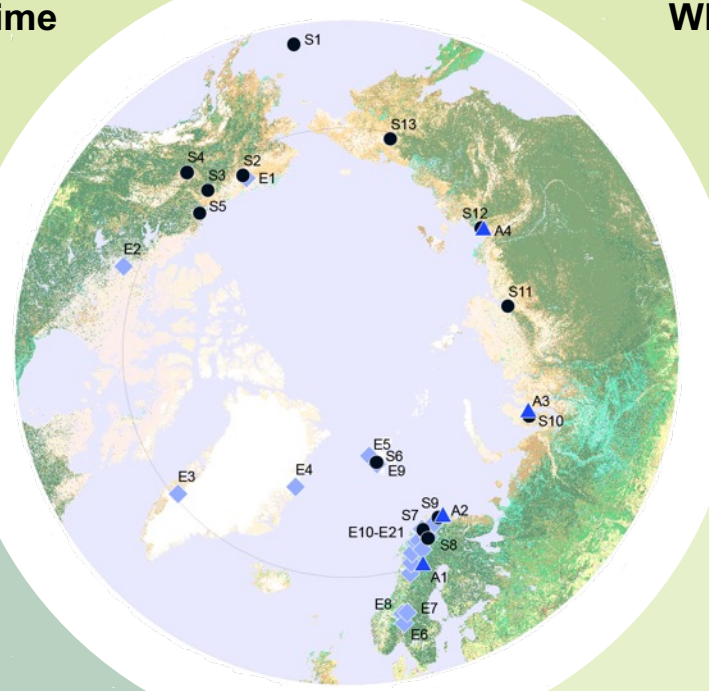
- Ancient environmental DNA from sediment cores

*U Konstanz, AWI Potsdam, U Tromsø, U Santa Cruz, Mc Master U, Brock U*

**WP2: Drivers of vegetation change**

- Vegetation recordings from exclosures throughout Arctic

*U Umeå, U Aarhus, U Tromsø*




**WP4: Scenario building**

- Dialogue between ILK holders and scientists – (how) can this be accomplished?

*U Paris-Saclay, U Tromsø, UNESCO*

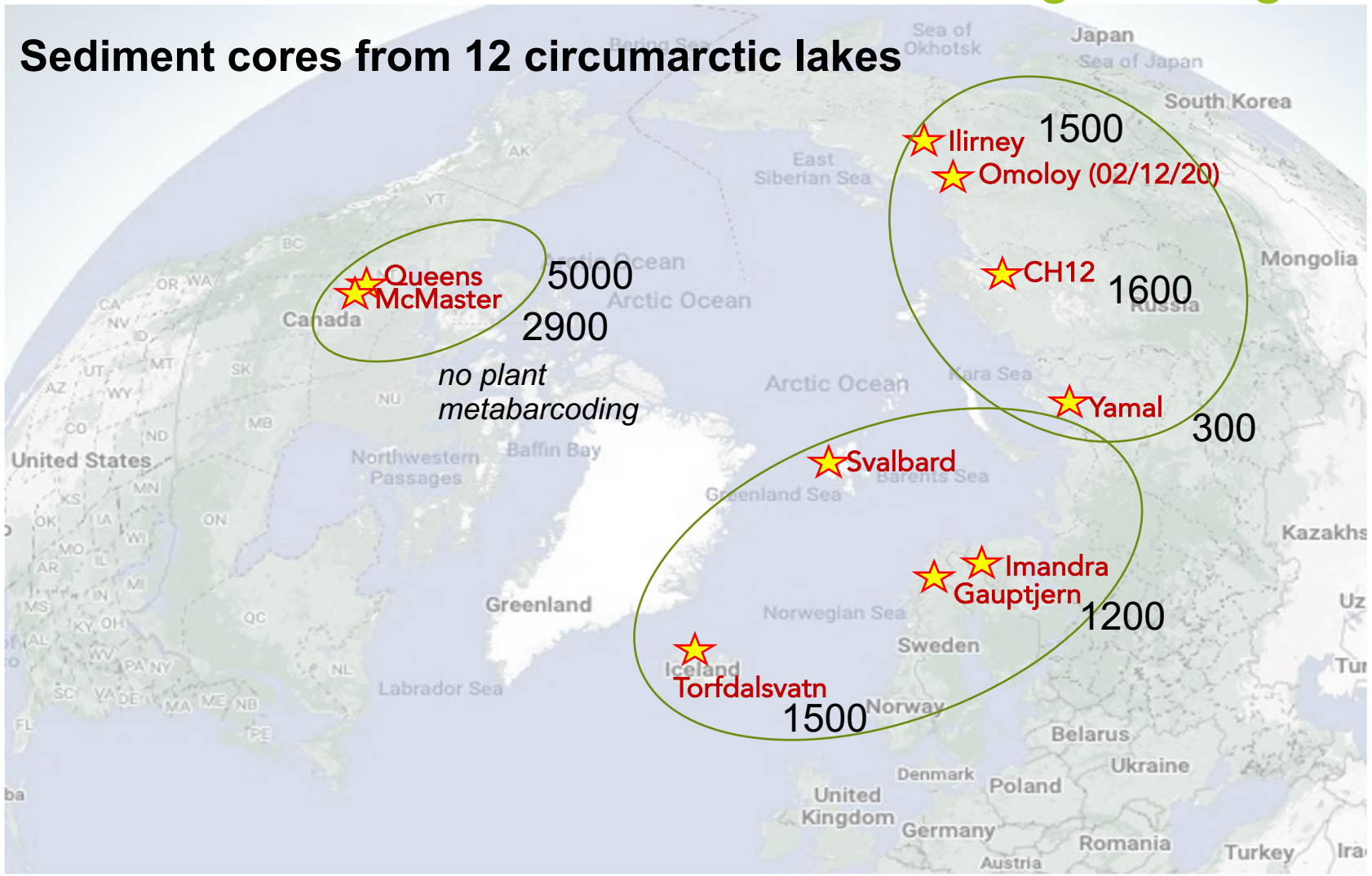
**WP3: Indigenous and local knowledge (ILK)**

- Field studies in 4 communities

*U Lapland, U Paris-Saclay*

Initial design as iterative process of dialogue and investigations.
However – this was made largely impossible due to the Covid19 pandemic.

# WP1 – Millennia and centuries of change in vegetation and herbivory

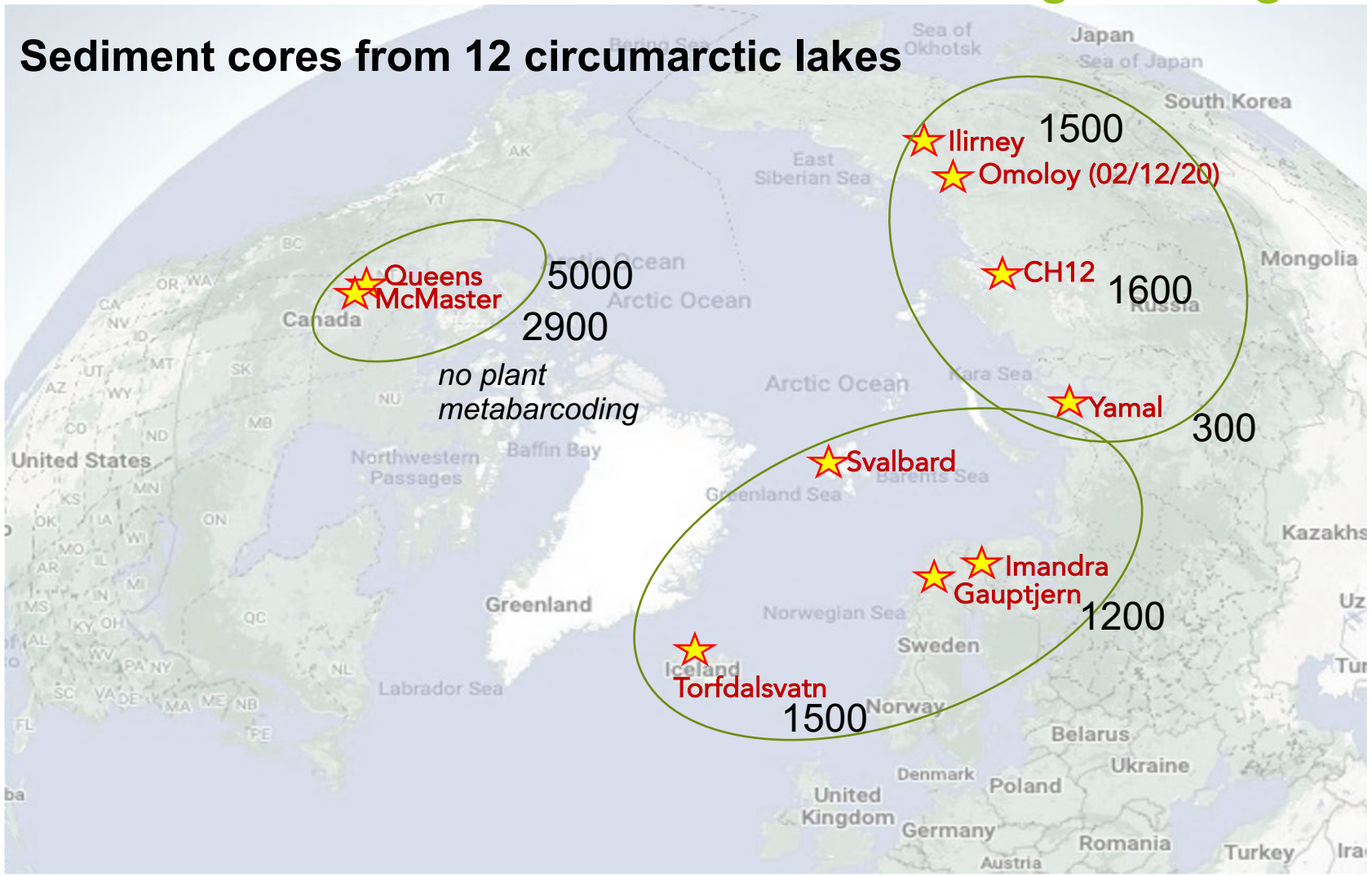



**Ancient DNA -**

***Methodological developments in the project***

- New assay for fungi sedaDNA (Seeber et al. 2022, von Hippel et al. 2022)
- DNA proxies (fungi, insects) not efficient to track mammals
- Hybridisation capture for mammals

# WP1 – Millennia and centuries of change in vegetation and herbivory




**Large Ancient DNA experiment:**

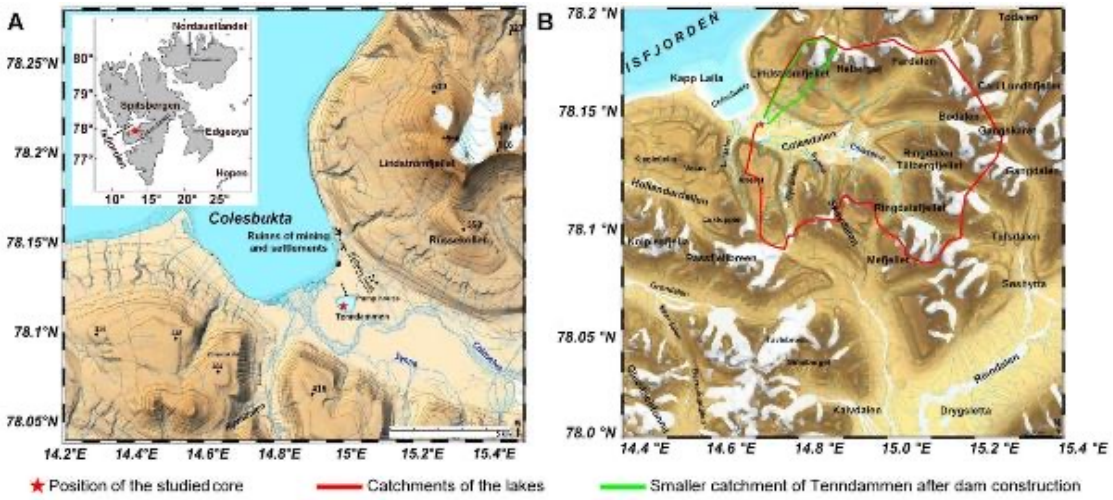
Mitogenomes of 17 herbivores

- *Bison bison*
- *Bos primigenius*
- *Rangifer tarandus*
- *Cervus elaphus*
- *Alces alces*
- *Saiga tatarica*
- *Ovis canadensis*
- *Ovibos moschatus*
- *Equus przewalskii*
- *Coelodonta antiquitatis*
- *Camelus ferus*
- *Lepus arcticus*
- *Ochotona collaris*
- *Mammuthus primigenius*
- *Sorex tundrensis*
- *Castor canadensis*
- *Dicrostonyx torquatus*

Seeber *et al.* in prep

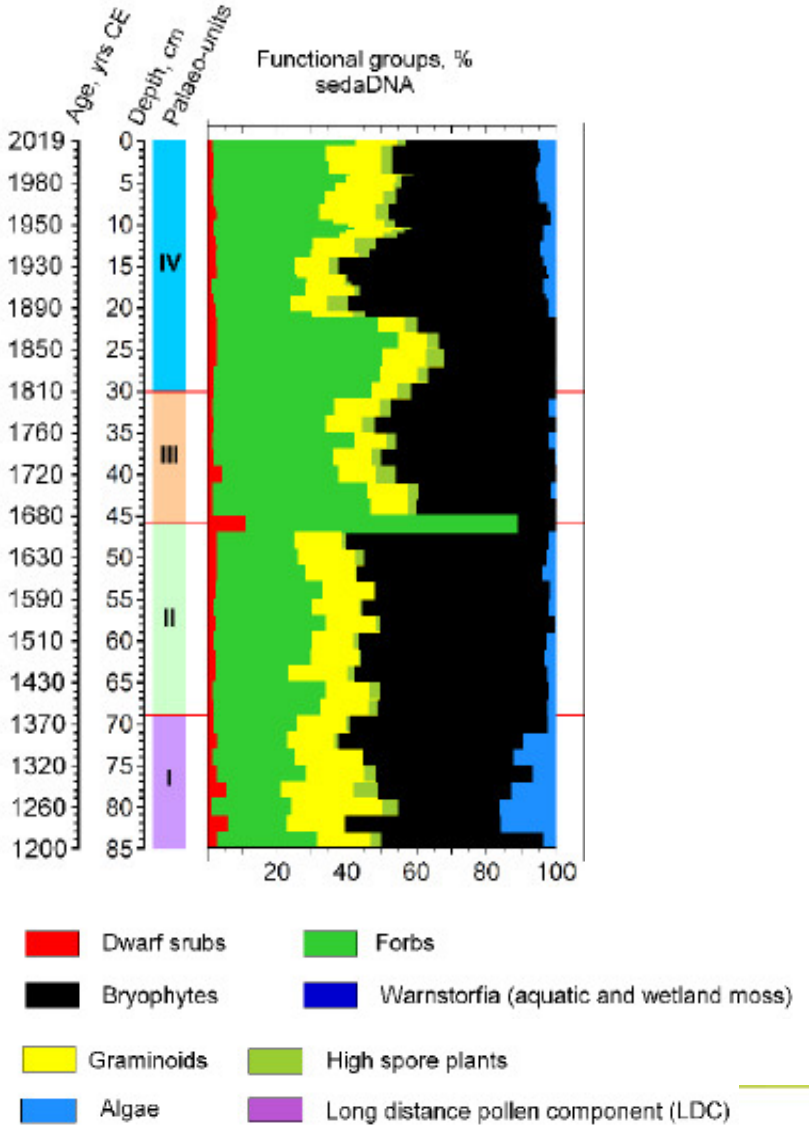
# WP1 – Millennia and centuries of change in vegetation and herbivory

## e.g. Lake Tendammen, Svalbard




| Tendammen | N017 | N018 | N019 | N020 | N021 | N022 | N023 | N024 |
|---|---|---|---|---|---|---|---|---|
| ***age*** | **30** | **72** | **132** | **212** | **302** | **392** | **512** | **652** |
| Bacteria | 0 | 0 | 0 | 137 | 9 | 129 | 0 | 50 |
| Callanthias japonicus | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Mammuthus | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Dicrostonyx torquatus | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Rattus | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 0 |
| Homo sapiens | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rangifer tarandus | 117 | 141 | 17 | 205 | 51 | 163 | 44 | 712 |
| Sus scrofa | 0 | 0 | 0 | 60 | 21 | 37 | 0 | 0 |
| Canis lupus familiaris | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 |
| Anser | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 |

Seeber *et al.* in prep




Poliakova *et al.* in prep

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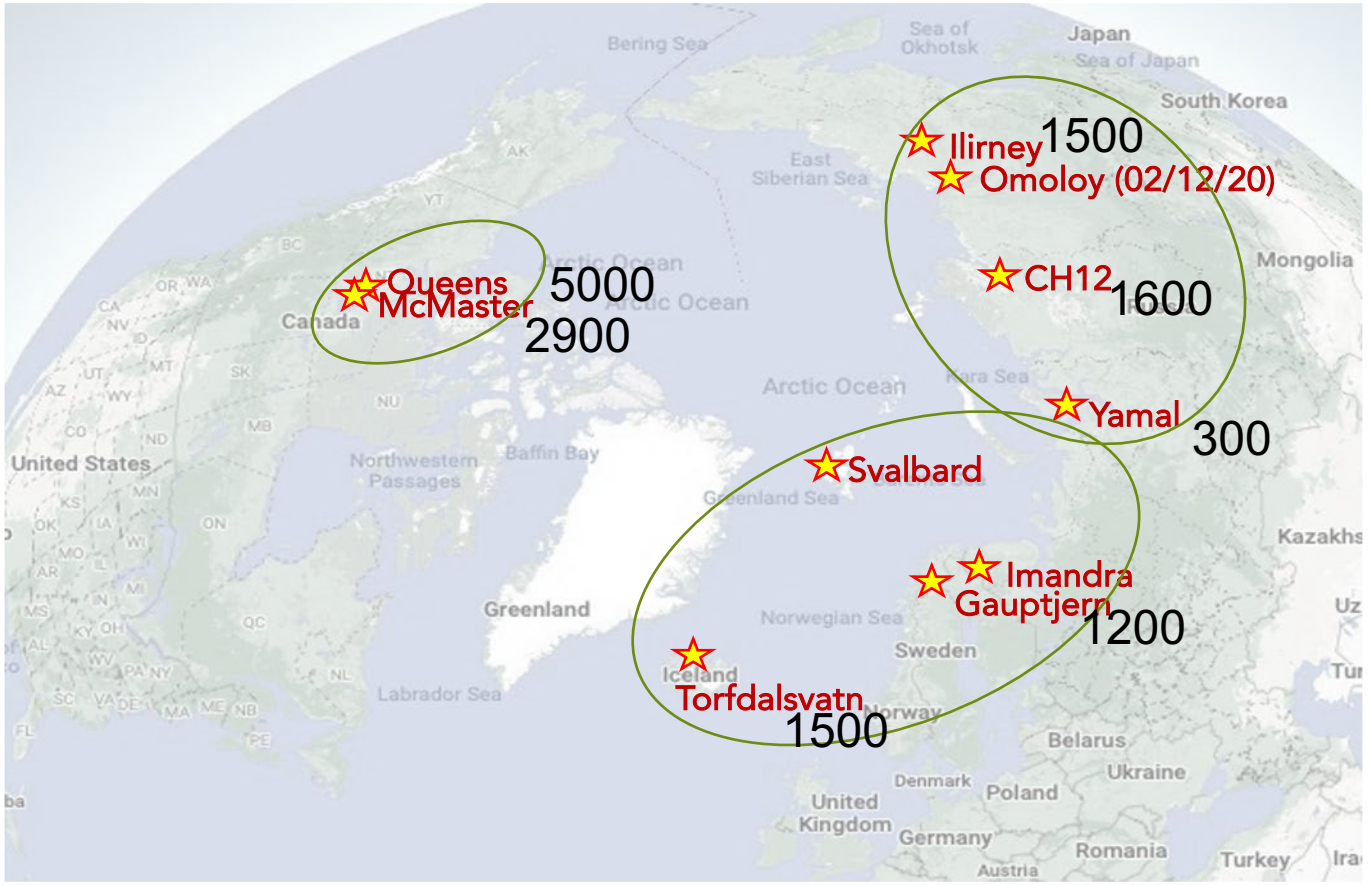
# WP1 – Millennia and centuries of change in vegetation and herbivory

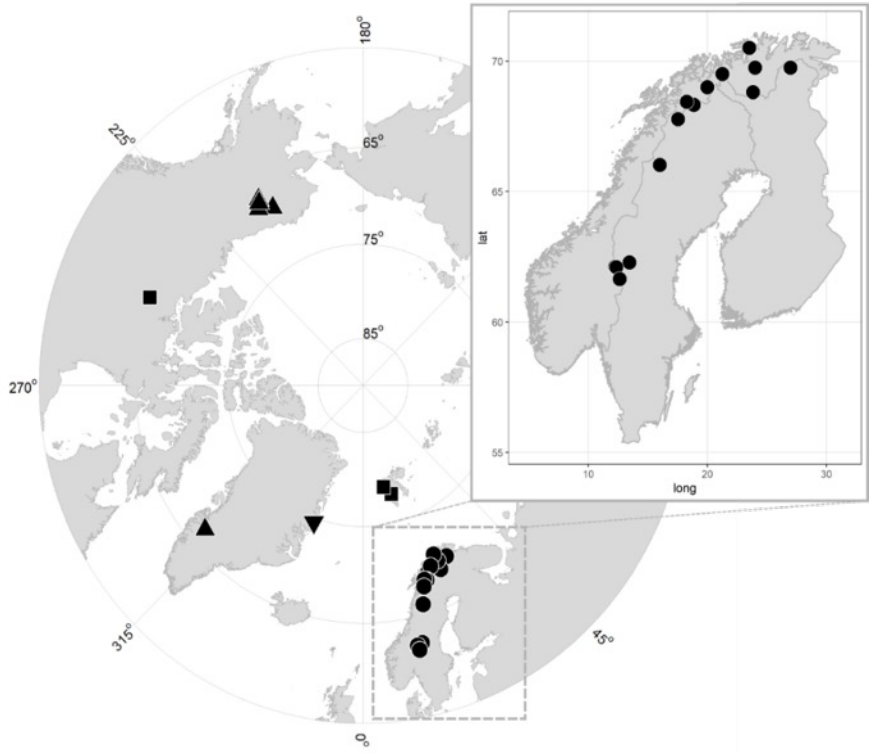
**Integrated results**

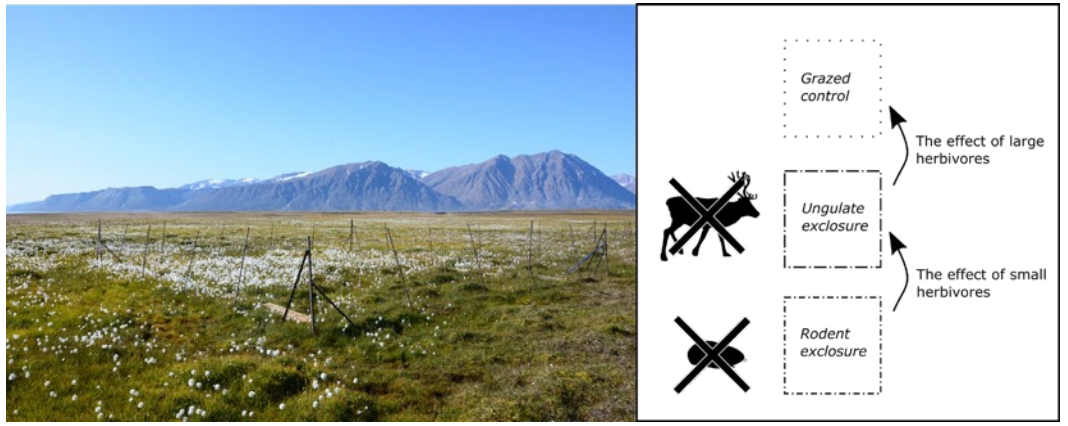
- Each region displayed unique historical trajectory of vegetation change
- No clear overall correlation with changes in reindeer DNA
- Contrast of sites with quite a lot of reindeer and sites with few / no reindeer
- Seems stable across past centuries – indication of long-term pastoral site fidelity and traditions?



# WP2 – Drivers of vegetation change

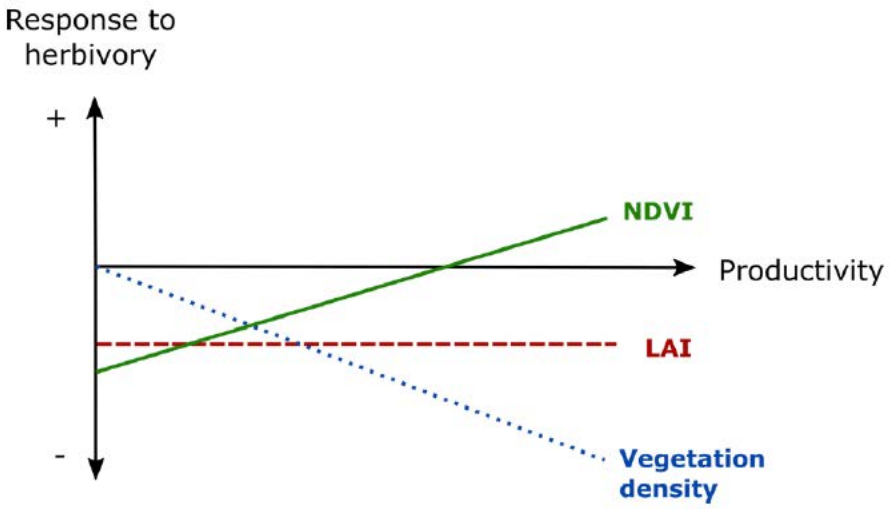
Investigations of exclosures to investigate the effect of grazing vs. non-grazing

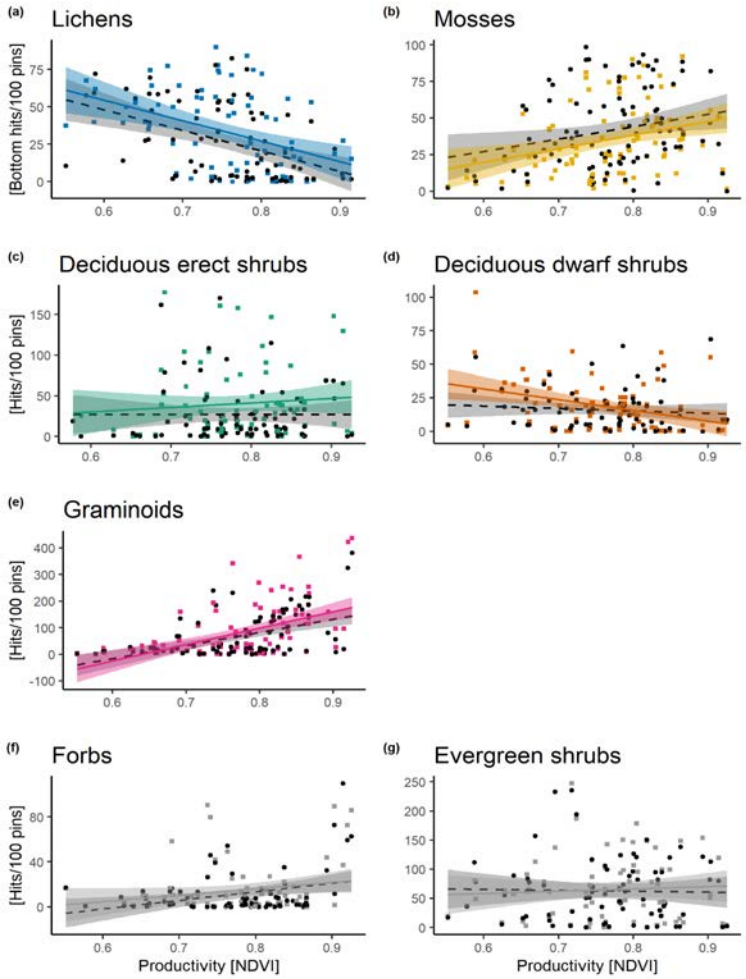


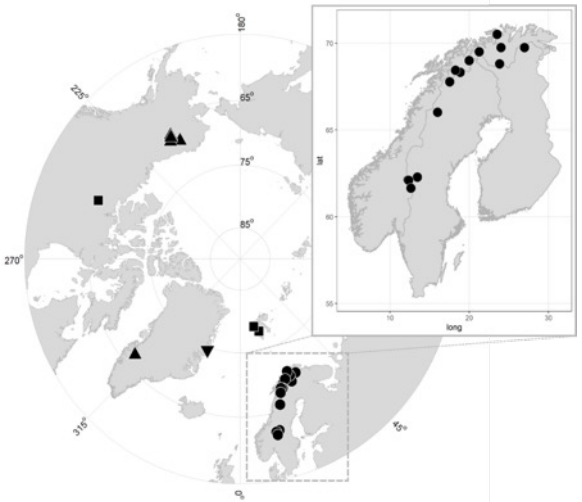




*Study locations across the Arctic tundra biome, a total of 28 locations and 95 long-term herbivore exclosures. Symbol shapes represent the type of large herbivores present at each location (circle = domesticated reindeer; square = wild caribou; down-facing triangle = muskoxen, up-facing triangle = wild caribou + muskoxen).*

# WP2 – Drivers of vegetation change



Productivity of the plots determines how they react to grazing:

- Strongest apparent reduction of NDVI (greenness) in low-productivity plots
- Strongest reduction of vegetation density in high productivity
- Reduction of leaf area index (LAI) independent of productivity

Different functional groups react differently, leading to vegetation change.

Linden *et al.* 2022

# WP3 – Cultural Embeddedness: Chronicle Indigenous and Local Knowledge

Field work in Siberia (2019 – 2022) and Fennoscandia (2021 – 2022)

Co-hosted an international networking workshop among different Arctic indigenous peoples, Nov. 2019 in Näkkälä and Rovaniemi, Finland.

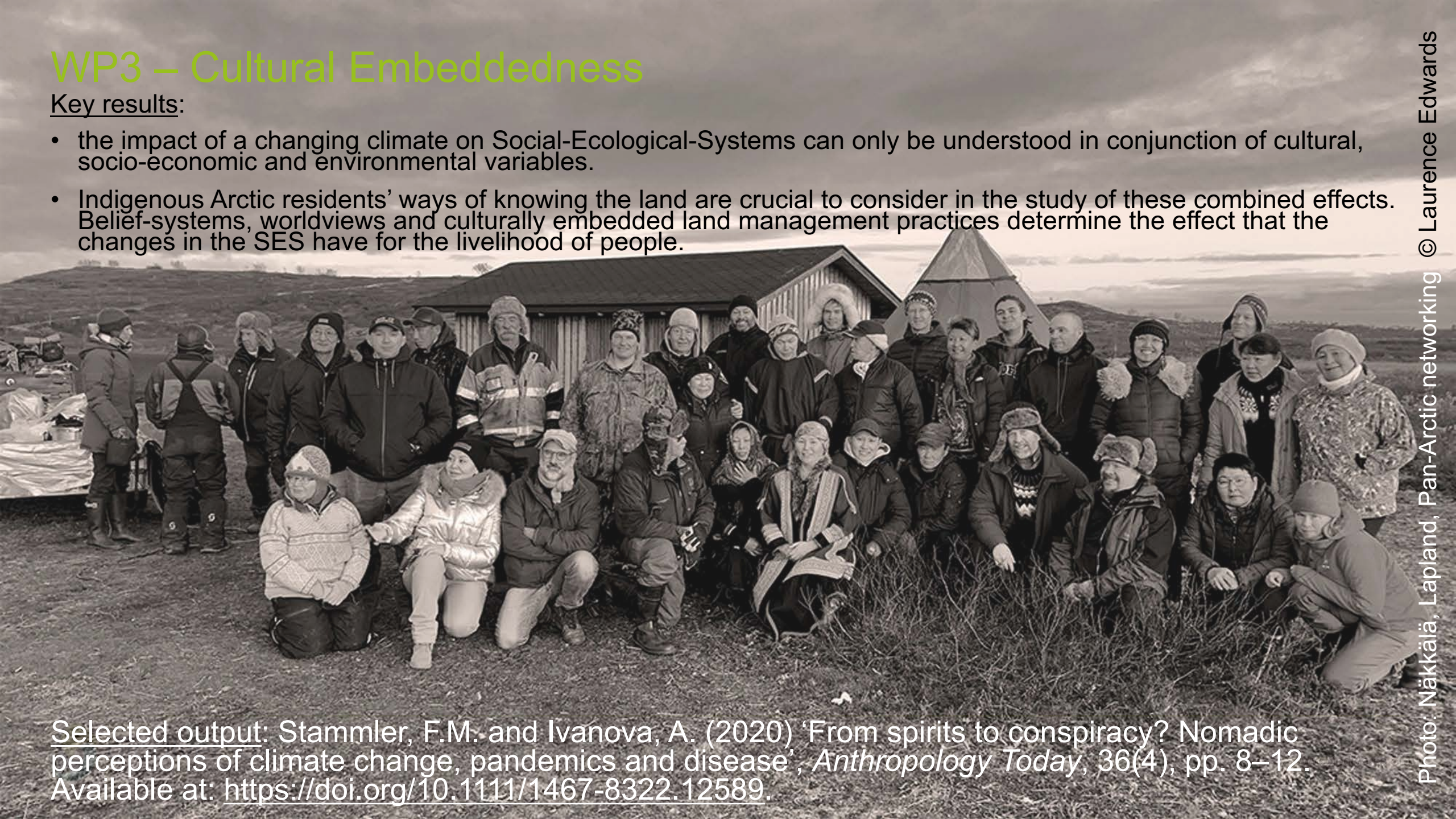
Set up of network of Arctic coastal residents from Alaska, Canada, Greenland, Europe and Siberia to facilitate sharing views, concerns and priorities in a changing Arctic climate and social environment. Network is active through social media (facebook, whatsapp).

Photo: Näkkälä, Lapland, Pan-Arctic networking © Laurence Edwards

# WP3 – Cultural Embeddedness

Key results:

- the impact of a changing climate on Social-Ecological-Systems can only be understood in conjunction of cultural, socio-economic and environmental variables.
- Indigenous Arctic residents' ways of knowing the land are crucial to consider in the study of these combined effects. Belief-systems, worldviews and culturally embedded land management practices determine the effect that the changes in the SES have for the livelihood of people.



Selected output: Stammler, F.M. and Ivanova, A. (2020) 'From spirits to conspiracy? Nomadic perceptions of climate change, pandemics and disease', *Anthropology Today*, 36(4), pp. 8–12. Available at: https://doi.org/10.1111/1467-8322.12589.

Photo: Näkkäläjä, Lapland, Pan-Arctic networking © Laurence Edwards

# WP4 – Current opportunities for scenario building?

The integration of Indigenous people and local communities (IPLC) and their knowledge can improve the quality of future scenarios, and empower IPLCs by maximizing the visibility.

But various limitations have been identified since the 1990s, e.g. in the field of nature conservation (institutionalization, compartmentalization of knowledge systems and unbalanced power relationships).

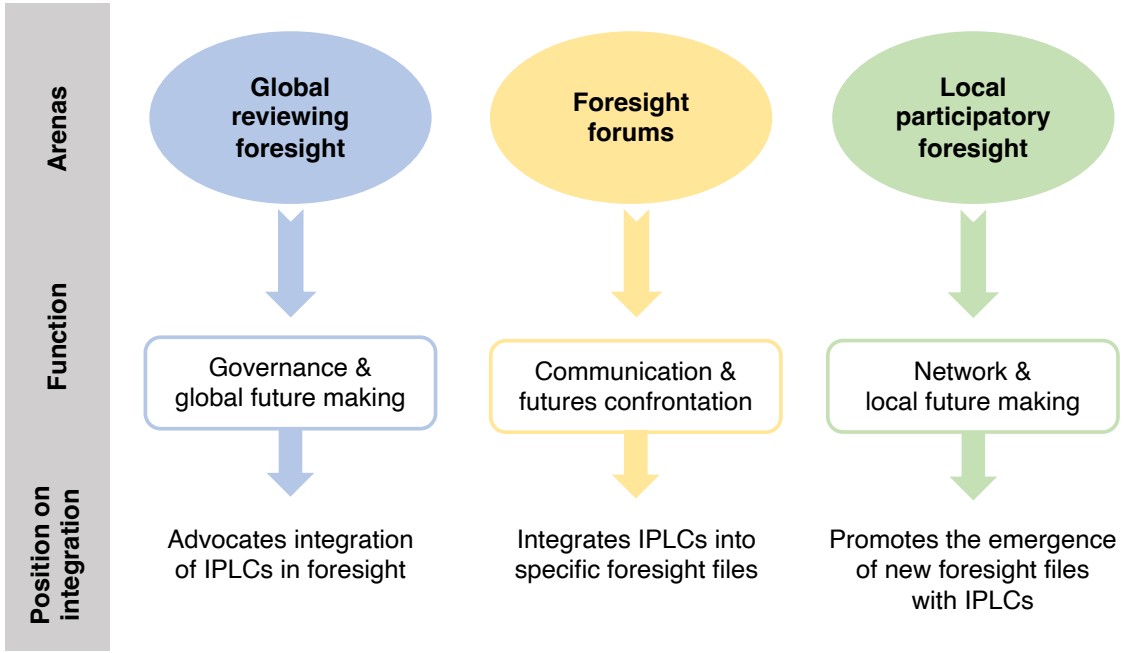
Our overall objective was to understand how ILK integration occurs in the manufacture of the futures and what was IPLCs' agency in this process.

We investigated the manufacture of futures (Lumbroso 2019) in three different arenas:

- the global reviewing foresight arena (European Commission, IPBES, IPCC, Arctic Council)
- the foresight forums (11 international conferences)
- the local participatory arena (4 case studies – analysis of published material)

Maraud S. & Roturier S. Producing futures for the Arctic. What agency for Indigenous communities in foresight arenas. *Futures* (in review)

# WP4 – Current opportunities for scenario building?




We **identify two strategies for IPLC** to take part in the manufacture of the futures:

- ***the battle of the futures***: the competition between different visions and values
- ***the decolonization of futures***: the future has become a new space to colonize, politicizing the functioning and ontologies/worldviews mobilized in the arenas is critical to ensure a real diversity of visions and potential futures

IPLC are integrated as legitimate stakeholders in all arenas, but under specific pre-defined priorities: economical development, international collaborations, climate change

Maraud S. & Roturier S. (in review)

# Policy and societal impacts / results

Within the course of the project, we

- Designed, evaluated & optimised tools and approaches (ancient eDNA, remote sensing)
- Generated and analysed circumarctic datasets to understand contemporary and past vegetation, herbivores and herding
- Developed hypotheses on drivers of circumarctic vegetation change and local specificies possibly linked to historical continuities in human herding practices
- Chronicled ILK and understood the importance of belief-systems, worldviews and culturally embedded land management practices for changes in Socio-Economical Systems
- Investigated how indigenous people and local communities (IPLC) are integrated into the manufacture of the futures and identified potential strategies for participation.

Policy impacts are not immediate, but can be carved out from here.

# Acknowledgements

This research was funded through the 2017-2018 Belmont Forum and BiodivERsA joint call for research proposals, under the BiodivScen ERA-Net COFUND programme, and with the funding organisations DFG, NFR, ANR, Formas, NSERC/CRSNG, NSF and the Academy of Finland.







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BELMONT FORUM

# Session 2

# Harnessing the full potential of early-warning systems and predictive scenarios builds on innovative approaches to biodiversity monitoring

**16:40 – 18:00 –** *Sheila JJ Heymans, Executive Director, European Marine Board, Belgium and Professor in Ecosystem modelling, University of the Highlands and Islands, Scotland*

# Presentation of the projects' results

- **GLOBAM –** ***Silke Bauer***

*Identifying the response of migrants to climatic and land-use changes is fundamental for efficient conservation and mitigation of human-wildlife conflicts.*

- **BONDS –** ***Marie-Paule Bonnet***

*Earth observation for the identification and monitoring of habitats in need of special protection in the lowland Amazonian floodplains*

- **REEF-FUTURES –** ***David Mouillot***

*Network of early detection systems for deep ocean to monitor changes in environmental stressors that are relevant for biodiversity*

- **ACCESS –** ***Janne E. Søreide***

*Mapping the coastline and initiate a monitoring and protection plan for coastal environments under warming that is creating a huge potential for increased colonization by boreal species, with potential negative impacts on "native" species assemblages and food webs*

- **ARCTIC BIODIVER –** ***Willem Goedkoop***

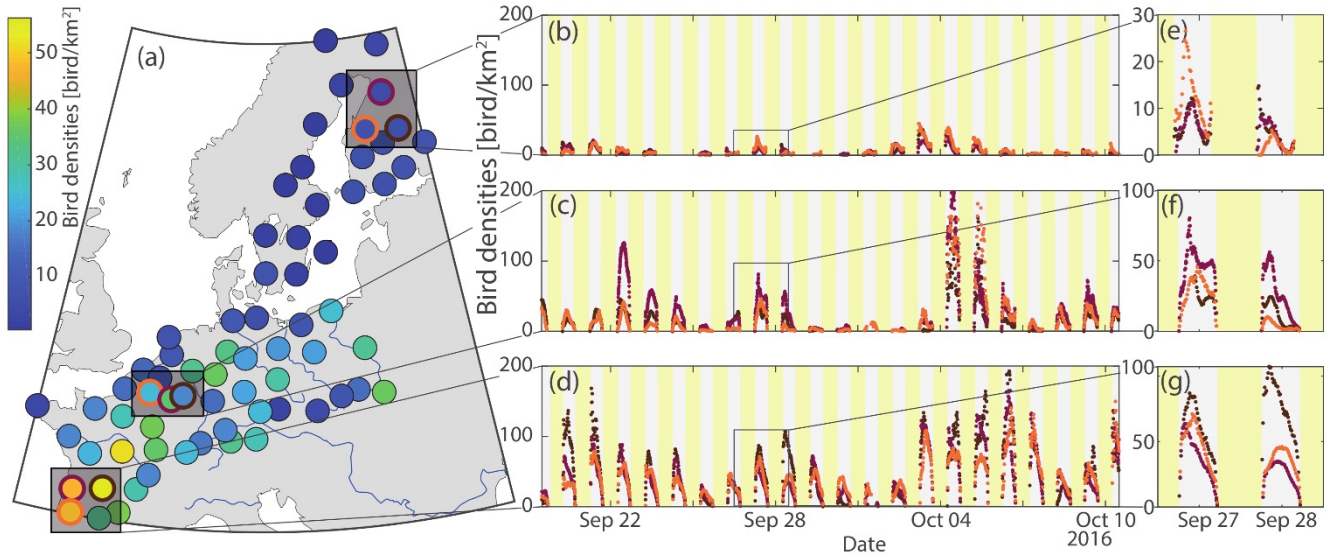
*Focus on intensified, coordinated monitoring of Arctic rivers and lakes*

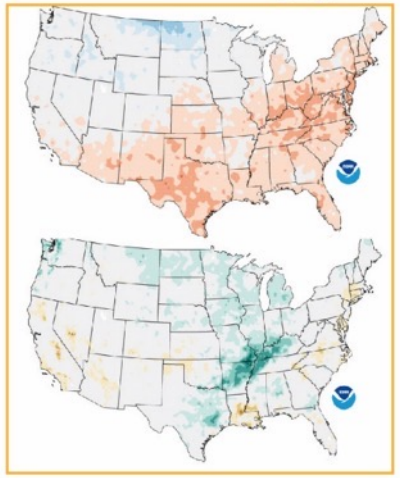
# Towards monitoring, understanding and forecasting global biomass flows of aerial migrants

Silke Bauer – coordinator & partner 1

# Scientific aims

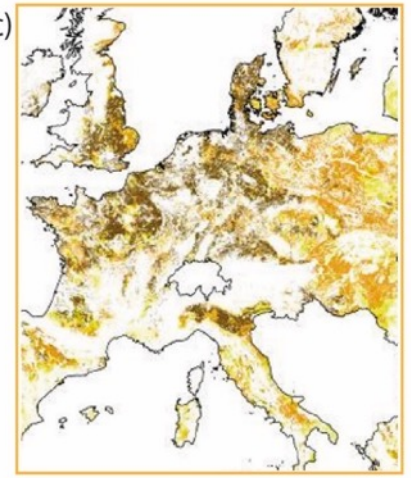
- Magnitude, spatial extent and timing of aerial migrations in Europe and North America from weather radar networks
- Link to environmental and socio-economic variables



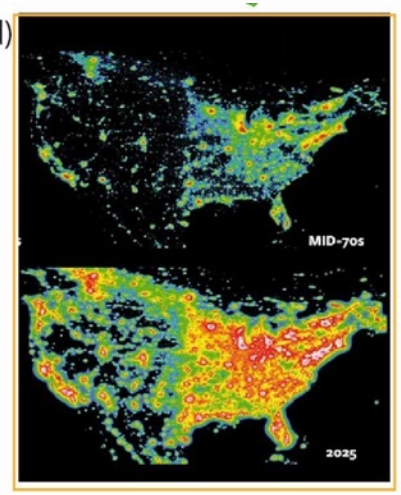
Climate and weather

c)



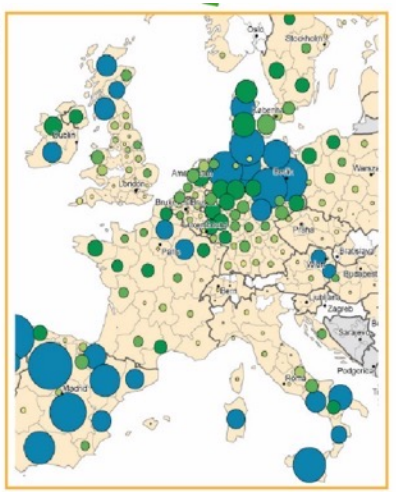
Habitat characteristics/ land use

d)




Artificial light

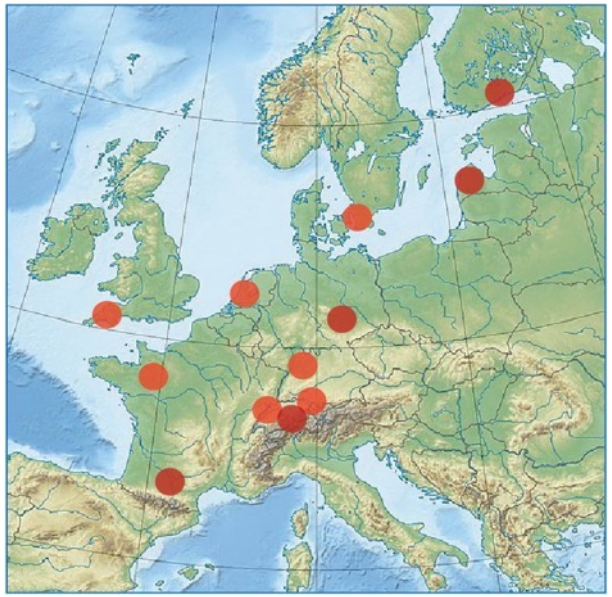
e)



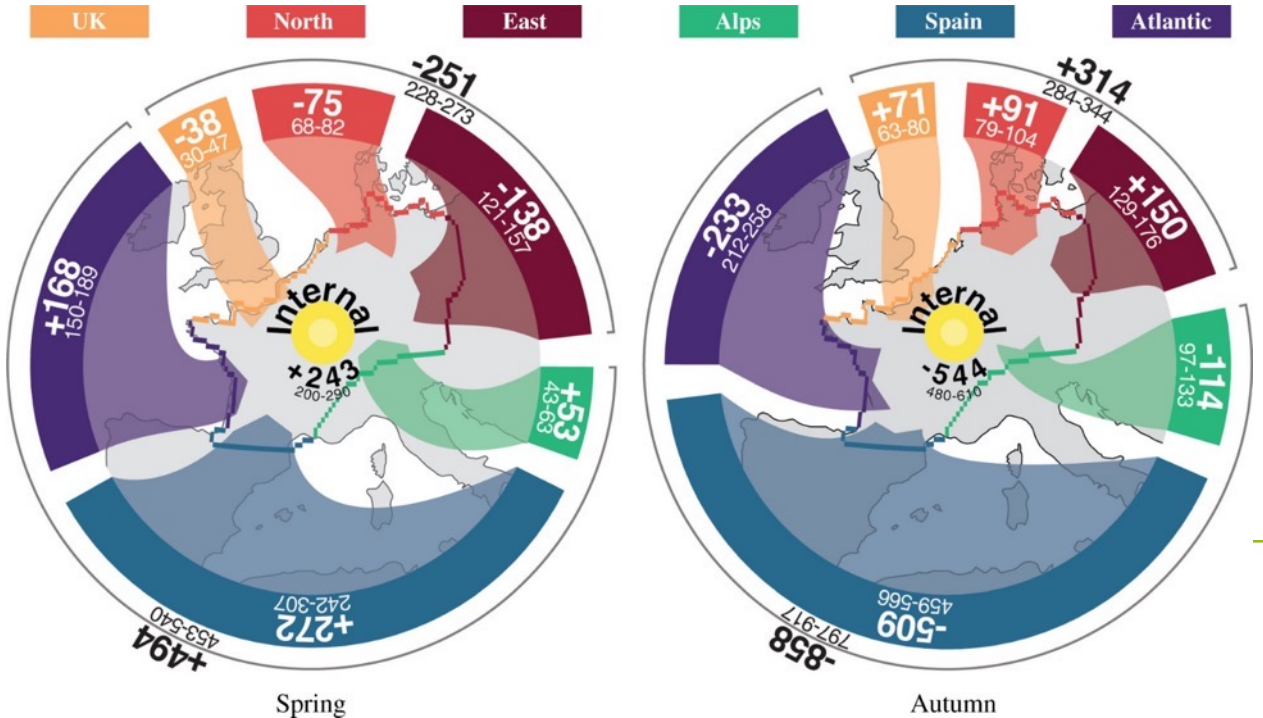
Wind energy installations

# Exemplary scientific results

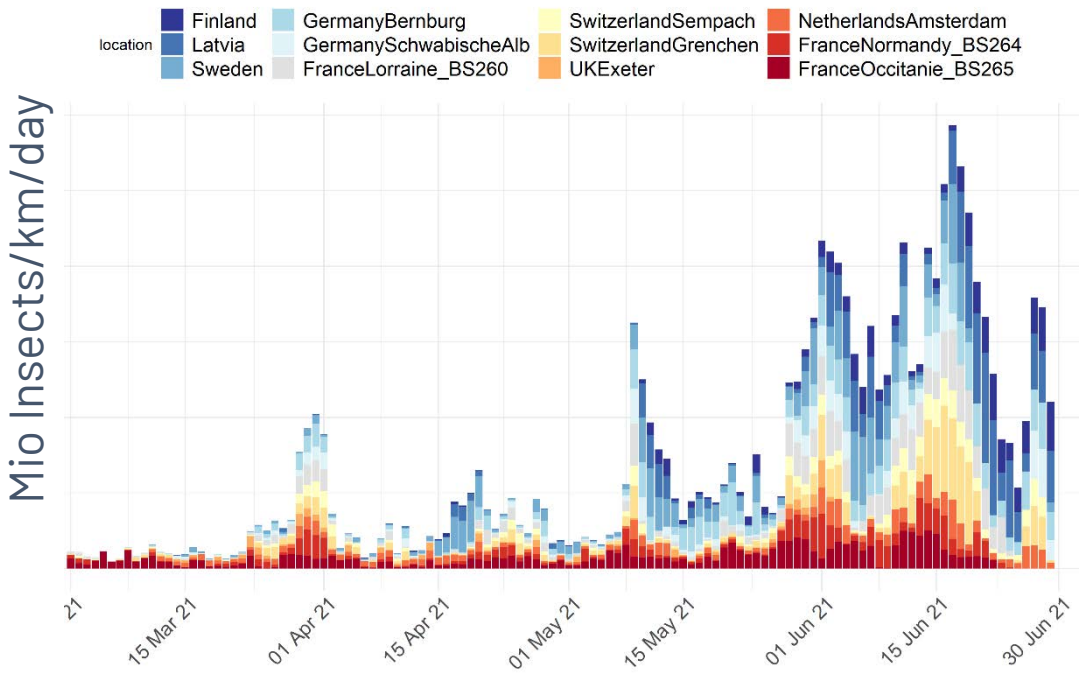
- Nr birds in the air throughout year - quantification of take-off, flight and landing, migration waves
- Seasonal inflow and outflow



## Bird numbers & migrations

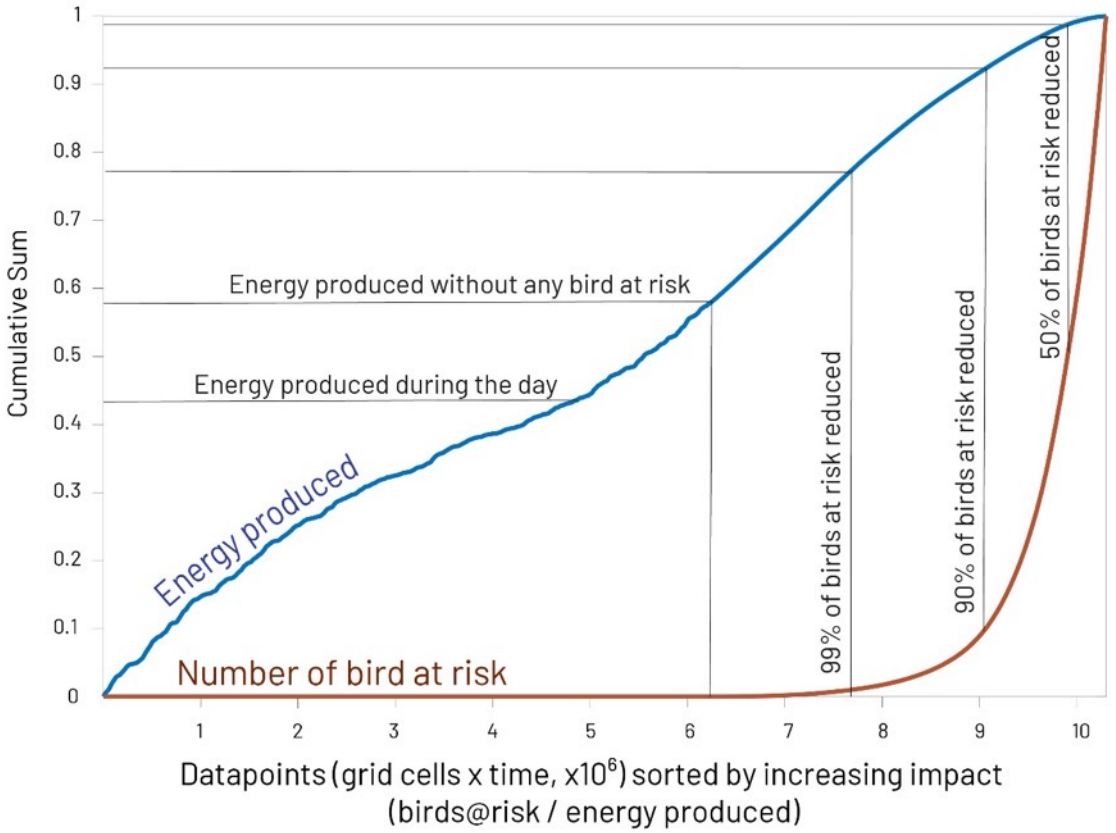


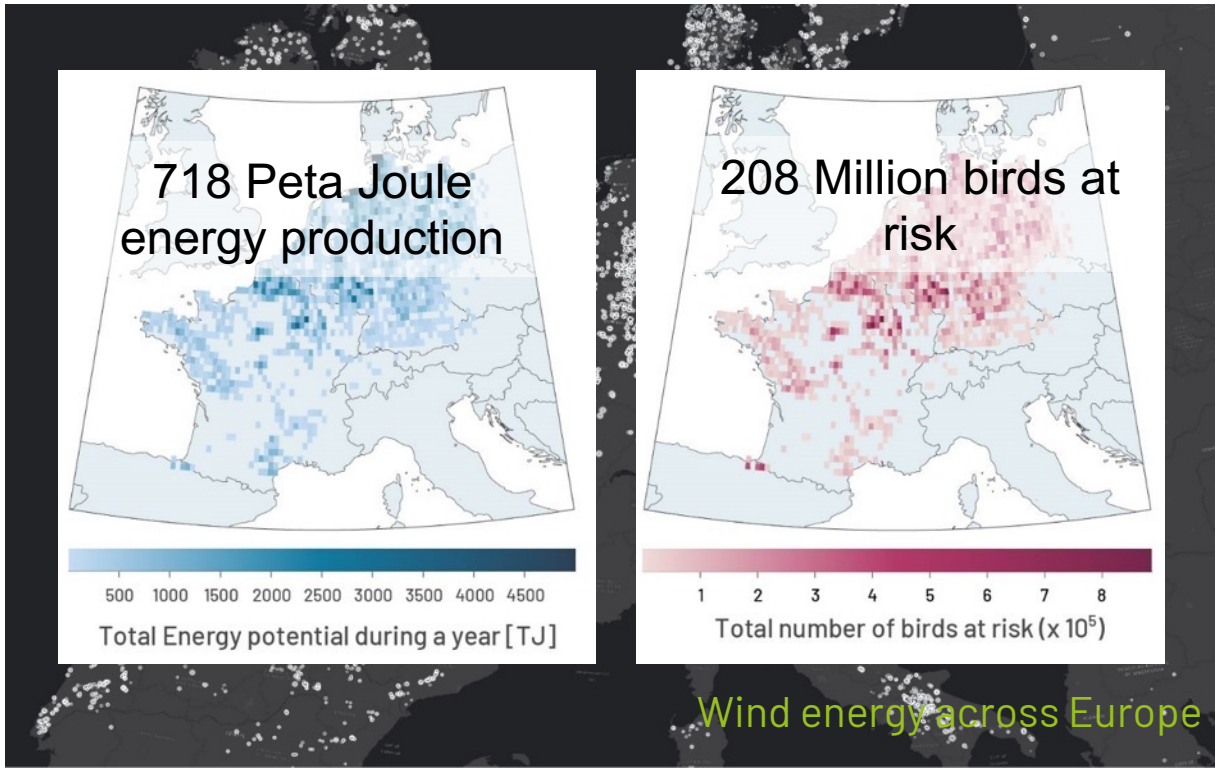

## Insect numbers & migrations



# Exemplary scientific results

- Number of birds at risk of colliding with wind energy installations
- Costs and benefits of curtailment




## Curtailment options

90% birds ‘saved’ by sacrificing
<10% of energy production

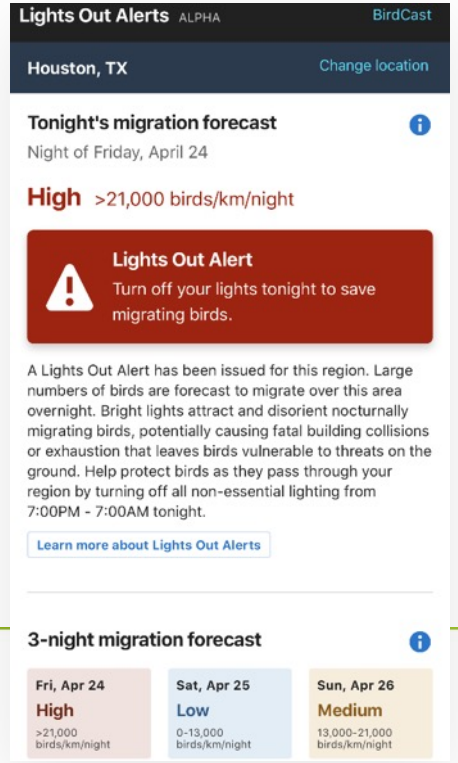
# Policy and societal impacts / results

- Open source analysis tools for weather radar data
- Interactive (live) visualizations
- „Lights out“ – campaigns & migration alerts
- Wind energy curtailment


OPINION

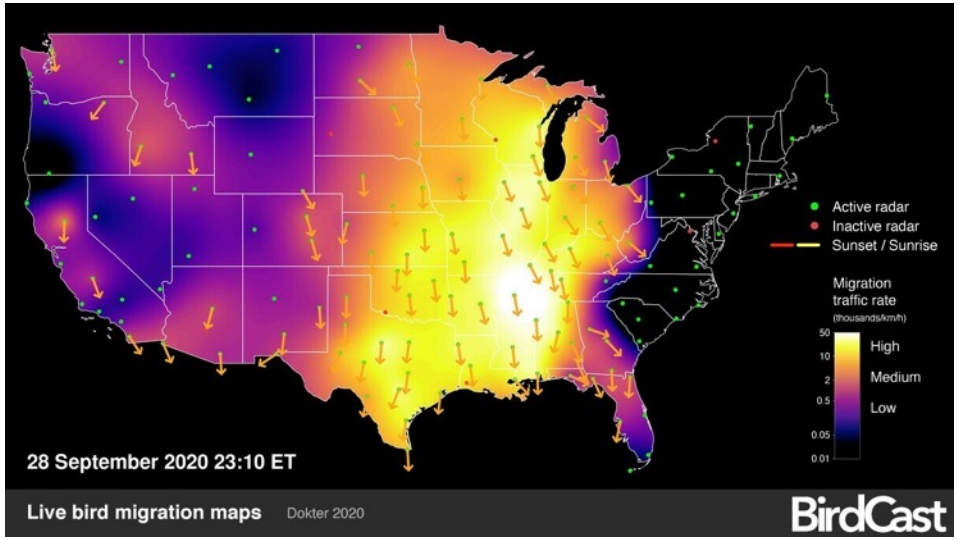
**Laura Bush: Texans, turn out the lights at night to help migratory birds**

It's easy for every Texan to help ensure birds migrate safely.



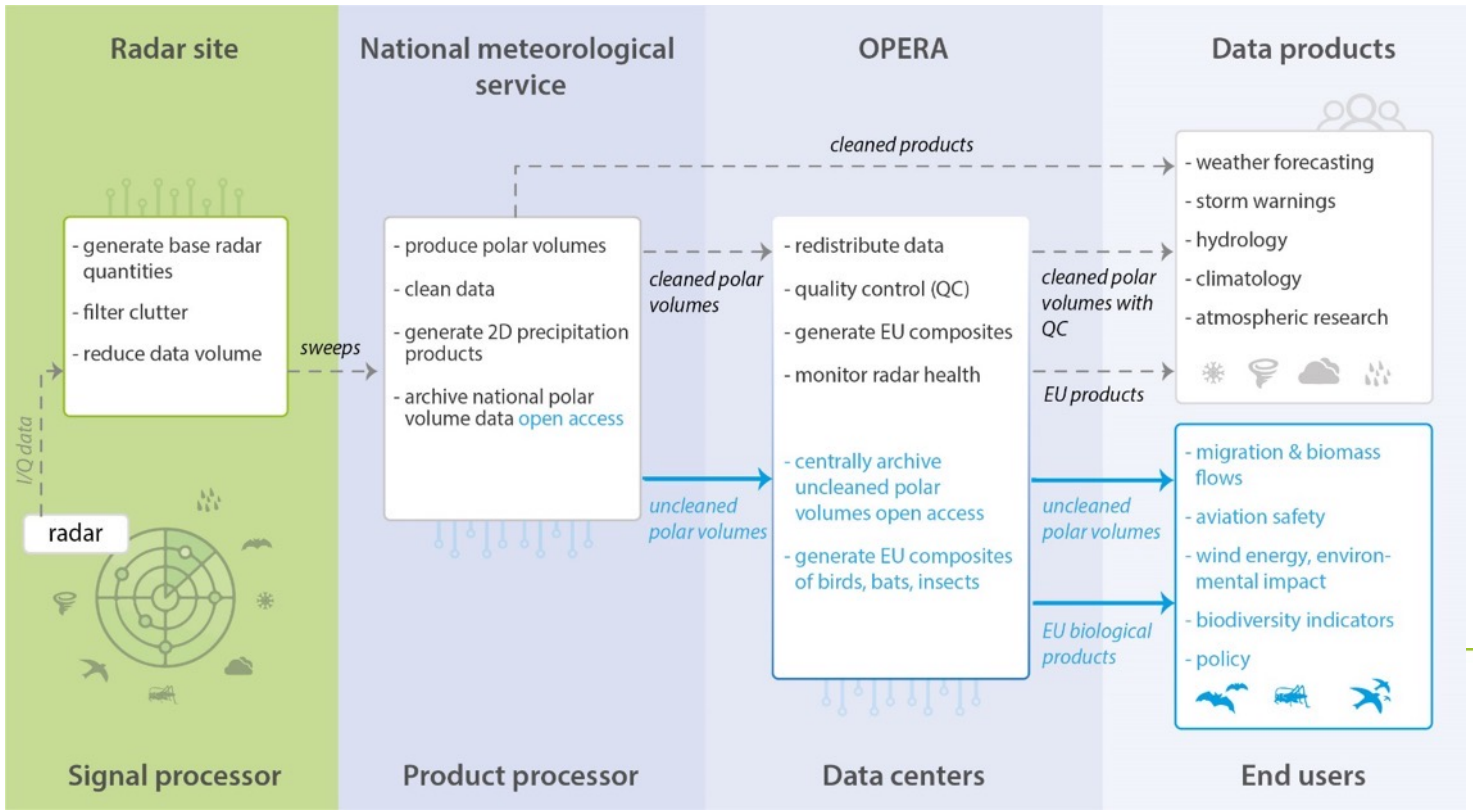

**CROW: A new tool to watch bird migration in real time**

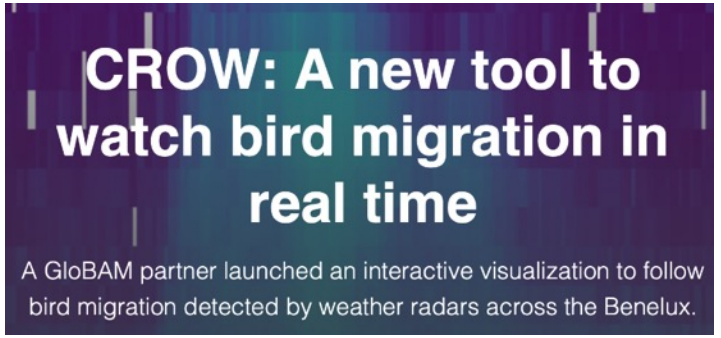
A GloBAM partner launched an interactive visualization to follow bird migration detected by weather radars across the Benelux.

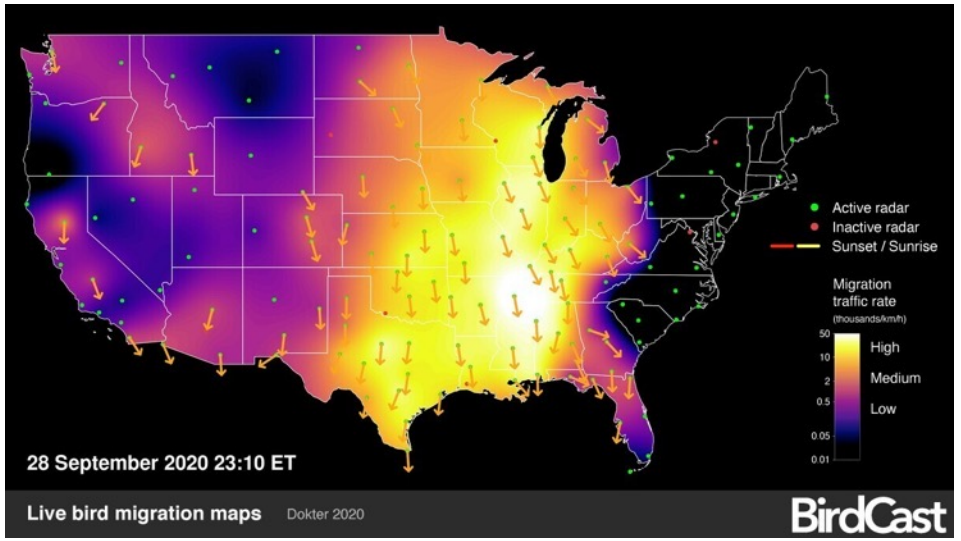


# Policy and societal impacts / results

- Open source analysis tools for weather radar data
- Interactive (live) visualizations
- „Lights out“ – campaigns & migration alerts
- Wind energy curtailment
- Meteorological data policies




Weather radars as standardized long-term, large-scale biodiversity monitoring system

# Acknowledgements

This research was funded through the 2017-2018 **Belmont Forum** and **BiodivERsA** joint call for research proposals, under the BiodivScen ERA-Net COFUND programme, and with the funding organisations **Swiss National Science Foundation** (SNF 31BD30_184120), **Belgian Federal Science Policy Office** (belspo BR/185/A1/globam-be), **Netherlands Organisation for Scientific Research** (NWO E10008), **Academy of Finland** (aka 326315) and **National Science Foundation** (NSF 1927743).

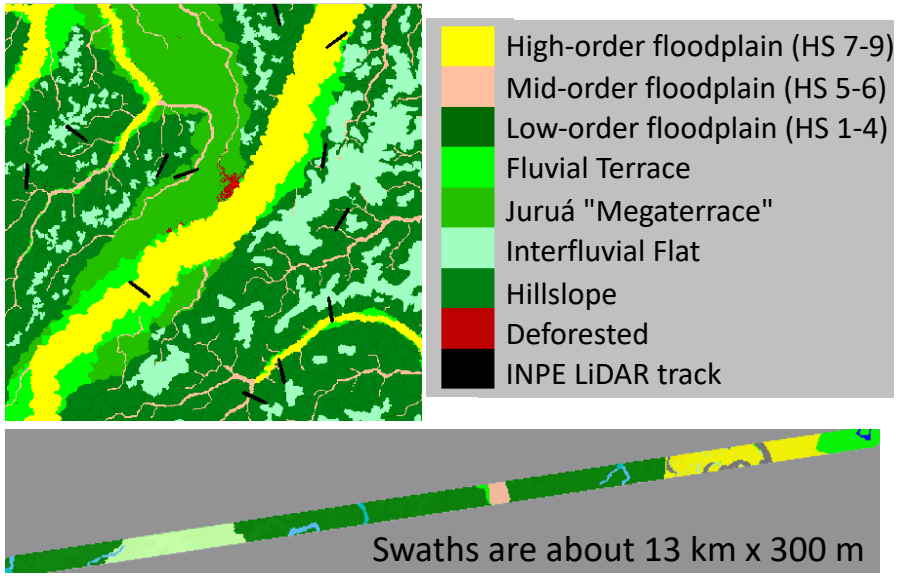
## Thank you!

# Balancing biOdiversity conservatioN with Development in Amazon wetlandS (BONDS)
# Focus on *Earth observation in BONDS*

Marie-Paule Bonnet (IRD)

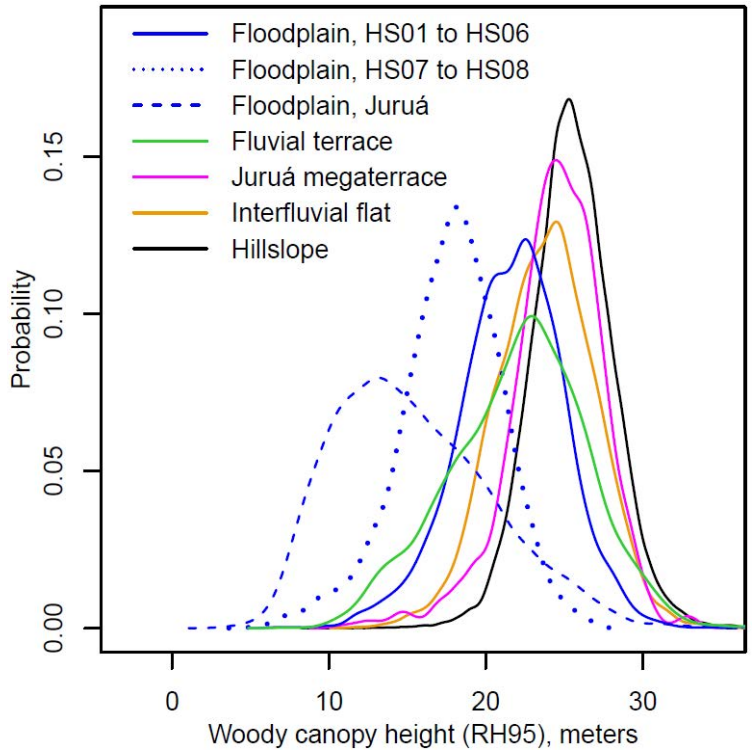
# Forest structure from Airborne Lidar analysis

12 airborne LiDAR (ALS) tracks acquired by INPE over the mid-Juruá region have been classified by terrain type to assess effect of geomorphologic variability on tree canopy height



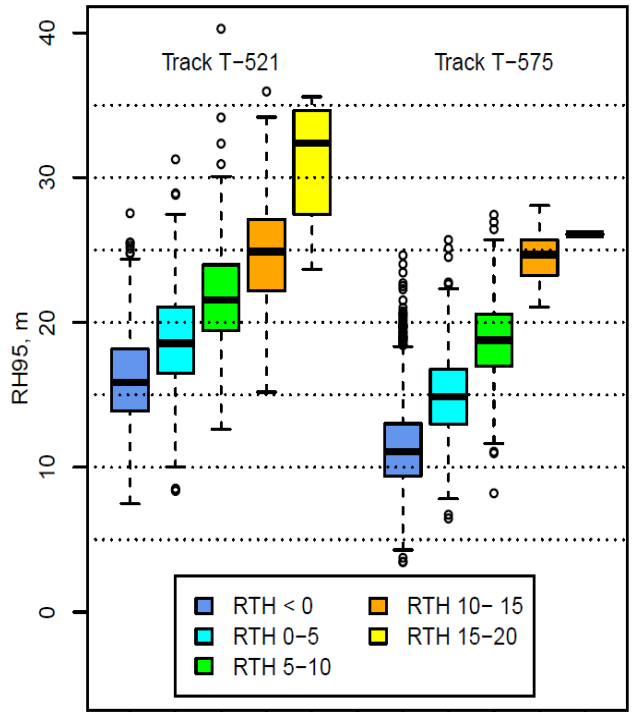

The 12 LiDAR track point clouds were processed into 1m Canopy Height Models and Digital Terrain Models. They were classified into terrain units and land cover classes at 1 m resolution.

**Canopy height for 8 terrain types**




**The tallest forest is on hillslopes, and the shortest is on the flood-plains of high-order rivers. We believe this is the most spatially extensive data set available for comparing Amazon wetland and upland forest heights.**

**Canopy Height vs. Relative Terrain Height, Juruá Floodplain**




**Canopy height increases monotonically with RTH (relative terrain height). LiDAR results extend sparse field observations that floodplain forests on levees and scroll ridges are taller than those on flats and swales.**

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# Forest structure from Airborne Lidar analysis

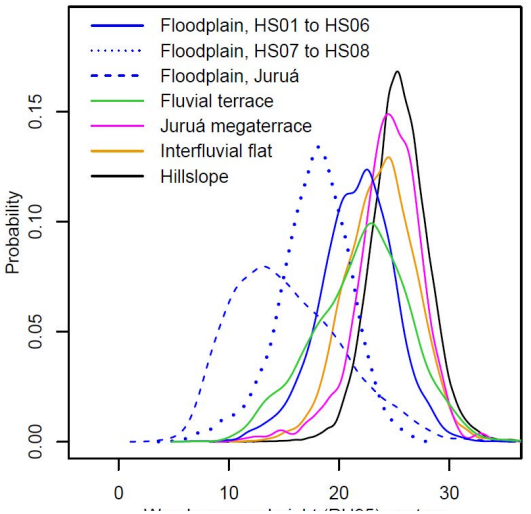
- ✓ **Hydrogeomorphic diversity** ( topography/geomorphology/ terrain type/stream order) has an important influence on forest structure. Differences in **forest structure** are linked to successional stage, water and soil chemistry, inundation period, and soil moisture regime, which have been shown to impact **biodiversity**

- ✓ Previous traditional **plot-based measurements** of Amazon forest structure and floristics **have largely failed to capture the full range of terrain type diversity**. Our studies have shown the utility of airborne and spaceborne LiDARs for forest structure mapping at landscape scale and should guide **sampling strategies** for future measurements of **Amazon forest biodiversity.**

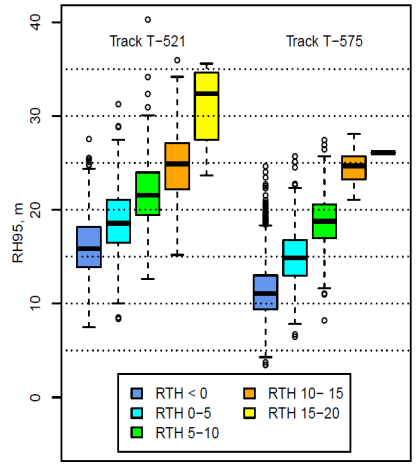
The airborne LiDAR results were presented at SBSR 2023, a manuscript is in progress for submission to *Forest Ecology and Management*

**VARIABILITY OF FOREST STRUCTURE AS A FUNCTION OF TERRAIN TYPE FOR UPLAND AND FLOODPLAIN FORESTS OF THE MID-JURUÁ REGION: RESULTS FROM AIRBORNE LIDAR**

*Laura L. Hess[1], Mikhail Urbazaev[2,5], Laurent Durieux[3], Luciane Yumie Sato[4], Jean Pierre Ometto[4], and Christiane Schmullius[5]*



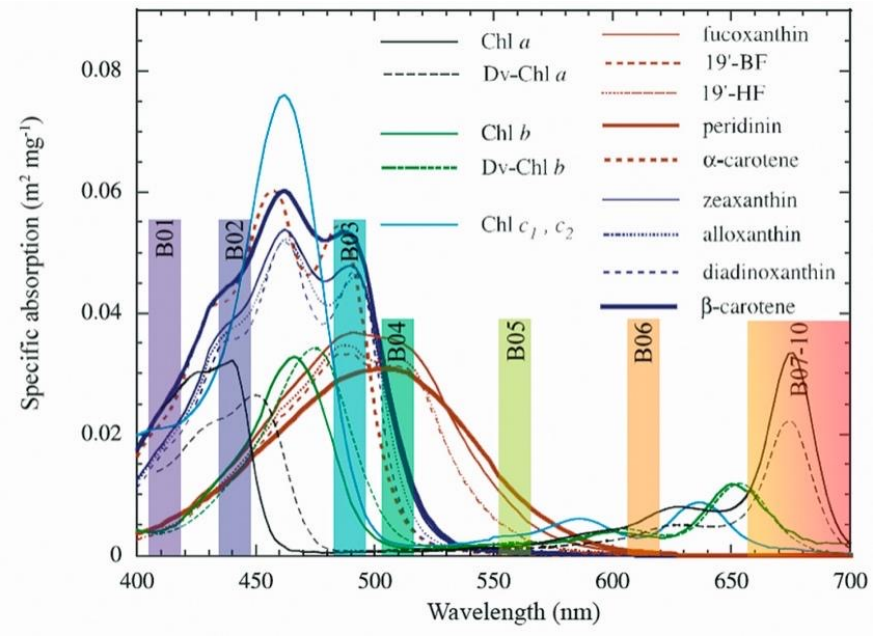

**Canopy height for 8 terrain types**




**Canopy Height vs. Relative Terrain Height, Juruá Floodplain**

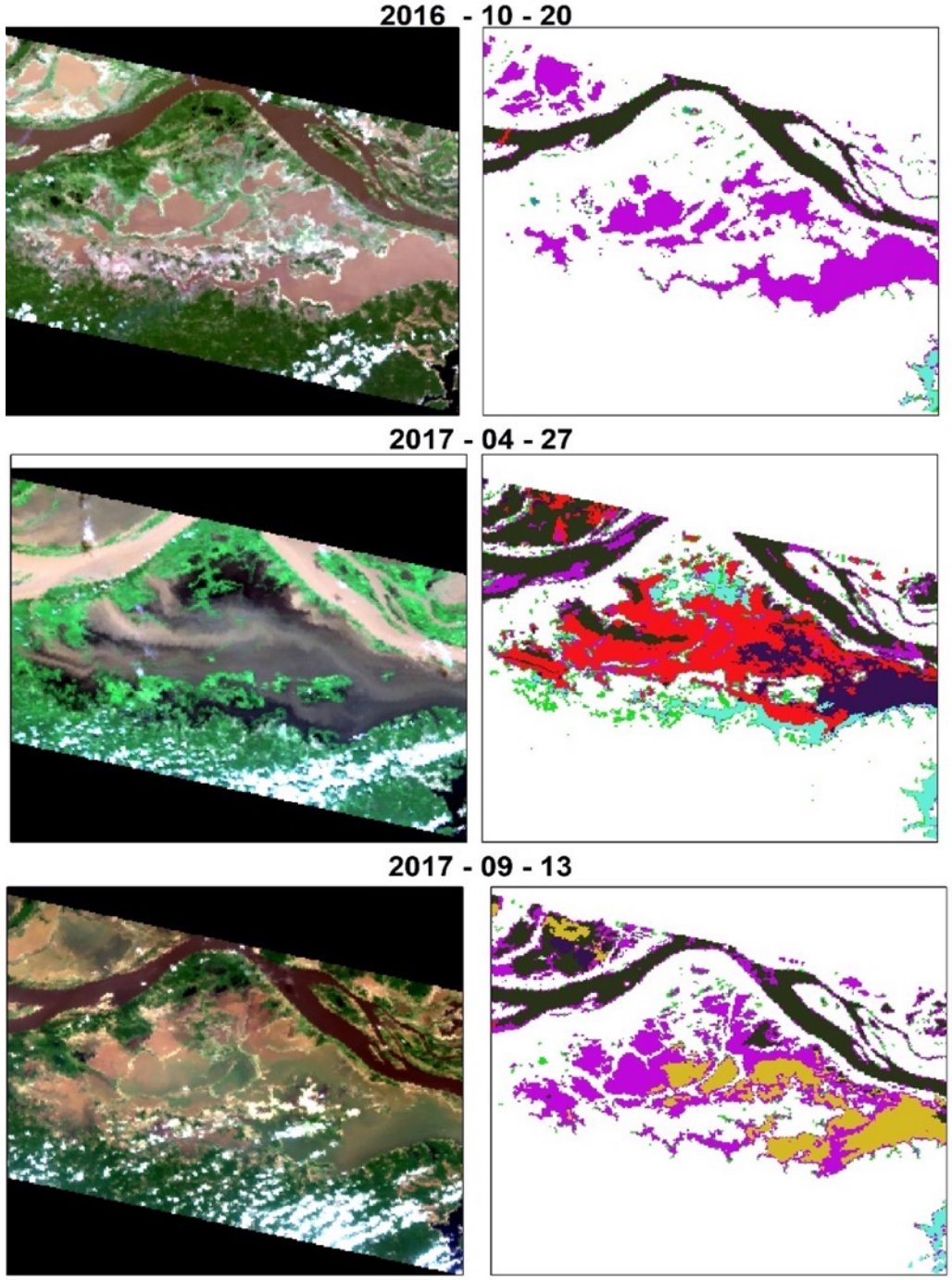
# Toward phytoplankton biodiversity maping from space

By relating the light absorption data in different spectra with the phytoplankton community composition would it be possible to create a remotely sensed biodiversity indicator ?




Sentinel 3/OCLI bands and pigments absorption spectra

- ✓ Phytoplankton genera are linked to the vertical light adsorbtion deduced from in situ radiometric data (Maciel *et al*., IPRS, 2020) and computed for Sentinel 3/ OCLI bands (Kraus *et al*., RS, 2021)
  - ✓ *Cyanobacteria are more related to higher Kd values. They use pigments, which maximize light absorption in the 550 to 600 nm wavelengths. Diatoms are related to lower Kd values in the blue-green bands. They have c-chlorophylls and carotenoids that maximize light absorption at 410-550 nm*



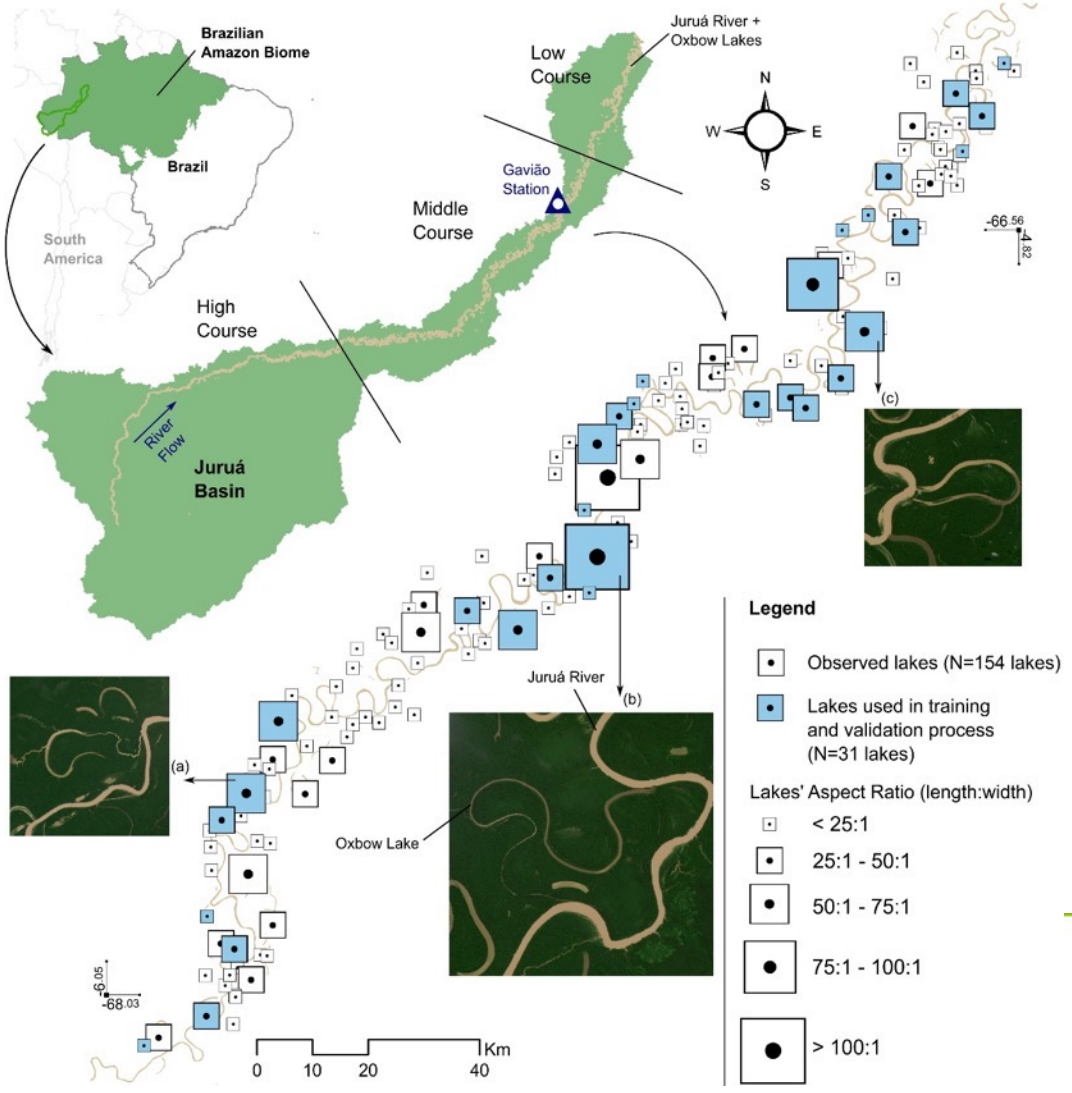

- ✓ Phytoplankton genera are linked to the vertical light adsorbtion coefficient (Kd) deduced from in situ radiometric data (Maciel *et al*., IPRS, 2020) and computed for Sentinel 3/ OCLI bands (Kraus *et al*., RS, 2021)
  - *Cyanobacteria are more related to higher Kd values. They use pigments, which maximize light absorption in the 550 to 600 nm wavelengths. Diatoms are related to lower Kd values in the blue-green bands. They have c-chlorophylls and carotenoids that maximize light absorption at 410-550 nm*

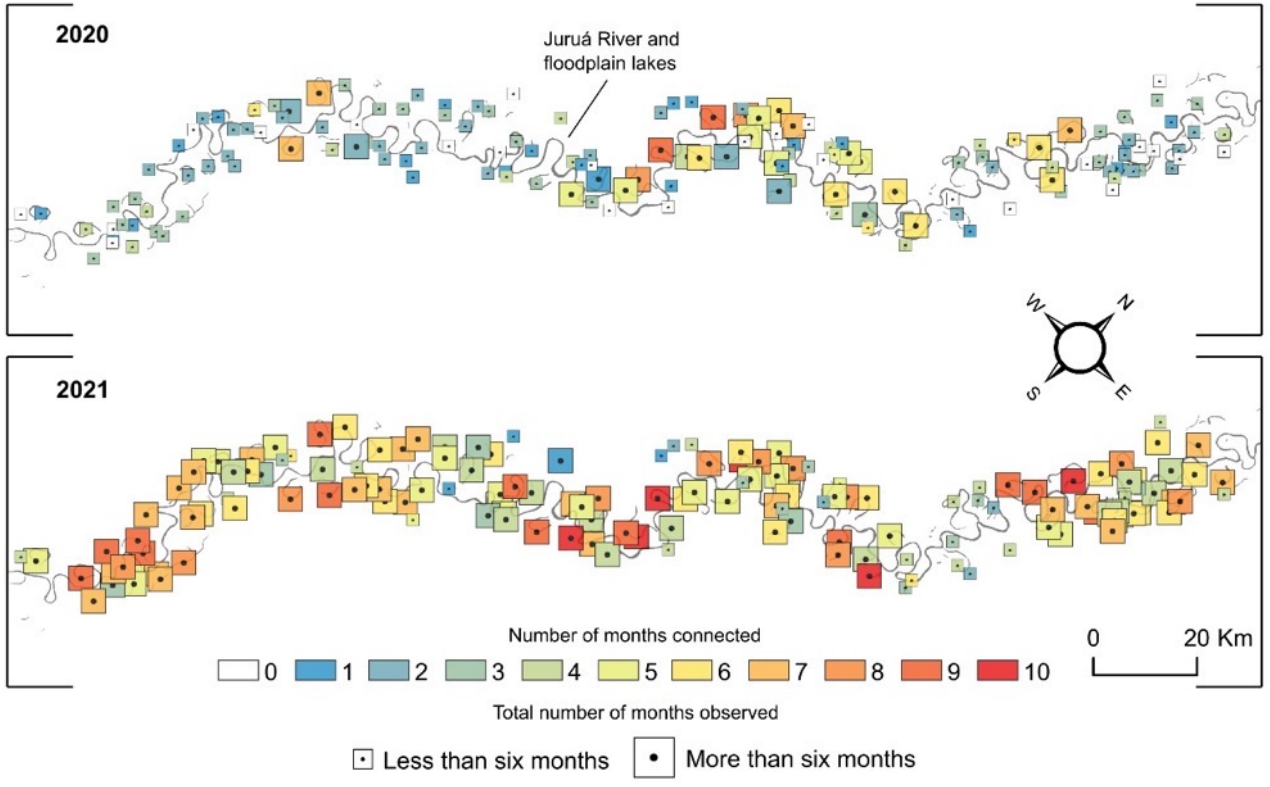
- ✓ Phytoplankton genera can be grouped according to Kd and water optical types (OWT) (Silva et al, 2021) for Amazonian water
  - *A multiple regression tree evidenced 5 groups based on phytoplankton genera mean abundance ("specificity") and frequency of occurrence ("fidelity"); Phytoplankton genera that are both abundant and occur in most of the same OWT, belong to the same MRT group (Kraus et al, SBSR,2023)*

# Surface hydrological connectivity and fisheries

Does water color permits to estimate the surface connectivity between water bodies ?

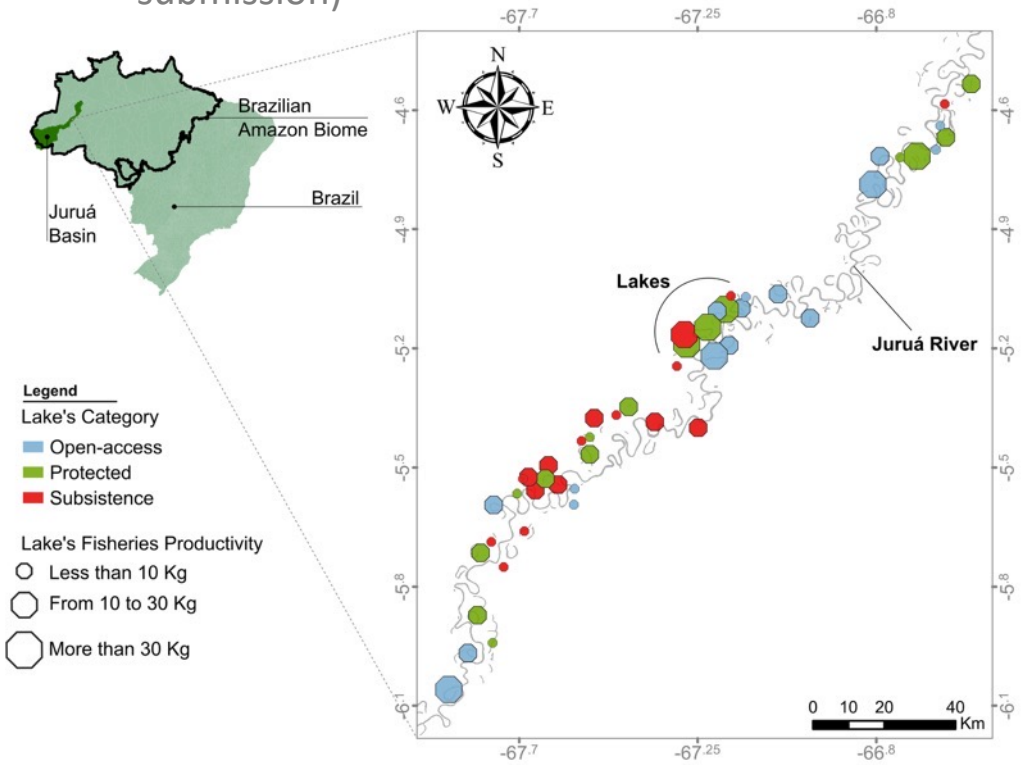
Spectral characteristics extracted from 3-m PlanetScope SuperDove imagery indicated when lakes were 'connected' or 'disconnected' from other water bodies as river water levels rose and lowered seasonally. The ML algorithm was assessed using field data (Paulino *et al.*, JOH, in revision)



# Surface hydrological connectivity and fisheries

- ✓ Effectiveness of "lake management", whereby fishers identify lakes for different types of use (three categories: protected lakes, subsistence lakes and open access lakes):
  - protected lakes provide greater catch and revenue for fishers, and these rules increase fish catch more than protected areas (Silva et al, Nat&Soc in submission)




How surface hydrological connectivity affects fish catch ?

- ✓ Connectivity is positively related to fish catch in open-access and subsistence lakes
  - larger, more hydrologically connected lakes lead to greater fish catches in lakes open to outsides and where fishing is allowed only for direct consumption purposes.
- ✓ Connectivity had a negative effect on fish catch in protected lakes,
  - ✓ larger and more connected lakes that are protected have smaller fish catches, probably because they are more exposed to illegal poaching.

# Policy and societal impacts / results

- ✓ We are building a modular systematic monitoring system (MAPQUALI).
  - ✓ Regularly searching and preprocessing imagens from Brasil Data Cube, searching preprocessed images and deriving water quality indicators maps, creates time-series maps, a web module for users' search

- ✓ We demonstrate the social benefits of living inside or outside sustainable use protected areas in the Brazilian Amazon. We show a clear benefit in the social well-being of communities inside protected areas (better access to health care, education, electricity, basic sanitation and communication infrastructure, household wealth) with impact on rural-urban migration (Campos-Silva et al., PNAS, 2021)
  - Large-scale "win–win" conservation solutions are possible in tropical countries with limited financial and human resources and reinforce the need to genuinely empower local people in integrated conservation-development programs

- ✓ We implemented with communities a comprehensive spatial zoning of fisheries that will ensure the local protection of 60 new oxbow lakes across the Juruá River.
  - Protected lakes, beyond the conservation aspects, provide greater catch and revenue for fishers

- ✓ We engage fishermen and their representatives and environmental secretaries into the revision of fishing agreements in the low Amazon through participatory modelling.
  - The approach was useful to restore the dialog between natural resource users and policy-makers that initially had difficulty communicating, and helped the revision of the fishing agreements in the region (Da Hora *et al*., ISAGA 2023; Da Hora et al, Ec&Soc, in prep)

# Acknowledgements

This research was funded through the 2017-2018 Belmont Forum and BiodivERsA joint call for research proposals, under the BiodivScen ERA-Net COFUND programme, and with the funding organisations French National Research Agency (ANR), São Paulo Research Foundation (FAPESP), National Science Foundation (NSF), the Research Council of Norway and the German Federal Ministry of Education and Research (BMBF)



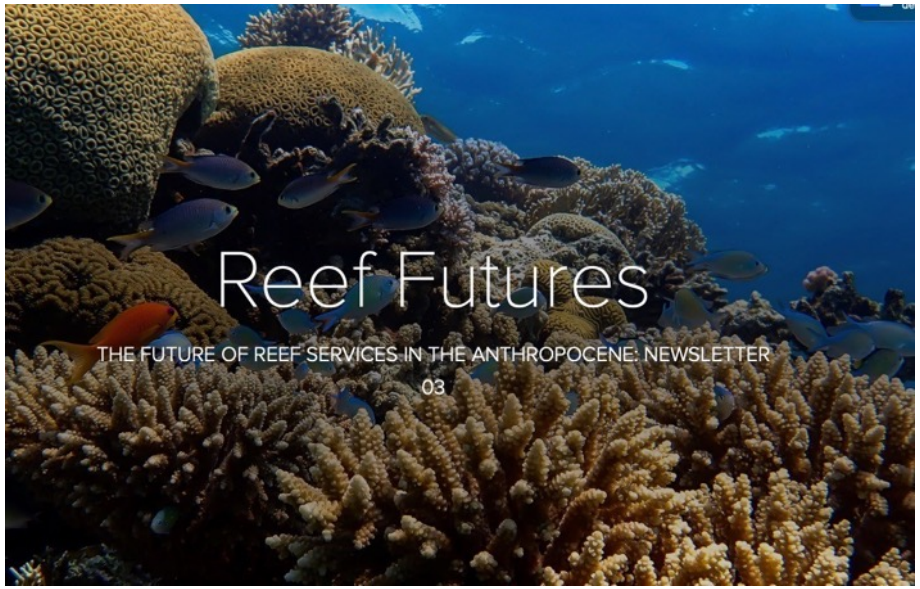




# The futures of reef services in the Anthropocene

**Pr. David Mouillot**

**University of Montpellier, France**



# 1st Ambition

## Beyond fish biomass and biodiversity: the need to estimate and predict Ecosystem Services or Nature's Contribution to People provided by reef fishes

- Biomass Production (g/m²/year), a flow-based rate measure
- Nutrient cycling that affects marine productivity (N, P)
- Regulation of the carbon cycle that affects $CO_2$ concentration
- Aesthetic value that sustains well-being and tourism
- Nutritional value insuring food security (zinc, iron, omega-3)

nature sustainability

Article

https://doi.org/10.1038/s41893-022-00981-x

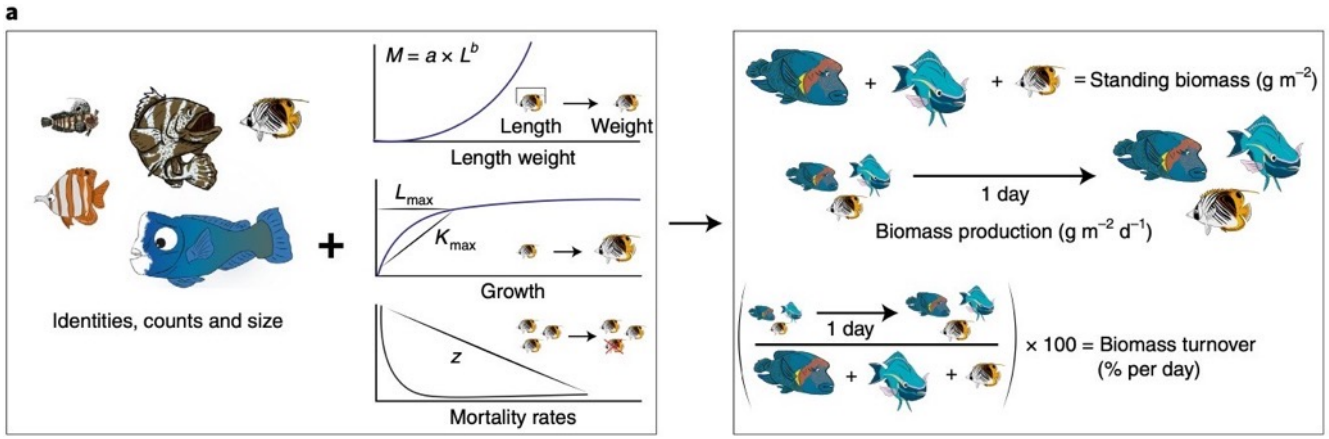
# Towards process-oriented management of tropical reefs in the anthropocene

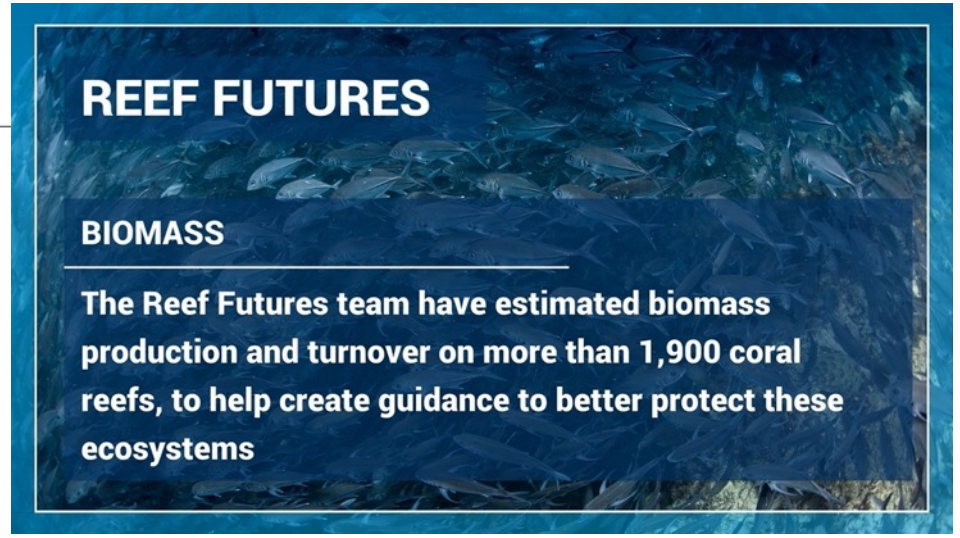
Received: 24 February 2022

Accepted: 14 September 2022

Published online: 14 November 2022

Raphael Seguin[1,2] ✉, David Mouillot[1], Joshua E. Cinner[3], Rick D. Stuart Smith[4], Eva Maire[5], Nicholas A. J. Graham[5], Matthew McLean[6], Laurent Vigliola[2,7] and Nicolas Loiseau[1,7]



Functional Ecology
BRITISH ECOLOGICAL SOCIETY

RESEARCH ARTICLE | Free Access

# Nutrient limitation, bioenergetics and stoichiometry: A new model to predict elemental fluxes mediated by fishes

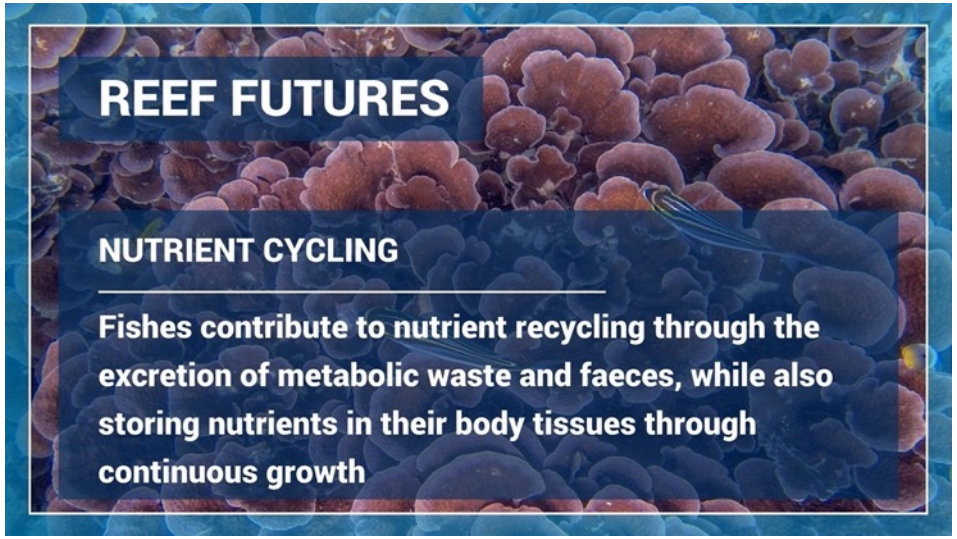
Nina M. D. Schiettekatte, Diego R. Barneche, Sébastien Villéger, Jacob E. Allgeier, Deron E. Burkepile, Simon J. Brandl, Jordan M. Casey, Alexandre Mercière, Katrina S. Munsterman ... See all authors

First published: 23 June 2020 | https://doi.org/10.1111/1365-2435.13618 | Citations: 15

nature ecology & evolution
ARTICLES
https://doi.org/10.1038/s41559-022-01710-5
Check for updates

# Biological trade-offs underpin coral reef ecosystem functioning

Nina M. D. Schiettekatte[1,2,3], Simon J. Brandl[4], Jordan M. Casey[4], Nicholas A. J. Graham[5], Diego R. Barneche[6,7], Deron E. Burkepile[8,9], Jacob E. Allgeier[10], Jesús E. Arias-Gonzaléz[11], Graham J. Edgar[12], Carlos E. L. Ferreira[13], Sergio R. Floeter[14], Alan M. Friedlander[15], Alison L. Green[16], Michel Kulbicki[2,17], Yves Letourneur[2,18], Osmar J. Luiz[19], Alexandre Mercière[1,2], Fabien Morat[1,2], Katrina S. Munsterman[10], Enrico L. Rezende[20], Fabian A. Rodríguez-Zaragoza[21], Rick D. Stuart-Smith[12], Laurent Vigliola[2,17], Sébastien Villéger[22,23] and Valeriano Parravicini[1,2,23]




**Nutrient cycling is at least five times higher than nutrient storage on most reefs, emphasizing the role of fish as a source, rather than a sink, of nutrients**

nature communications

Article

https://doi.org/10.1038/s41467-023-36617-7

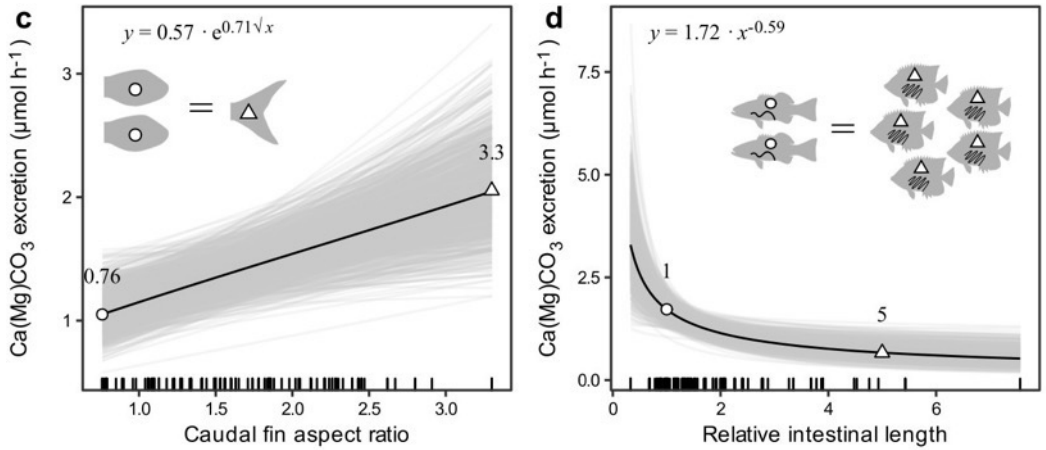
# Temperature, species identity and morphological traits predict carbonate excretion and mineralogy in tropical reef fishes

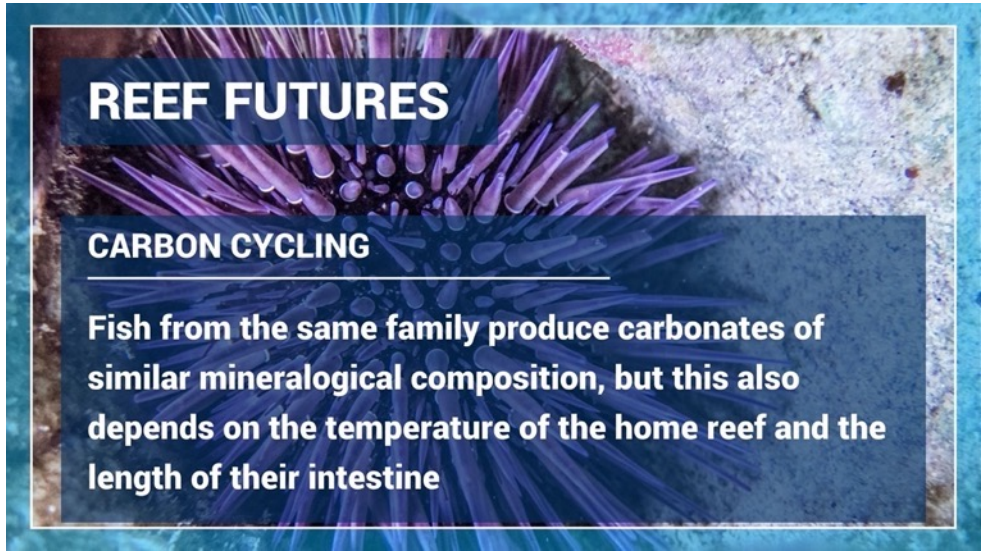
Received: 13 July 2022

Accepted: 8 February 2023

Published online: 22 February 2023

Mattia Ghilardi[1,2], Michael A. Salter[3], Valeriano Parravicini[4,5], Sebastian C. A. Ferse[1,2], Tim Rixen[1], Christian Wild[2], Matthias Birkicht[1], Chris T. Perry[6], Alex Berry[3], Rod W. Wilson[3], David Mouillot[7,5] & Sonia Bejarano[1]



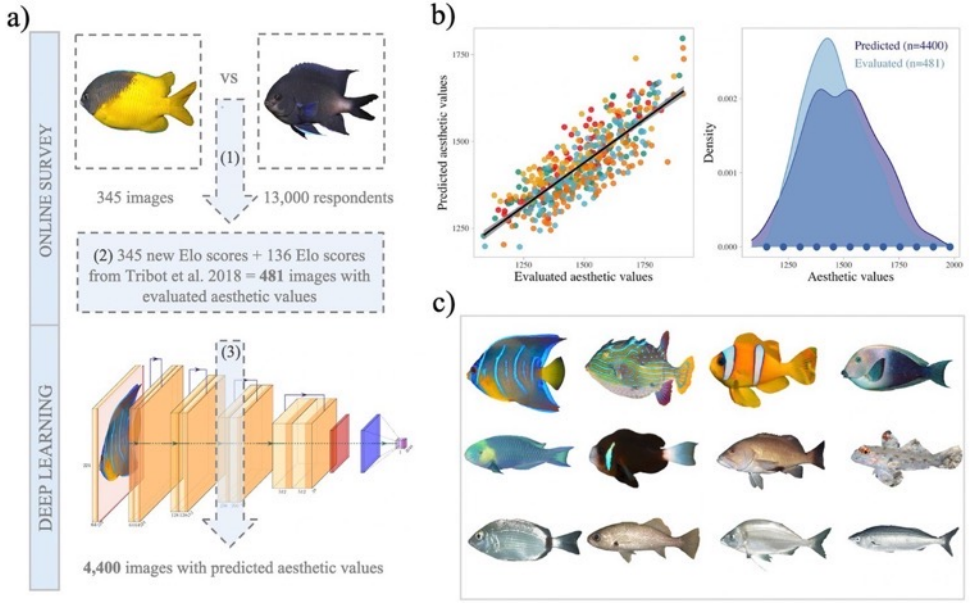



PLOS BIOLOGY

RESEARCH ARTICLE

# The aesthetic value of reef fishes is globally mismatched to their conservation priorities

**Juliette Langlois[1☯], François Guilhaumon[1,2], Florian Baletaud[1], Nicolas Casajus[3], Cédric De Almeida Braga[4], Valentine Fleuré[1], Michel Kulbicki[5], Nicolas Loiseau[1], David Mouillot[1,6], Julien P. Renoult[7], Aliénor Stahl[8], Rick D. Stuart Smith[9], Anne-Sophie Tribot[10,11], Nicolas Mouquet[1,3☯*]**





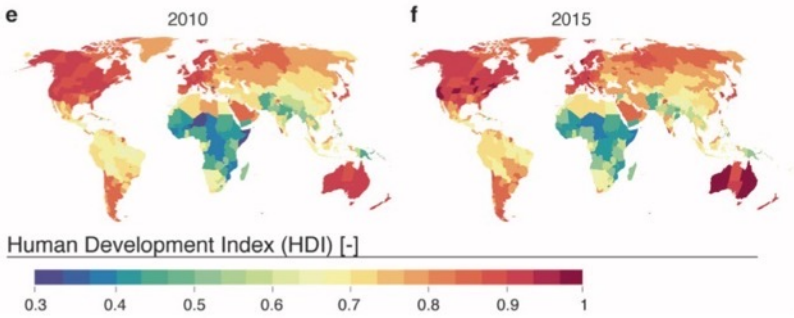
**“Ugly” reef fish are most in need of conservation support**

# 2nd Ambition

## Beyond climate scenarios: the need and the challenge to build socioeconomic and institutional scenarios on shallow reefs

- Population density
- Human gravity (density/access)
- Human Development Index (HDI)
- Management, so protection measures

***The World Population Prospects***




**30x30: protect 30 per cent of the world's oceans by 2030**
**Several levels of restrictions: No-Take vs. Partial MPA**



Report

Current Biology

## Micronutrient supply from global marine fisheries under climate change and overfishing

### Highlights

- Micronutrient-dense catches are more vulnerable to climate change than fishing
- Climate change threatens micronutrient fisheries yields in 40% of countries
- Catches are nutrient dense but vulnerable where dietary intakes are most inadequate
- Fisheries management can be optimized toward resilient and nutrient-dense species

### Authors

Eva Maire, Nicholas A.J. Graham, M. Aaron MacNeil, Vicky W.Y. Lam, James P.W. Robinson, William W.L. Cheung, Christina C. Hicks

### Correspondence

e.maire@lancaster.ac.uk

### In brief

nature ecology & evolution

PERSPECTIVE

https://doi.org/10.1038/s41559-022-01878-w

Check for updates

## Safeguarding nutrients from coral reefs under climate change

Camille Mellin[1✉], Christina C. Hicks[2], Damien A. Fordham[1], Christopher D. Golden[3], Marian Kjellevold[4], M. Aaron MacNeil[5], Eva Maire[2], Sangeeta Mangubhai[6], David Mouillot[7], Kirsty L. Nash[8,9], Johnstone O. Omukoto[2,10], James P. W. Robinson[2], Rick D. Stuart-Smith[8], Jessica Zamborain-Mason[3,11,12], Graham J. Edgar[8] and Nicholas A. J. Graham[2]

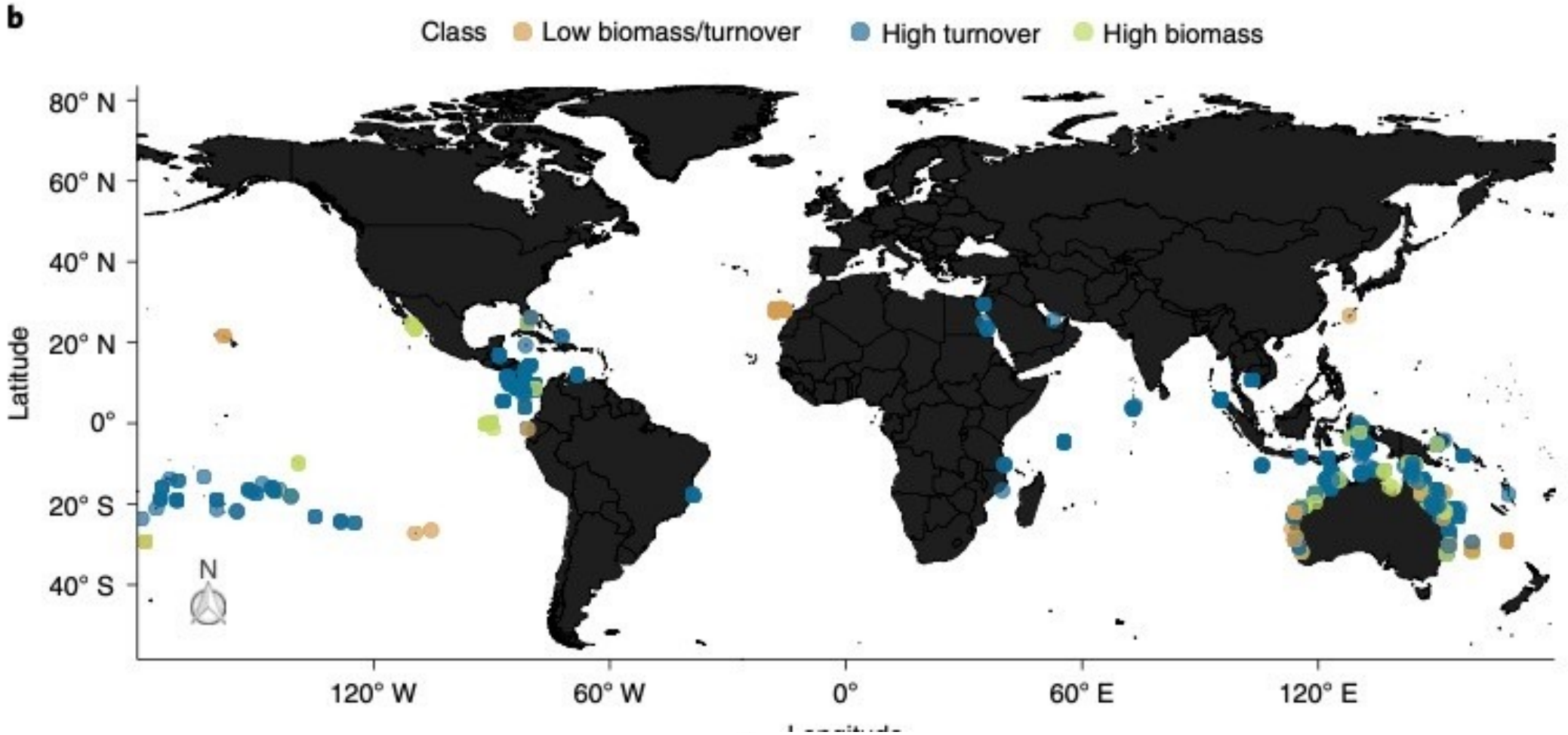
# Policy and societal impacts / results

- We developed new modelling techniques to improve our ability to make future projections of scenarios mixing both environmental and socioeconomic factor

- We can estimate potential “realized gains” as the difference between a conservation options (protection) and the original status (fished) for each site. We thus examine counterfactual scenarios for individual sites, while explicitly accounting for their specific socio-economic and environmental contexts.

- A key finding is that conservation gains tend to change non-linearly with human pressure, which means that relatively small changes in the context in which management is implemented (restricted marine protected areas or OECM) could have big impacts on ecosystem services

# Policy and societal impacts / results



# Acknowledgements


Partners of the Reef Futures project


# De-icing of Arctic Coasts: Critical or new opportunities for marine biodiversity and Ecosystem Services? ACCES

Janne E. Søreide; janne.soreide@unis.no

The University Centre in Svalbard

ACCES project meeting, February 2020, Svalbard (© B. Damsgaard)

# Scientific results

**Climate change** and **habitat loss** are two of the main threats to global biodiversity and ecosystem functions.

Arctic coastal ecosystems are particularly vulnerable since climate change is 2 to 6 times more rapid here than elsewhere on the globe.

- De-icing of the Arctic coastline is extensive. In Svalbard, extent of landfast sea ice is reduced by 50% in years 2005-2019 compared to 1973-2003 average. A further +2°C in winter air temperature will result in a 90% decline in sea ice compared to 1973-2003 average (Urbanski & Litwicka, 2022)

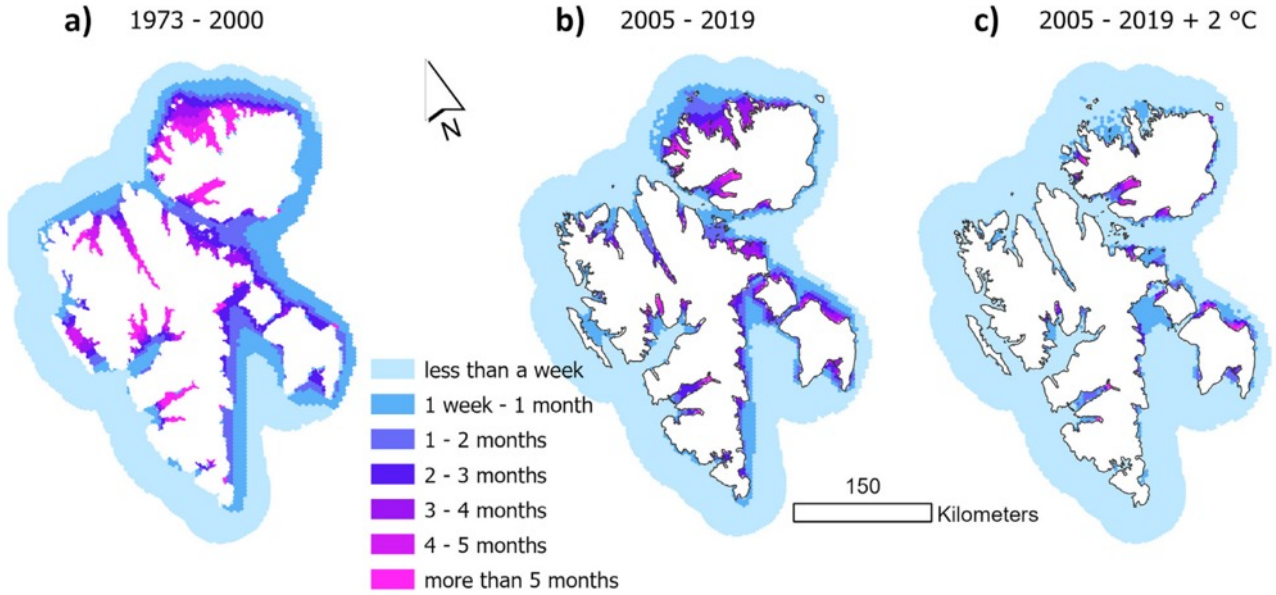



**Figure 6** The mean distribution of the fast ice duration in Svalbard (a) during the ice seasons of 1973–2000, (b) during the ice seasons of 2005–2019, and (c) in the near future, assuming a 2°C increase in winter air temperature.

# Scientific results

- Less sea ice and sea ice scouring result in more macroalgae in the intertidal zone that again facilitate a richer and more diverse intertidal community (Weslawski et al. 2020, 2021, Wiktor et al. 2022)
- There is a positive relationship between open water days (days without sea ice) and kelp biomass and seaweed diversity (Filbee-Dexter et al. 2022) and kelp growth depth (Castro de la Guardia et al. 2022).

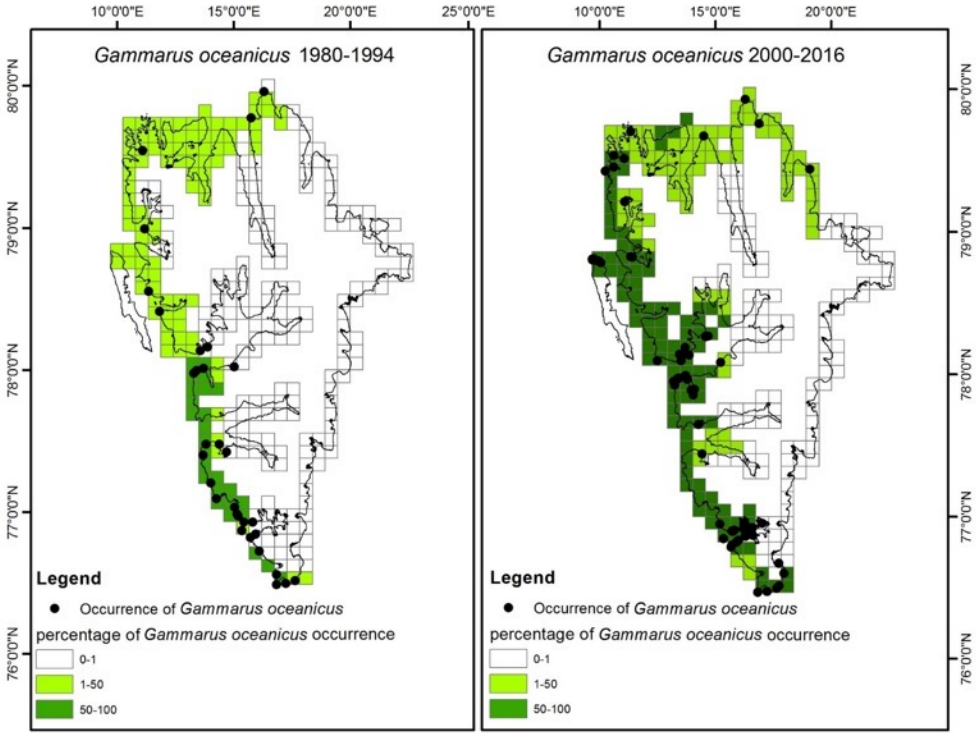

©JE Søreide


©JM Wiktor

# Scientific results

- A change from a cold Arctic to a warmer sub-Arctic climate leads to higher intertidal biodiversity with boreal and Arctic species co-existing due to their wide range of environmental tolerance and the heterogeneity of Arctic coastal habitats (Weslawski et al. 2020, 2021, Kotwicki et al. 2021).
- A 20-year long evolution of coastal bays from iced to ice free basins (Yoldiabukta, Svalbard) show an increase in benthic abundance, biomass and biodiversity following the deglaciation (Legeżyńska et al. subm.). .
- Besides shipping, a new transport vector - large plastic debris – may play a significant role in re-introducing boreal species such as blue mussels in Svalbard (Kotwicki et al. 2021).

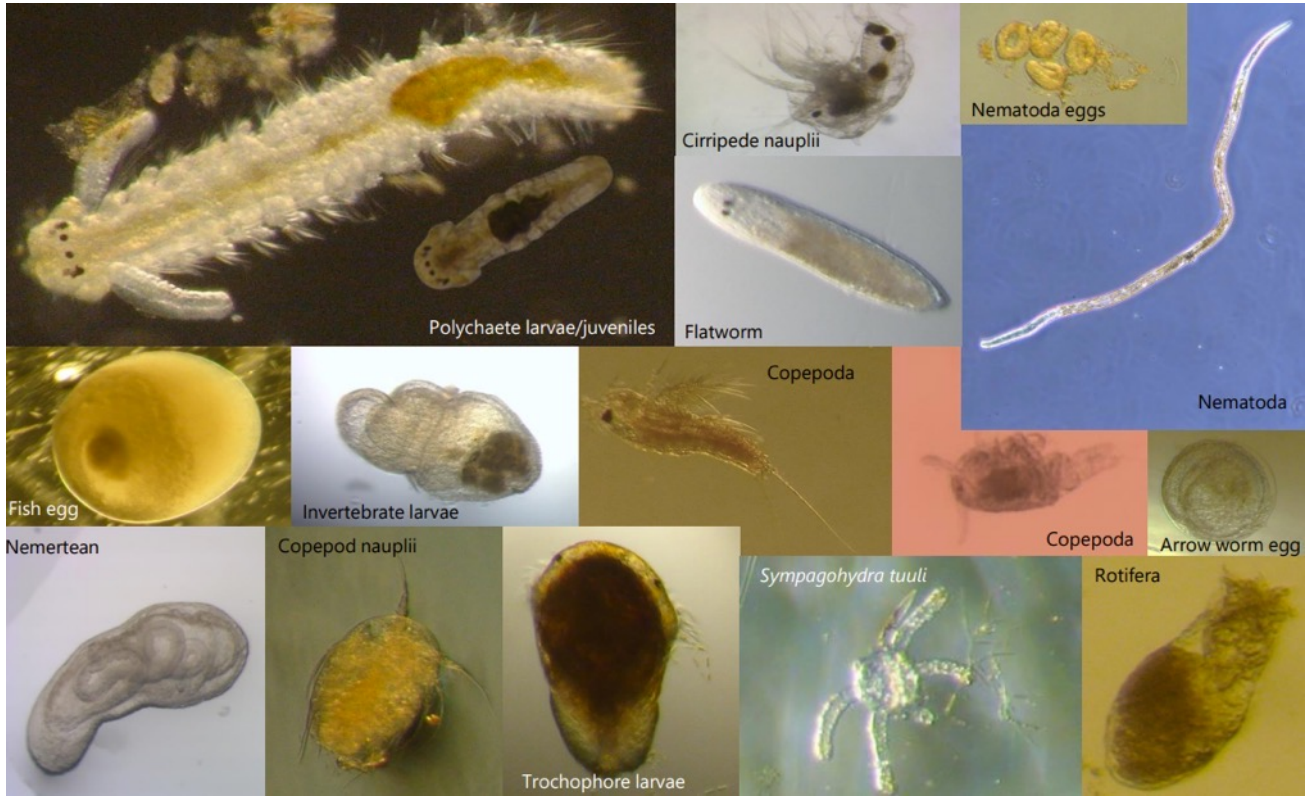
*Gammarus oceanicus* (boreal) expands its distribution in Svalbard, but it does not out-compete the Arctic *G. setosus* (yet!).



# Scientific results

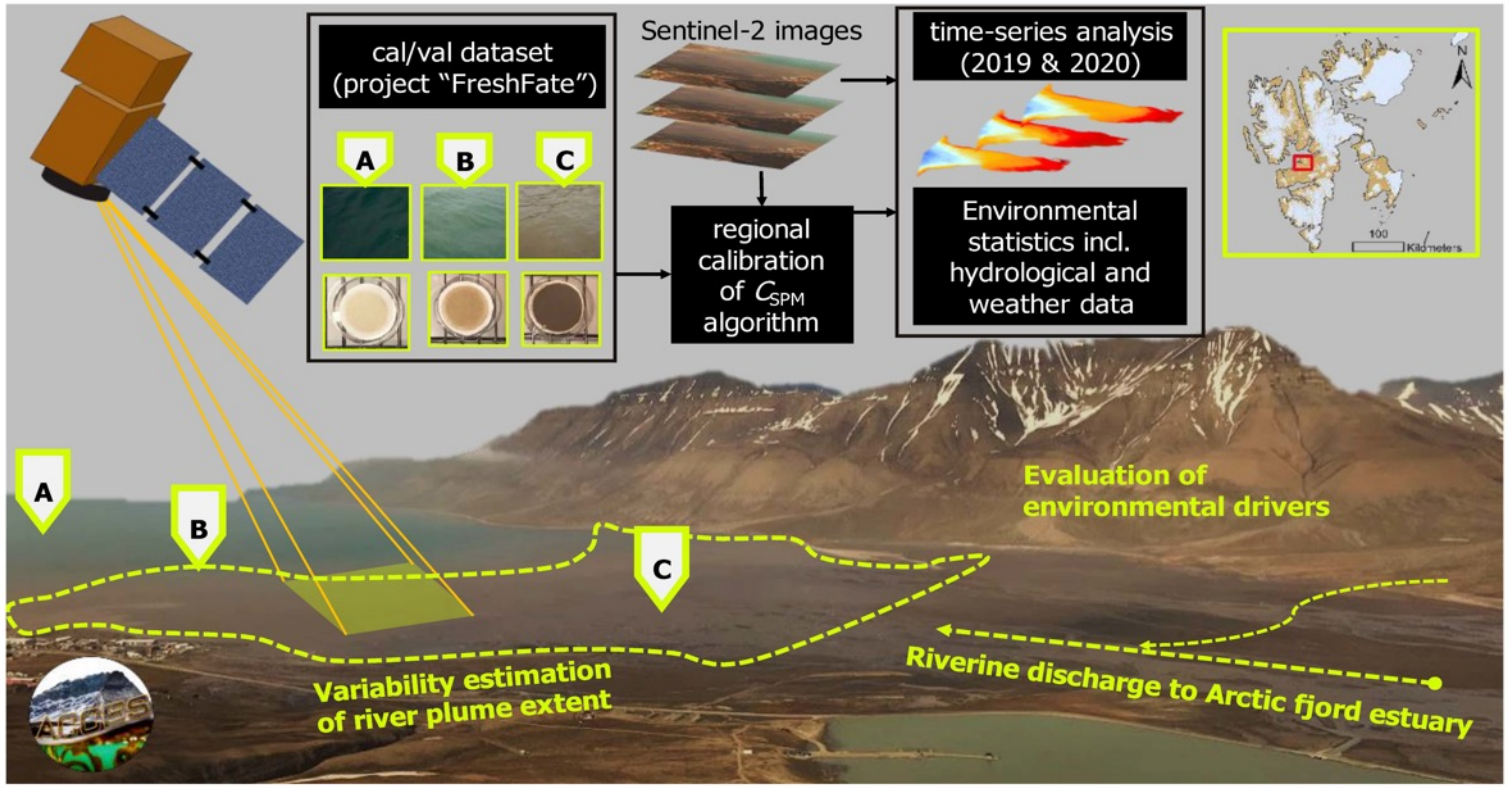
- Coastal sea ice is an important nursery ground for benthic larvae – up to 25.000 ind. $m^{-2}$. Here the larvae find plenty of nutritious ice algae and shelter for predators (Pitusi et al. 2021; Pitusi et al. subm.).
- Loss of coastal sea ice and ice algae food  will likely have a negative impact on Arctic benthic species.
- Arctic marine mammals have a high dependence on ice algae-derived carbon  (53.3 ± 22.2 %) through their consumption of benthic invertebrate prey which confirms that a decline in ice algae could lead to cascading effects on Arctic ecosystems (Amiraux et al. 2023).

Extensive sea ice biology work has been conducted during the ACCES project



# Scientific results

## Extensive work on calibration and validation of satellite data – to improve algorithms for cost efficient monitoring of Arctic coastal waters.




**Spatio-Temporal Variability of Suspended Particulate Matter in a High-Arctic Estuary (Adventfjorden, Svalbard) Using Sentinel-2 Time-Series**

by Daniela M. R. Walch [1,2,3,*], Rakesh K. Singh [3], Janne E. Søreide [1], Hugues Lantuit [2,4] and Amanda Poste [5,6]

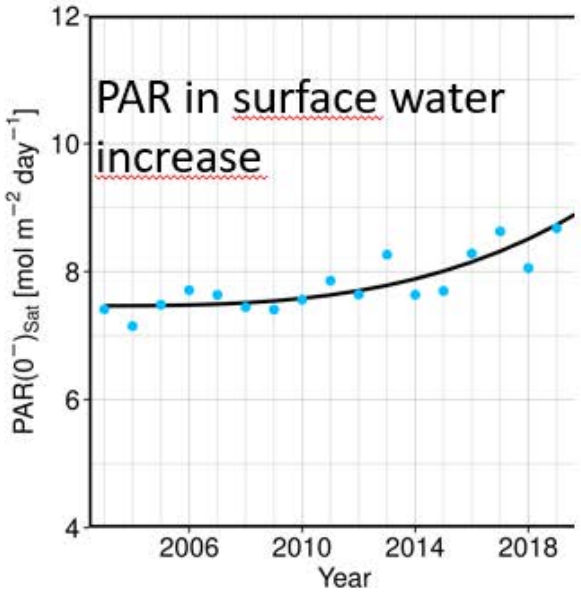
# Scientific results

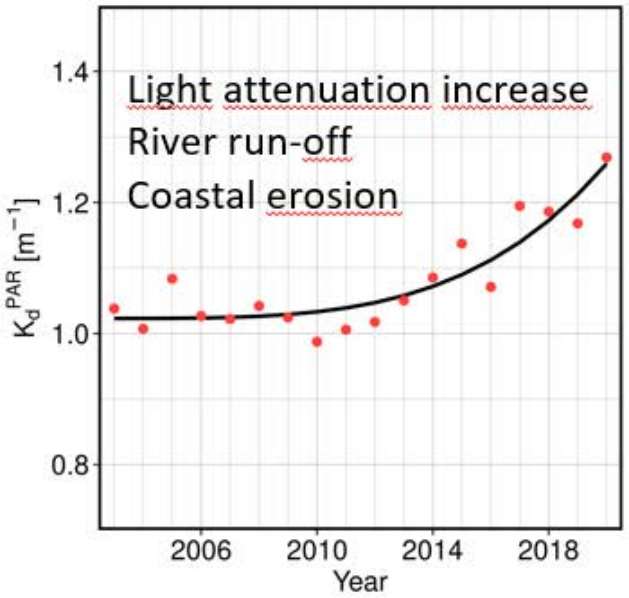
remote sensing
MDPI
Article

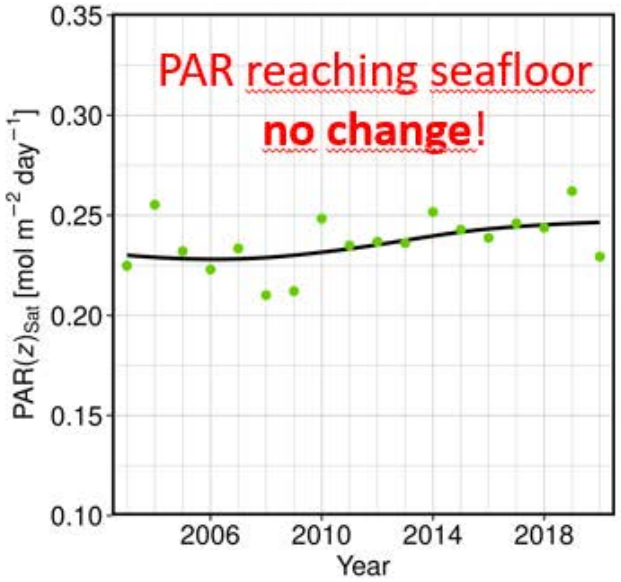
**Satellite-Derived Photosynthetically Available Radiation at the Coastal Arctic Seafloor**

Rakesh Kumar Singh [1,*], Anna Vader [2], Christopher J. Mundy [3], Janne E. Søreide [2], Katrin Iken [4], Kenneth H. Dunton [5], Laura Castro de la Guardia [3], Mikael K. Sejr [6] and Simon Bélanger [1]

- 23% increase in underwater light (PAR) in the coastal Arctic in the period 2003-2020. *BUT* increased melting and river run-off, combined with more coastal erosion, result in higher turbidity (increased light attenuation) and thus only a net increase of 1% more light available on annual basis for primary production compared to years before 2003 (Singh et al. 2022).



# Policy and societal impacts / results

Arctic coastline:

- ~34% of the global coastline
- most productive regions in the Arctic
- >95% of the Arctic human settlements
- Less sea ice – increased human activity!

ACCES has reached out to stakeholders and policy makers by arranging a workshop in Svalbard, February 2020.

The interaction with policy makers and stakeholders were, however, restricted due to the pandemic…….

# Policy and societal impacts / results

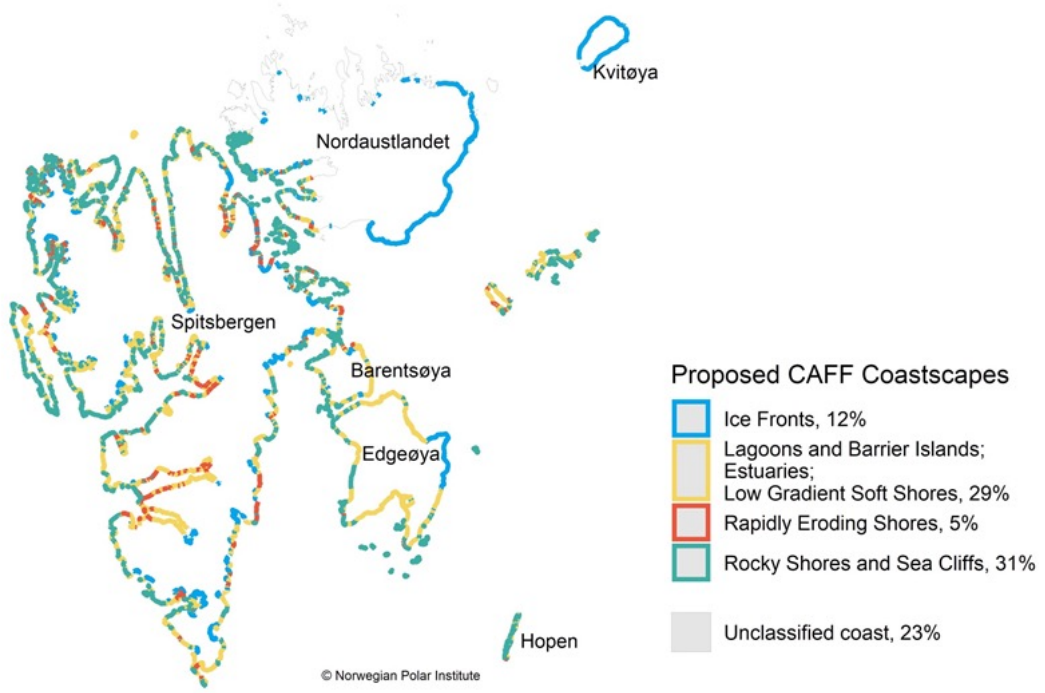

## Environmental status of Svalbard coastscapes and focal ecosystem components

Janne E. Søreide[1], Vanessa Pitusi[1], Anna Vader[1], Børge Damsgård[1], Frank Nilsen[1], Ragnheid Skogseth[1], Amanda Poste[2], Allison Bailey[3], Kit M. Kovacs[1,3], Christian Lydersen[3], Sebastian Gerland[3], Sébastien Descamps[3], Hallvard Strøm[3], Paul E. Renaud[1,4], Guttorm Christensen[4], Maria P. Arvnes[5] Piotr Graczyk[6], Denis Moiseev[7], Rakesh Kumar Singh[8], Simon Bélanger[8], Josef Elster[9], Jacek Urbański[10], Mateusz Moskalik[11], Józef Wiktor[12], and Jan Marcin Węsławski[12]

**Corresponding author:** Janne E. Søreide, Janne.Soreide@unis.no


# Policy and societal impacts / results

First coastscape (nature type) mapping of Svalbard




Based on aerial photos (1987-1991) of 8 739 km of Svalbard coastline (77%), 1 km resolution
(Map: Norwegian Polar Institute)

UNIS

Arctic Coastal Biodiversity Monitoring Plan




SESS report 2020 | sios.metsis.met.no (sios-svalbard.org)

# Policy and societal impacts / results

ACCES co-chaired the science session: **Arctic Coasts in Transition**

Both natural and social scientists took part


Arctic Frontiers Conference in Tromsø, Norway one of few arenas where scientists, industry, and policy makers meet and interact!

[Arctic Frontiers 2022 - Arctic Frontiers]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# Acknowledgements

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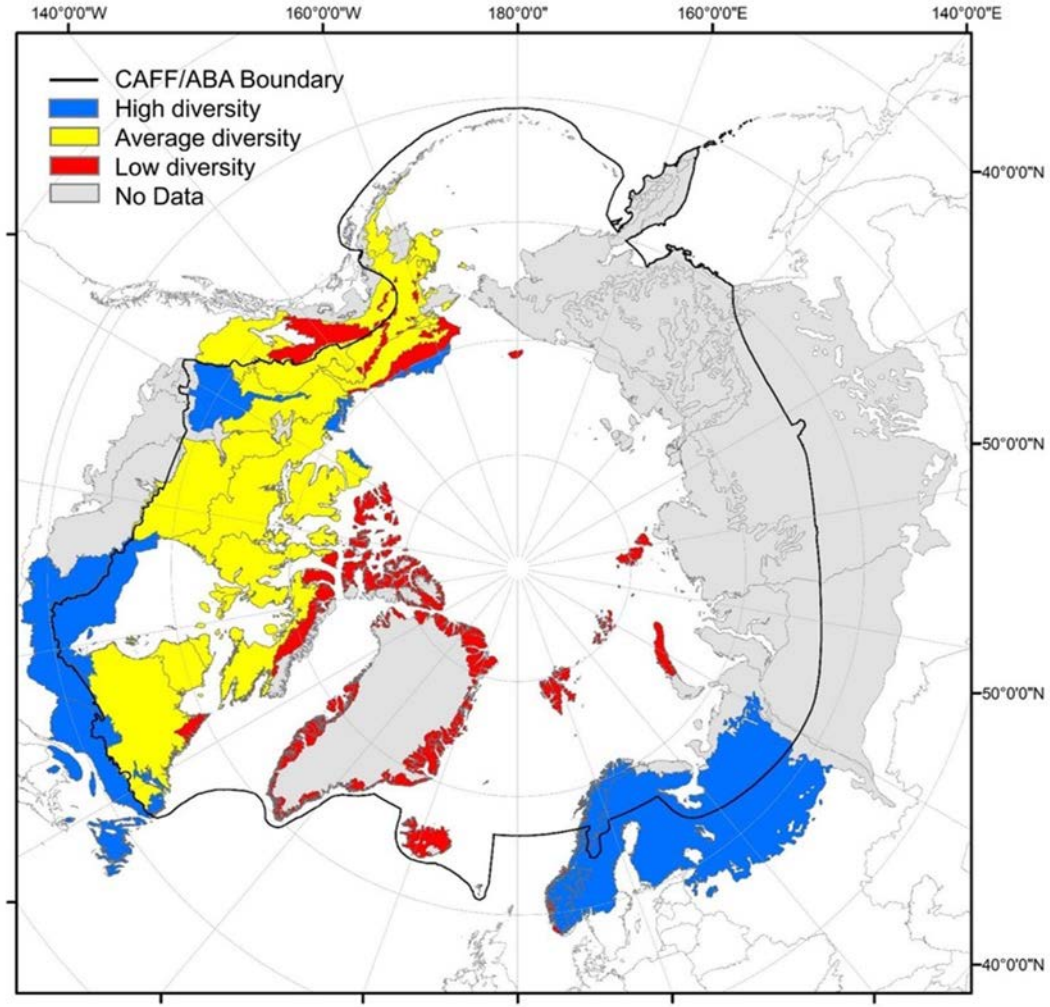
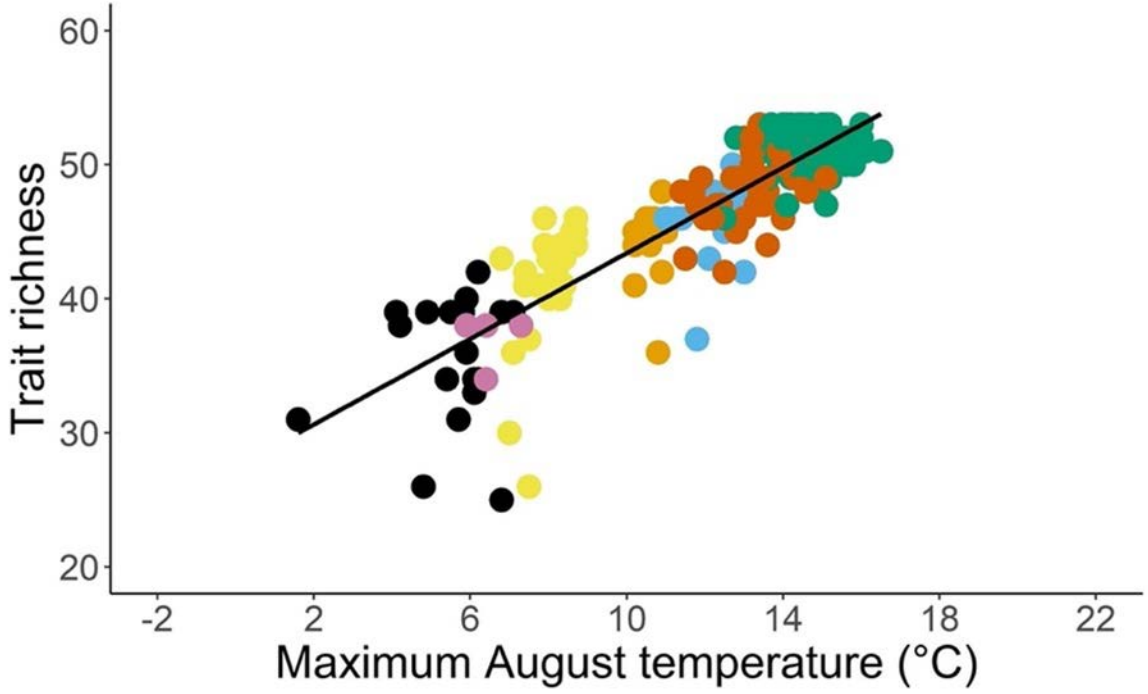
# Arctic-BIODIVER: Scenarios of freshwater biodiversity and ecosystem services in a changing Arctic

*Willem Goedkoop (S), Joseph Culp (CAN-W), Dag Hessen (N), Erin Larson (US), Isabelle Lavoie (CAN-E), Kirsten Christoffersen (DK/Greenland)*

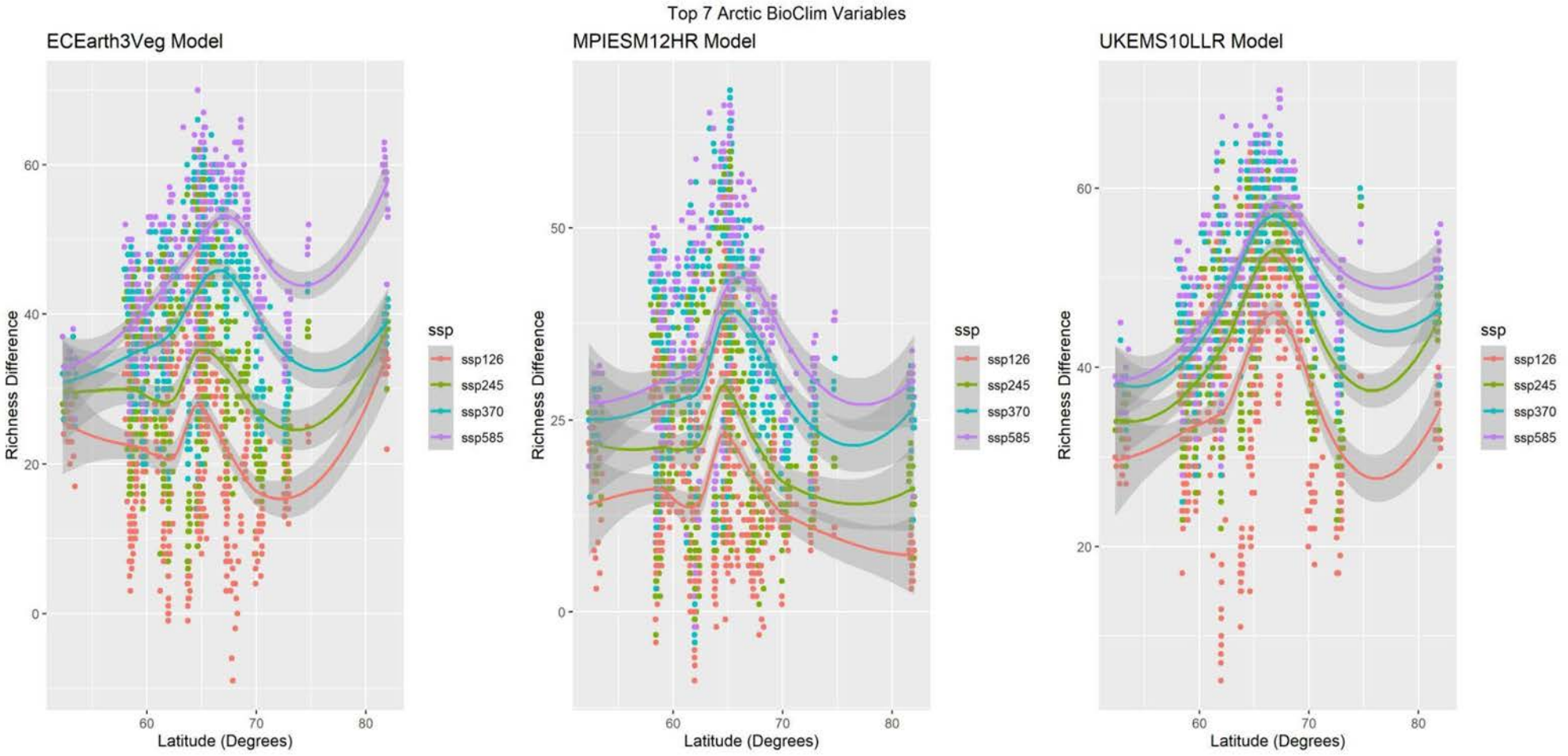
# Scientific results (1)



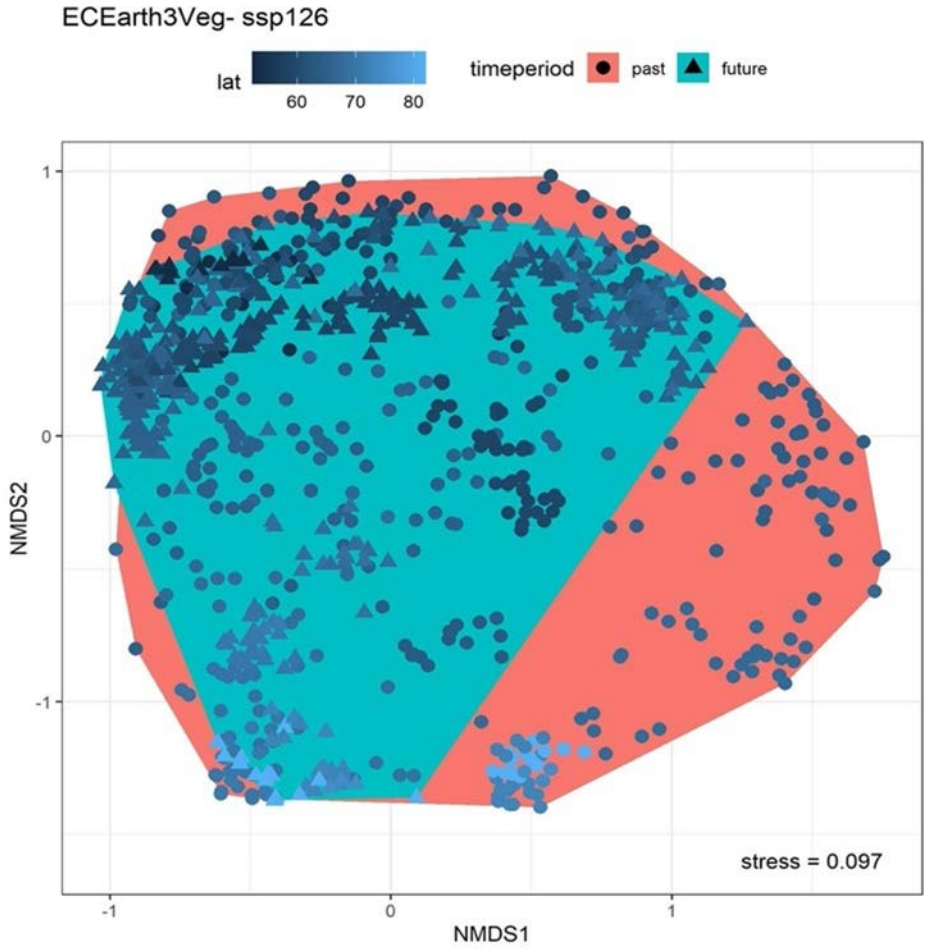

- Spatial analysis of taxonomic data indicated lower (but unique) diversity at high latitudes and cold temperatures
- Biological trait diversity also declined with increasing latitude and decreasing temperature
- Trait patterns reflected the extreme environment of the high Arctic

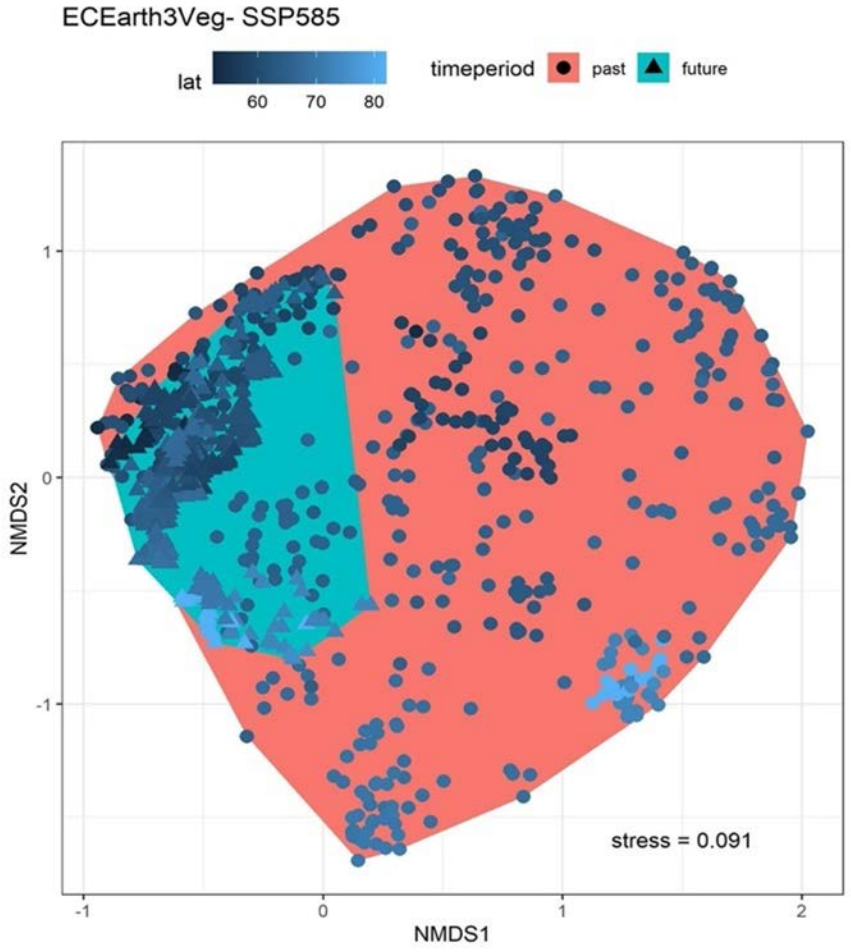


# **Scientific results (2)** – Genus richness changes under different climate models and shared socioeconomic pathways (543 sites)



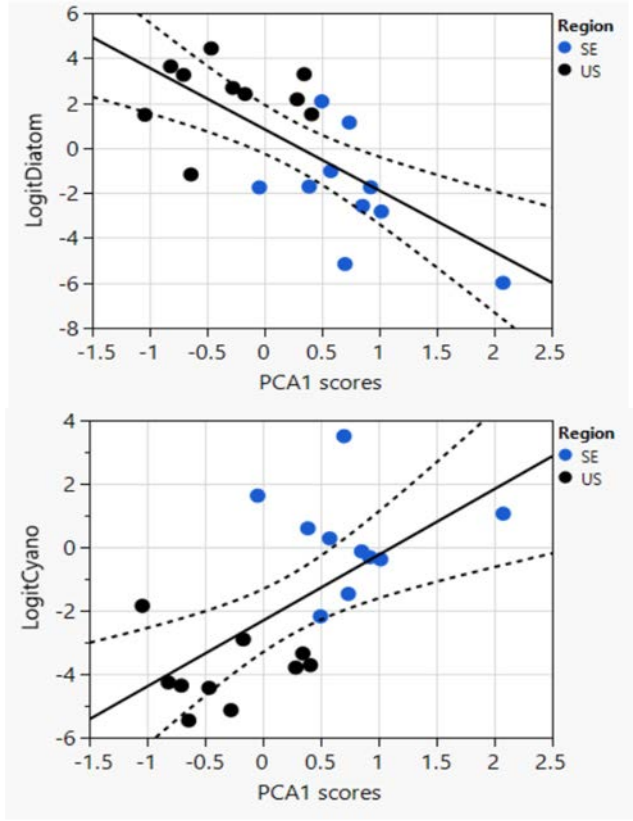
# **Scientific results (3)** – Biotic homogenization of invertebrate communities under different shared socioeconomic pathways



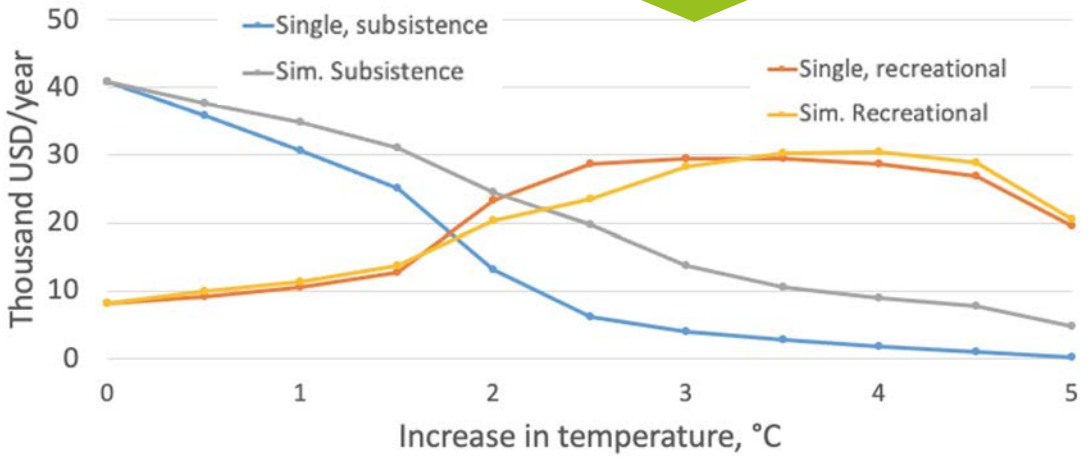
# Scientific results (4)

- Warming- and eutrophication-induced shifts from benthic diatom- to cyanobacteria-predominated primary producers implies a **shift towards lower-quality of basal resources in food webs**. BIODIVER has identified nutrient levels where such shifts likely occur




- The **cold-adapted, unique species of Arctic inlands waters are at risk** when ecosystems heat up and when they experience increased competition from northward migrating southern species (**"conveyor belt to extinction"**)

- Socio-economic modelling shows **T-effects on net values for subsistence and recreational fishers** on only fish population (Single) and also on fishers' net value (Sim.)

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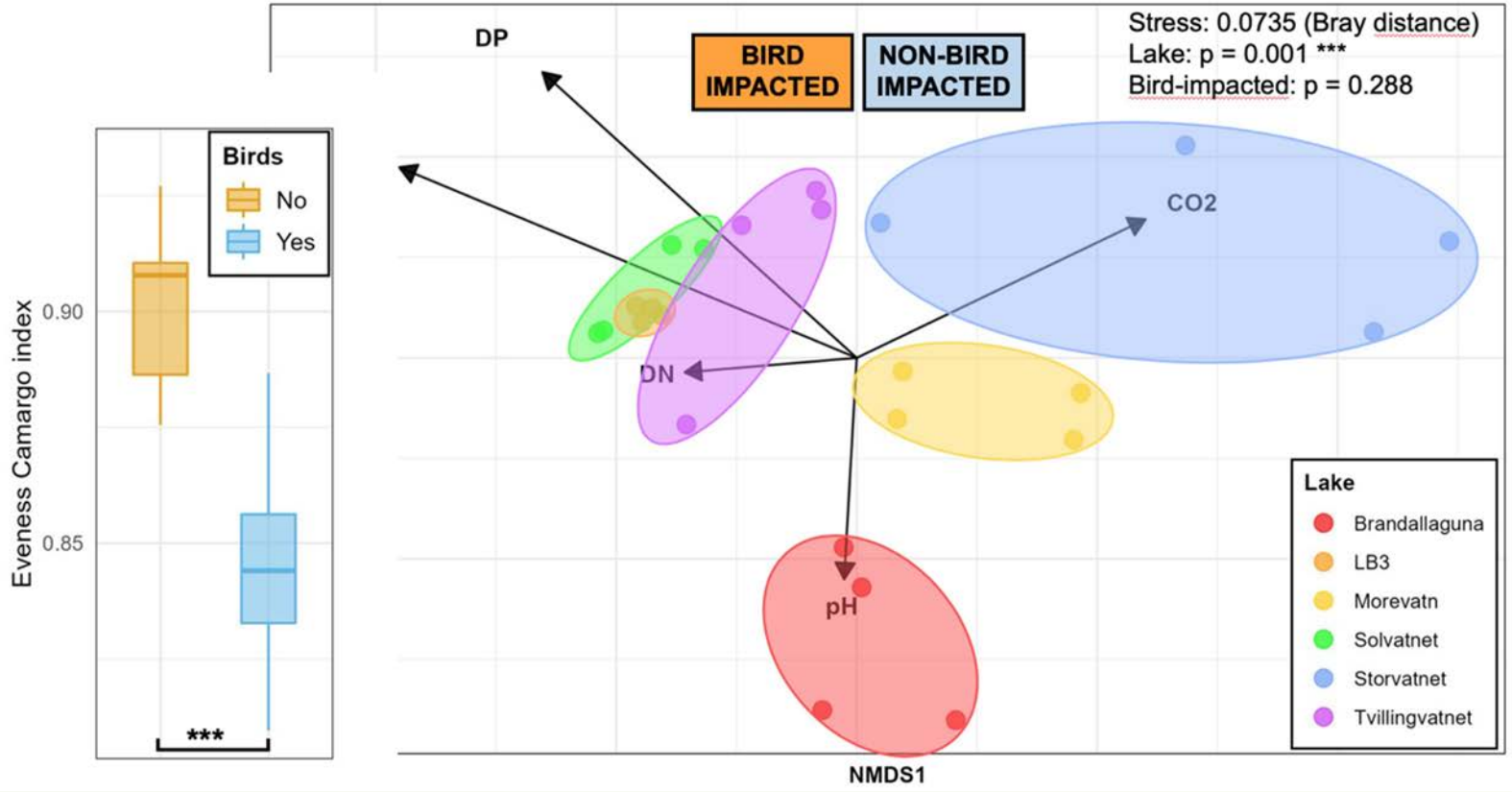
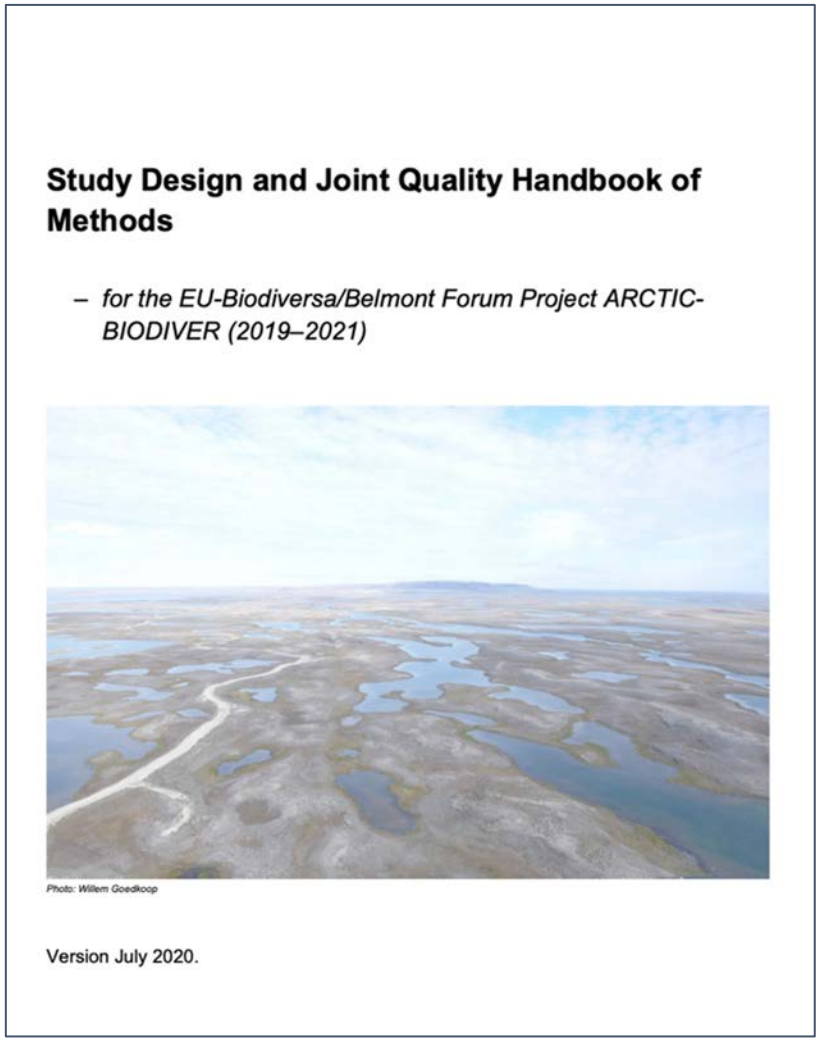
**Scientific results (5)** – Microbial diversity correlates positively with permafrost thaw and bird impacts in the High Arctic.
This is not necessarily "good", as such impacts imply a genomic succession which is not completely understood



# Policy and societal impacts / results

- Developed Joint Quality Handbook of Methods – harmonized methods approach for monitoring biodiversity of Arctic freshwaters that will be promoted at circumpolar level
- Created databases of harmonized traits for diatoms and benthic invertebrates to facilitate mechanistic linkages
- Outputs will feed into CAFF policy advice through a  paper on harmonization of methods and data across Arctic countries
- Future scenarios of biodiversity change will be used to identify key monitoring areas in the Arctic
- Economic modelling of fish valuation contributed to increased understanding of socio-economic impacts of climate change in the Arctic
- Project included stakeholder involvement from Indigenous Peoples (see next slide)



# Indigenous Involvement

- Arctic-BIODIVER has led to enhanced Indigenous community biomonitoring capacity
- In the western Canadian Arctic, community-based monitoring organizations have played a supporting role in contributing sample collection, site selection, knowledge sharing about the sample region, and joint presentations to regional community stakeholder groups (i.e., Inuvialuit Game Council – Dec. 2022).
- Indigenous monitoring collaborators are using methods from Arctic-BIODIVER's Joint Quality Handbook as part of their enhanced biomonitoring techniques to address community concerns in the Western Canadian Arctic.
- This has resulted in ongoing partnership development conducive for long-term biodiversity monitoring.

Indigenous participation and biomonitoring certification in the Western Canadian Arctic, July 2022

Inuvialuit Joint Secretariat

Imaryuk Monitors

# Acknowledgements

Funders from West to East:

- National Science Foundation (NSF)
- National Sciences and Engineering Council of Canada (NSERC)
- Fonds de recherche sur la nature et les technologies (FRQNT)
- The Research Council of Norway (NFR)
- Swedish Research Council for Sustainable Development (FORMAS)

# Concluding words

Frédéric Lemaître, Senior SSI/SPI officer, Biodiversa+

# End of the first day’s presentations

See you tomorrow!

# Session 3
# Scenarios of fate of ecosystem services or disservices

**09:00 – 10:40– *Theme leader :*** *Sarah Clement, Associate Professor of Environmental Policy, Fenner School of Environment & Society, The Australian National University, Canberra, Australia*

# Presentation of the projects' results

- **LimnoScenES**

*Integrated landscape management approach and plan in order to ameliorate the condition of the lake and its catchment as well as ecosystem services for: agriculture, water course maintenance, nature protection, tourism and infrastructure.*

- **BioDiv-Support**

*Protect high-altitude ecosystems and their ecosystem services, under the pressure of future climate change and air pollution loads*

- **AlienScenarios**

*The future of biological invasions under different scenarios*

- **InvasibES**

*Environmental impacts of biological invasions*

- **Land2Sea**

*integrated modelling of consequences of terrestrial activities and climate change for freshwater and coastal marine biodiversity and ecosystem services*

- **SOMBEE**

*Scenarios of Marine Biodiversity and Evolution under Exploitation and climate change*

# BioDiv-Support


**Camilla Andersson**

**Coordinator of BioDiv-Support**

**PIs**

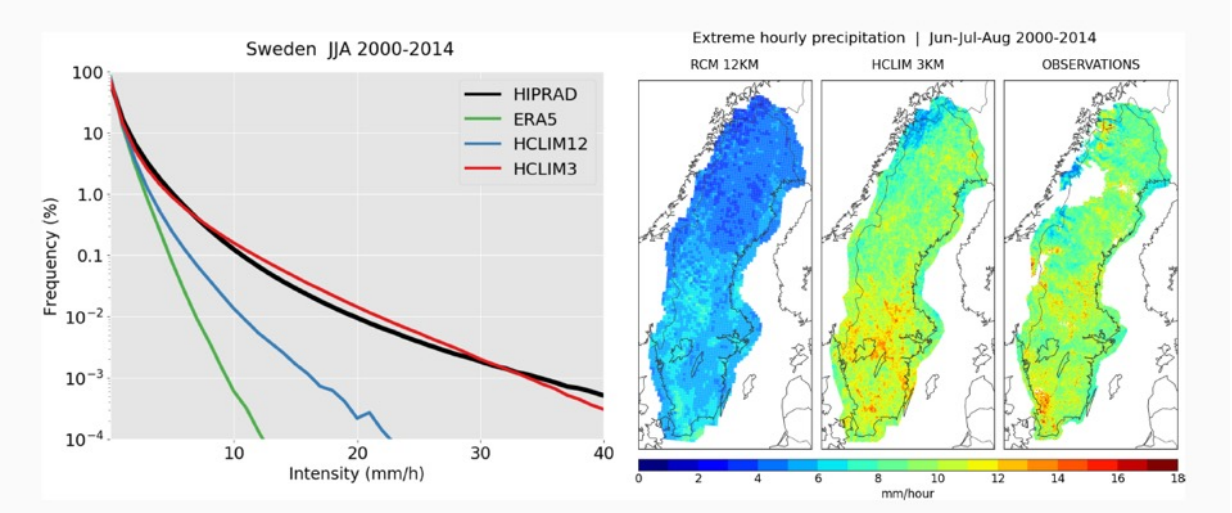
Robert G. Björk, Augustin Colette, Thomas Hickler, Jukka-Pekka Jalkanen, Paul Miller, Gunhild Rosqvist, Marta Vivanco

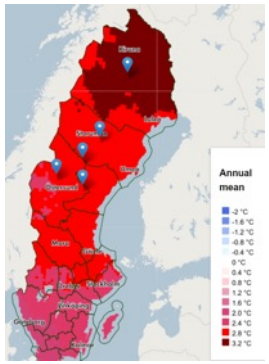
**Additional team members**

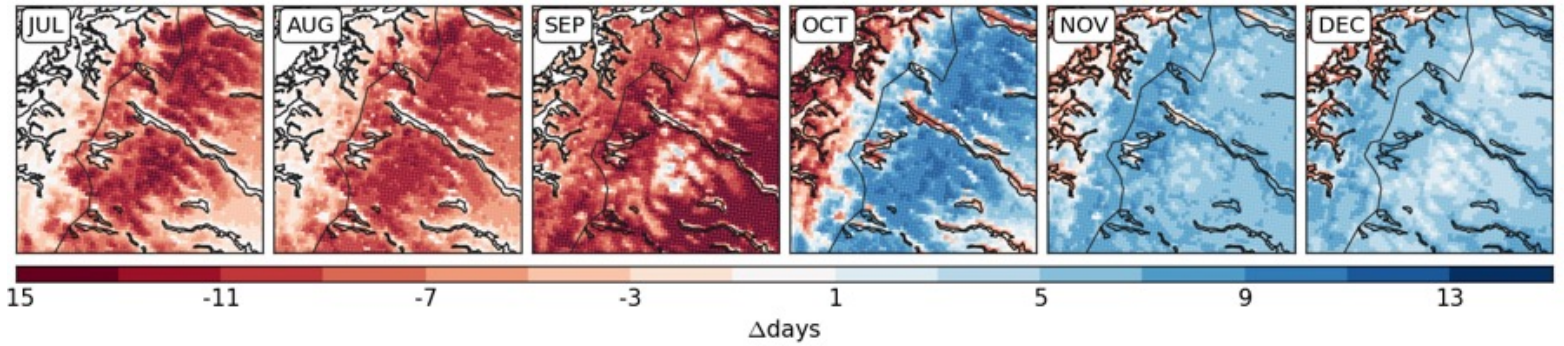
Maurizio Bagnara, Danijel Belušić, Victoria Bermejo, Mats P. Björkman, Florian Couvidat, , Héctor García-Gómez, Juan Luis Garrido, Victoria Gil, Coralina Hernández, Erik Kjellström, Petter Lind, Fredrik Lagergren, David Lindstedt, Tinja Olenius, Håkan Pleijel, Antonio Spanu, Mark Theobald

# Scientific results – climate change

Unprecedented, very high spatial and temporal resolution including convective permitting treatment permits an **improved assessment of the frequency and intensity for extreme precipitation events** and a wider range of climate change indicators including also in areas of complex terrain.




Highest temperature increase in the north

Changed frequency of rain-on-snow events and zero-crossings

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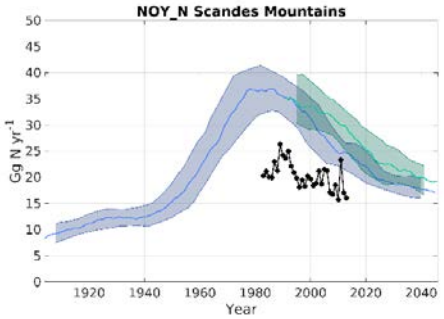
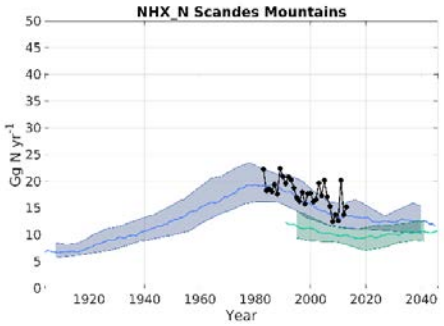
# Scientific results – air pollution change

Policy has led to decreasing nitrogen deposition in Europe, but despite this the pressure is still far above preindustrial levels in most parts of Europe, also at high altitude areas such as the Scandinavian Mountains.

Critical loads of nitrogen will still be exceeded in mid-21st century in parts of Europe. Additional policy action is necessary, especially for agriculture!

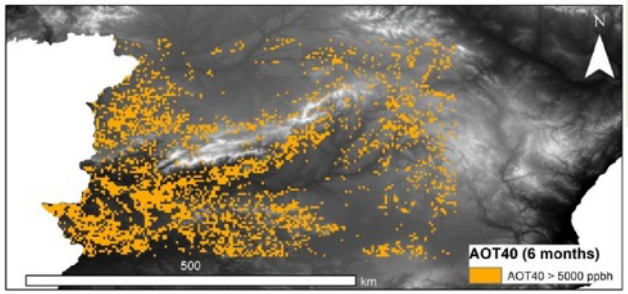



***Risk Assessments for vegetation of the Central System***

***AOT40 -$O_3$ exposure- based indicators***

**FUTURE**




**AIR CONVENTION**
**Critical level for**
- **DECIDUOUS FOREST**
- **PERENNIAL PASTURES**

6-month AOT40
10 000 µg $m^{-3}$ h (5000 ppb h)

- ✓ Whole DECIDUOUS FOREST and PERENNIAL PASTURE lands under ozone risk
- ✓ No improvement in the future

The Spanish Central System is expected to meet the target value for impacts to vegetation set out in the current EU Air Quality Directive, but not the corresponding long-term objective.

# Scientific results – ecosystem change

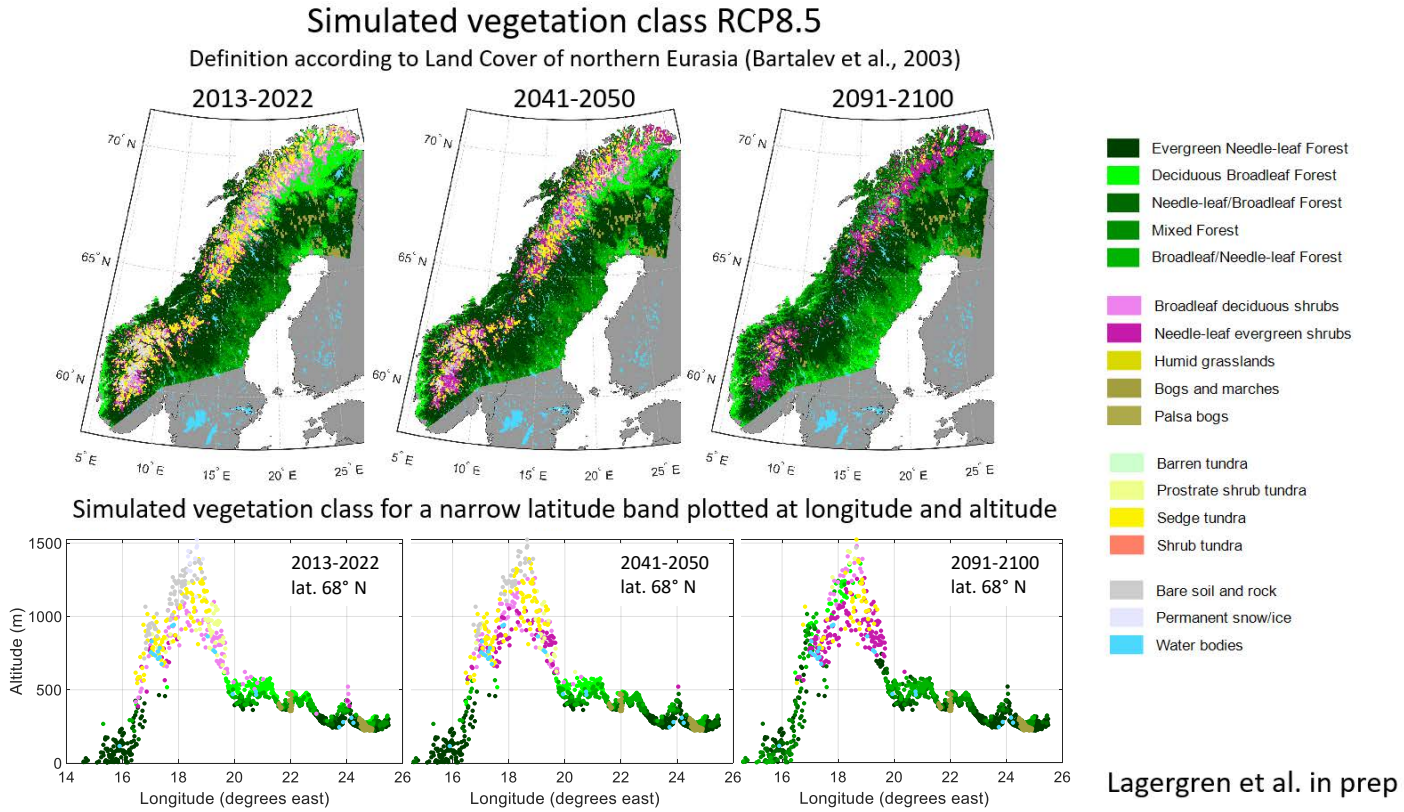
**Vegetation zones** are projected to shift to higher elevations and towards the north in high alpine areas

**Tundra** disappears almost completely in 2100 (shrubification)

**Increased vulnerability/ extinction** of species

**Forestry** practices

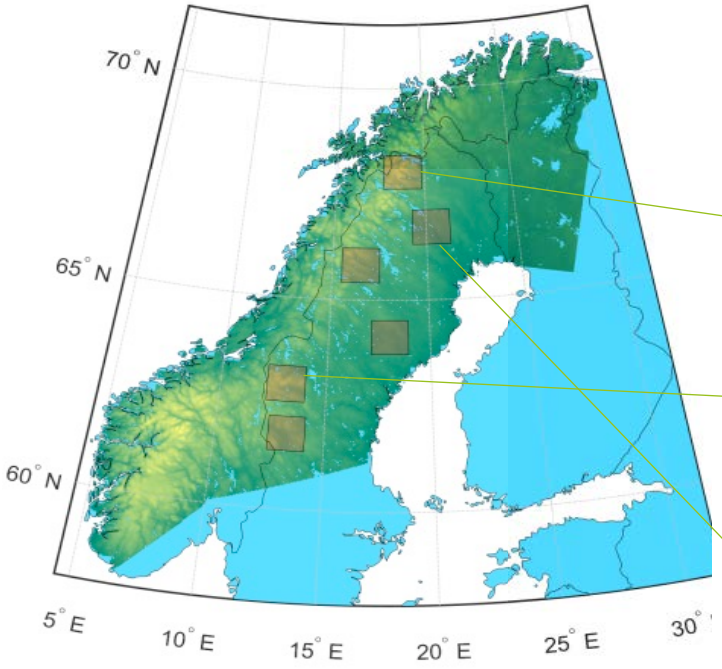
**Herding practices**, e.g. reindeer management



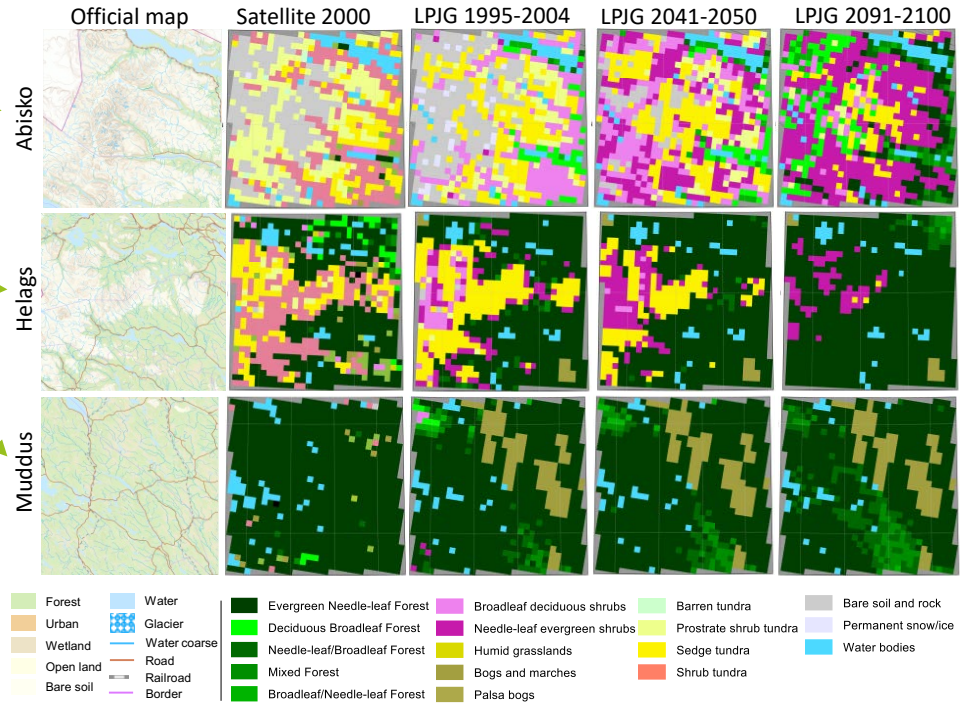

Lagergren et al. in prep

# Scientific results – ecosystem change

## Many Alpine species will likely be added to the list of threatened species




5% of 2765 threatened species in the mountains today

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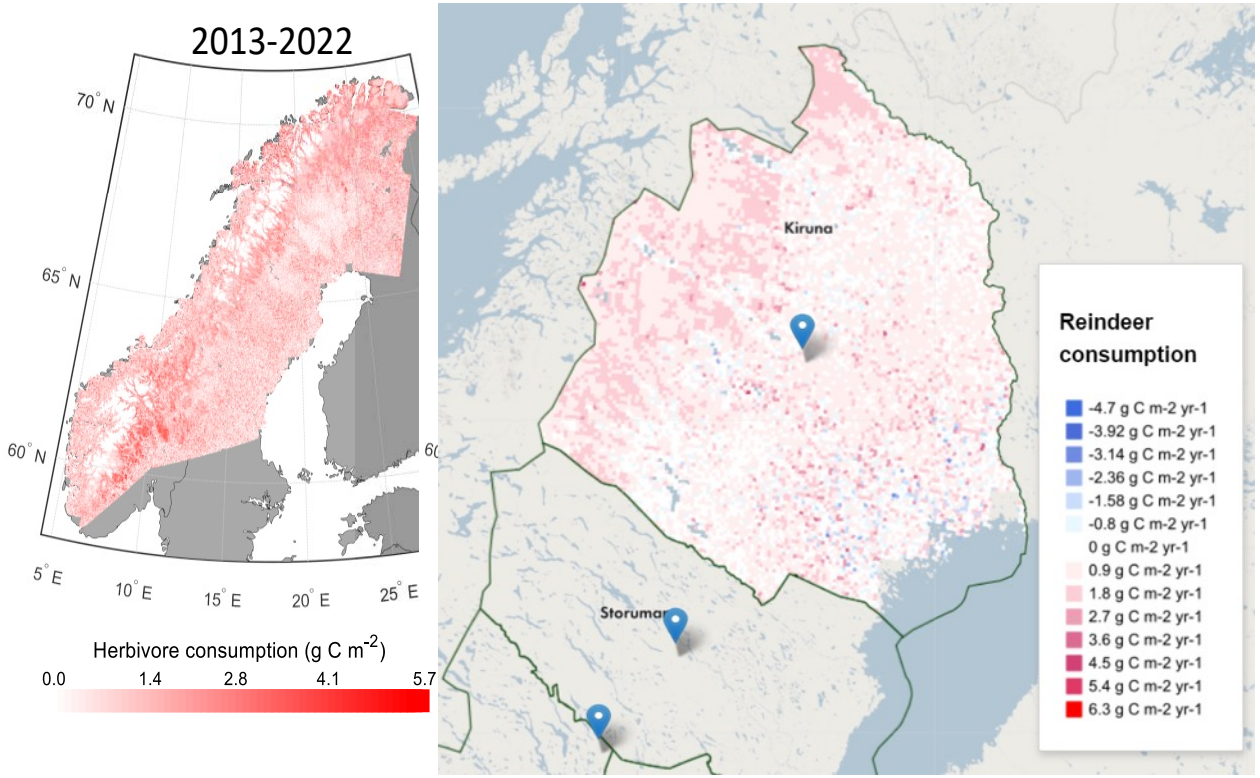
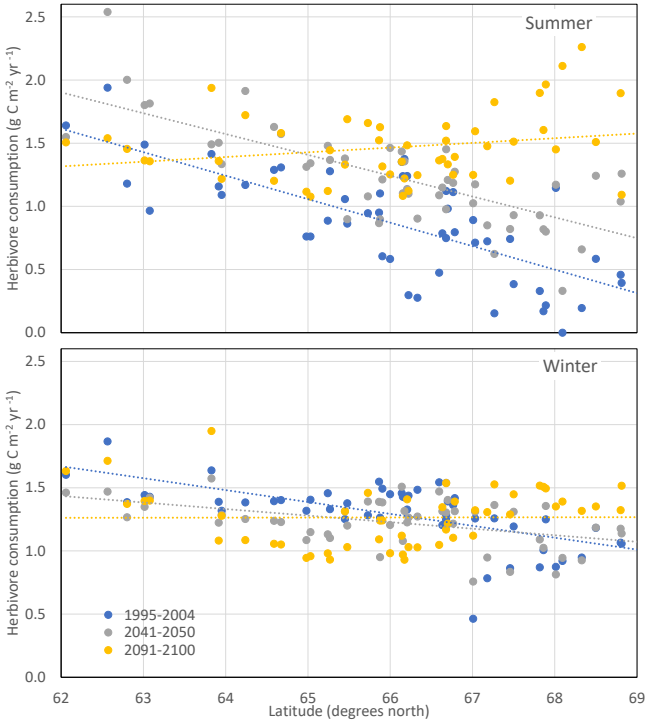
# Scientific results – ecosystem change

## Potential reindeer feed increases, but the shift in vegetation poses a major challenge to reindeer management




Simulated potential reindeer consumption (g C $m^{-2}$ $yr^{-1}$) 2013-2022 and the change to 2041-2050 and 2091-2100 based on RCP8.5.

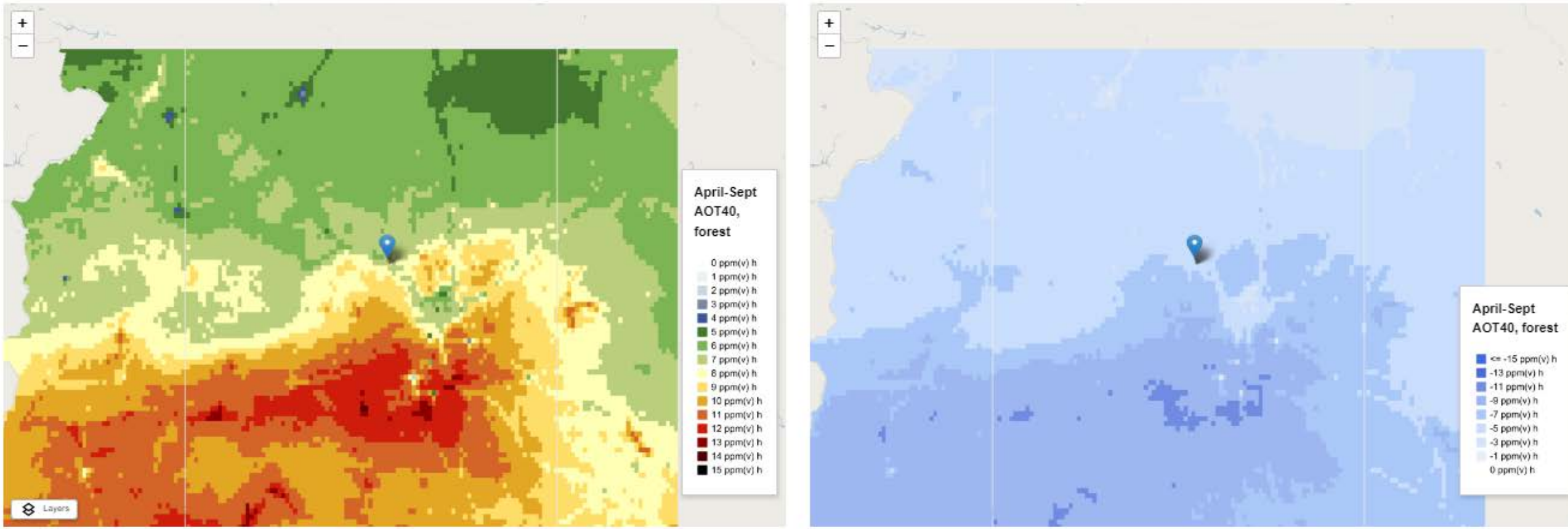
Simulated potential reindeer consumption in reindeer-herding communities in Sweden for the summer and autumn grazing grounds, based on RCP8.5



# Policy and societal results – Webtool for policy planning

## SMHI BioDiv-Support

Indicators were selected after discussions with stakeholders.
Final stakeholder/end user meeting Sept 4 in Sweden.




Link: https://biodivsupport-tst.smhi.se/

# Acknowledgements

AGENCE NATIONALE DE LA RECHERCHE ANR
formas
AGENCIA ESTATAL DE INVESTIGACIÓN
Bundesministerium für Bildung und Forschung
SUOMEN AKATEMIA

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**Adrián García-Rodríguez**
Division of BioInvasions, Global Change, and Macroecology
Department of Botany and Biodiversity Research
University of Vienna

bio invasions
global change · macroecology

universität wien

# Scientific results:

More than 15 scientific articles (16 published and more to come) contributing on:

- **Conceptual frameworks**

- Workflows for **standardization of data on alien species distributions**

- **Datasets**

- **Drivers** of future biological invasions

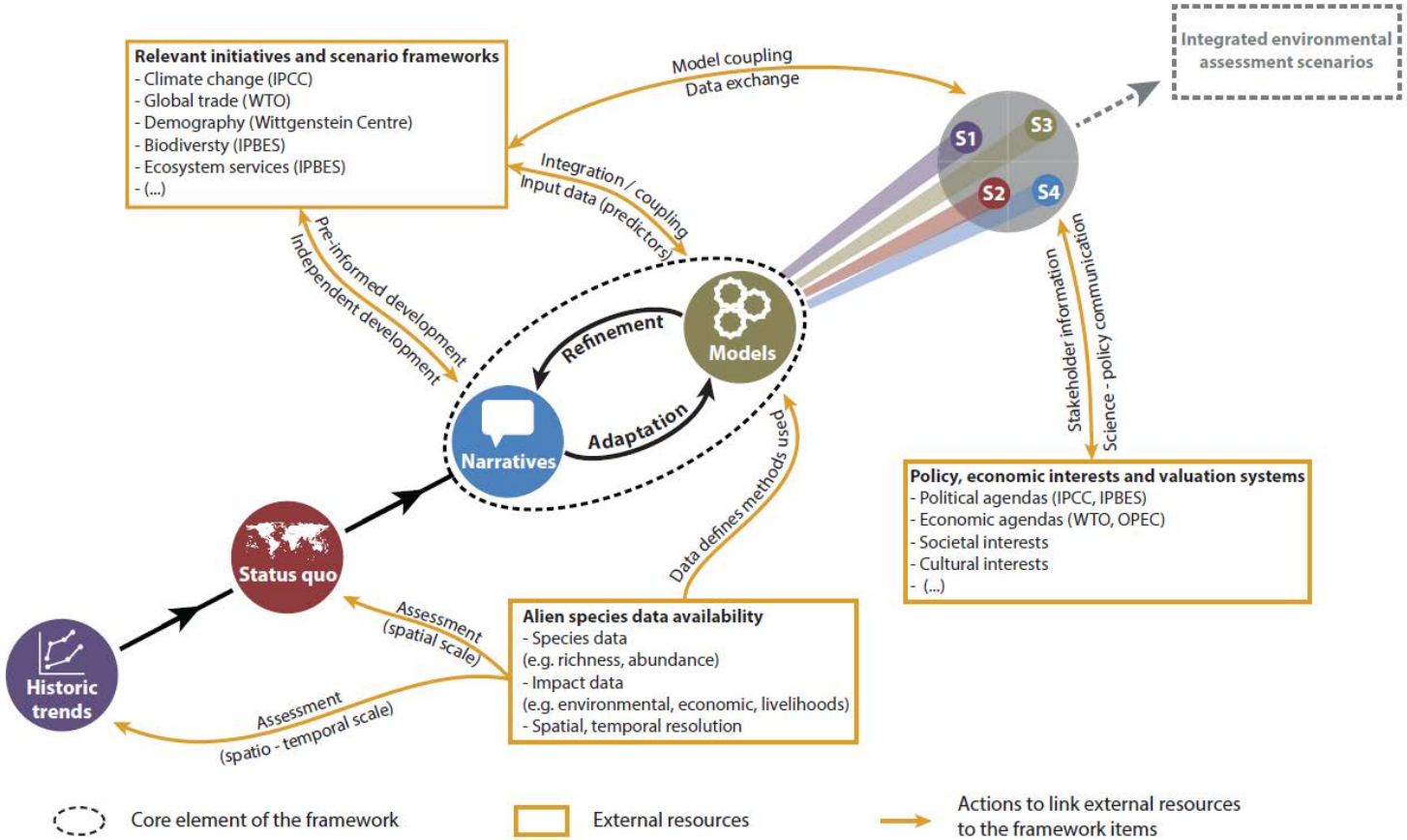
- **Quantitative projections** of alien species numbers

- **Global and Regional Scenarios for Alien Species**

# Scientific results:

## A Framework for Global Twenty-First Century Scenarios and Models of Biological Invasions

- **Limited understanding of future trajectories** of biological invasions
- Comprehensive **global datasets**
- Conceptual framework for the 21st century
- Call for the scientific community to join forces

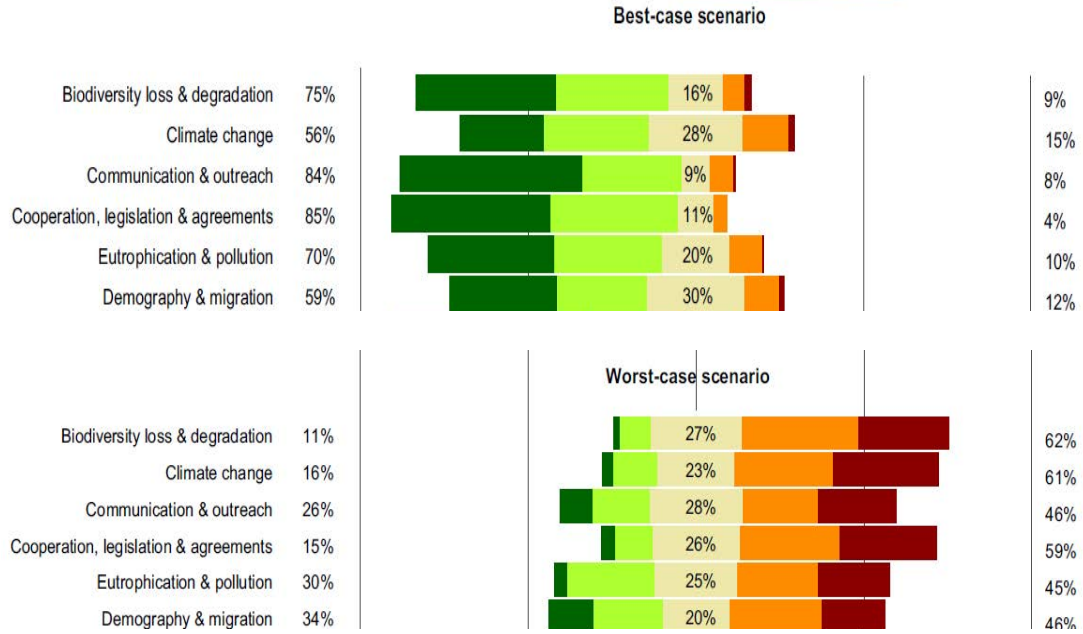



**Lenzner et al., 2019. *BioScience*, *69*(9), 697-710**

# Scientific results:

## Drivers of future alien species impacts: An expert-based assessment

**Essl et al. 2020. *Global Change Biology 26*(9), 4880-4893**




Expert-based assessments (**36 invasion experts**)

Even a **moderate increase** in invasions may represent **major impacts** on biodiversity

Main drivers: transport, climate change, and socio-economic change

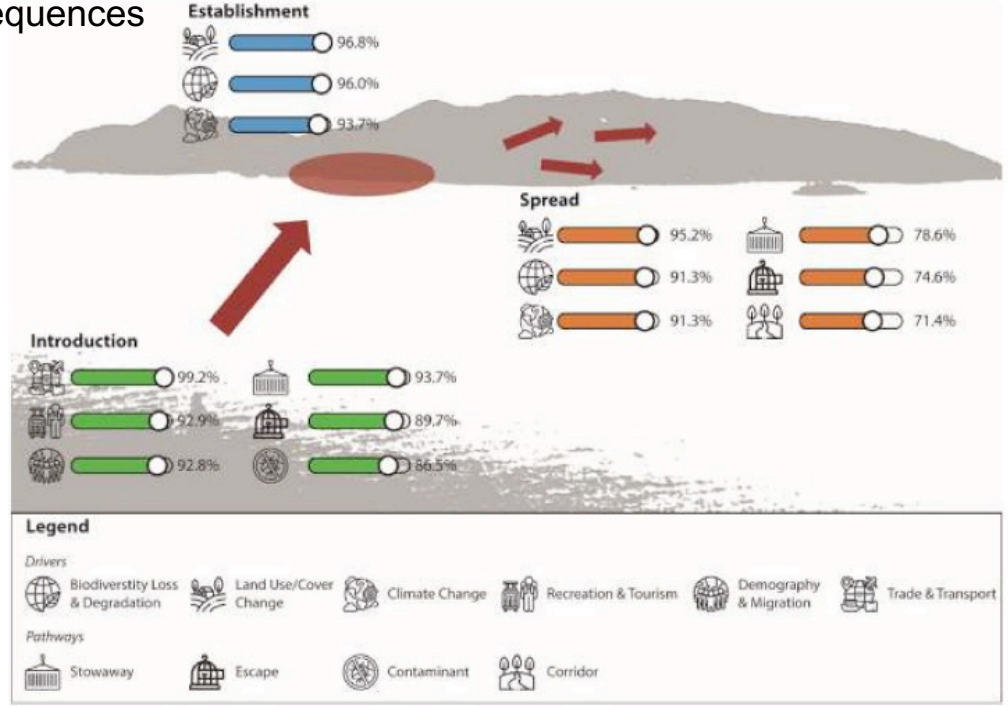
**Rapid actions are necessary** to achieve the goals of the Post-2020 Framework of the Convention on Biological Diversity

## What Will the Future Bring for Biological Invasions on Islands? An Expert-Based Assessment

Survey among **126 experts** in invasion science

**Impacts** of alien species **will increase** on all types of islands

Effective **communication**, scientific **research**, and **pro-active management** of AS on islands to reduce their future consequences

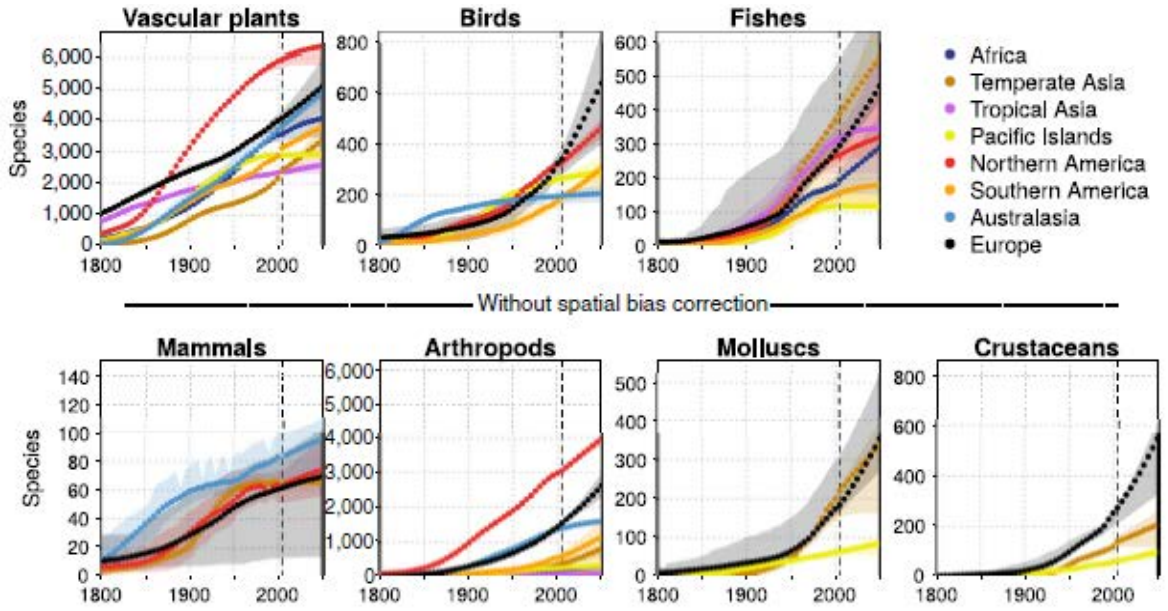



**Lenzner et al. 2020. *Frontiers in Ecology and Evolution 8*, 280**

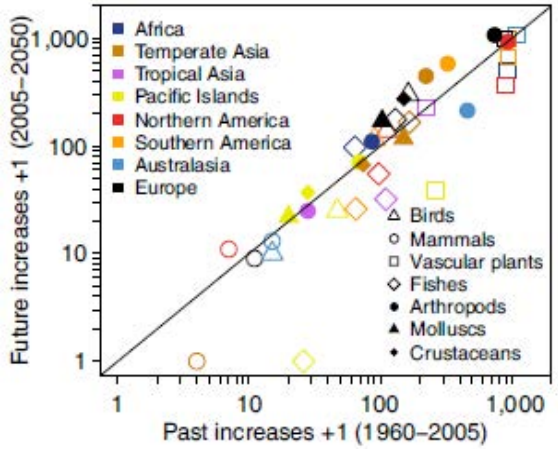
# Scientific results:

## Projecting the continental accumulation of alien species through to 2050

- **First quantitative projections** of future trajectories of AS numbers (**7** taxonomic groups in **8** continents)
- Model based on estimated **sizes of source pools** and dynamics of **historical invasions**
- **36% increase** of established AS numbers per continent from **2005 to 2050**
- Strong increases projected for **Europe, Temperate Asia, Northern America, and Southern America**.
- Strong increases projected for **invertebrates** globally.




| Continent | Relative increase 2005–2050 (%) | Absolute increase* 2005–2050 |
|---|---|---|
| Africa | 39 (14, 51) | 767 ± 133 |
| Temperate Asia | 50 (0, 117) | 1,597 ± 197 |
| Tropical Asia | 30 (10, 67) | 360 ± 78 |
| Australasia | 16 (5, 28) | 1,286 ± 44 |
| Europe | 64 (13, 100) | 2,543 ± 237 |
| Northern America | 23 (6, 42) | 1,484 ± 74 |
| Pacific Islands | 21 (0, 56) | 132 ± 29 |
| Southern America | 49 (16, 99) | 1,391 ± 258 |
| Average | 36 (0, 117) | 1,195 ± 131 |




Seebens et al. 2021.*Global Change Biology*, *27*(5), 970-982.

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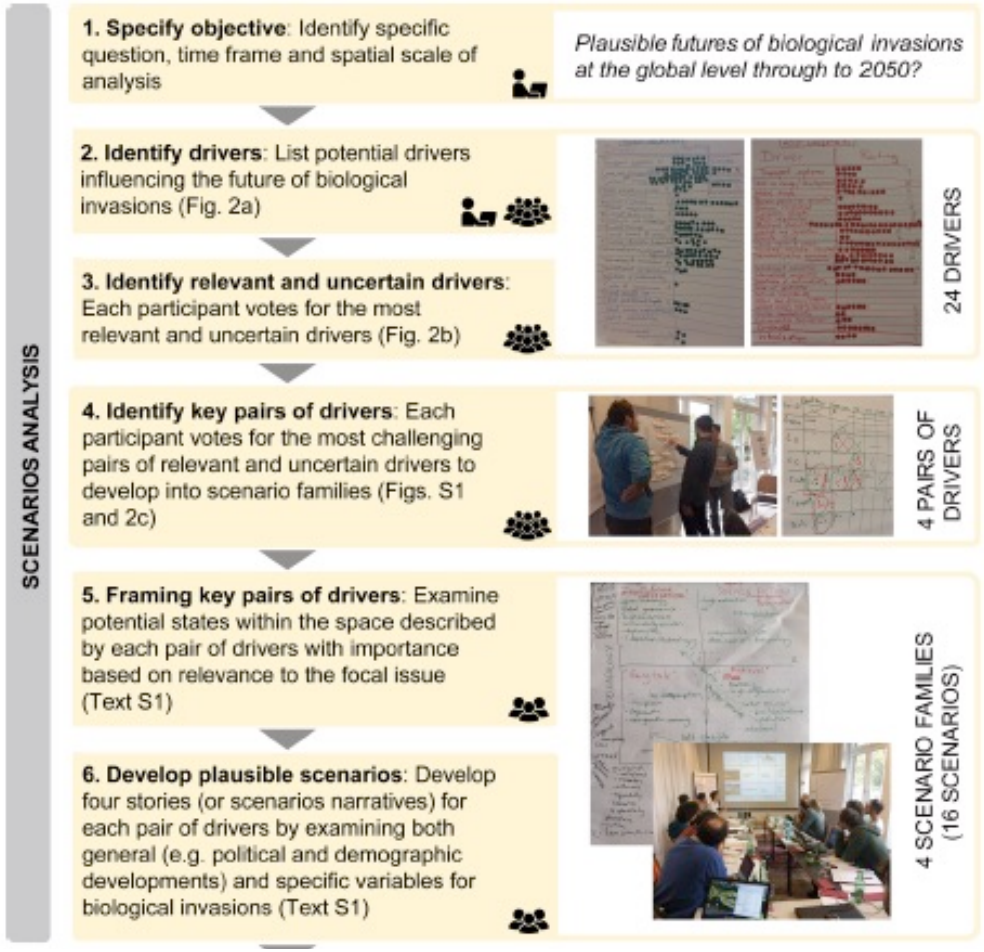
# Scientific results:

## Alternative futures for global biological invasions

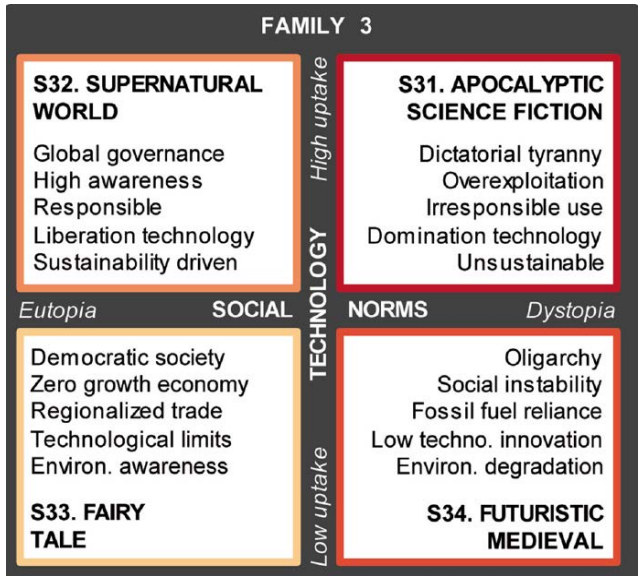
Roura-Pascual, et al. 2021. *Sustainability Science*, *16*(5), 1637-1650.




**Participatory process** to develop a diverse set of global biological invasion scenarios

**16 scenarios** in four groups

**Socioeconomic developments** and **technological innovation** have the potential to shape biological invasions, in addition to well-known drivers



# Policy and societal impacts

## The management of invasive alien species: practices and perceptions

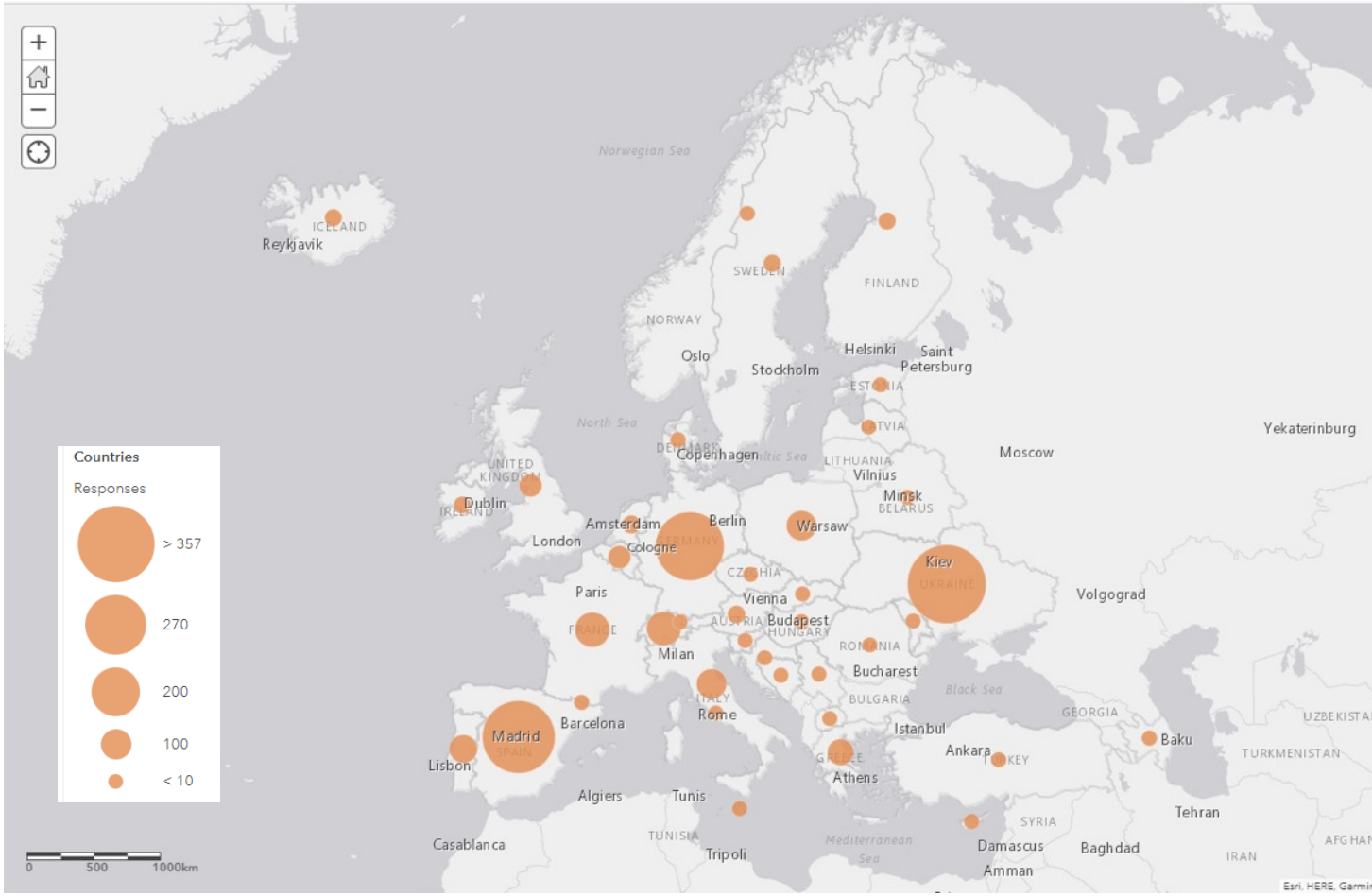
Survey for **local managers** of invasive alien species

To understand the **trends** of IAS and their associated **management in Europe**.

Distributed in **23 European countries**

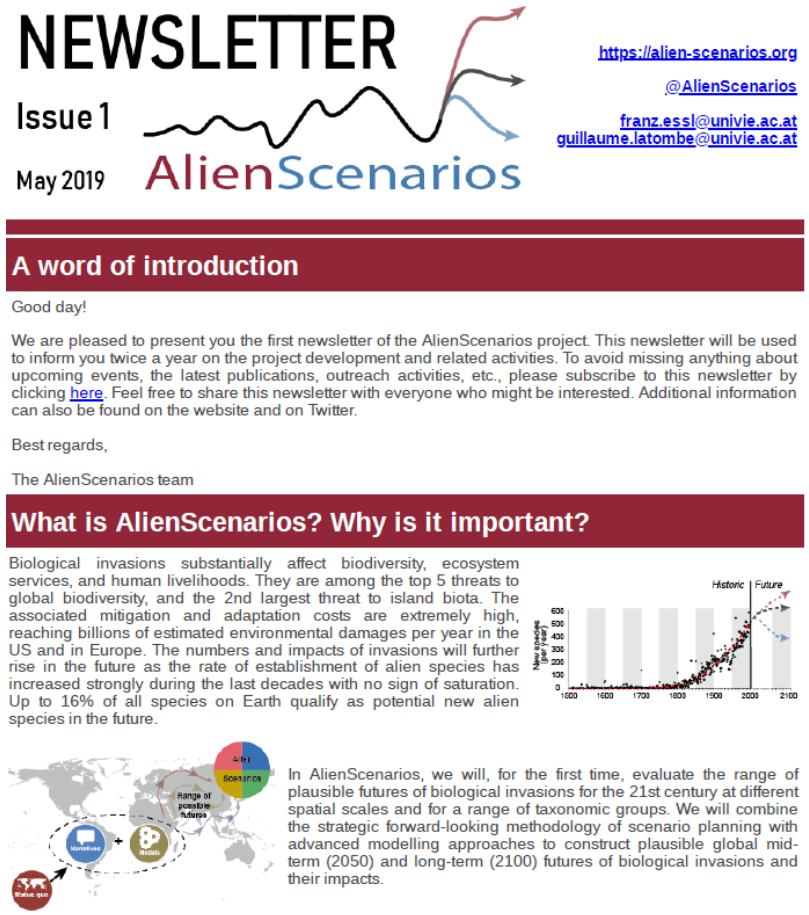
>2000 responses collected

Manuscript in preparation



# Policy and societal impacts:

## Outreach



NEWSLETTER

Issue 1

May 2019

AlienScenarios

https://alien-scenarios.org

@AlienScenarios

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### A word of introduction

Good day!

We are pleased to present you the first newsletter of the AlienScenarios project. This newsletter will be used to inform you twice a year on the project development and related activities. To avoid missing anything about upcoming events, the latest publications, outreach activities, etc., please subscribe to this newsletter by clicking here. Feel free to share this newsletter with everyone who might be interested. Additional information can also be found on the website and on Twitter.

Best regards,

The AlienScenarios team

### What is AlienScenarios? Why is it important?

Biological invasions substantially affect biodiversity, ecosystem services, and human livelihoods. They are among the top 5 threats to global biodiversity, and the 2nd largest threat to island biota. The associated mitigation and adaptation costs are extremely high, reaching billions of estimated environmental damages per year in the US and in Europe. The numbers and impacts of invasions will further rise in the future as the rate of establishment of alien species has increased strongly during the last decades with no sign of saturation. Up to 16% of all species on Earth qualify as potential new alien species in the future.

In AlienScenarios, we will, for the first time, evaluate the range of plausible futures of biological invasions for the 21st century at different spatial scales and for a range of taxonomic groups. We will combine the strategic forward-looking methodology of scenario planning with advanced modelling approaches to construct plausible global mid-term (2050) and long-term (2100) futures of biological invasions and their impacts.

## Participation of AlienScenarios team members

ipbes
Science and Policy for People and Nature

## Key collaborations with related projects:

Invacost.

InvasiBES

# Acknowledgements








# Understanding and managing the impacts of invasive species on biodiversity and ecosystem services

**Montserrat Vilà**

montse.vila@ebd.csic.es

@MontseVila_Lab

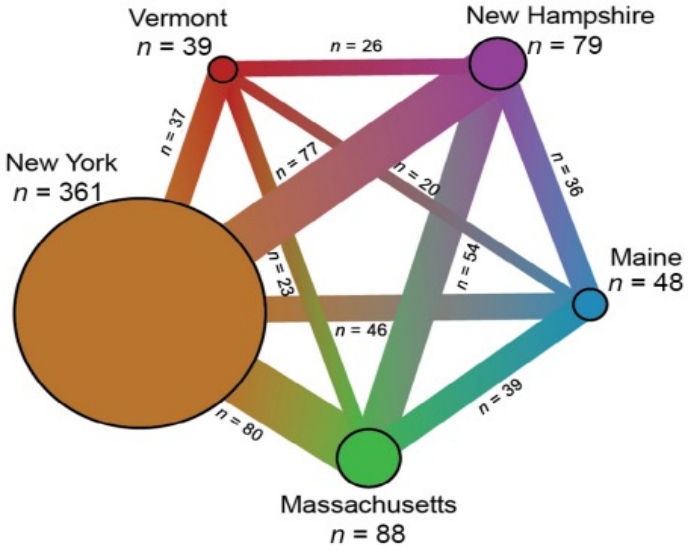
@InvasiBES

# Scientific results: Participatory planning and evaluation of scenarios of invasive species and ecosystem services

NAISMA
North American Invasive Species Management Association

- How do we manage invasive species in the context of climate change?
- How do we build more consistent and proactive invasive plant regulations?

Northeast RISCC Management
Regional Invasive Species & Climate Change

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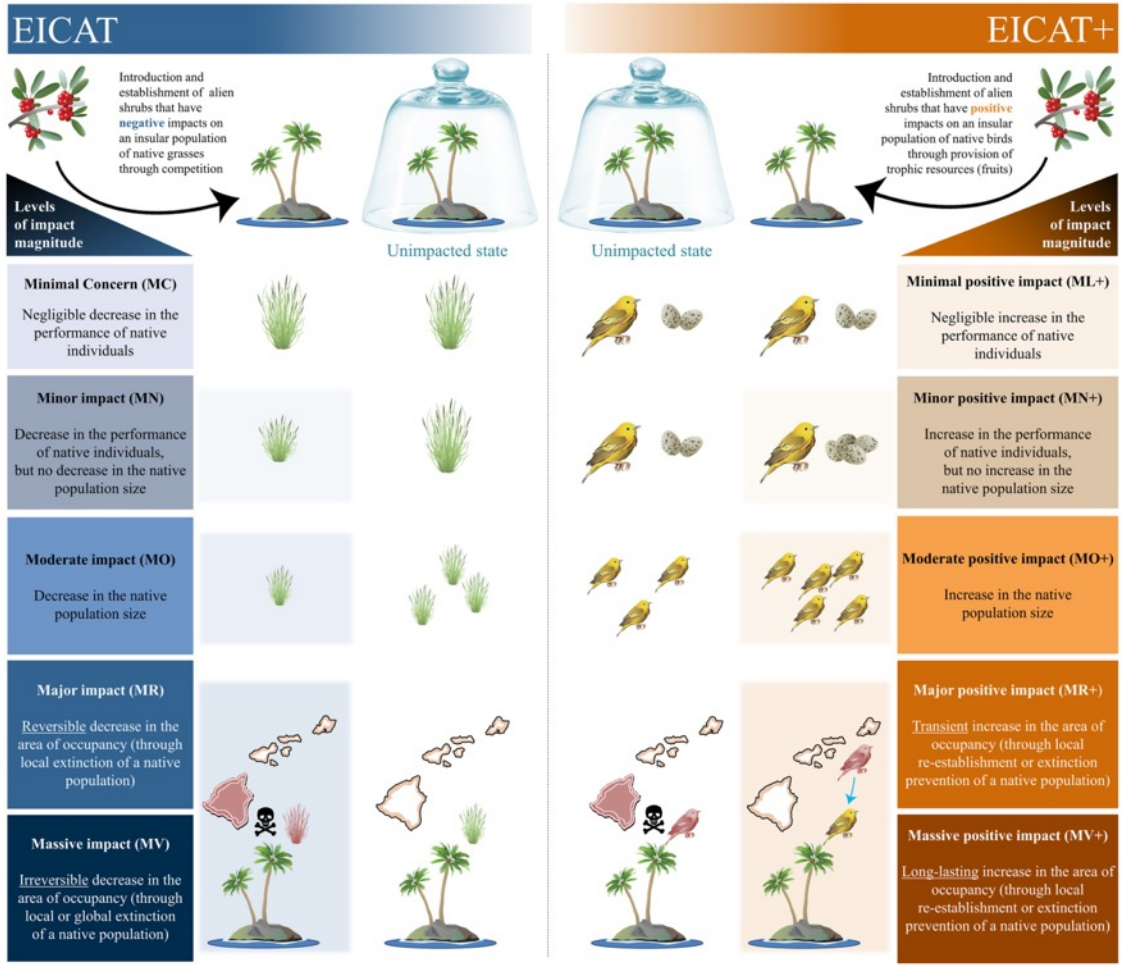
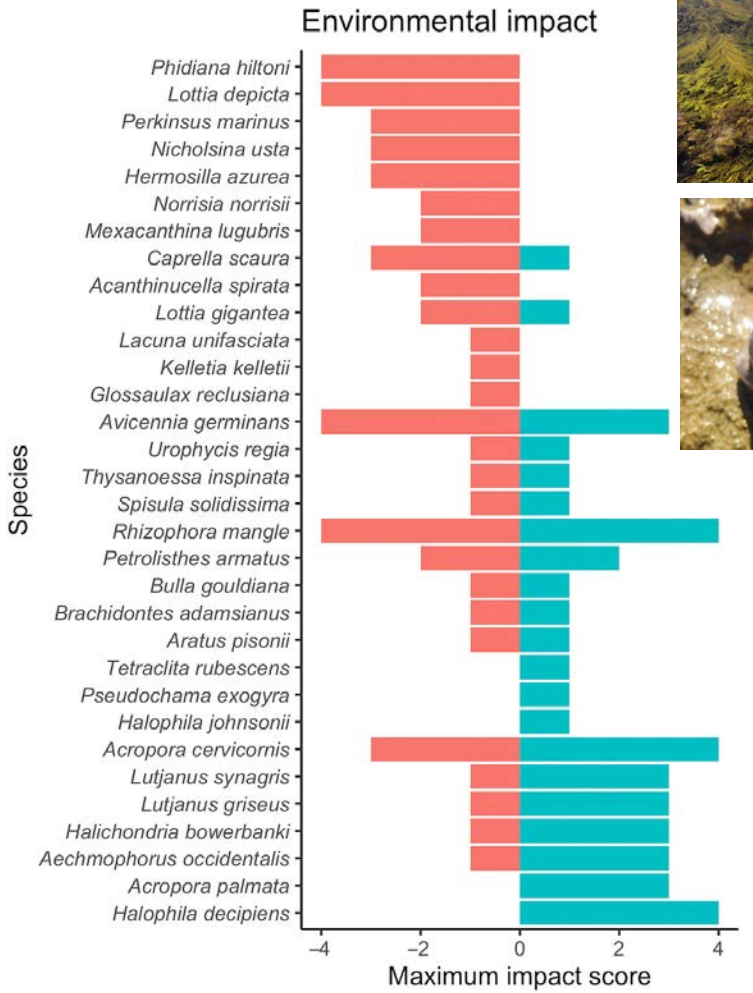
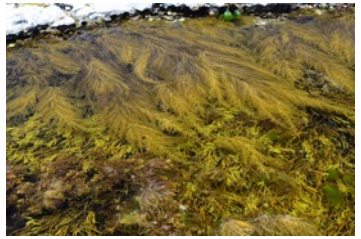
(Bradley et al. 2022 Ecosphere 13: e4014)

# Scientific results: Evaluating the negative & positive impacts of invasive species and range-shifting species



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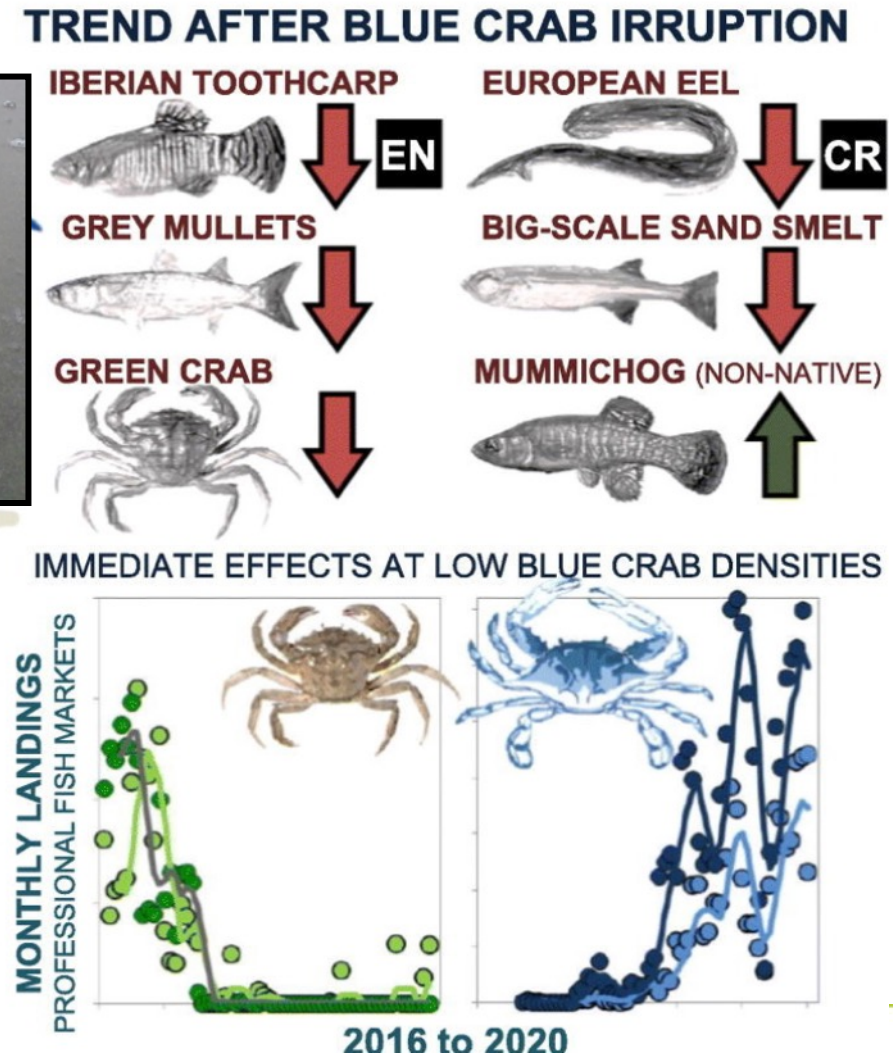
(Vimercati et al. 2022. PLoS Biol 20(8): e3001729)
Henry & Sorte 2022. Frontiers in Ecology and Evolution 20: 161-169)

# Scientific results: Assessing and mapping the impacts of invasive species on ecosystem services in Europe

# Scientific results: Impacts of invasive species on ecosystem services at the local scale. E.g. Blue crab impact on fisheries in the Mediterranean coast (Spain)

*Callinectes sapidus*




(Clavero et al. 2022 Marine Pollution Bulletin 176, 113479)

# Policy and societal impacts / results

1. Classifying both the negative and positive environmental impacts of invasive alien species on native biodiversity to inform conservation decisions - Vimercati et al. 2022. *PLoS Biol* 20: e3001729.

2. Using the same tools to quantify the impacts of invasive alien species for native range-expanding species that track climate change - Henry & Sorte 2022. *Frontiers in Ecology and Evolution* 20: 161-169.

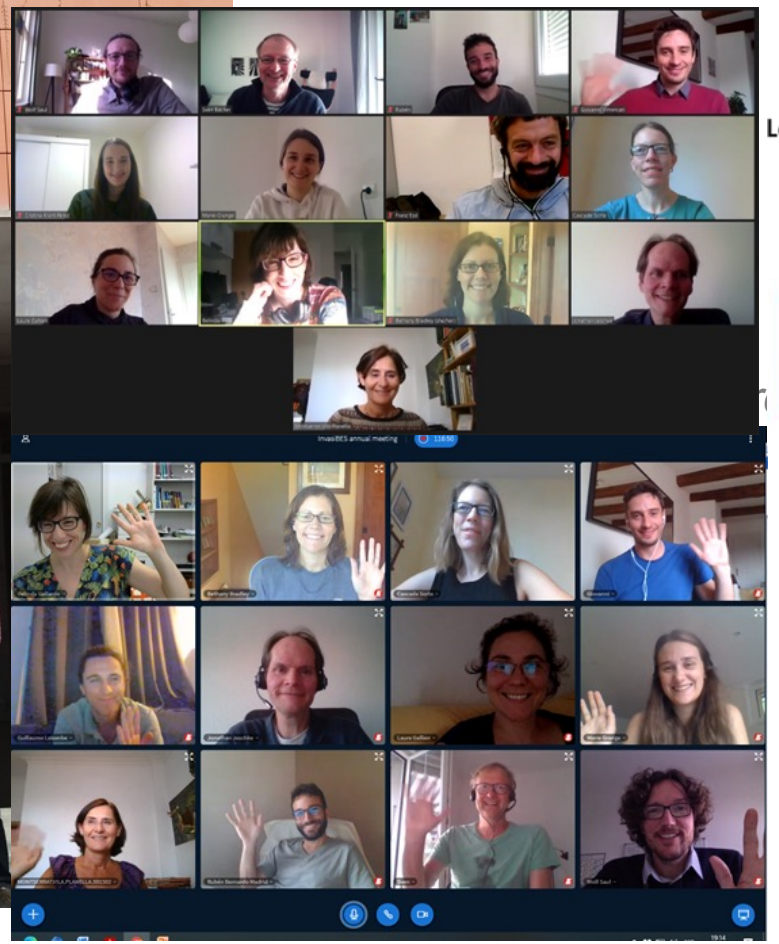
3. Eradicating early infestations to prevent the negative non-linear negative relationship between invader abundance and native species abundance - Bradley et al 2019 *PNAS* 116, 20: 9919-9924.

4. Reducing the spread of invasive alien species for mitigating harms from other anthropogenic changes such as warming temperatures and nitrogen deposition - Lopez et al 2022 *PNAS* 119, 22: e2117389119.

5. Evaluating future impacts of invasive alien species require species distribution models calibrated using bioclimatic, environmental and human impact variables - Perez et al 2022 *Ecosystem Services* 56.

6. Be consistent and proactive in the regulation of invasive alien species across jurisdictional boundaries to prevent their introduction and spread – Bradley et al. 2022 *Ecosphere* 13: e4014.

# Acknowledgements

Estación Biológica Doñana CSIC

IPE Instituto Pirenaico de Ecología CSIC

IGB Leibniz-Institute of Freshwater Ecology and Inland Fisheries

Université Grenoble Alpes

UNI FR

Université de Fribourg
Universität Freiburg

University of Massachusetts Amherst

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# Aquatic ecosystem services in a changing world

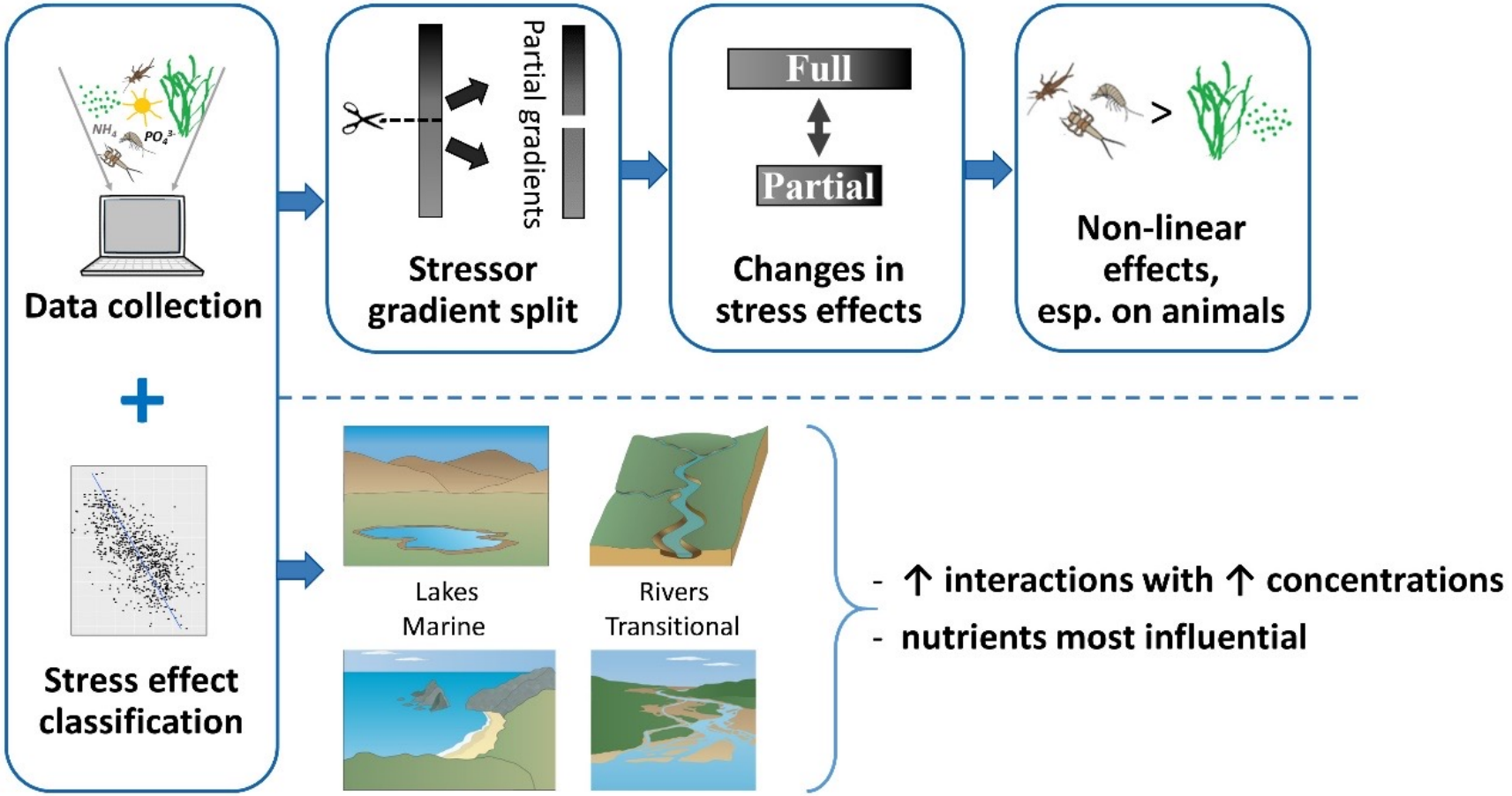

Professor Tasman Crowe

University College Dublin

Philippe Archambault, Edward Barbier, John Brannigan, Michael Bruen, Craig Bullock, Charlotte Carrier-Belleau, Roland Cormier, Christian Feld, Camino Fernandez de la Hoz, Kira Gee, Pierre Glynn, Ainhoa Gonzalez, Daniel Hering, Andreas Kannen, Mary Kelly-Quinn, Leoni Mack, Matthias Obst, Nessa O'Connor, Marcin Penk, Jeremy Piggott, Katharina Rettig, Jürgen Schaper, Katrin Schertenleib, Andreas Skriver Hansen, Marie Stenseke, Valentin Volland, Michelan Wilson

# Scientific results

## 1. Global meta-analyses

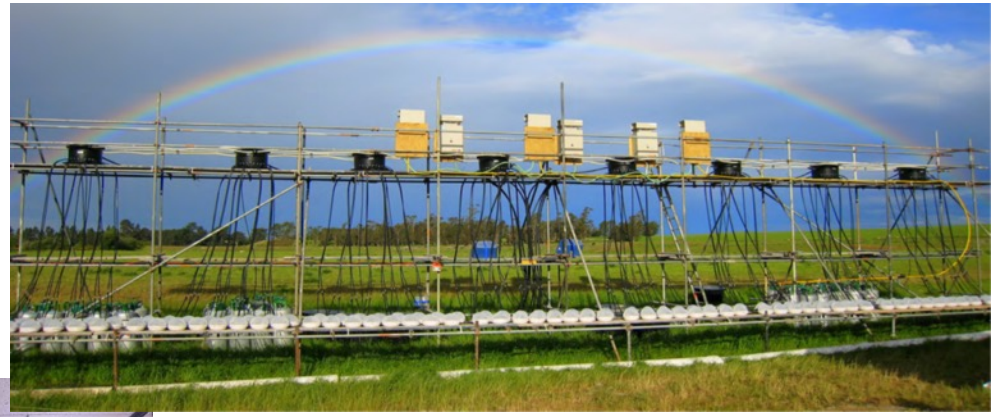


# Scientific results

## 2. Ecological experiments

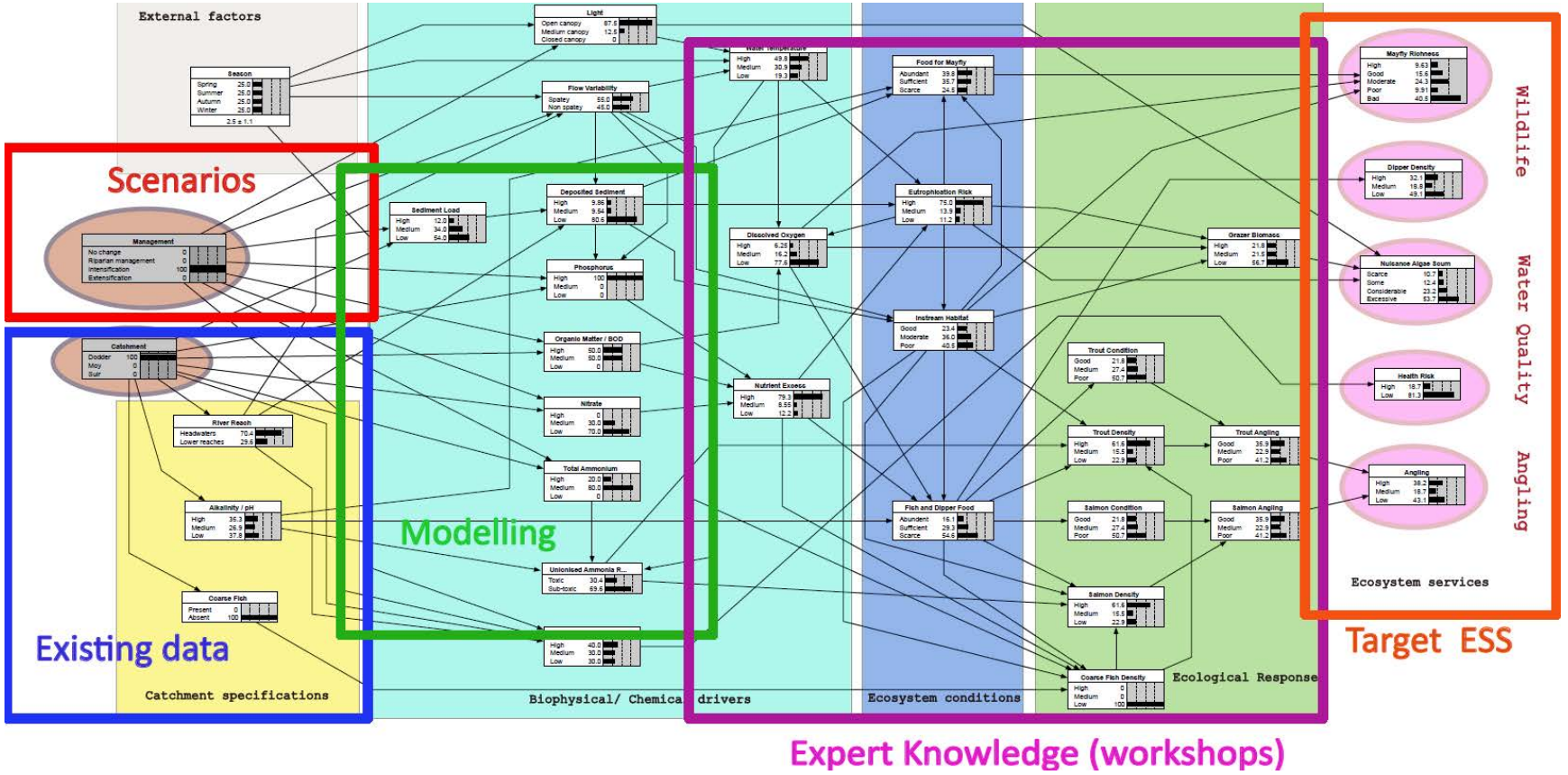

13 concentrations en nutriments


13 concentrations en nutriments + apport d'eau salée (3 PSU)



# Scientific results

## 3. Bayesian Belief Network models & ecological-economic modelling

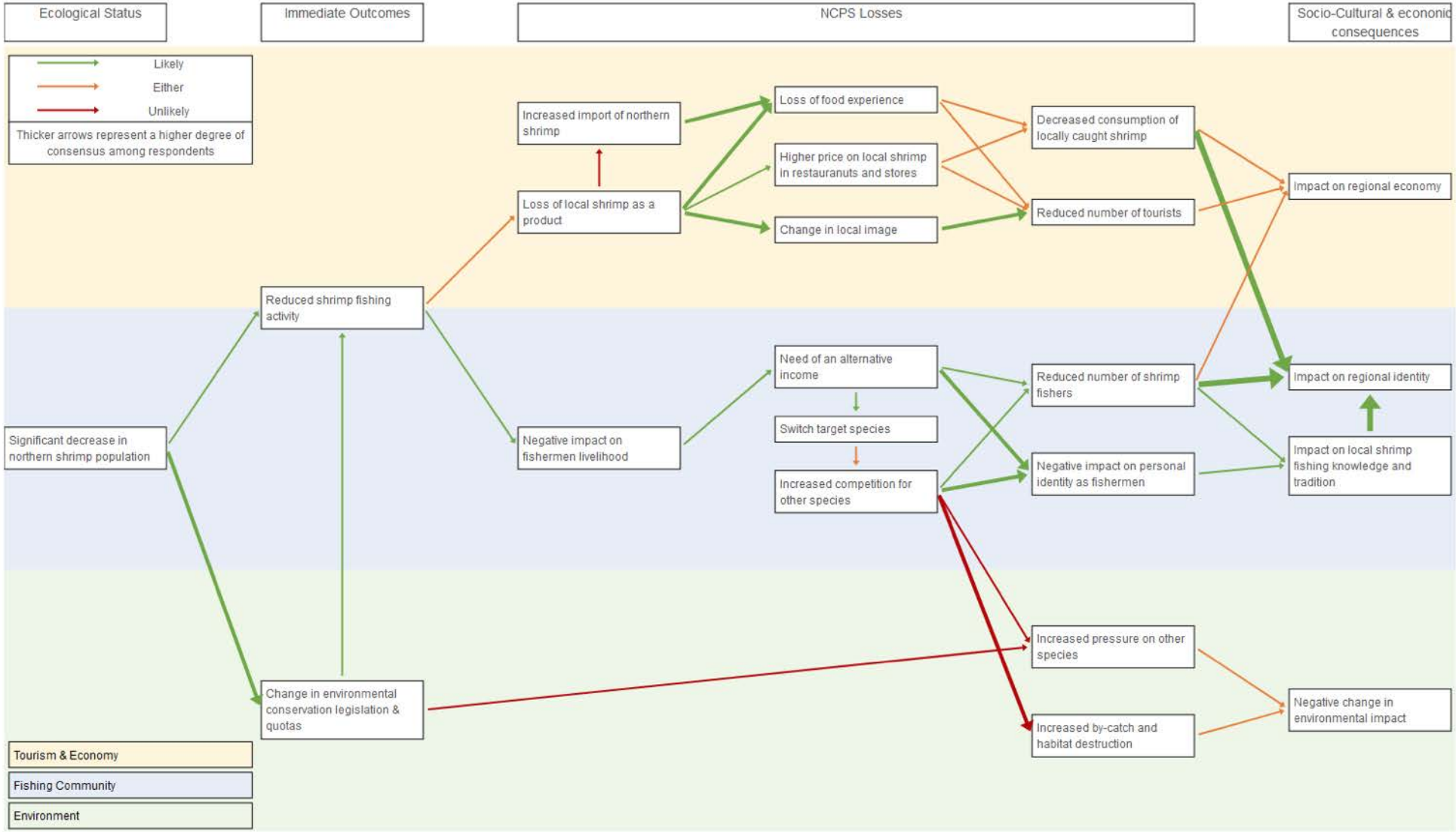


# Scientific results

## 4. Socio-cultural research & interdisciplinarity

Interdisciplinarity

- People
- Process
- Perspectives

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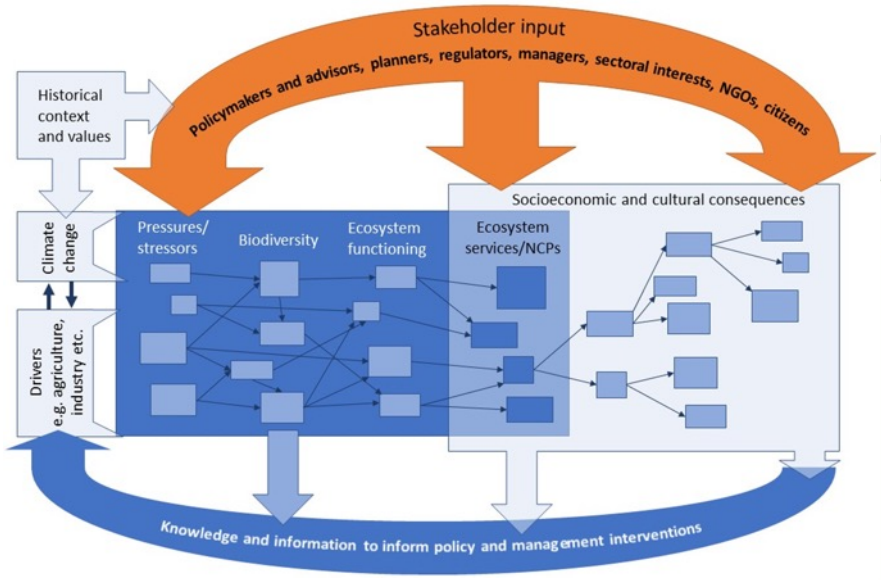
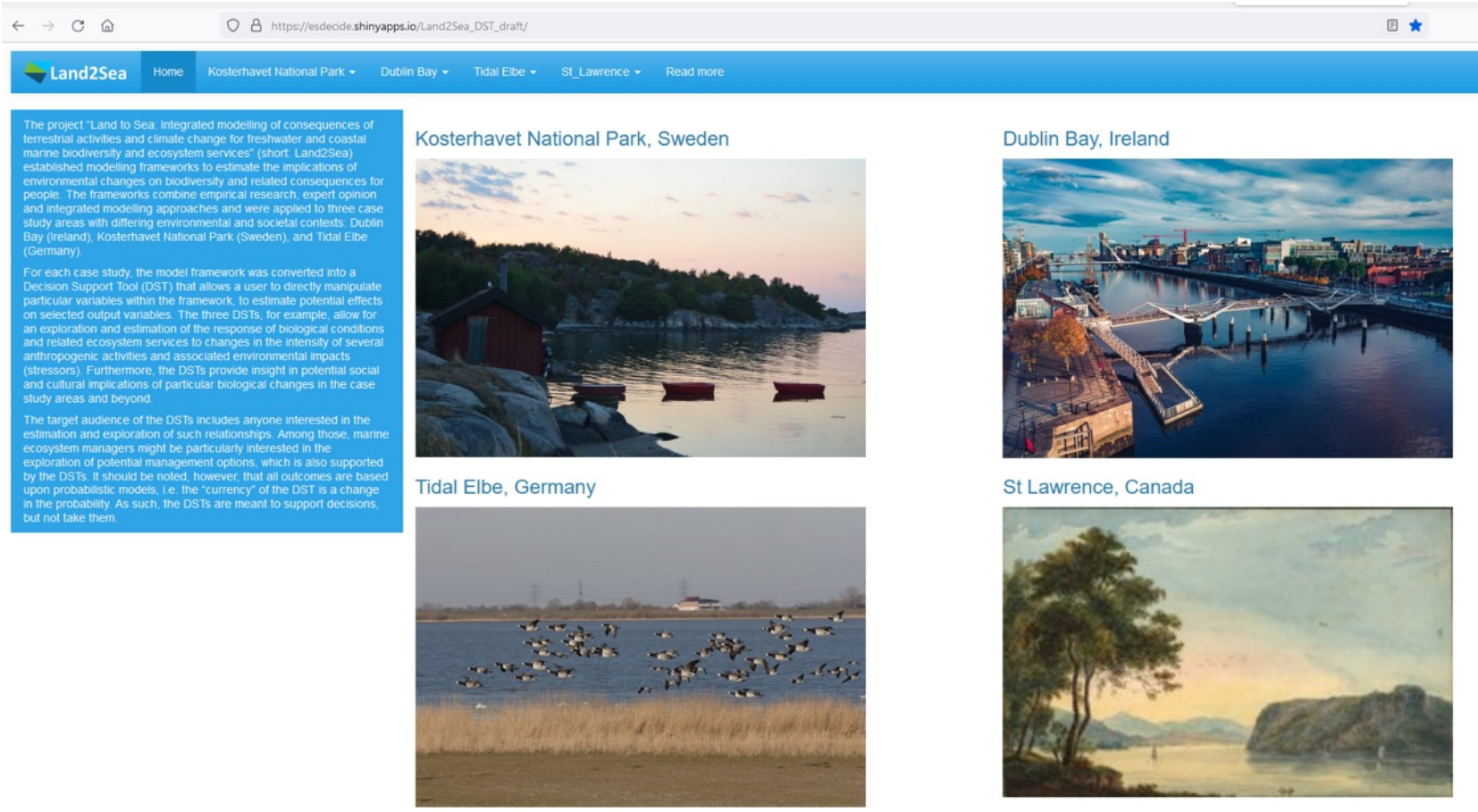
# Policy and societal impacts / results

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https://esdecide.shinyapps.io/Land2Sea_DST/

# Acknowledgements

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Marine Institute
Foras na Mara

formas

DLR Projektträger

Forskningsrådet för miljö, areella näringar och samhällsbyggande, Formas

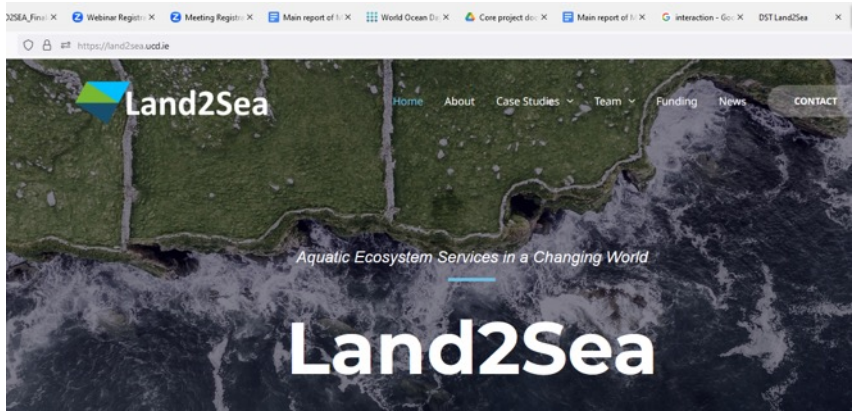
DFG

Fonds de recherche Nature et technologies Québec

NSF

epaResearch
Climate - Water - Sustainability
Identifying pressures • Informing policy • Developing solutions

NSERC CRSNG




https://land2sea.ucd.ie/


tasman.crowe@ucd.ie

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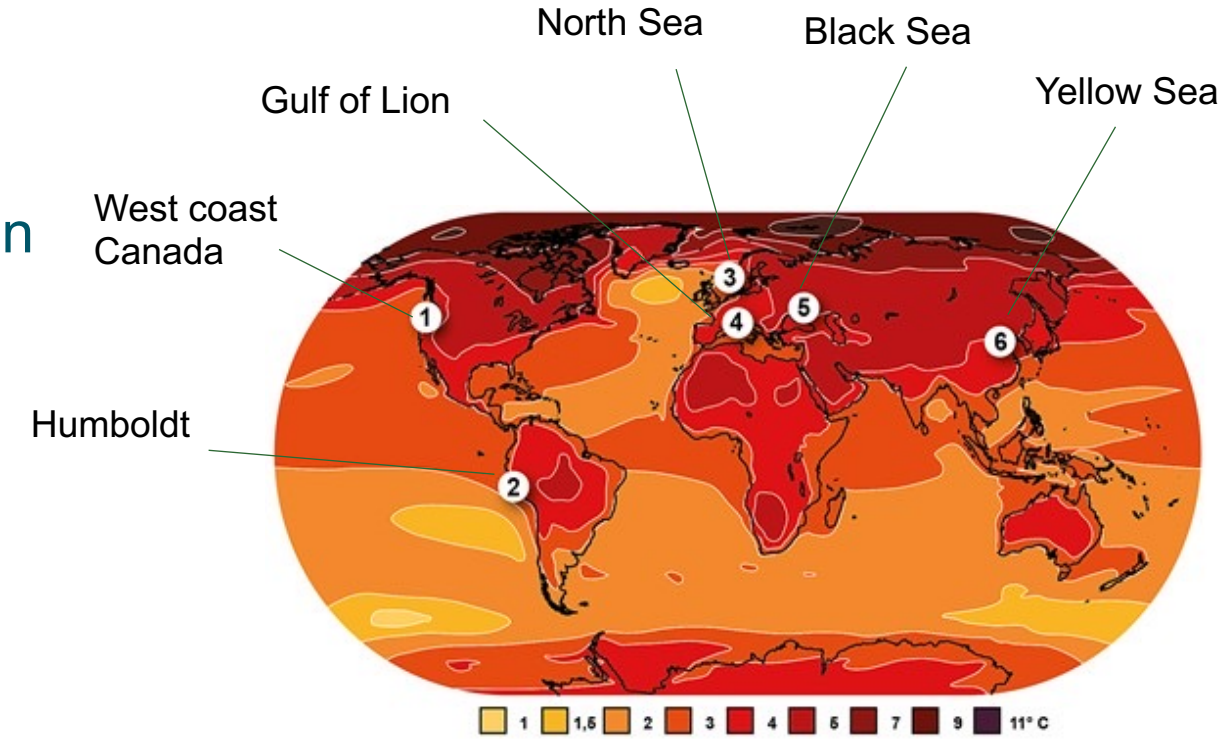
# SOMBEE

## Scenarios Of Marine Biodiversity and Evolution under Exploitation and climate change

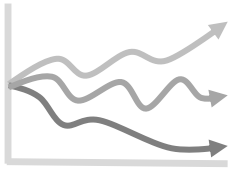



Bruno Ernande & Yunne Shin
*IFREMER, IRD – UMR MARBEC, Montpellier, France*

marbec
marine biodiversity exploitation & conservation

# Objectives

## Project realistic futures of:



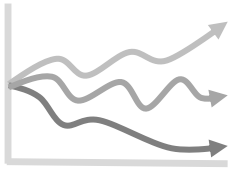
- **intra-** and **inter-specific** dynamics in marine fish biodiversity

Convention on Biological Diversity

**Post-2020 Biodiversity Framework**
High-level Goal: The conservation and sustainable use of species, ecosystems and genetic diversity

# Objectives

**Project realistic futures of:**

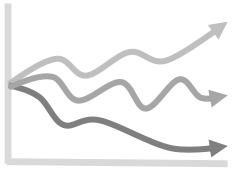


- **intra-** and **inter-specific** dynamics in marine fish biodiversity

- their consequences on **ecological and economic fisheries sustainability**

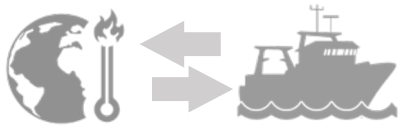
# Objectives

## Project realistic futures of:



◆ **intra-** and **inter-specific** dynamics in marine fish biodiversity

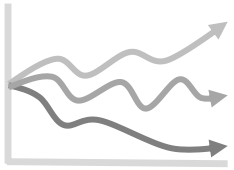
◆ their consequences on **ecological and economic fisheries sustainability**



◆ under combined scenarios of **fishing and climate change to the horizon of 2050 and 2100**

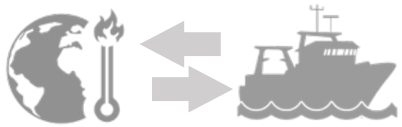
# Objectives

## Project realistic futures of:



◆ **intra-** and **inter-specific** dynamics in marine fish biodiversity

◆ their consequences on **ecological and economic fisheries sustainability**

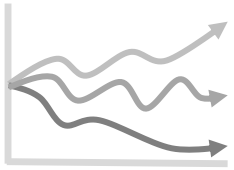


◆ under combined scenarios of **fishing and climate change to the horizon of 2050 and 2100**

**Do eco-evolutionary dynamics dampen (evolutionary rescue) or worsen (evolutionary trap) global change impacts on future marine fish biodiversity and its sustainable use?**

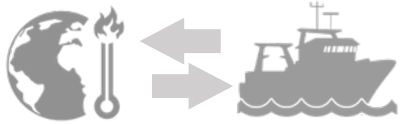
# Objectives

## Project realistic futures of:



◆ **intra-** and **inter-specific** dynamics in marine fish biodiversity

◆ their consequences on **ecological and economic fisheries sustainability**



◆ under combined scenarios of **fishing and climate change to the horizon of 2050 and 2100**

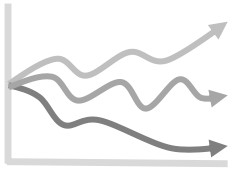
**Do ec… …dynamics d… …rescue) or v… …hary trap) & … …on future ma… …versity and …**

What about local vs global scales?

What about the synergistic effects between climate change & fishing?

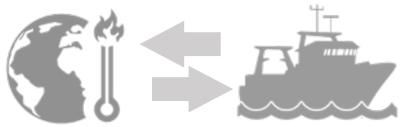
# Objectives

## Project realistic futures of:



◆ **intra-** and **inter-specific** dynamics in marine fish biodiversity

◆ their consequences on **ecological and economic fisheries sustainability**



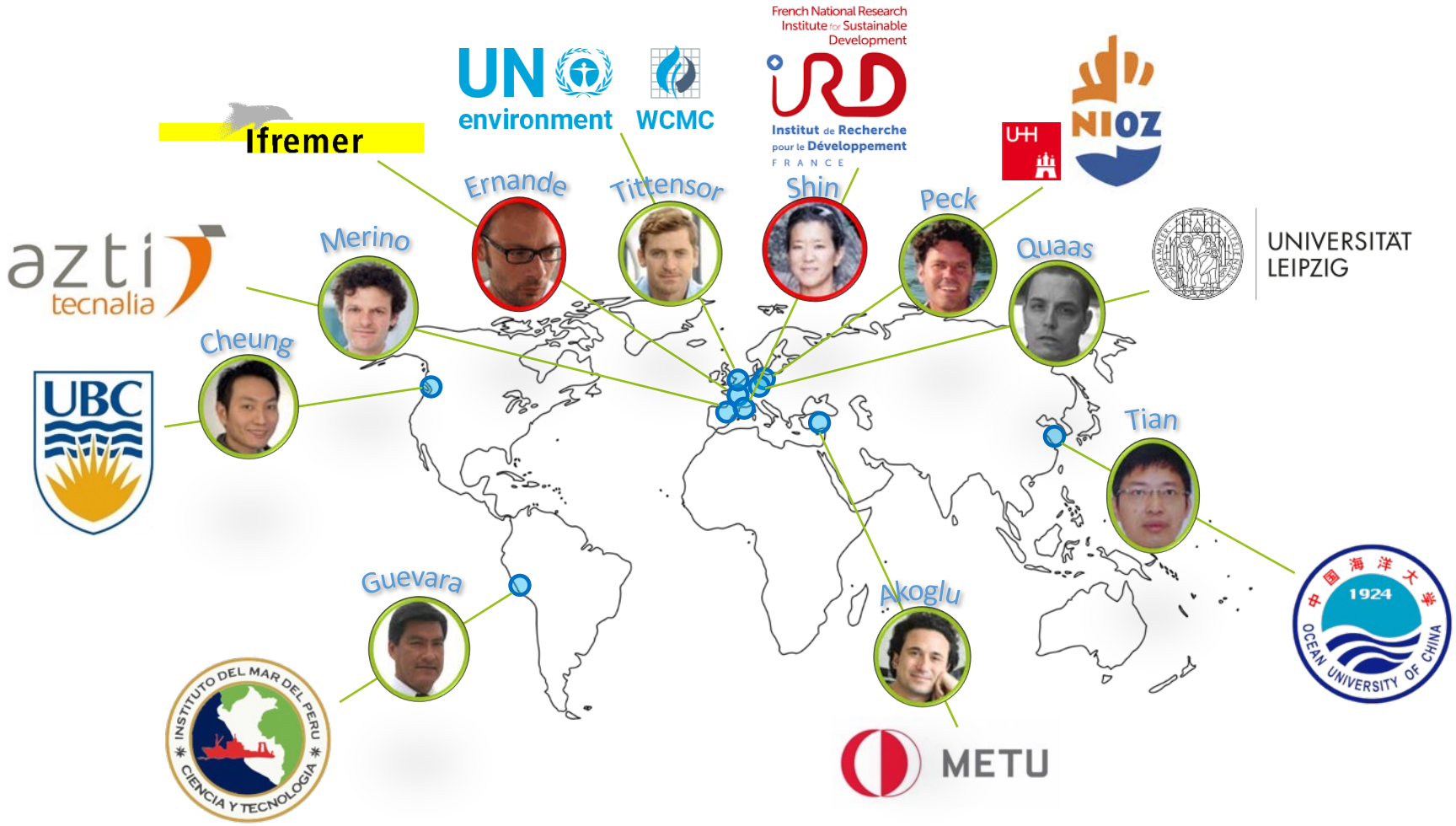
◆ under combined scenarios of **fishing and climate change to the horizon of 2050 and 2100**

**Developed a mechanistic interdisciplinary evolutionary-ecosystem-economic model** that accounts for various aspects from fish biology to fisheries economics

**Co-created scenarios with various stakeholders:** future policy and fisheries management options to be tested in the context of climate change.

**Downscaled** global scale scenarios to the regional/local scale.

# Consortium


Ifremer
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WCMC
French National Research Institute for Sustainable Development
Institut de Recherche pour le Développement
FRANCE
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azti tecnalia
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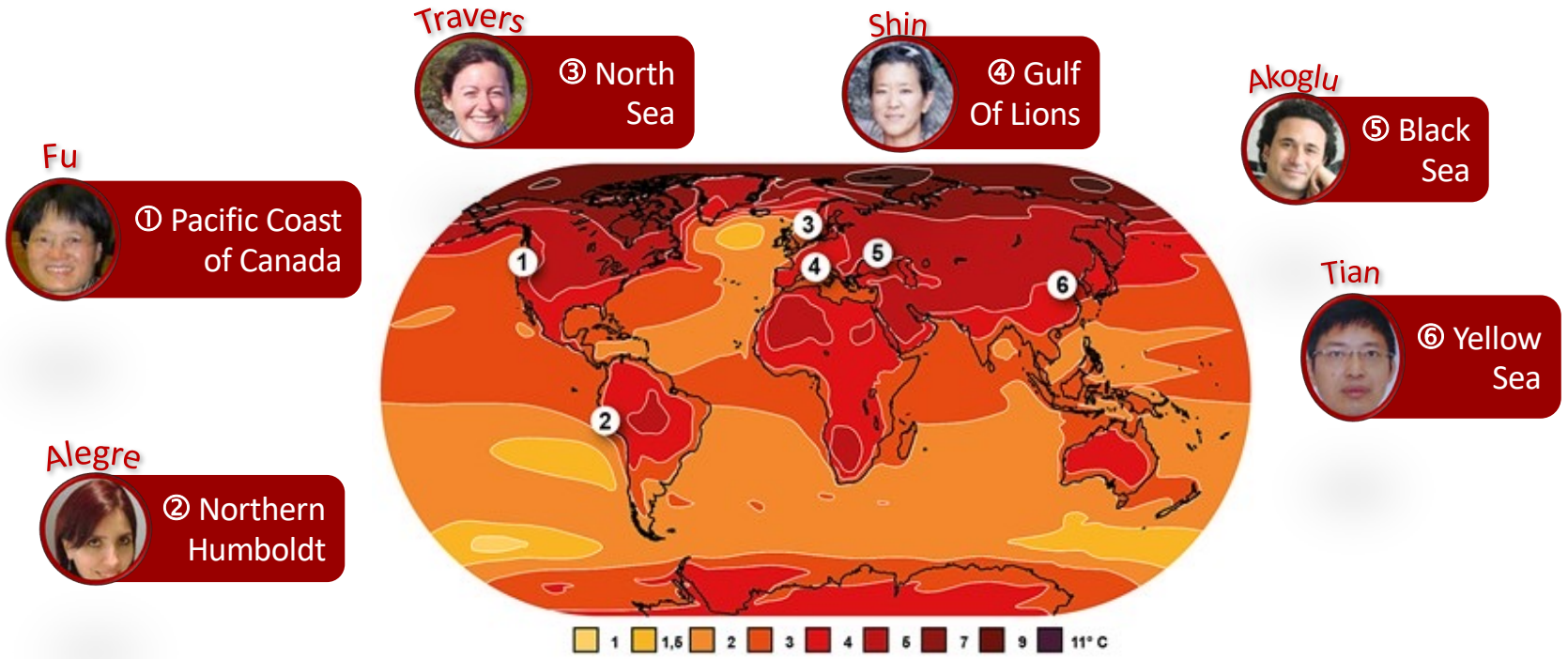
OCEAN UNIVERSITY OF CHINA
METU

# Case studies

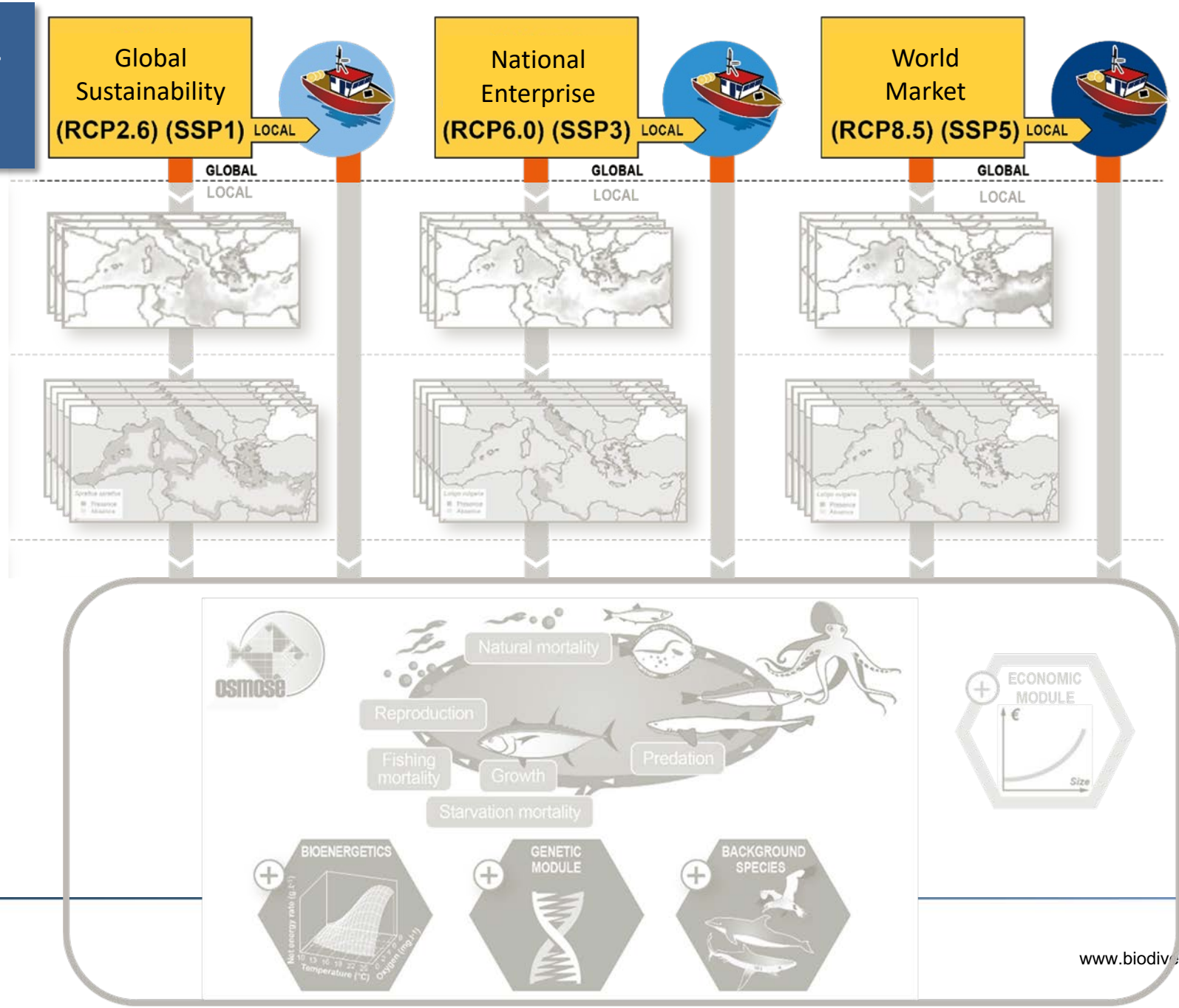
SOMBEE conducted its work in **six regional marine ecosystems**, with important contrasts in oceanography and ecology, history of fisheries, socio-economics, and management and policy frameworks.




Change in average surface temperature 1986-2005 to 2081-2100, RCP8.5 (IPCC AR5)

# Scientific results

# Downscaling scenarios from global to local socio-ecosystems



**Global climatic & socio-economic scenarios**

Global Sustainability (RCP2.6) (SSP1) LOCAL GLOBAL

National Enterprise (RCP6.0) (SSP3) LOCAL GLOBAL

World Market (RCP8.5) (SSP5) LOCAL GLOBAL

**Downscaling climate scenarios**

## A multi-model selection approach for statistical downscaling and bias correction of Earth System Model outputs for regional impact applications

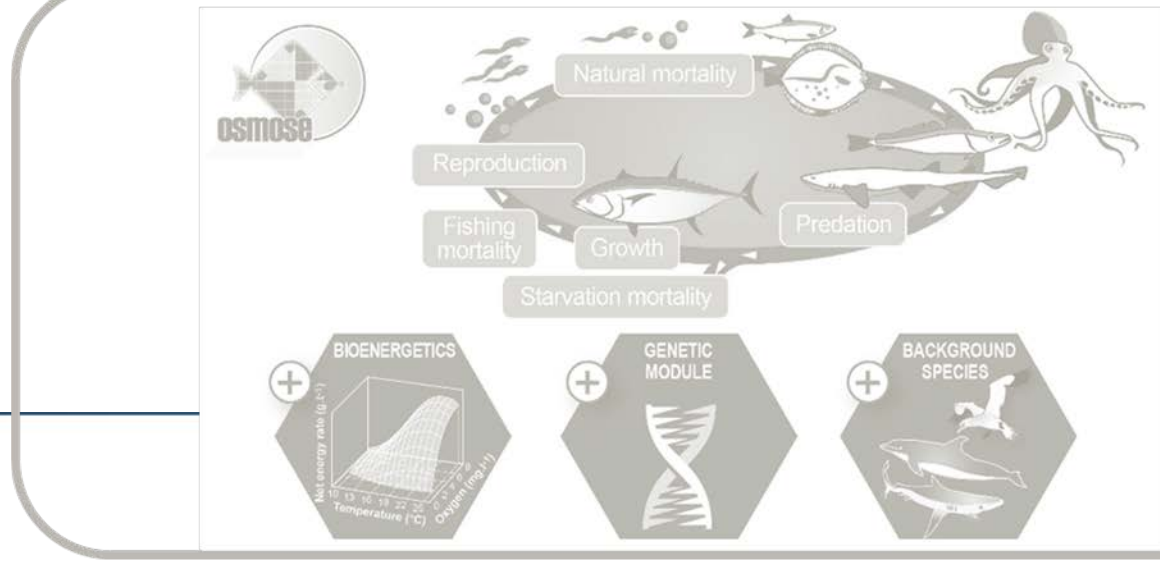
BIAS CORRECTION | CLIMATE CHANGE | GCM DOWNSCALING | MULTI-MODEL SELECTION | STATISTICAL DOWNSCALING

ESS Open Archive 2023

Earth's Future

AGU ADVANCING EARTH AND SPACE SCIENCE

Ricardo Oliveros-Ramos, Yunne-Jai Shin, Dimitri Gutierrez, Verena M Trenkel




FISHERIES & MARINE ECOSYSTEM FISH-MIP MODEL INTERCOMPARISON PROJECT

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**Global climatic & socio-economic scenarios**

**Downscaling climate scenarios**

**Species distribution models**

Global Sustainability (RCP2.6) (SSP1) LOCAL

National Enterprise (RCP6.0) (SSP3) LOCAL

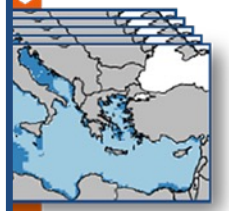
World Market (RCP8.5) (SSP5) LOCAL

GLOBAL

GLOBAL

GLOBAL

LOCAL



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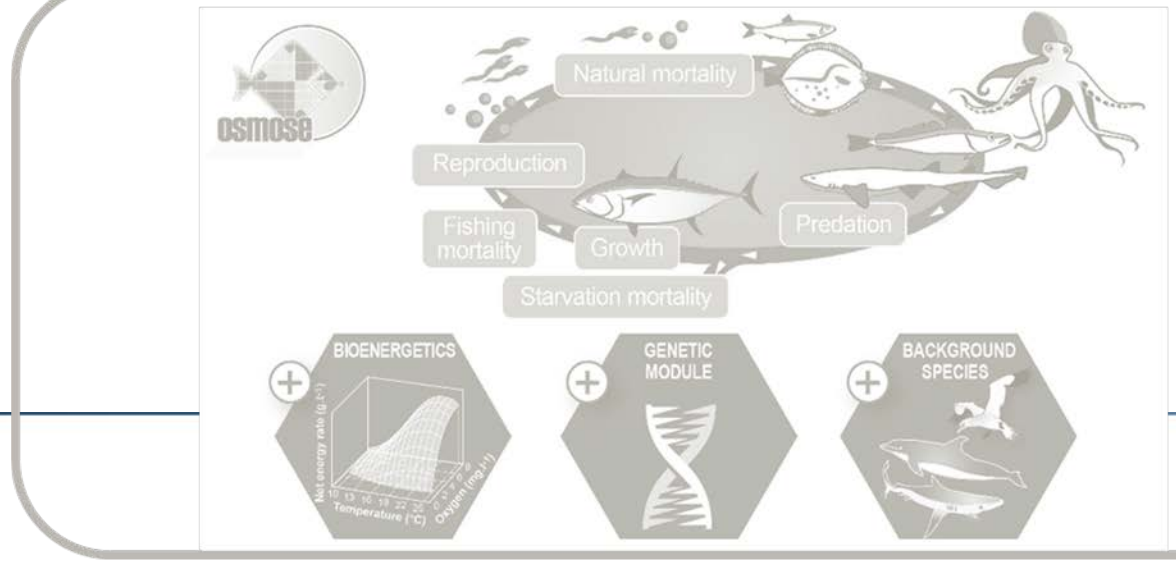
February 16, 2023

Technical note Open Access

Species' climate niche modeling framework Predicting historical & future species' spatial distributions & estimation of species' thermal tolerance

Drira, Sabrine; Hattab, Tarek; Barrier, Nicolas; Morell, Alaia; Oliveros-Ramos, Ricardo; Shin, Yunne-Jai

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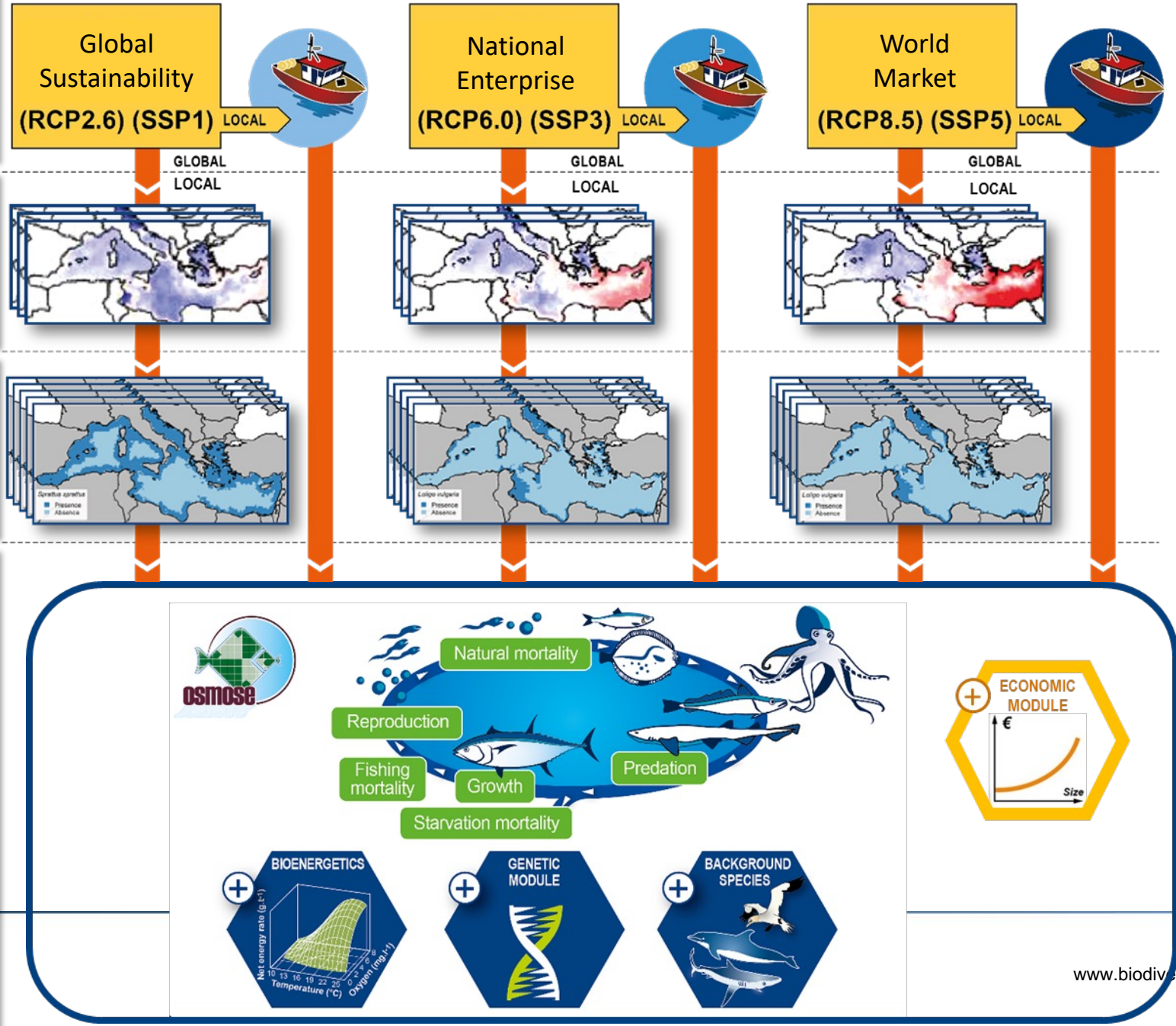
**Global climatic & socio-economic scenarios**

**Downscaling climate scenarios**

**Species distribution models**

**Evolutionary-ecosystem-economic model**

- Genetics
- Physiology
- Life-history traits
- Individual
- Population
- Community
- Food web
- Fisheries yield, costs & benefits

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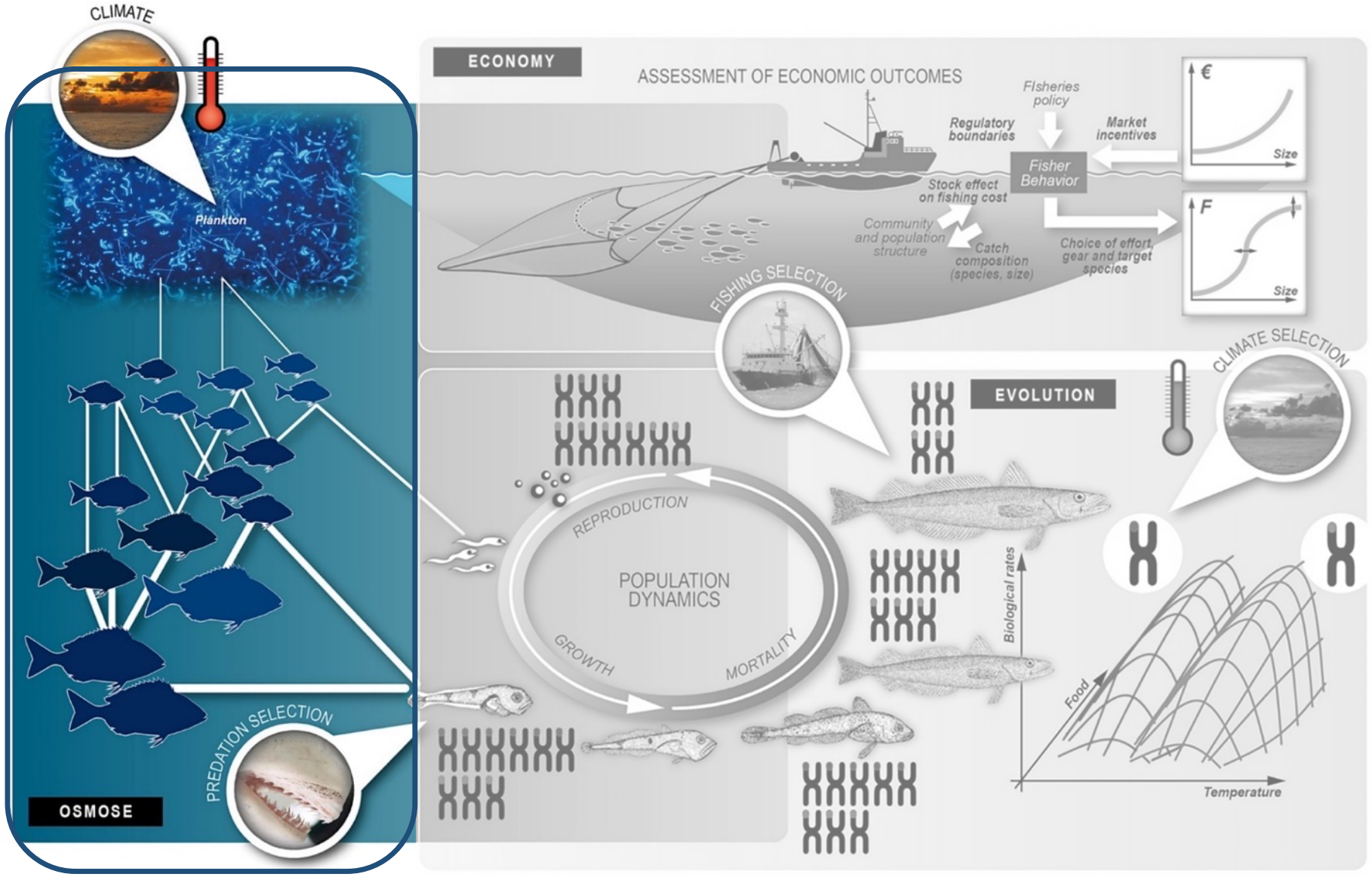
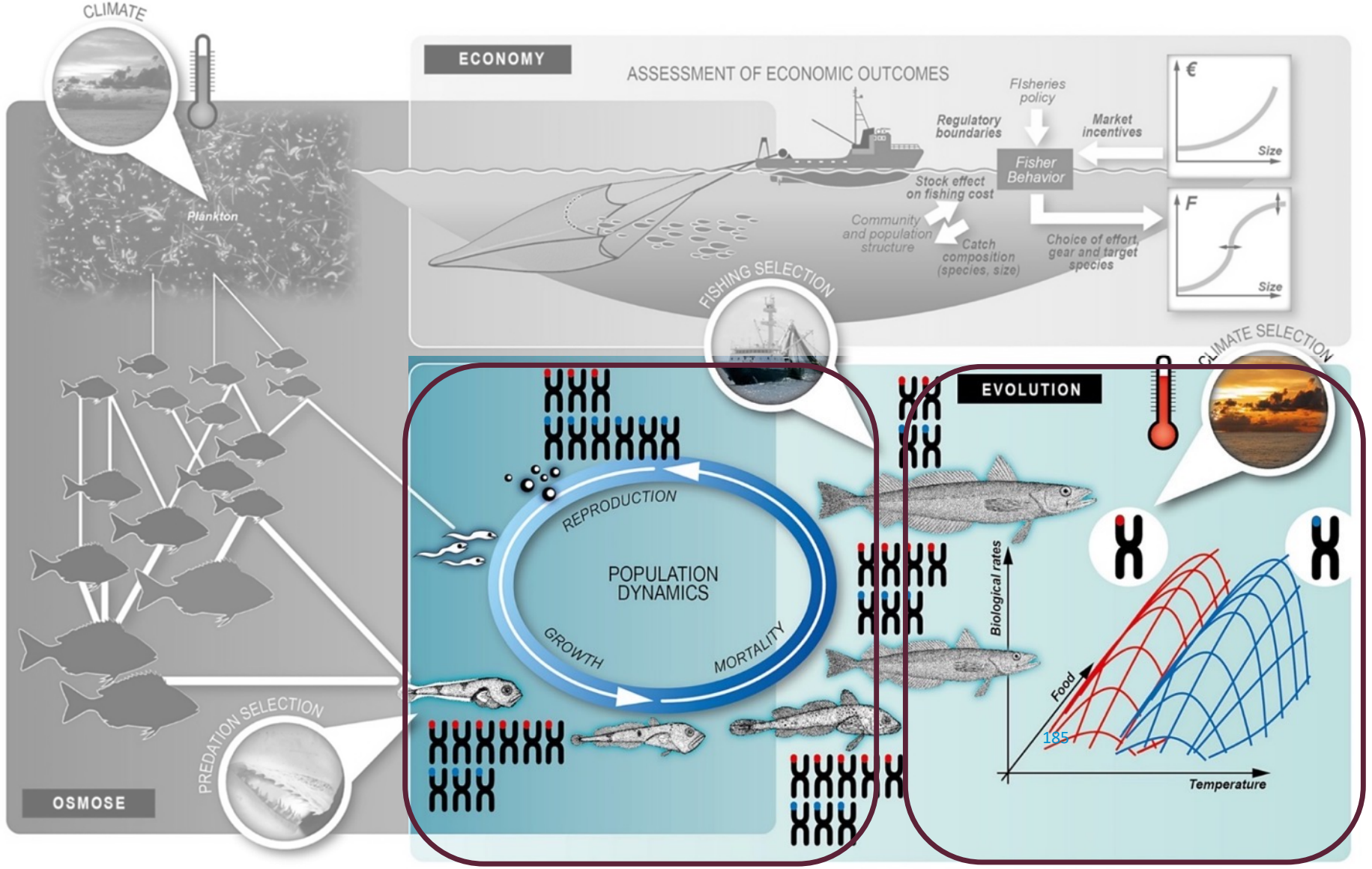
# Modeling framework




**OSMOSE**
**Multi-species model**

# Modeling framework

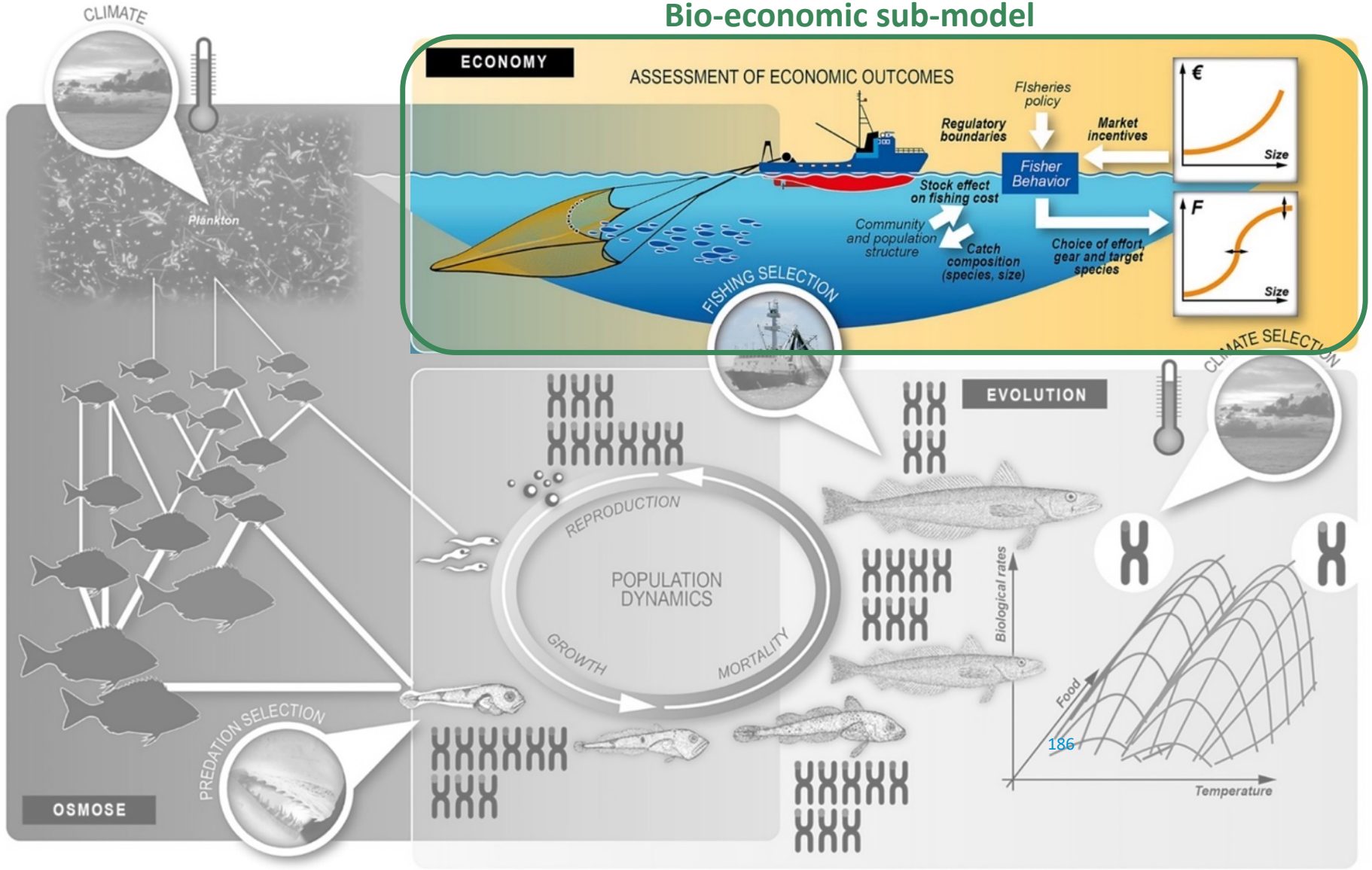



Evolutionary sub-model

Bioenergetic sub-model

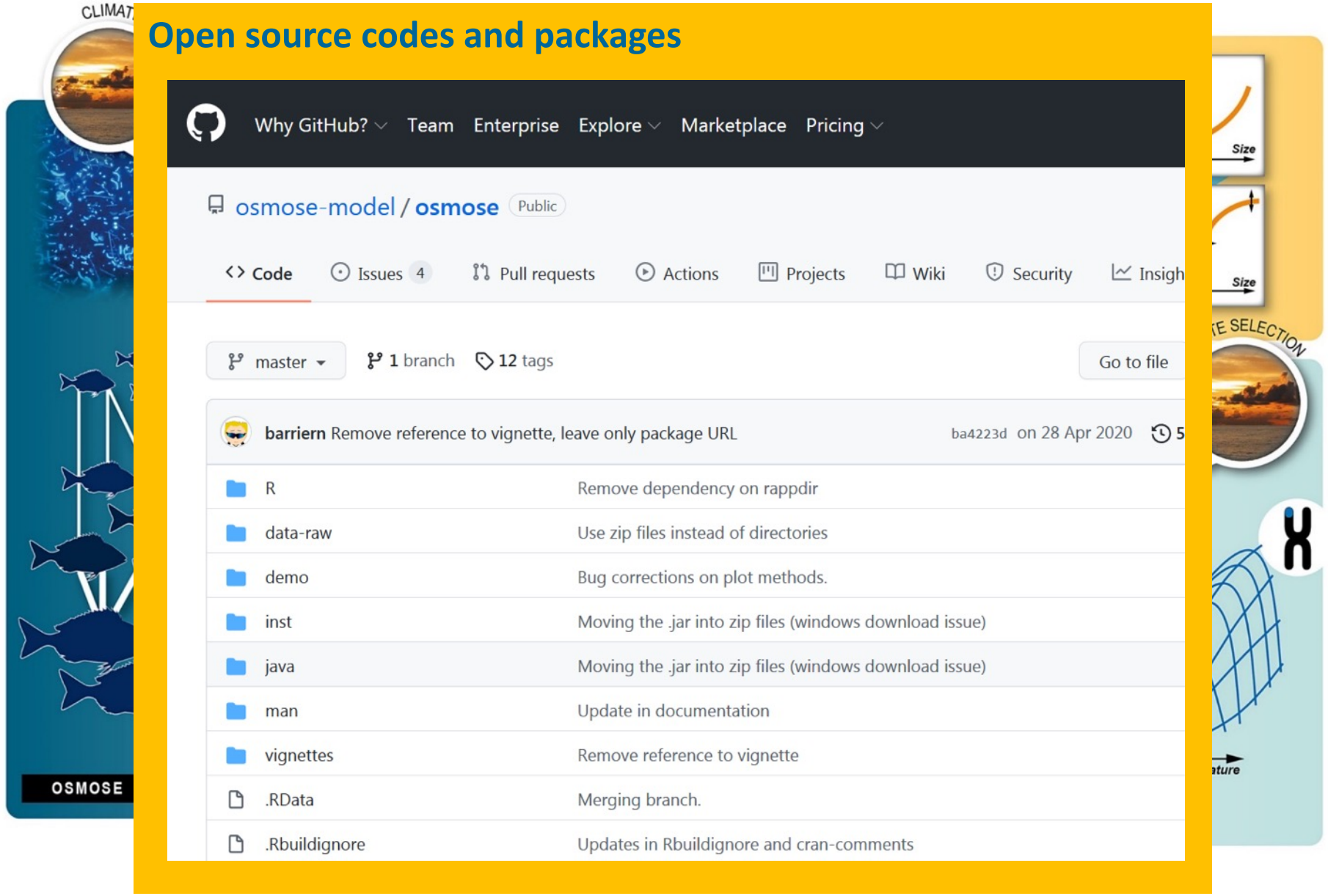
# Modeling framework

## Bio-economic sub-model

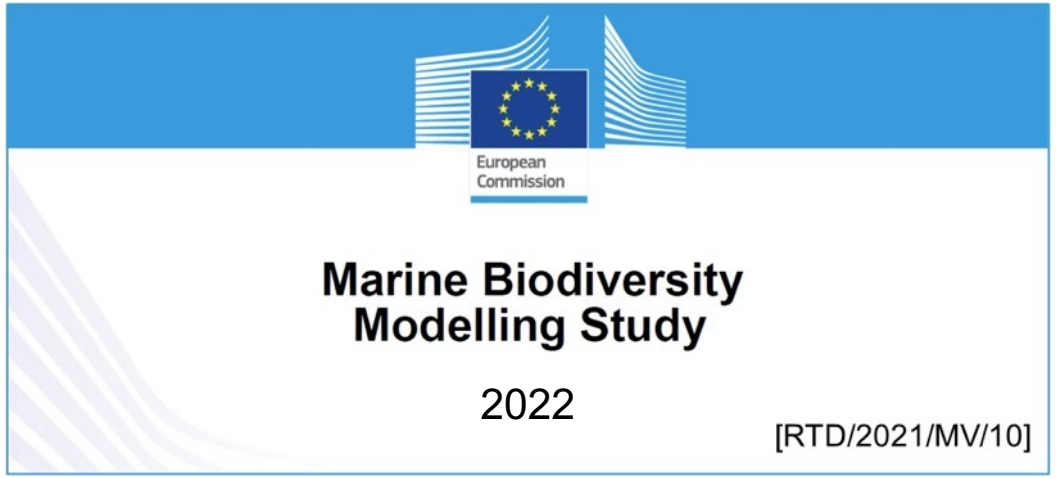


# Modeling framework

## Open source codes and packages



# Independent study commissioned by the EU

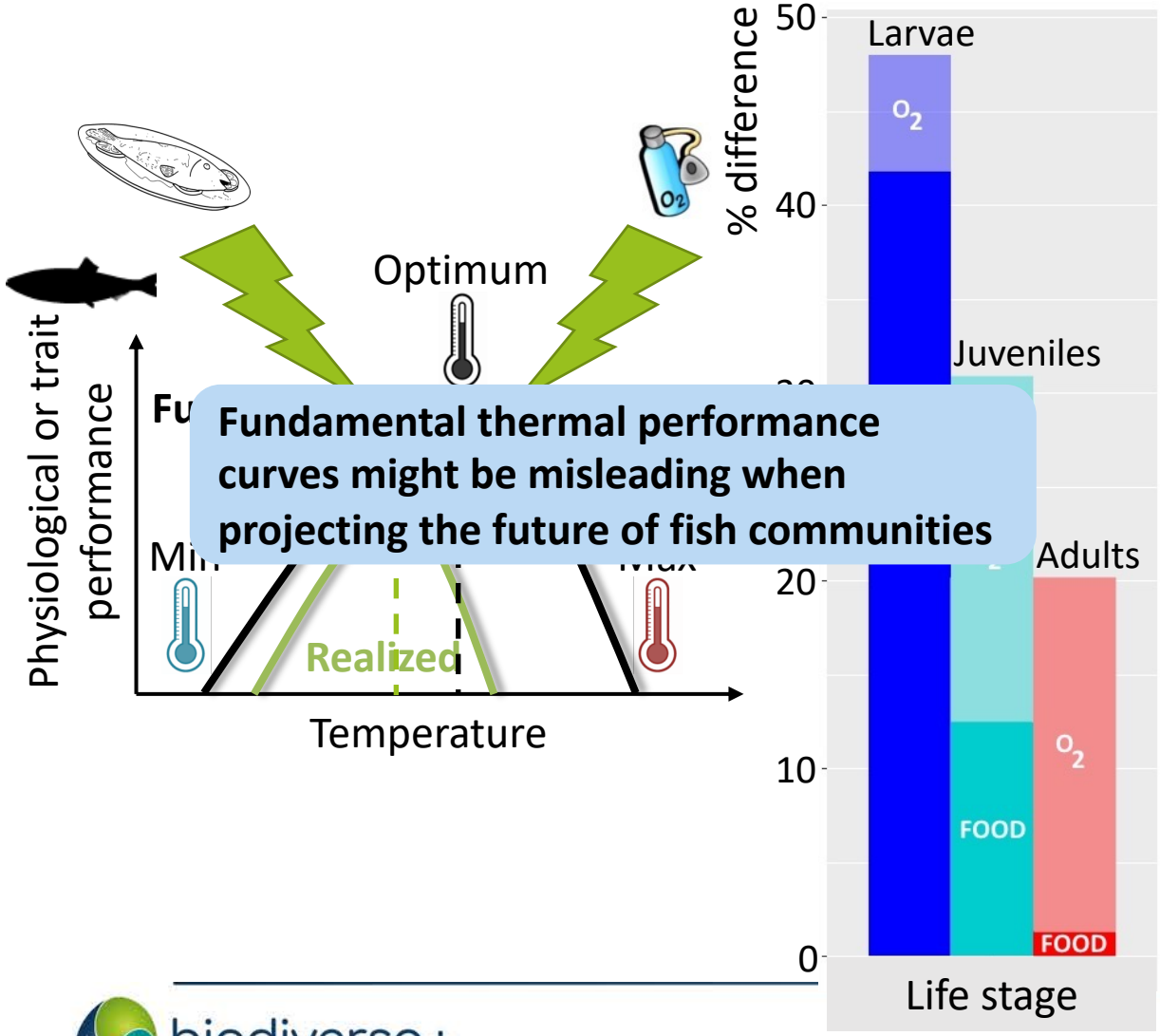



**Ranked 1st** among 62 marine ecosystem models

**Table 7:** Definitive list of selected biodiversity models to implement higher trophic levels and complex food webs in DTO and support EU policies

| Model name | Model category |
|---|---|
| OSMOSE | Multispecies individual-based models |
| Atlantis | Whole system or end-to-end models |
| StrathE2E | Whole system or end-to-end models |
| NORWECOM.E2E | Whole system or end-to-end models |
| Ecopath with Ecosim | Mass based - food web models |
| ECOSMO-E2E | Whole system or end-to-end models |
| APECOSM | Multispecies size-based models |
| ECOTRAN e2e | Whole system or end-to-end models |
| SEAPODYM | Multispecies individual-based models |
| Macroecological | Multispecies size-based models |

# Some modelling practices may bias scenario projections




**Fundamental thermal performance curves might be misleading when projecting the future of fish communities**

Contents lists available at ScienceDirect

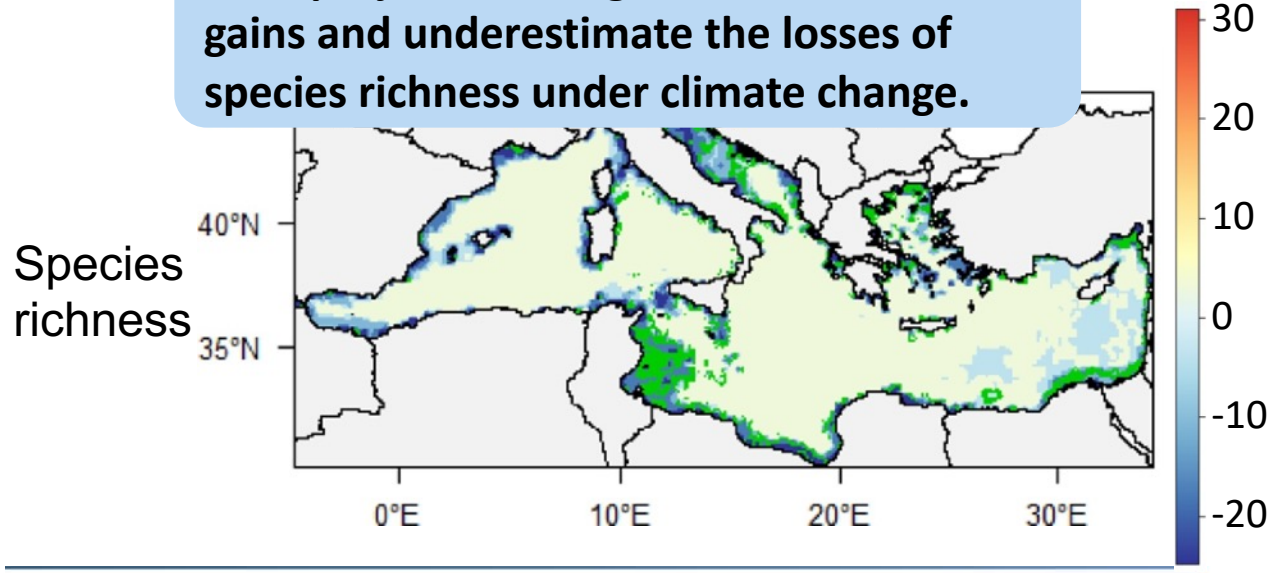
Ecological Modelling

journal homepage: www.elsevier.com/locate/ecolmodel

Using species distribution models only may underestimate climate change impacts on future marine biodiversity

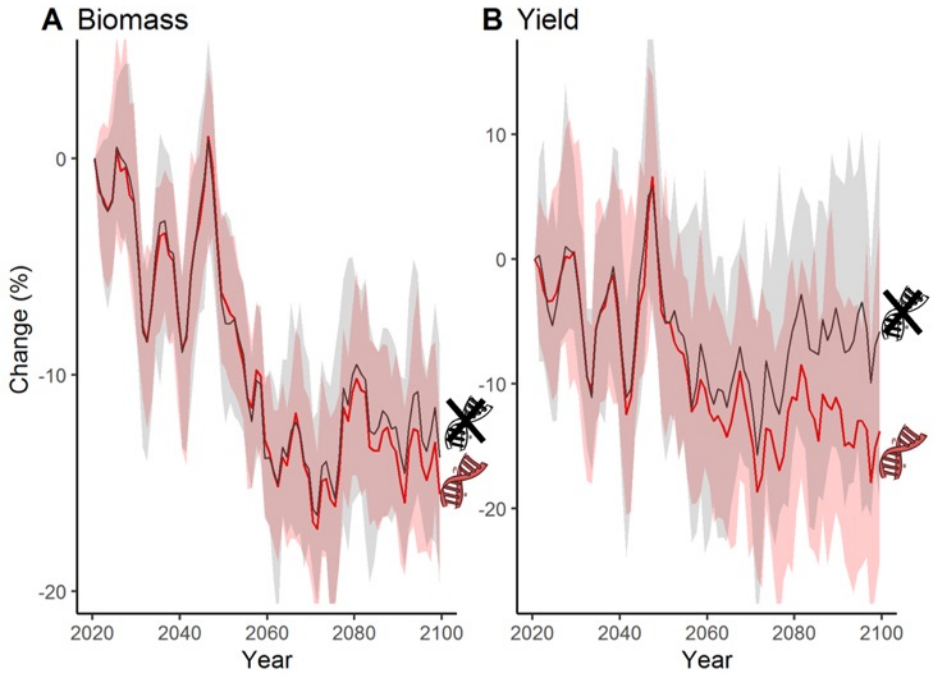
Fabien Moullec [1,2,3,*], Nicolas Barrier [4], Sabrine Drira [4], Francois Guilhaumon [3,5], Tarek Hattab [4]

**SDM projections might overestimate the gains and underestimate the losses of species richness under climate change.**

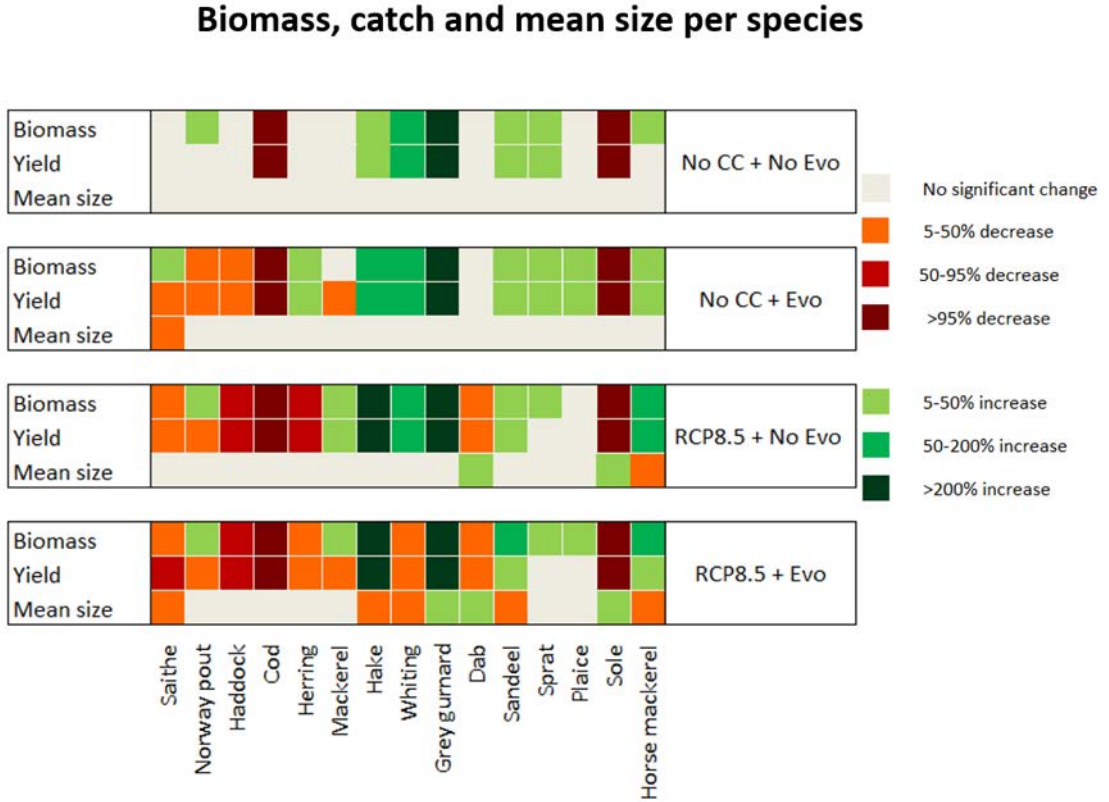


# Evolution worsen the reduction in catch volume and value in projections of fish communities under climate change (RCP 8.5)

Morell et al. 2023. ECCWO



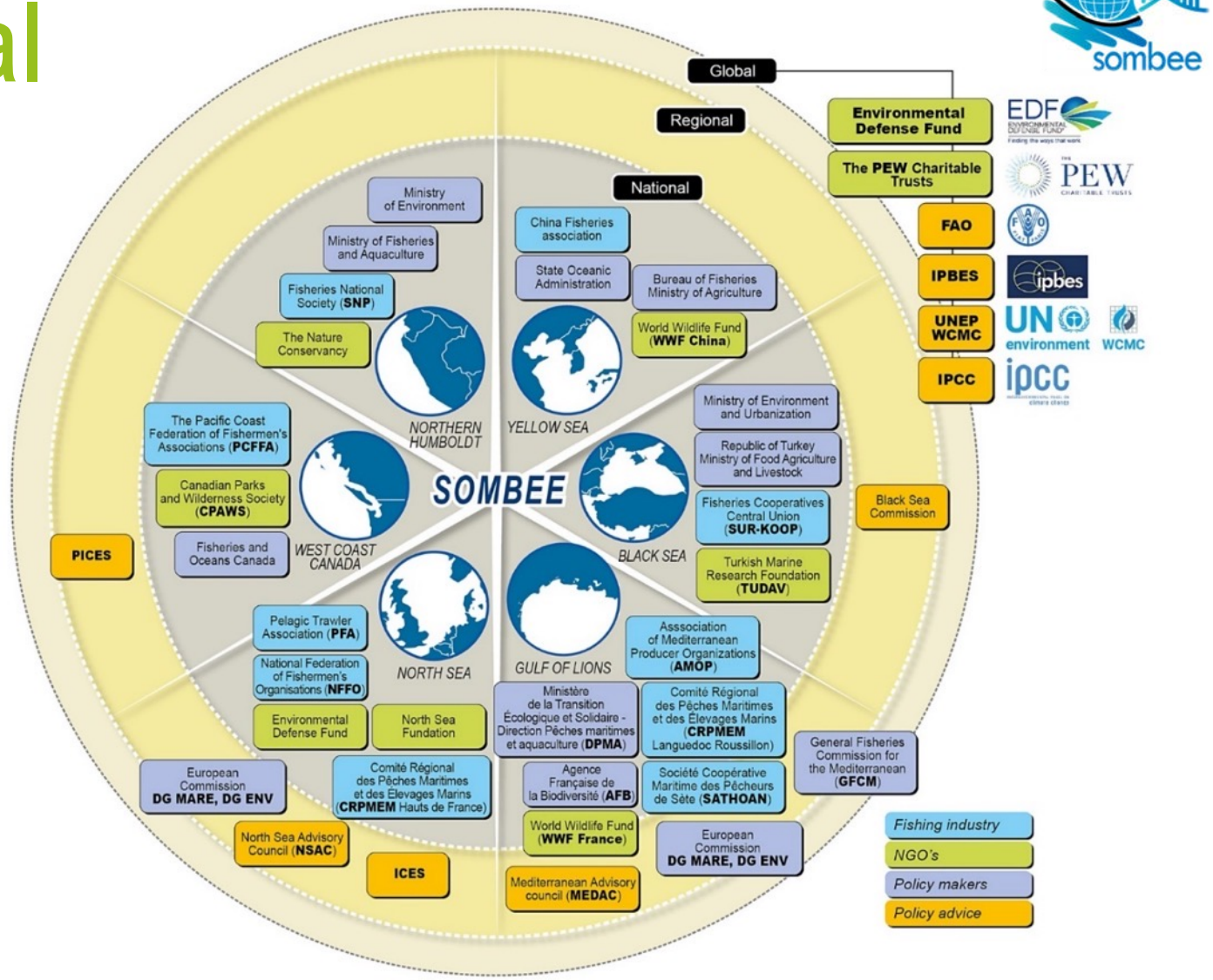





**Yield decreases by an additional 10% additional due to evolution**

**The biomass, yield and size of the most valuable species decreases more with evolution**

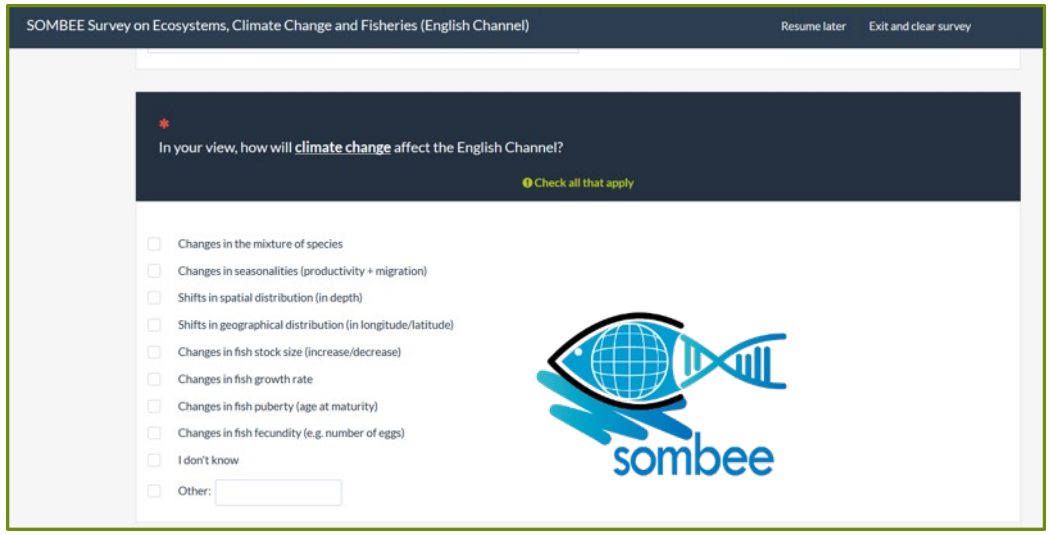
# Policy and societal impacts / results



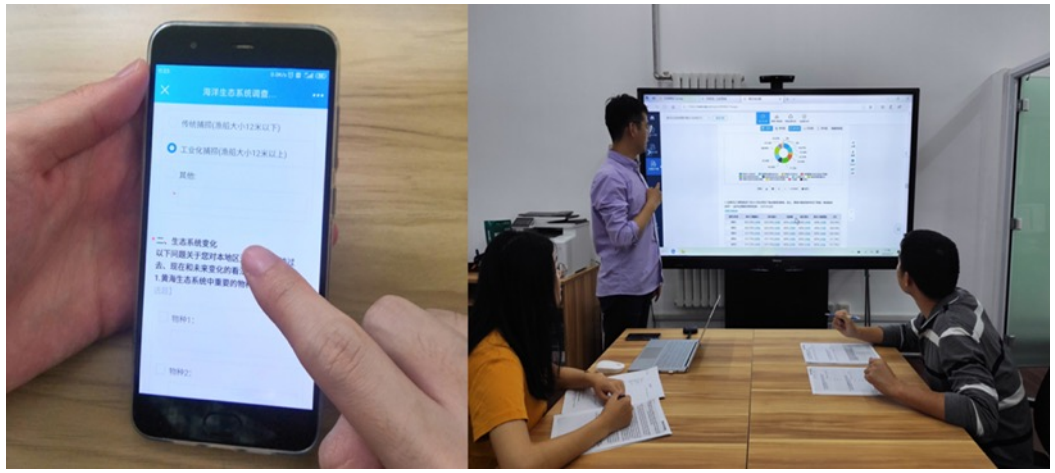
# Online survey on Ecosystems, Climate Change and Fisheries

**How do stakeholders perceive the effects of climate change and fisheries on fish biodiversity ?**

**Web interface: Lime survey**



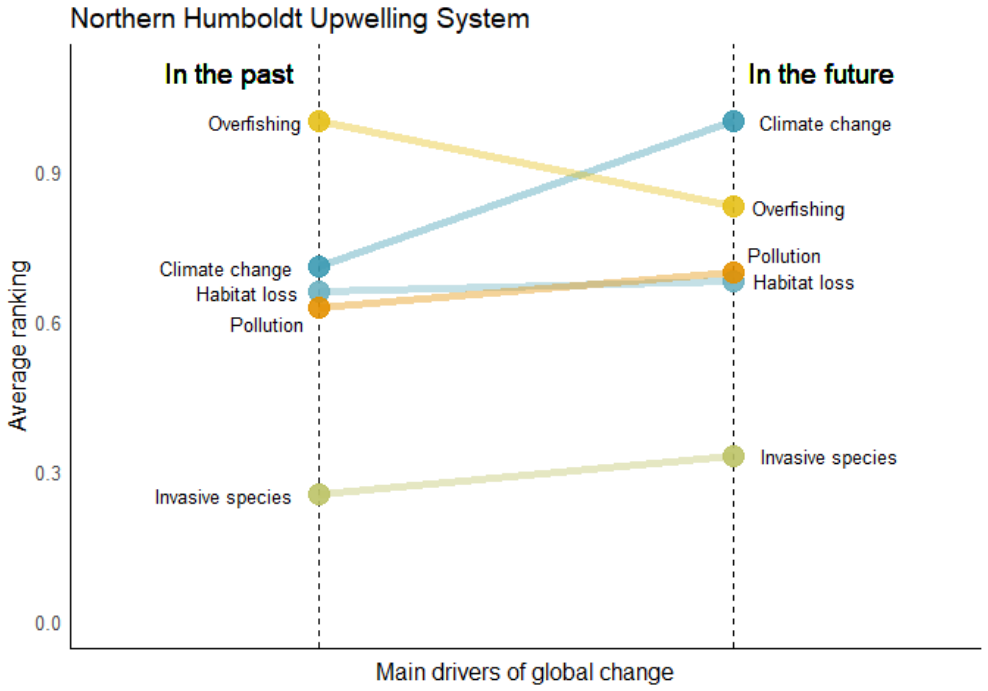

**+ Mobile app for the Yellow Sea**

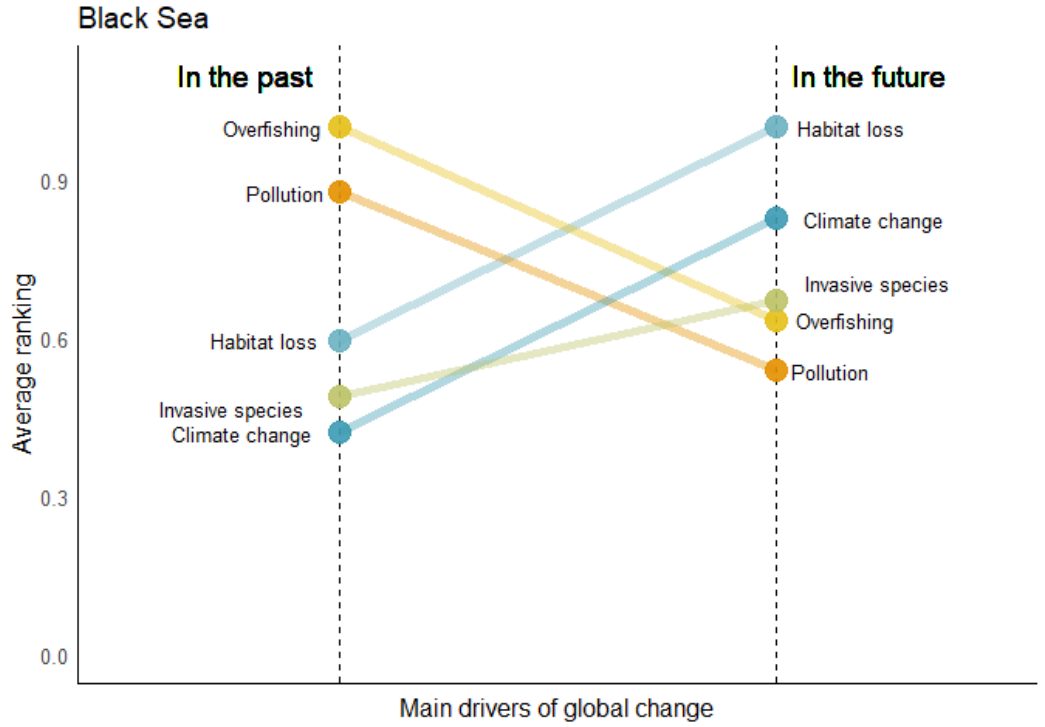


**6 languages**

**6 surveys (specific to case studies)**

# Online survey on Ecosystems, Climate Change and Fisheries




**Stakeholders perception:**
**the main drivers of fisheries resources shifted from overexploitation to climate change and habitat loss**

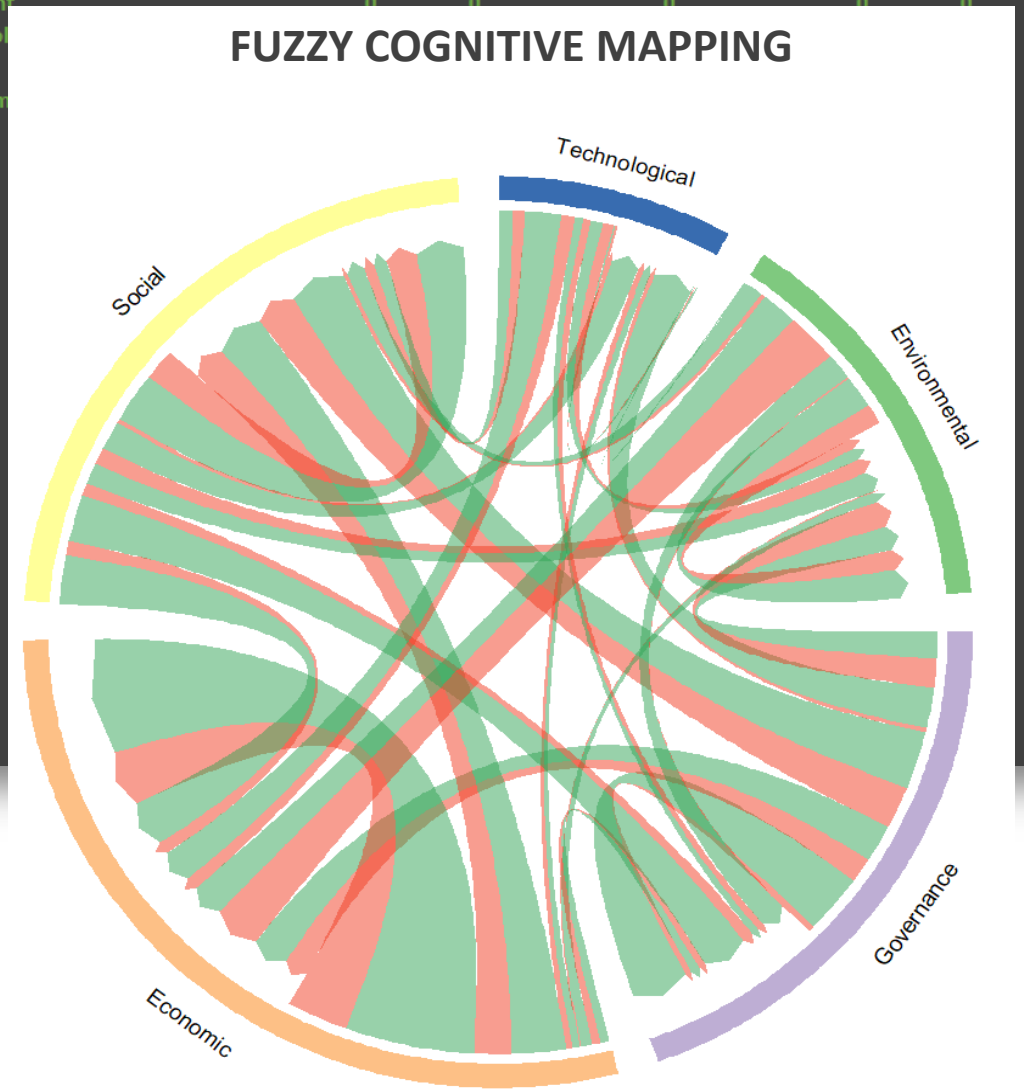
# Understanding the functioning and sustainability of local fisheries

## Homogeneous focus groups of stakeholders

GULF OF LION | NORTH SEA

- *Fish producer organizations*
- *National and regional fisheries committees*
- *Regional scientific teams*
- *NGOs*

- **Interdisciplinary approach**
- **Plurality of visions, values and knowledge**
- **Complex model with 71 variables and 805 interactions**



# SSP-RCP scenario downscaling

## Foresight workshops with heterogeneous focus groups of stakeholders

- *Fish producer organizations*
- *National and regional fisheries committees*
- *Regional scientific teams*
- *NGOs*

*Black Sea*

zoom Google Docs Jamboard

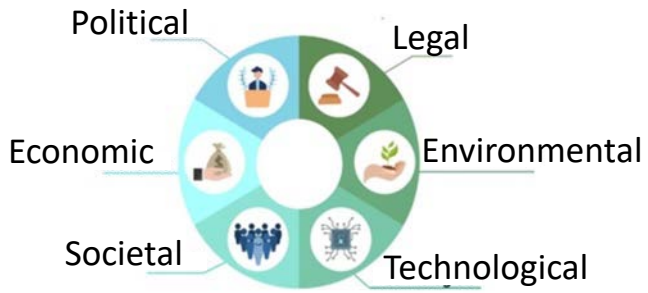
*Canada*

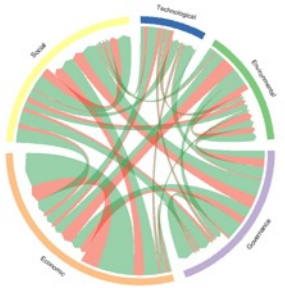
*Yellow Sea*

*Humboldt*

*North Sea*

*Gulf of Lion*

Global Sustainability
SSP1-RCP2.6

- **Co-building interdisciplinary storylines**
- **Comparison between social-ecological systems**
- **Scenario implementation in the FCM model**

Valued by society and growi
attractiveness. It is now more
a progressive breakdown in
of local and traditional know
attracting younger, more edu
technology. These fishers are
attach more importance to environmental issues. This demographic renewal combined with improved living conditions leads to less individualism, competition, and intra- and inter-sectoral conflicts. The working conditions are also improving. However, in spite of a strong attractiveness, overall, the number of fishers is decreasing in the Gulf due to a decrease in the European consumption of animal proteins, the exit plan for bottom trawls, numerous environmental regulatory constraints that may discourage some fishers, and virulent criticisms from NGOs and the media reproaching them for their strong impacts on marine ecosystems.

NORTH SEA

…d is no longer limited to
…e, responsible for the
civil servant status and a
…cess to fishing resources
and are more cooperative. They are also more educated thanks to the development of training centers. The working conditions are improving. Working hours are reduced with shorter tides and the establishment of a shift system. There is more comfort on board and physical work now benefits from technological assistance. The reduction in the arduousness of the work is attracting more women on board for positions as deckhands, captains, and navigation technicians. Women are also present in the foot fishing sector.

Similarities
Divergences

| GULF OF LION Dimension | Variable | Global Sustainability | Local Stewardship | National Enterprise | Global Markets | Business As Usual |
|---|---|---|---|---|---|---|
| Social | Conflicts of use | ↓ | ↗ | ↑ | ↑ | ↑ |
| | Social and territorial inequalities | ↘ | ↗ | ↑ | ↑ | ↑ |
| Environment | Health status of the marine ecosystem and resources | ↑ | ↑ | ↓ | ↓ | ↘ |
| | Negative impacts of biological invasions | ↓ | ↘ | ↗ | ↑ | ↑ |
| Economy | Volumes produced | ↑ | ↓ | ↓ | ↓ | ↓ |
| | Company debt | ↘ | ↗ | ↑ | ↑ | ↗ |

# Outcome: Partnership on a new 4-year project

## ADAPT 2023-2026

GULF OF LION

NORTH SEA

- *French fish producer organizations*
- *Regional fisheries committees*
- *Regional scientific teams*
- *NGOs*

Downscaling of IPCC socio-political and climate scenarios ✓


*Cinner et al. 2018*

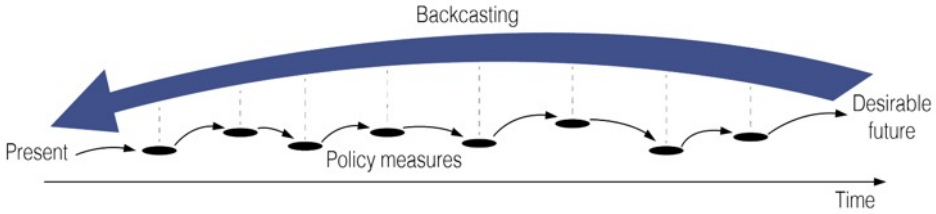
**Adaptive capacity**

- Assessing the **adaptive capacity** of the fisheries to be resilient to socioeconomic and environmental risks in a context of global change

- **Desirable scenarios** for sustainable exploitation of the marine resource


*UN Sustainable Development Goals*

- **Scenario backcasting** to determine step-by-step pathways




- **Forward modeling** to assess the ability of these pathways to reach the desirable scenarios

# Outcome: Partnership on a new 4-year project

## ADAPT 2023-2026

GULF OF LION

NORTH SEA

- *French fish producer organizations*
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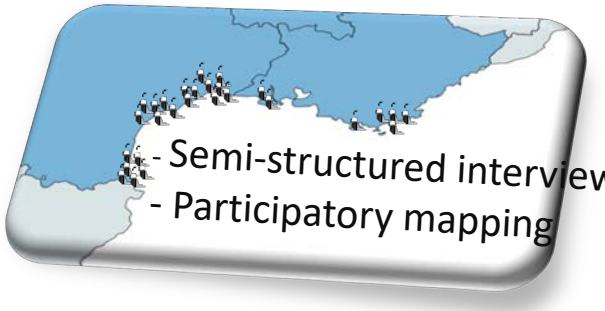
sombee

Downscaling of IPCC socio-political and climate scenarios ✓




- Assessing the **adaptive capacity** of the fisheries to be resilient to socioeconomic and environmental risks in a context of global change

- **Desirable scenarios** for sustainable exploitation of the marine resource

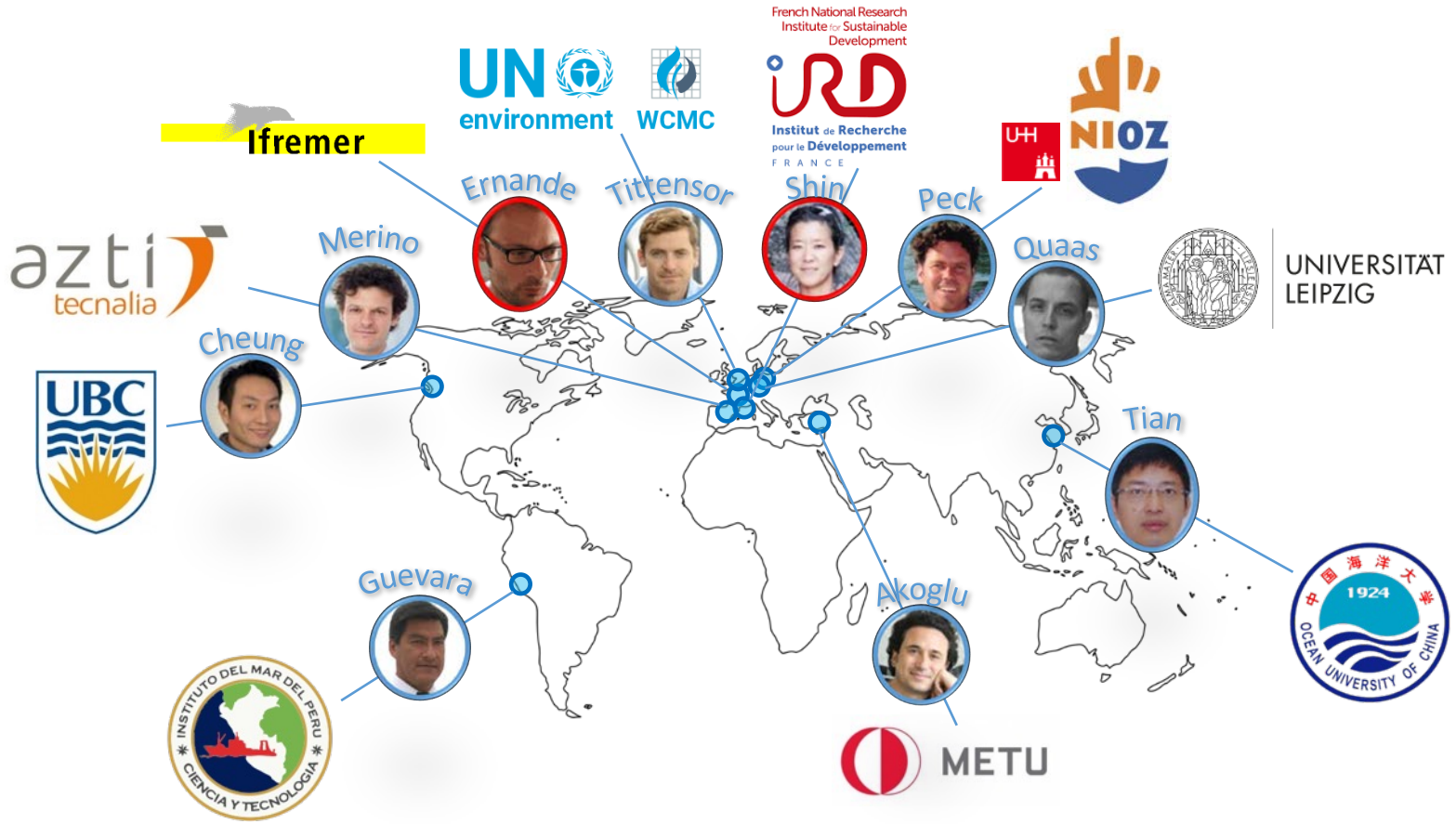
- Heterogeneous focus groups

- **Scenario backcasting** to determine step-by-step pathways

Participatory approaches will inform ecosystem models

- **Forward modeling** to assess the ability of these pathways to reach the desirable scenarios

# Acknowledgements




This research was funded through the 2017-2018 Belmont Forum and BiodivERsA joint call for research proposals, under the BiodivScen ERA-Net COFUND programme, and with the funding organisations ANR, DFG, MINECO-AEI, TUBITAK, NSERC and OUC

# Session 4:
# Scenarios as tools for territorial ecological planning: where, when, how to protect biodiversity?

**11:00 – 12:20– *Theme leader :*** *Osman Tikansak, Formas*

# Presentation of the projects' results

- **Future Web**

*Guidelines where to target protection or restoration activities, what kind of actions under future scenarios of climate change*

- **SALBES**

*Accepting planetary boundaries and the search for a safe operating space (as binding guidelines for environmental policy making)*

- **WILDHEALTH**

*Maintaining greenspaces in urban environments has multifunctional role in promoting human health and wellbeing, and also for biodiversity conservation*

- **Future Birds Scenarios**

*Wetland protection and restoration to maintain birds at favourable conservation status and recommendations for management of networks of protected areas in the HELCOM context*

- **BIOESSHEALTH**

*Scenarios for biodiversity and ecosystem services acknowledging health*

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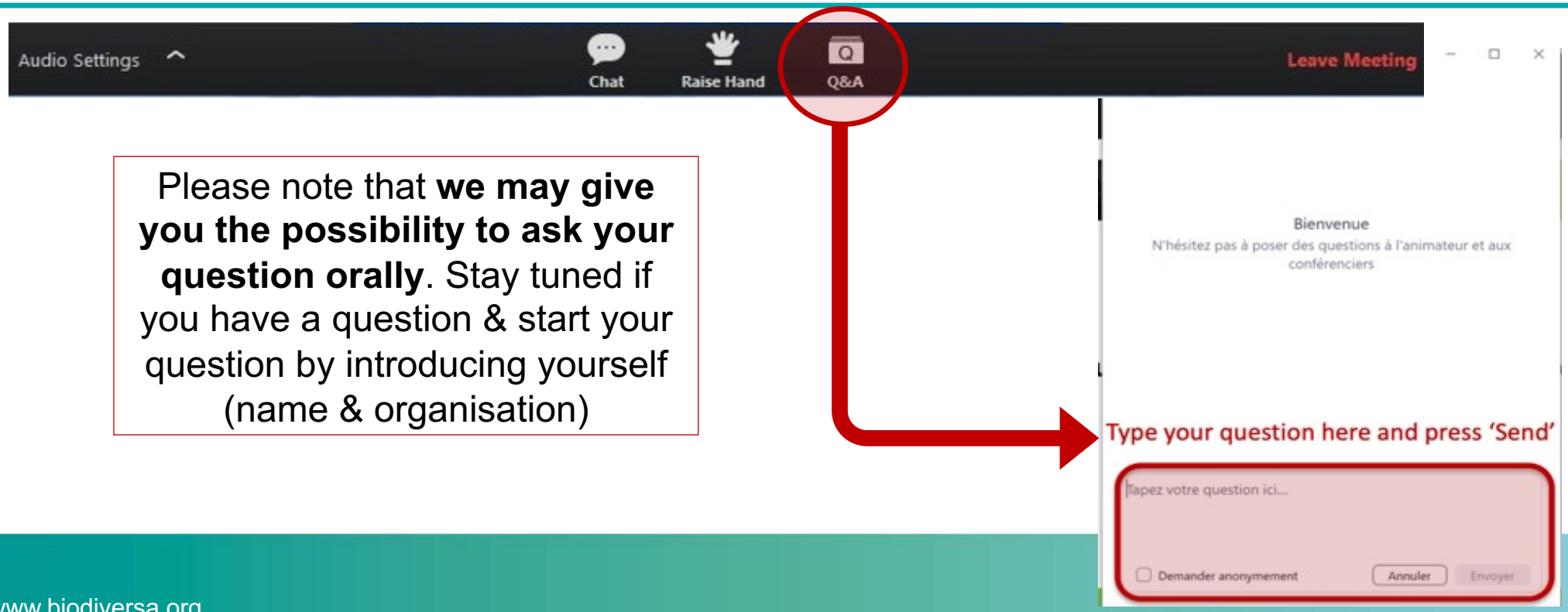
# Thank you very much for attending!

# Any question?

**For any question: USE “Q&A” FUNCTION**




Please note that **we may give you the possibility to ask your question orally**. Stay tuned if you have a question & start your question by introducing yourself (name & organisation)

# Time for a break

See you in 20 minutes!

# Session 1

## Dissensus, controversies, representations and values of biodiversity: towards compromises to initiate transformative change

**15:10 – 16:30 –** ***Theme leader : Juana Mariño***

# Presentation of the projects' results

- **ENVISION**

*Considering different visions for protected areas management will help to achieve socially relevant, economically productive and environmentally sustainable outcomes while enhancing the conservation status of protected areas*

- **SECBIVIT**

*Biodiversity and agriculture: measures to increase biodiversity in vineyard without affecting grape yield*

- **OBServ**

*Resolving the tension between pollinator conservation and pollination ecosystem service delivery to crops*

- **FARMS4BIODIVERSITY**

*Agroecology can slow deforestation and restore degraded agricultural land*

- **FATE**

*Future ArcTic Ecosystems: drivers of diversity and future scenarios from ethno-ecology, contemporary ecology and ancient DNA*

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# Session 2

# Harnessing the full potential of early-warning systems and predictive scenarios builds on innovative approaches to biodiversity monitoring

**16:40 – 18:00 –** *Sheila JJ Heymans, Executive Director, European Marine Board, Belgium and Professor in Ecosystem modelling, University of the Highlands and Islands, Scotland*

# Presentation of the projects' results

- **GLOBAM**

*Identifying the response of migrants to climatic and land-use changes is fundamental for efficient conservation and mitigation of human-wildlife conflicts.*

- **BONDS**

*Earth observation for the identification and monitoring of habitats in need of special protection in the lowland Amazonian floodplains*

- **REEF-FUTURES**

*Network of early detection systems for deep ocean to monitor changes in environmental stressors that are relevant for biodiversity*

- **ACCESS**

*Mapping the coastline and initiate a monitoring and protection plan for coastal environments under warming that is creating a huge potential for increased colonization by boreal species, with potential negative impacts on "native" species assemblages and food webs*

- **ARCTIC BIODIVER**

*Focus on intensified, coordinated monitoring of Arctic rivers and lakes*

# End of the first day’s presentations

See you tomorrow!

# Session 3
# Scenarios of fate of ecosystem services or disservices

**09:00 – 10:40– *Theme leader :*** *Sarah Clement, Associate Professor of Environmental Policy, Fenner School of Environment & Society, The Australian National University, Canberra, Australia*

# Presentation of the projects' results

- **LimnoScenES**

*Integrated landscape management approach and plan in order to ameliorate the condition of the lake and its catchment as well as ecosystem services for: agriculture, water course maintenance, nature protection, tourism and infrastructure.*

- **BioDiv-Support**

*Protect high-altitude ecosystems and their ecosystem services, under the pressure of future climate change and air pollution loads*

- **AlienScenarios**

*The future of biological invasions under different scenarios*

- **InvasibES**

*Environmental impacts of biological invasions*

- **Land2Sea**

*integrated modelling of consequences of terrestrial activities and climate change for freshwater and coastal marine biodiversity and ecosystem services*

- **SOMBEE**

*Scenarios of Marine Biodiversity and Evolution under Exploitation and climate change*

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*Scenarios for biodiversity and ecosystem services acknowledging health*

# Closure to the meeting

Frédéric Lemaître, Biodiversa SSI/SPI

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# Thank you very much for attending!