

# Scenario-modelling to secure biodiversity and ecosystem services under uncertainty

Insights from Peru and Switzerland



**Benjamin Black**<sup>1,2</sup>, **Adrienne Grêt-Regamey**<sup>2</sup>, and **Manuel Kurmann**<sup>2</sup>

1. Leibniz Center for Agricultural Landscape Research · ZALF
2. Planning Of Landscape and Urban Systems · ETH Zurich

Section 01

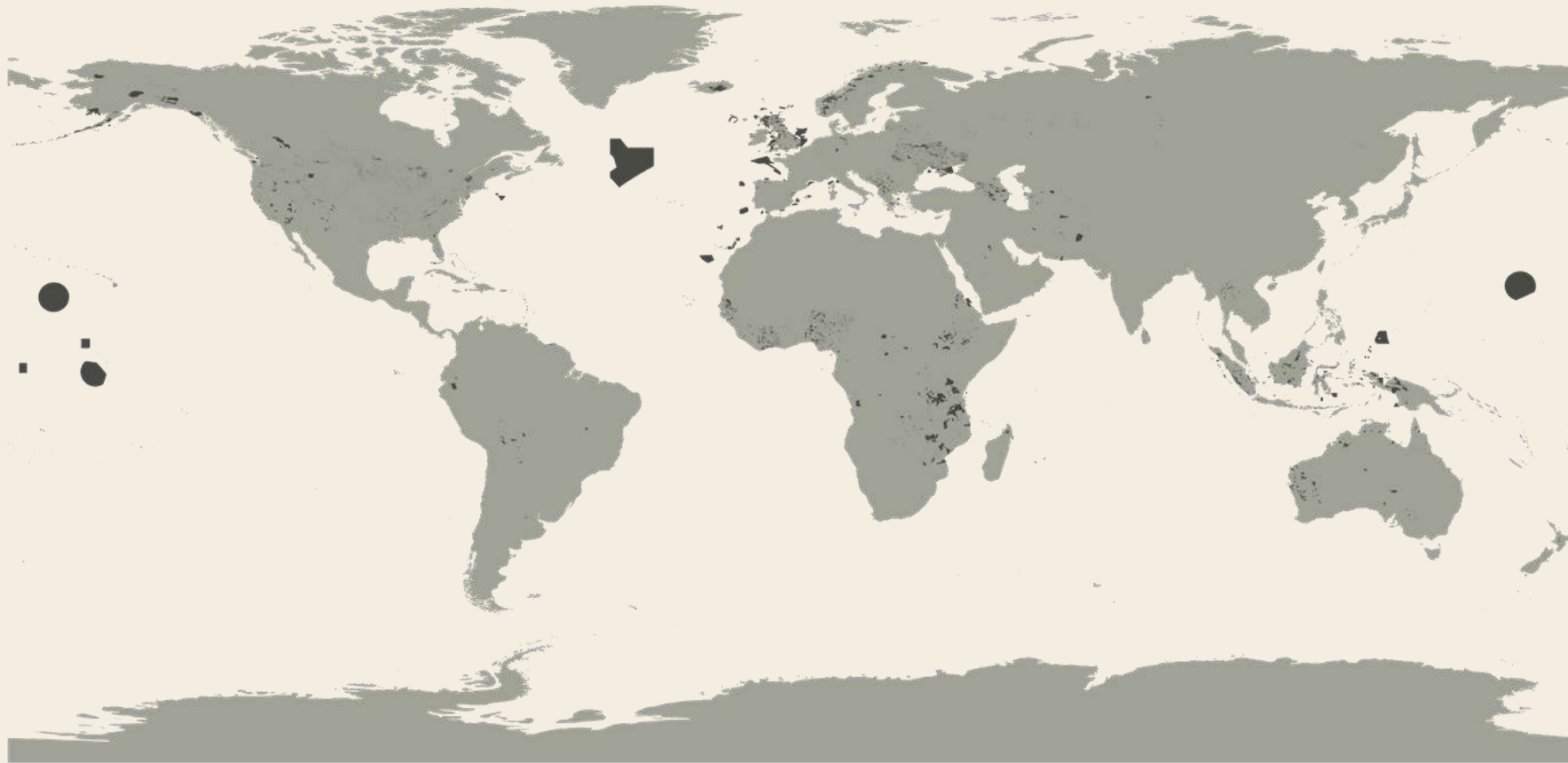
# The problem, and our approach

Conservation planning under uncertainty — and how scenario-modelling addresses it

The problem, and our approach

Global coverage of conservation areas has increased substantially:

1910



International targets will see this trend continue:



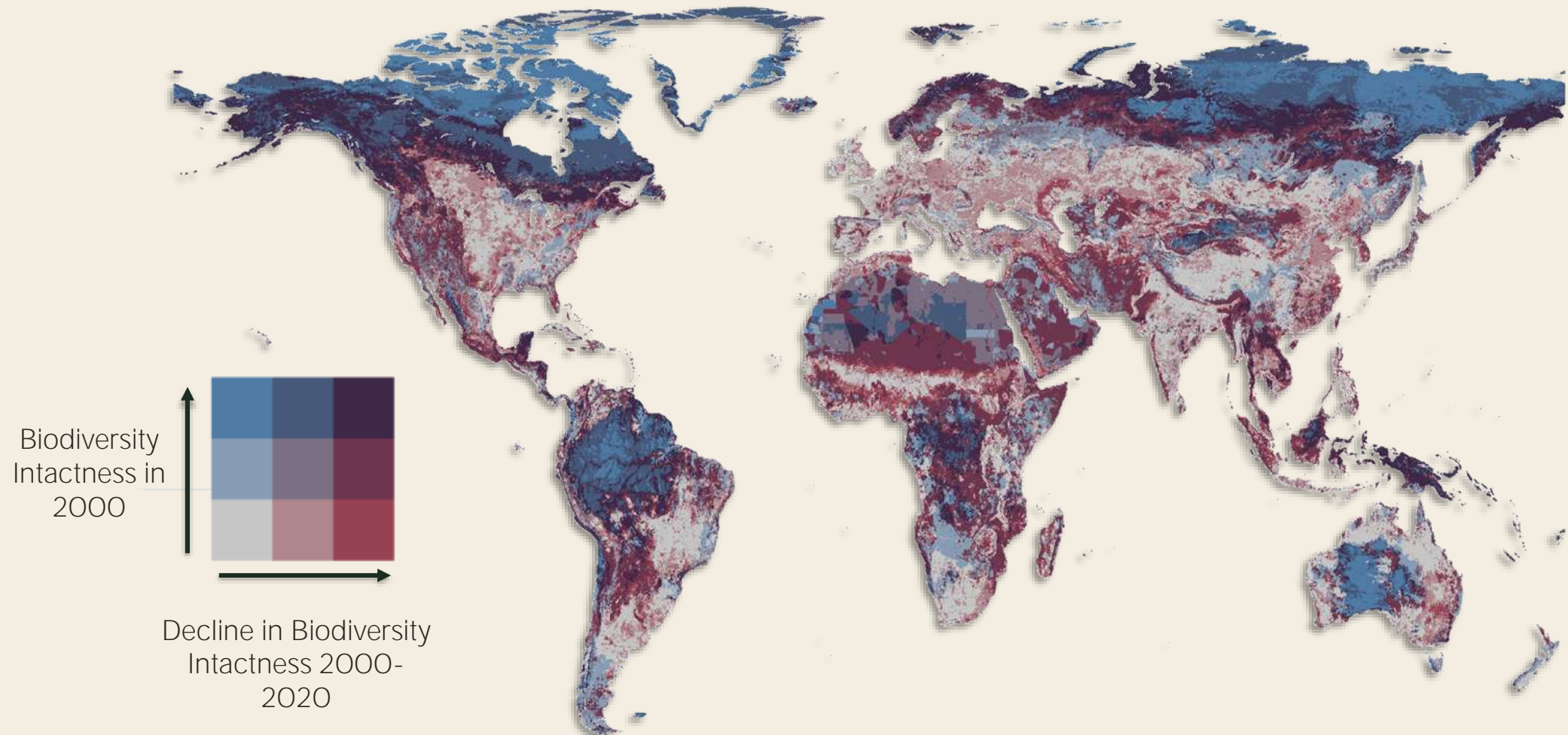
Kunming-Montreal

**GLOBAL BIODIVERSITY  
FRAMEWORK**

**“By 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas... are effectively conserved and managed...”**

KM-GBF Target 3 (30 x 30)

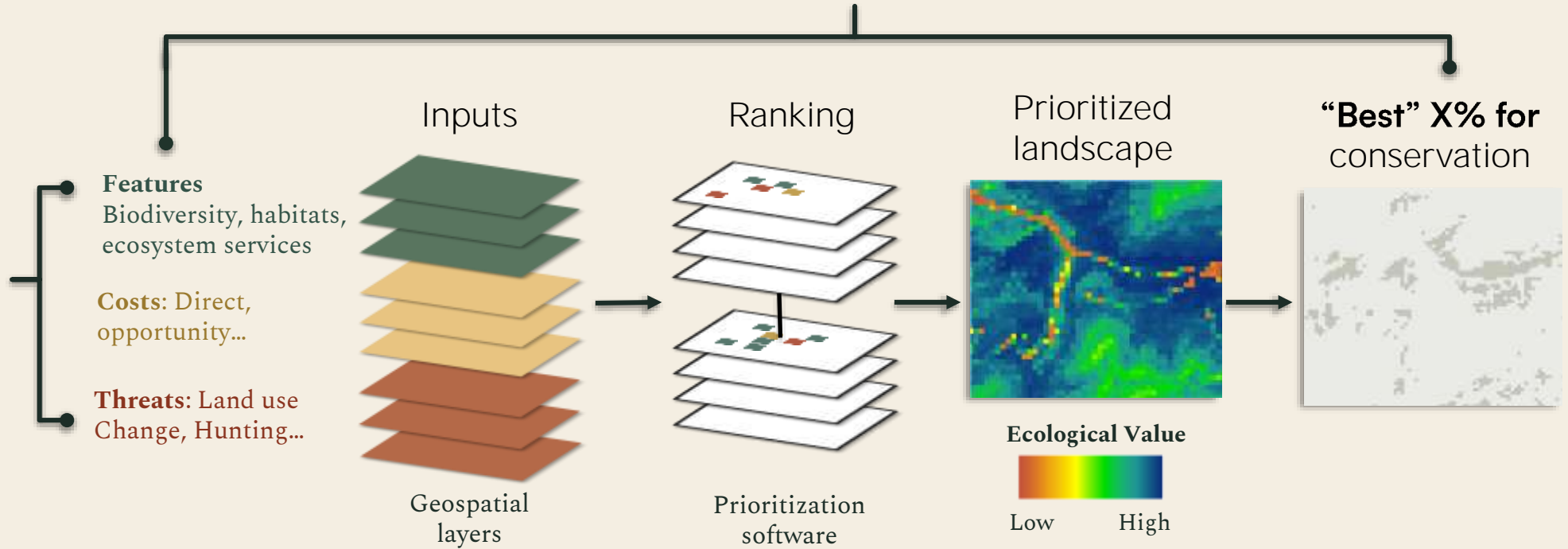
# However, biodiversity continues to decline...



# Current approaches to planning area-based conservation insufficiently capture:

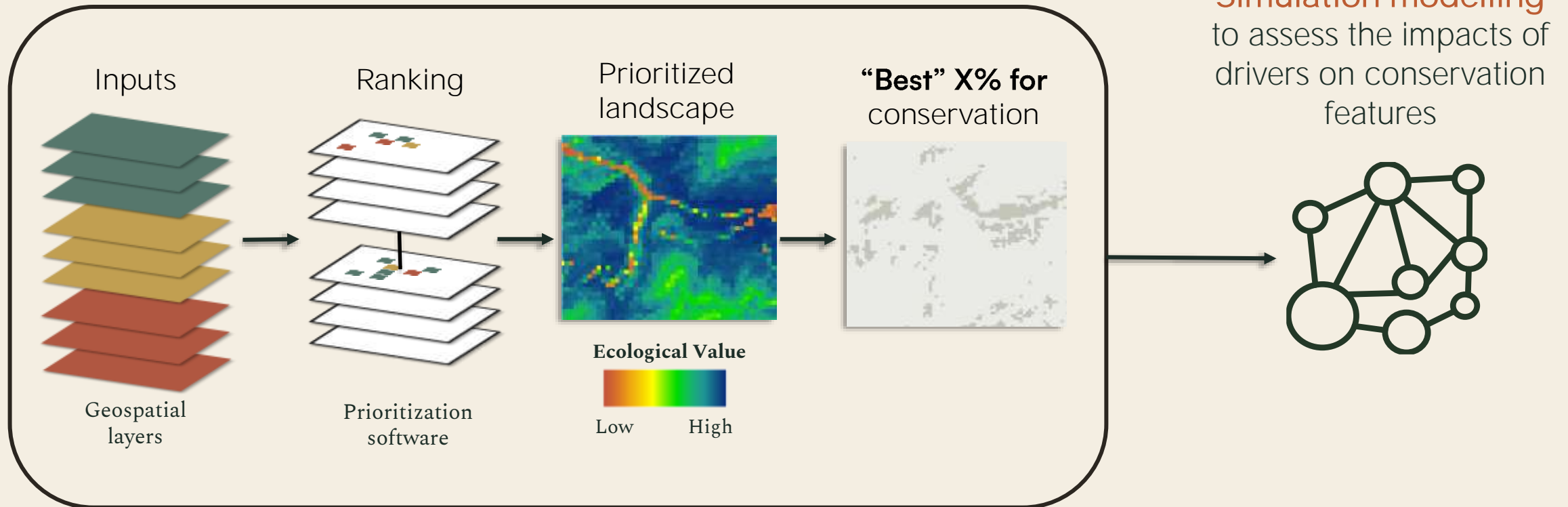
Pluralistic social preferences: What should be conserved, what conservation actions are preferable

Impacts of future developments in drivers of biodiversity and ecosystem service decline



# Proposed solution

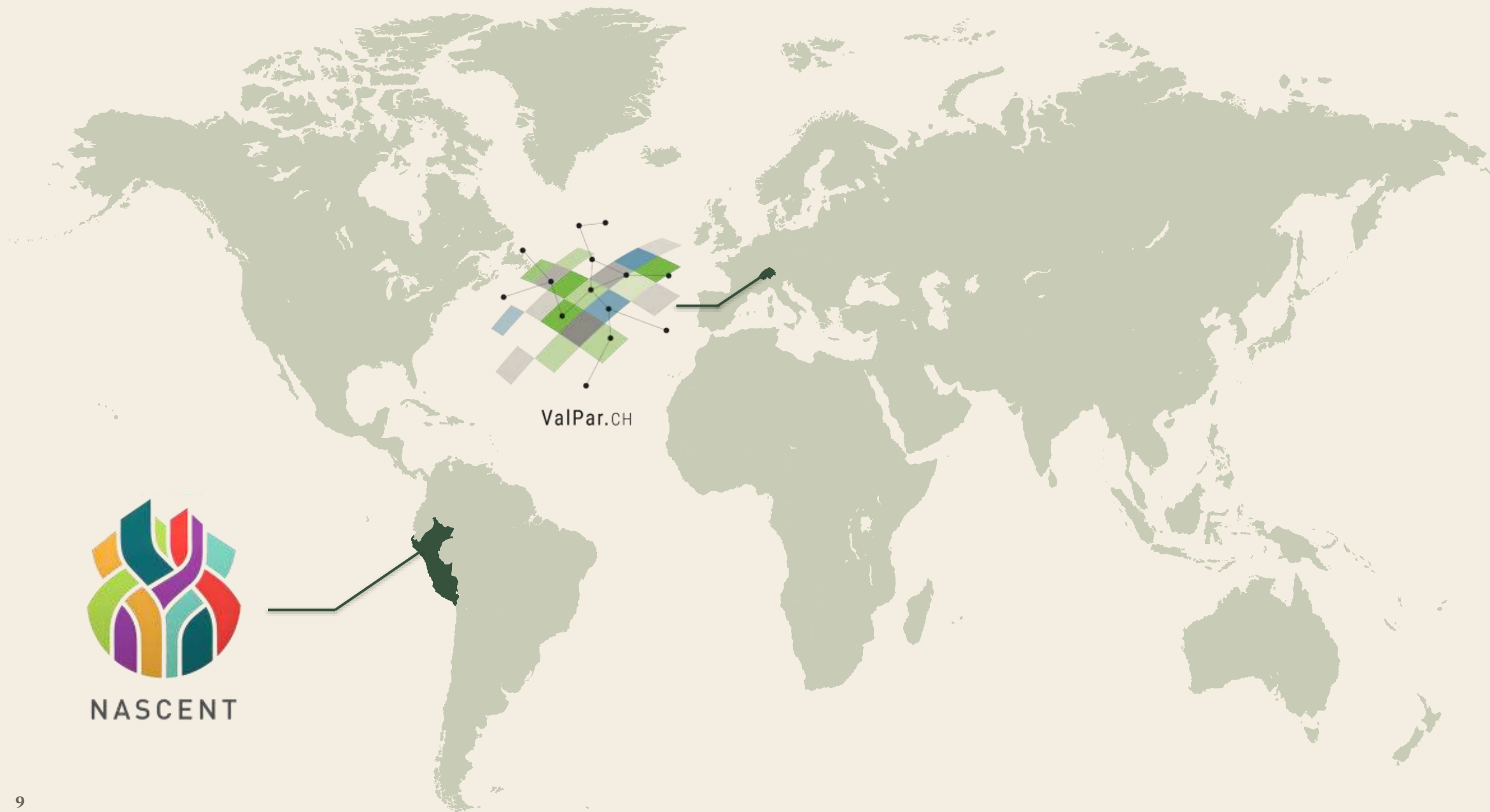
Scenarios to represent different driver trajectories and conservation preferences



Section 02

# Application in practice

Conservation-planning case studies in Peru and  
Switzerland



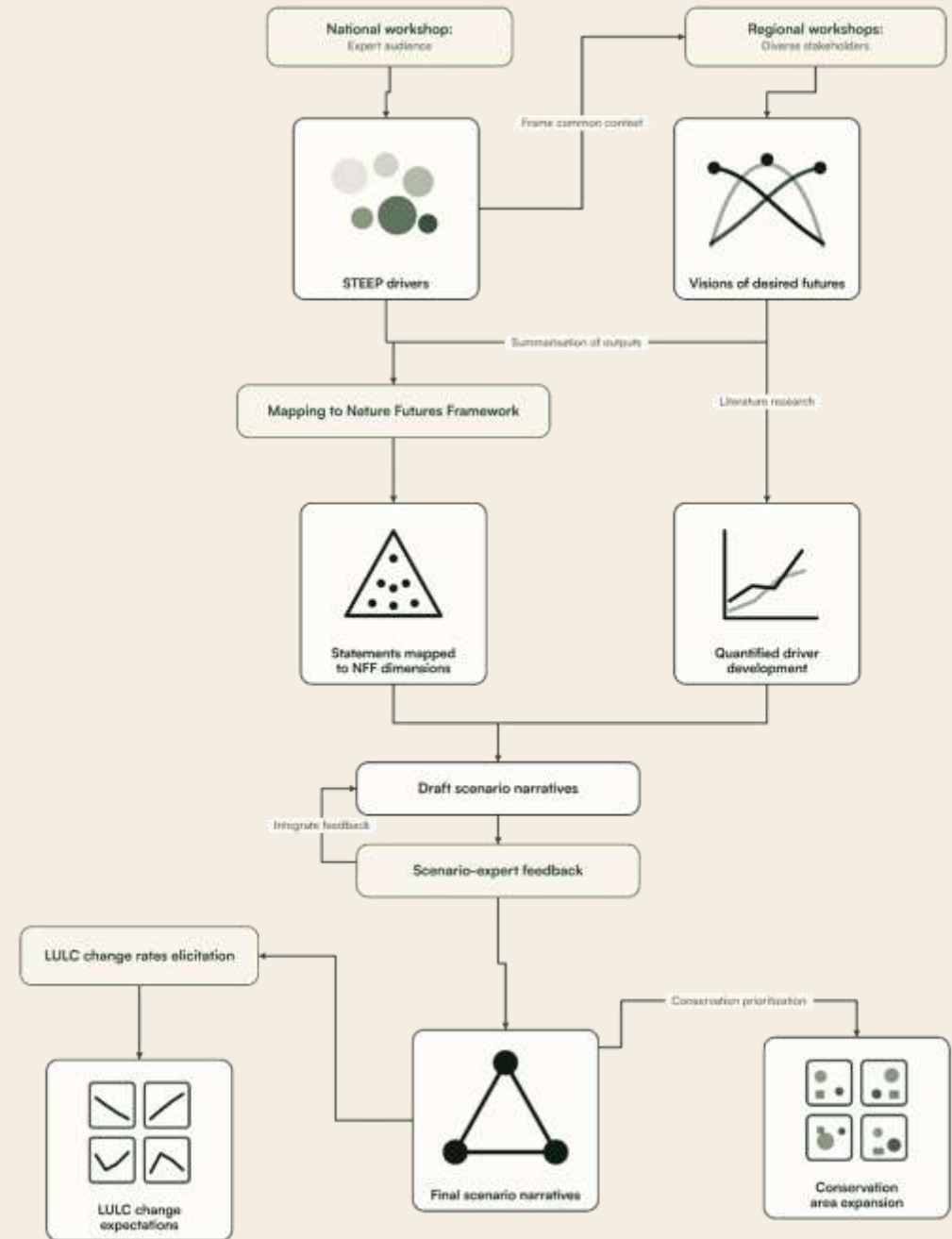
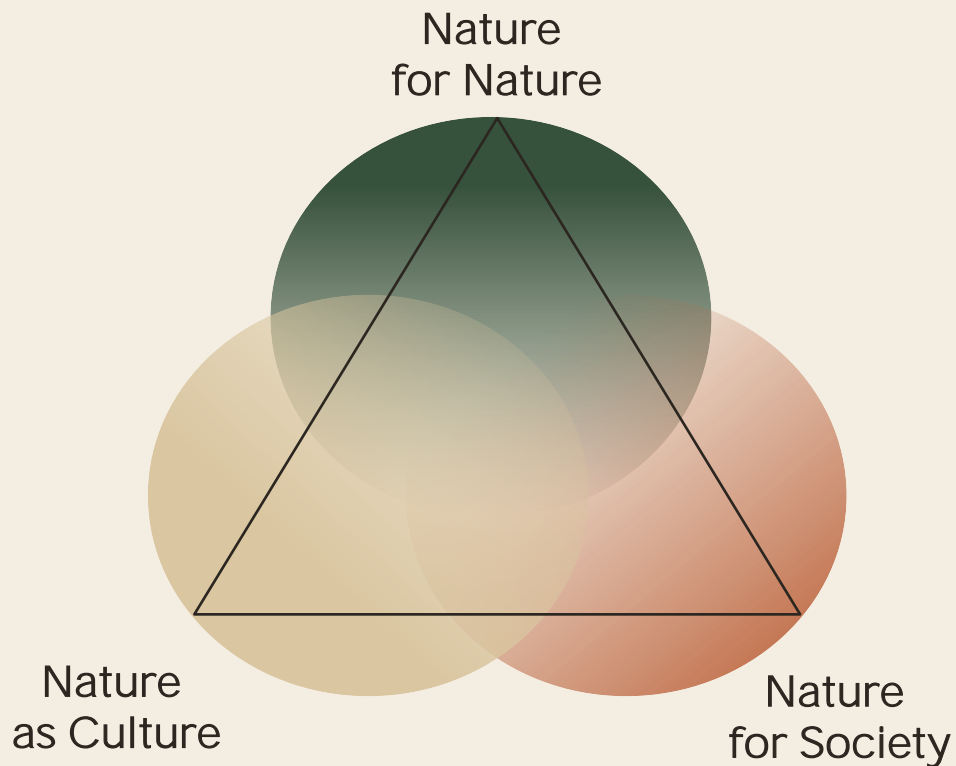
ValPar.CH



NASCENT

# Scenario Development

Multi-step iterative participatory processes using the Nature Futures Framework



**Application in practice**

**Normative scenarios**

Collectively desired future landscape characteristics across different regions.

**Exploratory scenario**

Reflects probable landscape change based on current trends.

NATURE FOR  
NATURE



NATURE AS  
CULTURE

BUSINESS AS  
USUAL



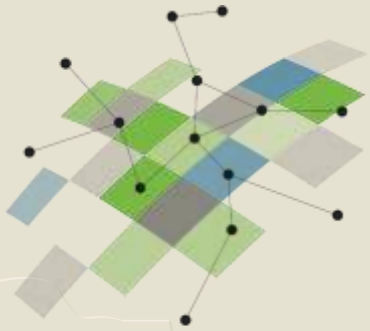
NATURE FOR  
SOCIETY



NASCENT



## Application in practice

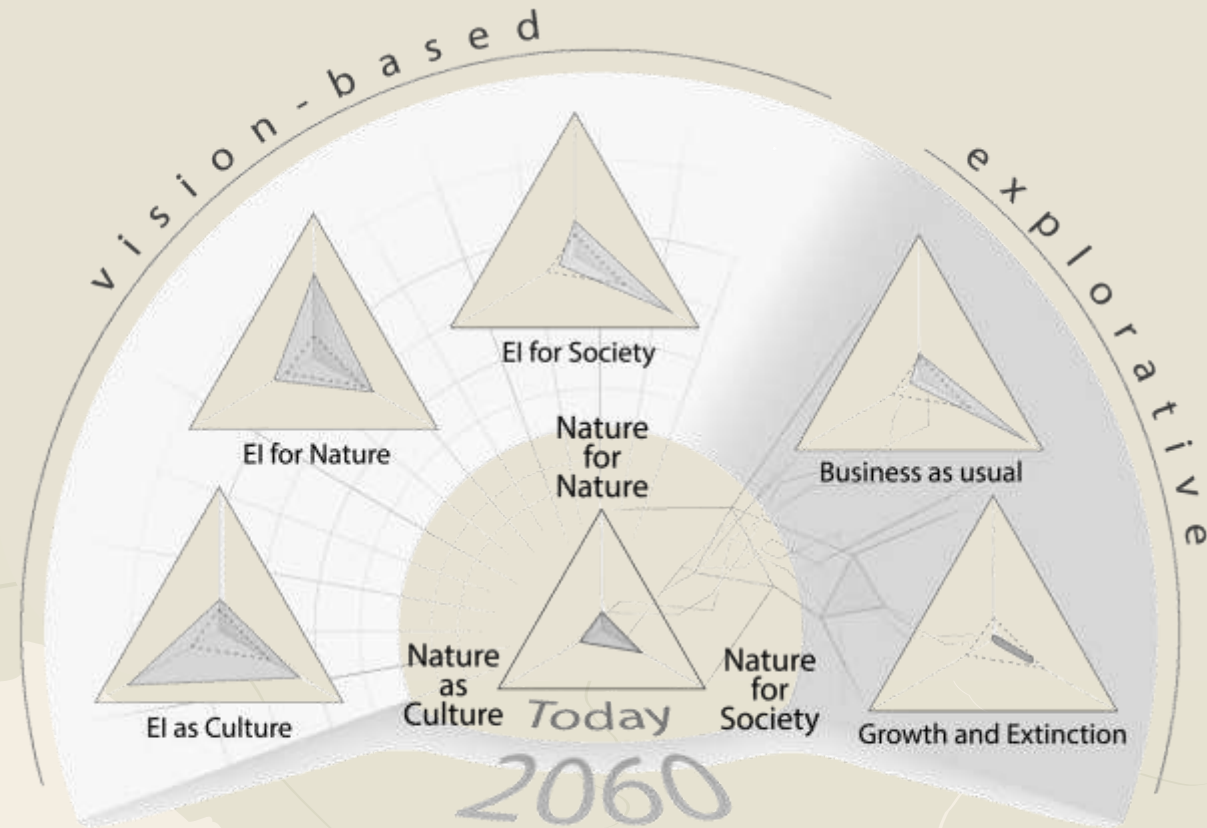
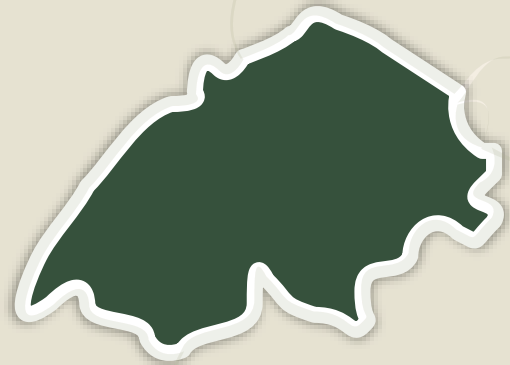


ValPar.CH

Inter/Transdisciplinary project  
Analysing the value of nature from  
ecological, social, and economic  
perspectives.

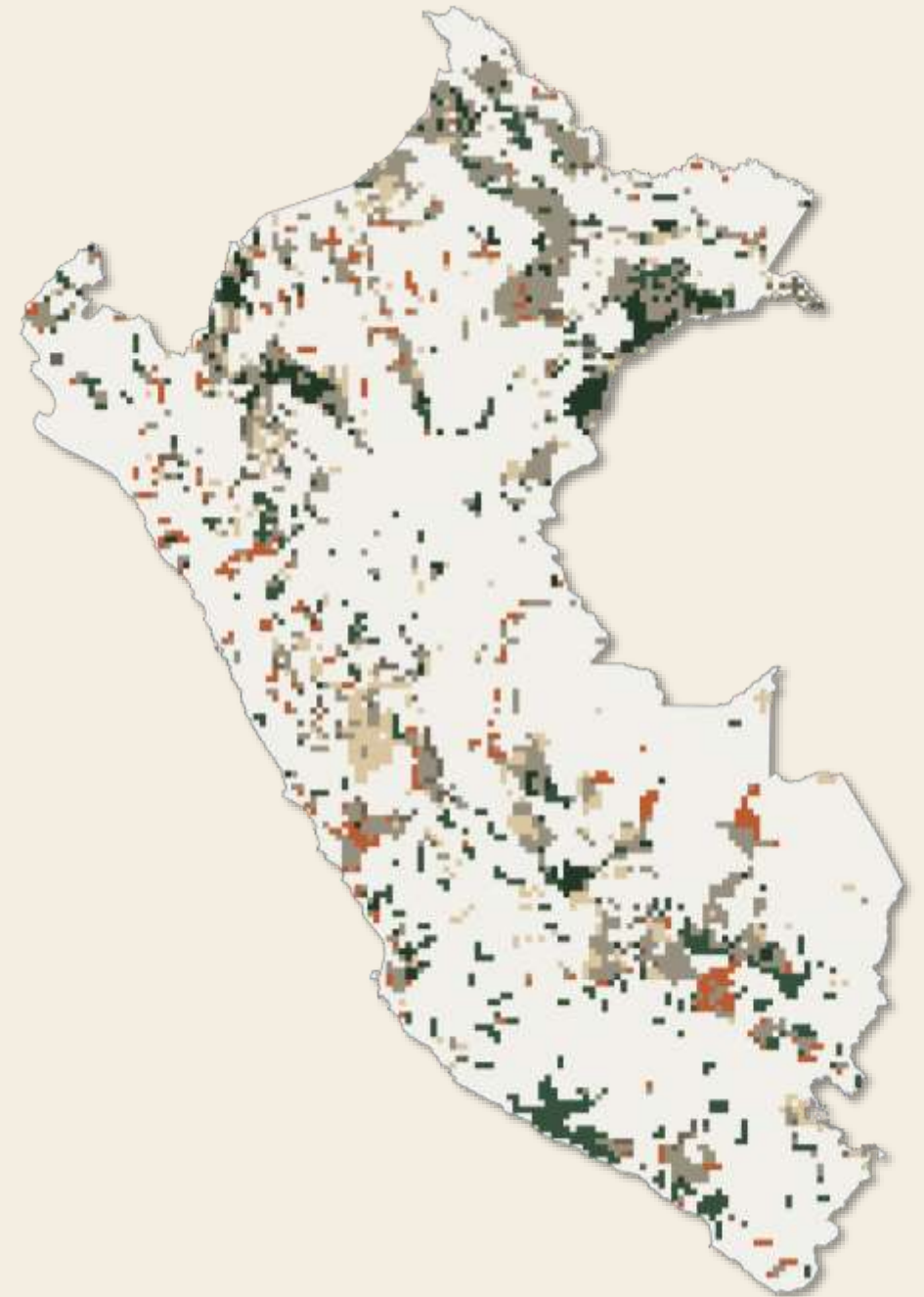
## Developed NFF scenarios

Conditions framing the development of a  
functioning Ecological Infrastructure for  
Switzerland.

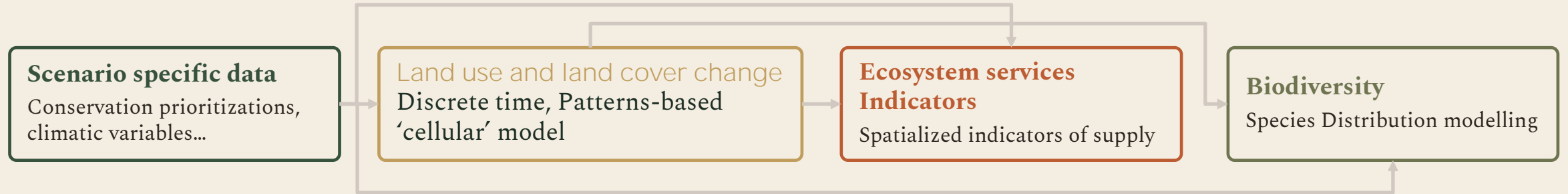


# Conservation prioritization

	Nature for Nature	Nature for Society	Nature as Culture	BAU
Biodiversity	2	1	1	1
Carbon	1	2	1	1
Water	1	2	1	1
Human constraint	-3	-1	0	-2
Tourism	-2	1	2	1
Connectivity maximisation	20	25	20	10
% of area for PAs	30	30	30	25
Ecoregional representation	17	17	10	10
Indigenous land titles	30%	60%	75%	0%



# Simulation Modelling



Section 03

# Results

Insights from scenario-modelling in Peru

Results

# Securing Peru's Biodiversity

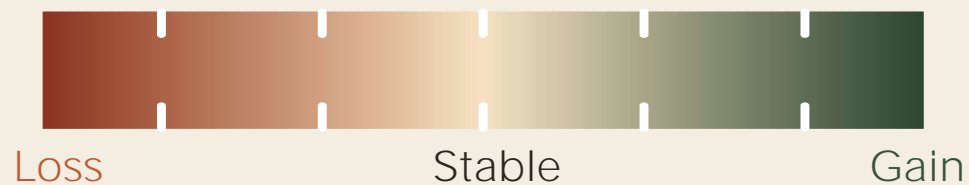
Change in mean suitability between 2020-2060 across species under SSP5-RCP8.5



117  
Endemic  
bird species

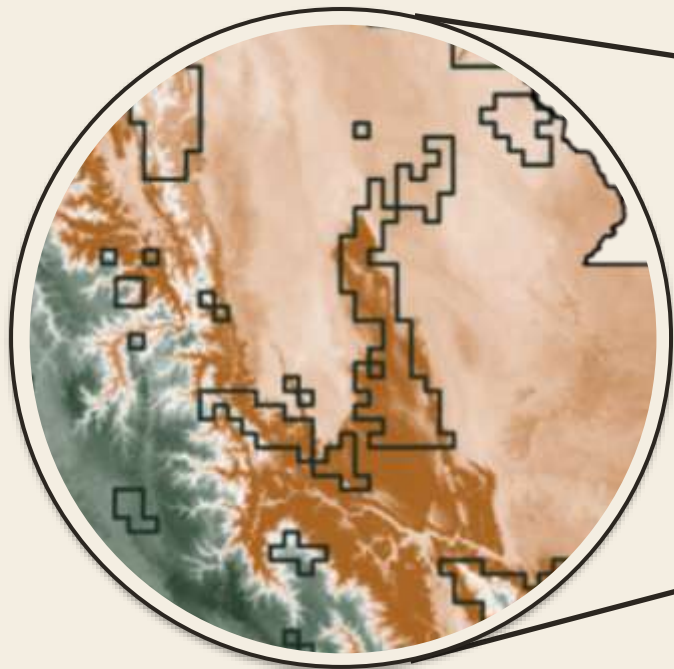


200+  
Pollinator  
species



Results

# Securing Peru's Biodiversity



Existing protected areas



Results

# Securing Peru's Ecosystem Services

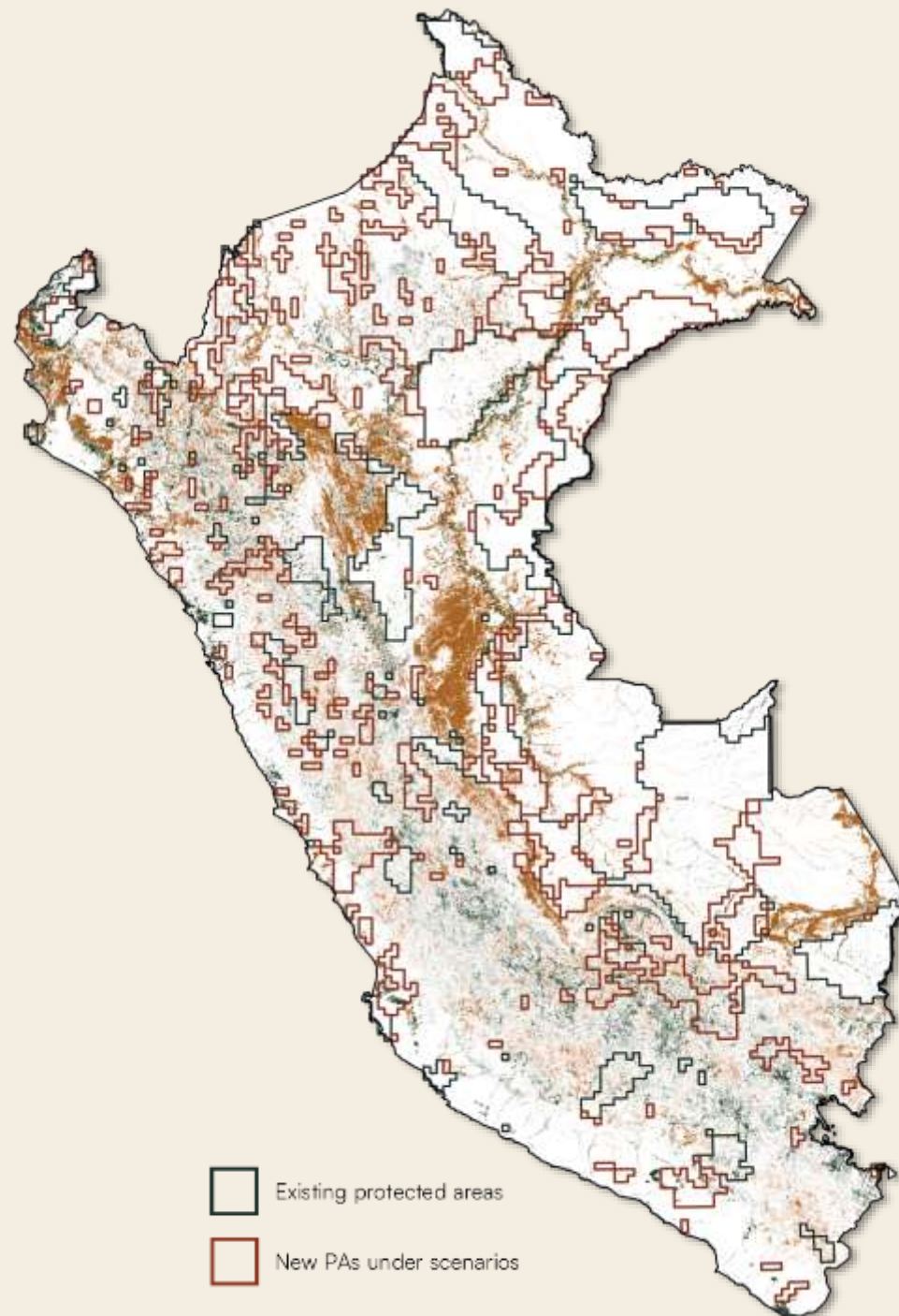
Mean change in carbon sequestration between 2020-2060

Business as Usual: -0.0042

Nature as Culture: -0.0111

Nature for Society: -0.0007

Nature for Nature: -0.0019



Loss

Stable

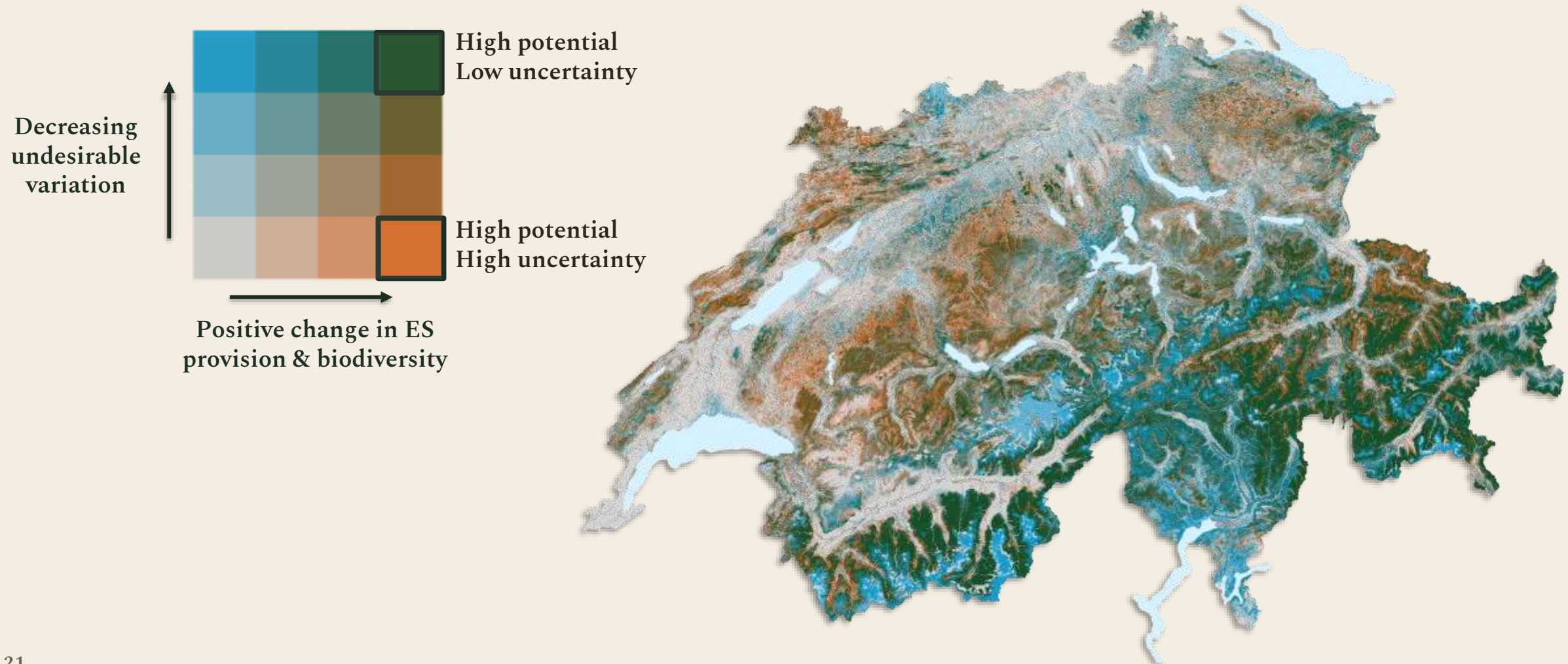
Gain

Section 04

# From science to impact

Informing decisions across policy, business, and practice

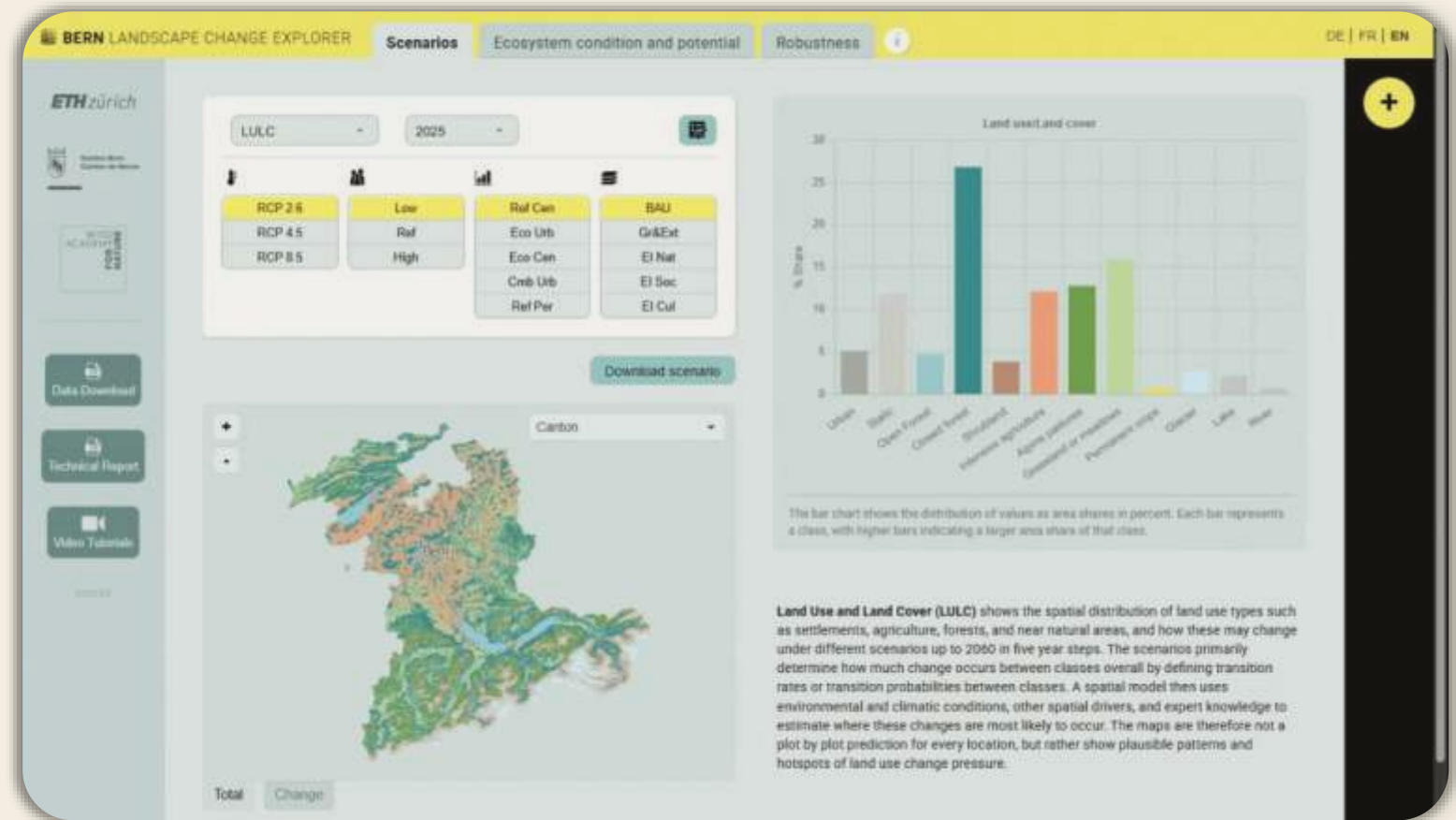
# Scenarios highlight synergies and trade-offs



# Transfer products are needed

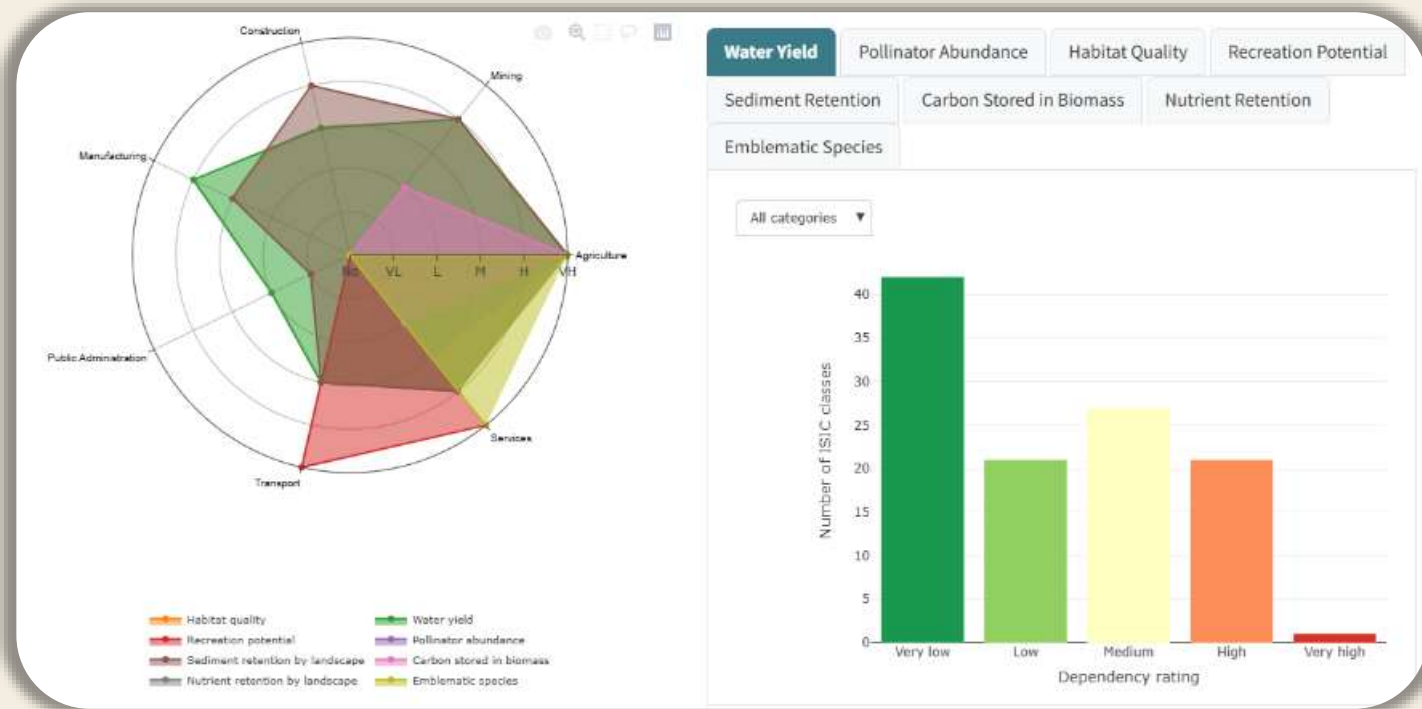


**BERN  
LANDSCAPE  
CHANGE  
EXPLORER**



# Linking to economic sectors

Ecosystem Service indicators to linked relevant economic sectors for Peru using:

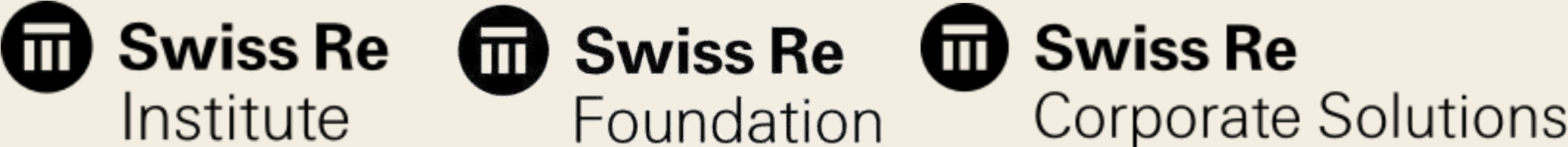


Challenges remain:

- Indicator—service definitions don't align cleanly.
- Changes in indicator values not translatable to monetary impacts on sectors.
- Insufficient spatial data for economic activities to analyse against simulations.

# Acknowledgements

We would like to thank the Swiss Re Foundation, Swiss Re Institute, EY, WWF, AXA Research Fund, and Swiss Re Corporate Solutions for financial support of the NASCENT-Peru Project.



AXA  
Research Fund



# Thank you.

I am happy to take any questions

Connect and  
follow my work

