



# Mountain biodiversity in policy processes: monitoring, research, and reporting

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# Mountain biodiversity in global agendas

2011(-2020)

## Aichi Biodiversity Target

**Target 14.** By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable

## Indicators

- Coverage by protected areas of important sites for mountain biodiversity
- Mountain Green Cover Index.

2015 (-2030)

## Sustainable Development Goal

**SDG 6.** Ensure availability and sustainable management of water and sanitation for all

**SDG 15.** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

## Targets and Indicators

**6.6.** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

**15.1.** By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

**15.4.** By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development

- 15.4.1.** Coverage by protected areas of important sites for mountain biodiversity
- 15.4.2.** Mountain Green Cover Index

2022 (-2030/50)

## Kunming Montreal Global Biodiversity Framework

N/A

# Post SBSTTA 26 headline indicators

## Indicator name

A.1 Red List of Ec

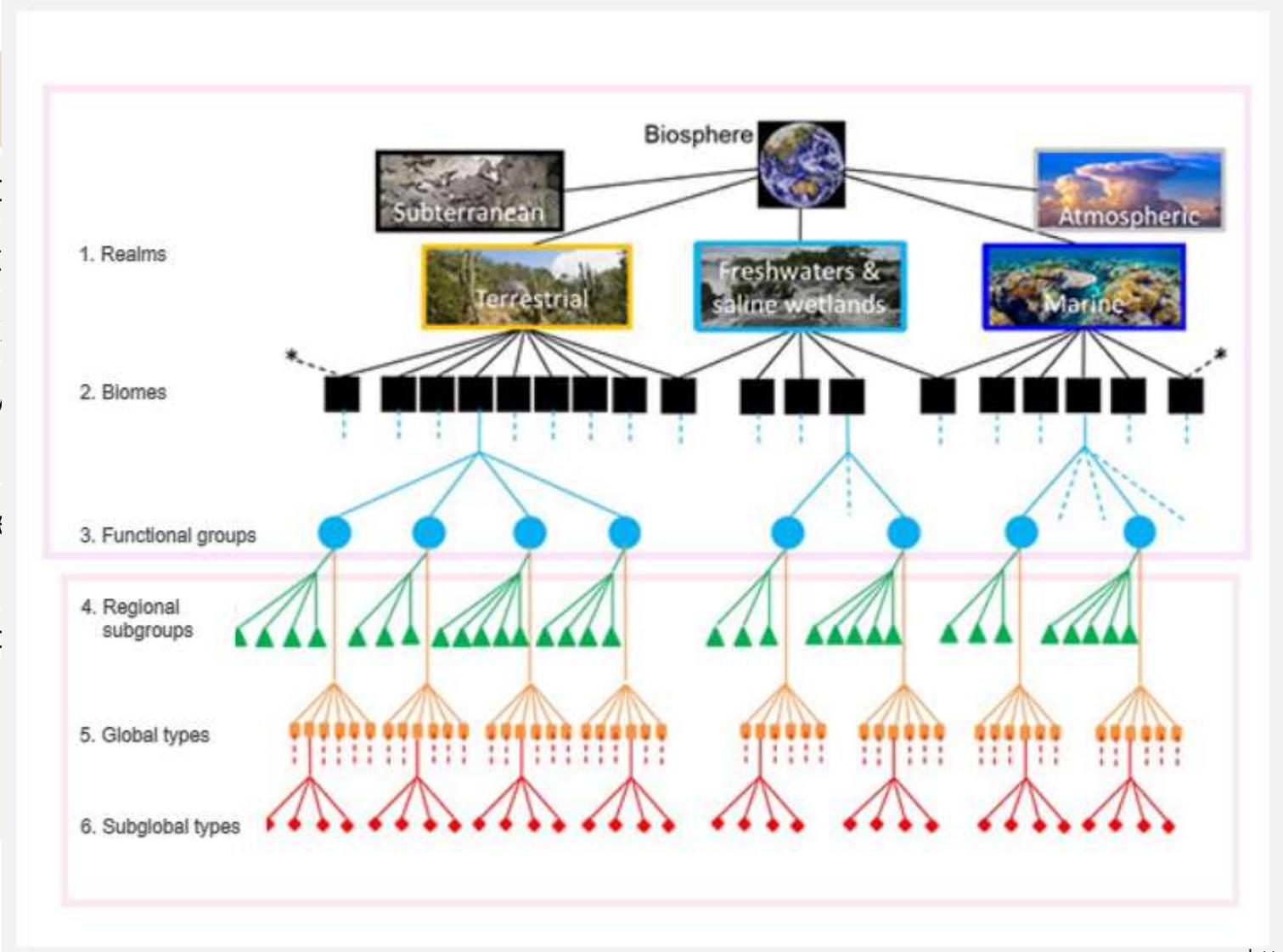
A.2 Extent of nat

A.3 Red List Inde

B.1 Services prov

2.1 Area under re

3.1 Coverage of f



Global Ecosystem territories, By PAs/ (ne)

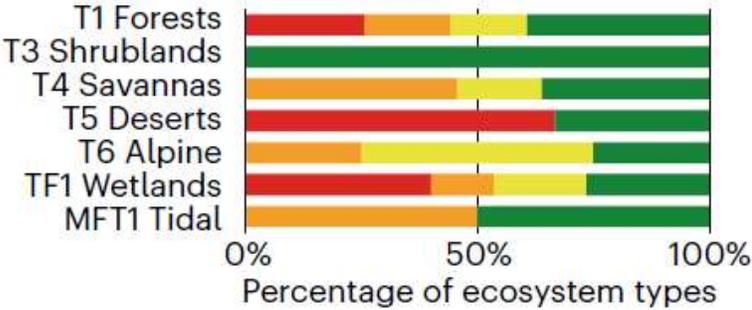
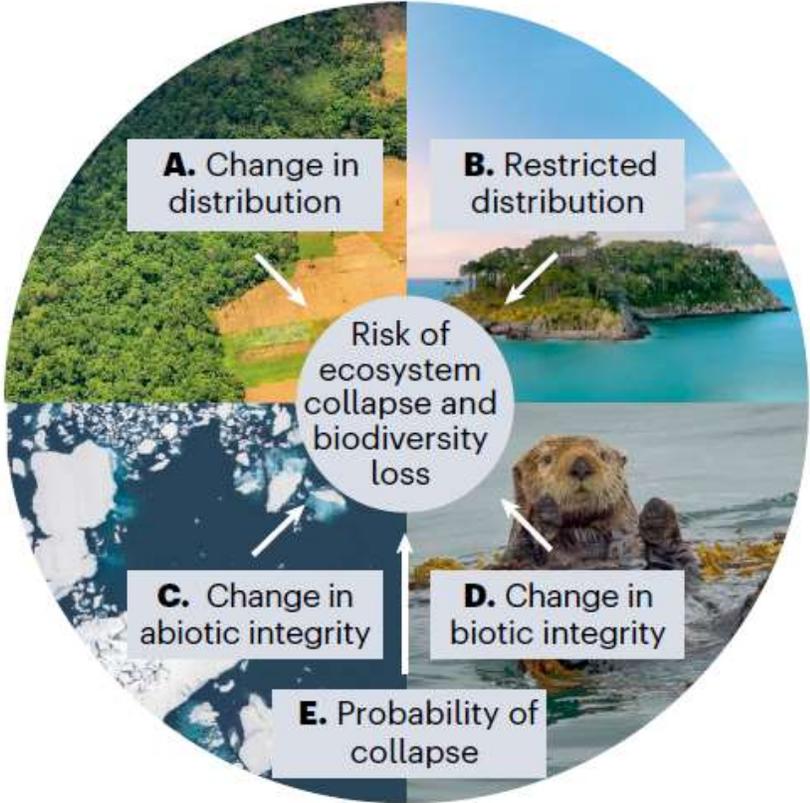
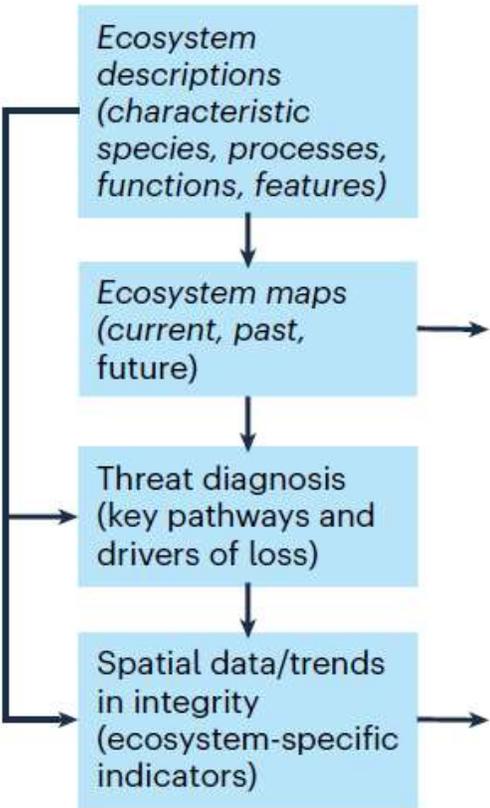
cosystem functional

raditional territories;

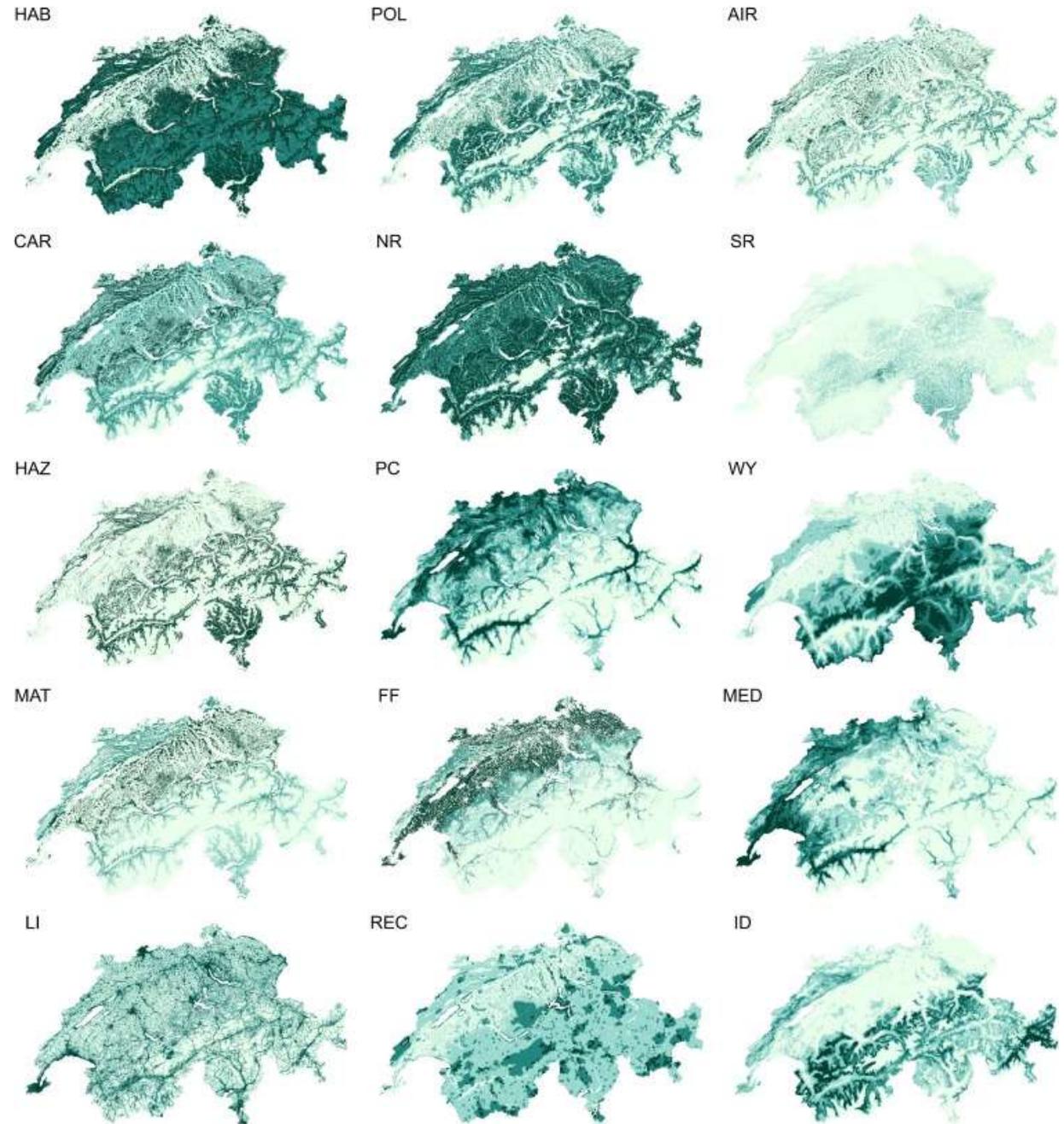
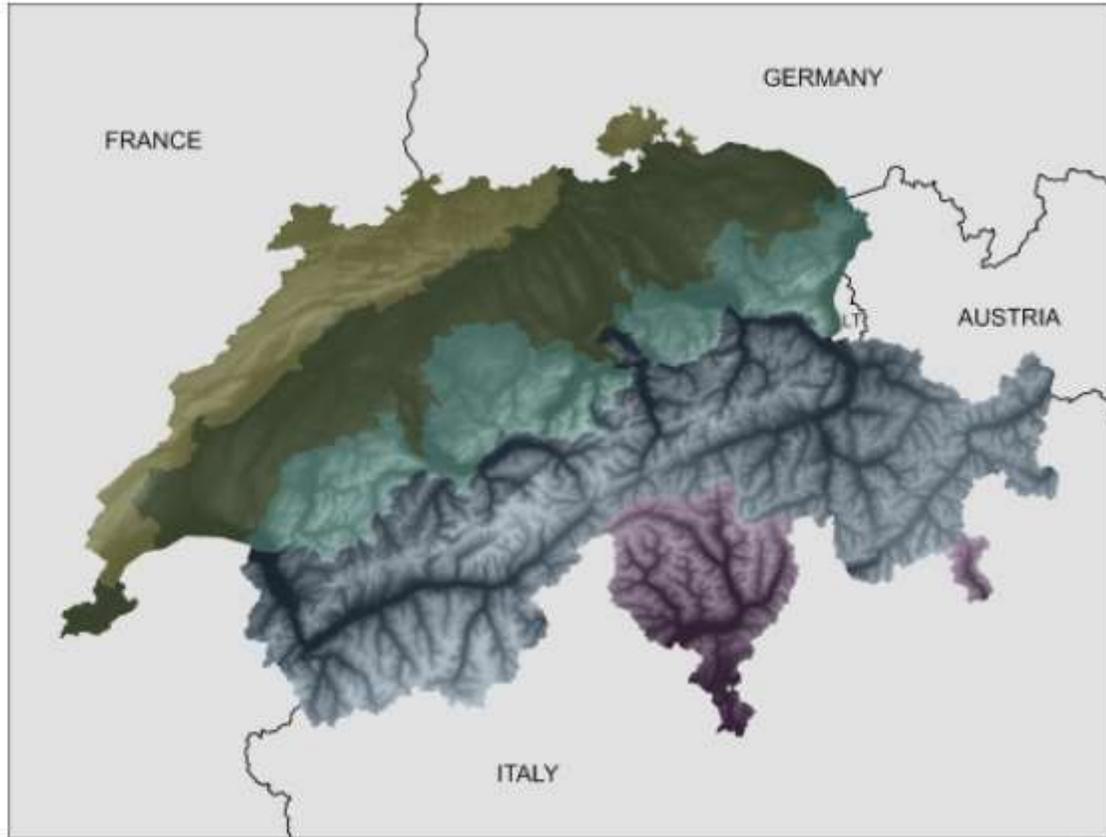
ctional group []; areas of ors 4.5.1, 15.1.2, **15.4.1**); ervation type;

# Red list of ecosystems

**a** Knowledge synthesis → **b** Assessment against criteria → **c** Risk assessment outcomes **d** Colombia assessment outcome



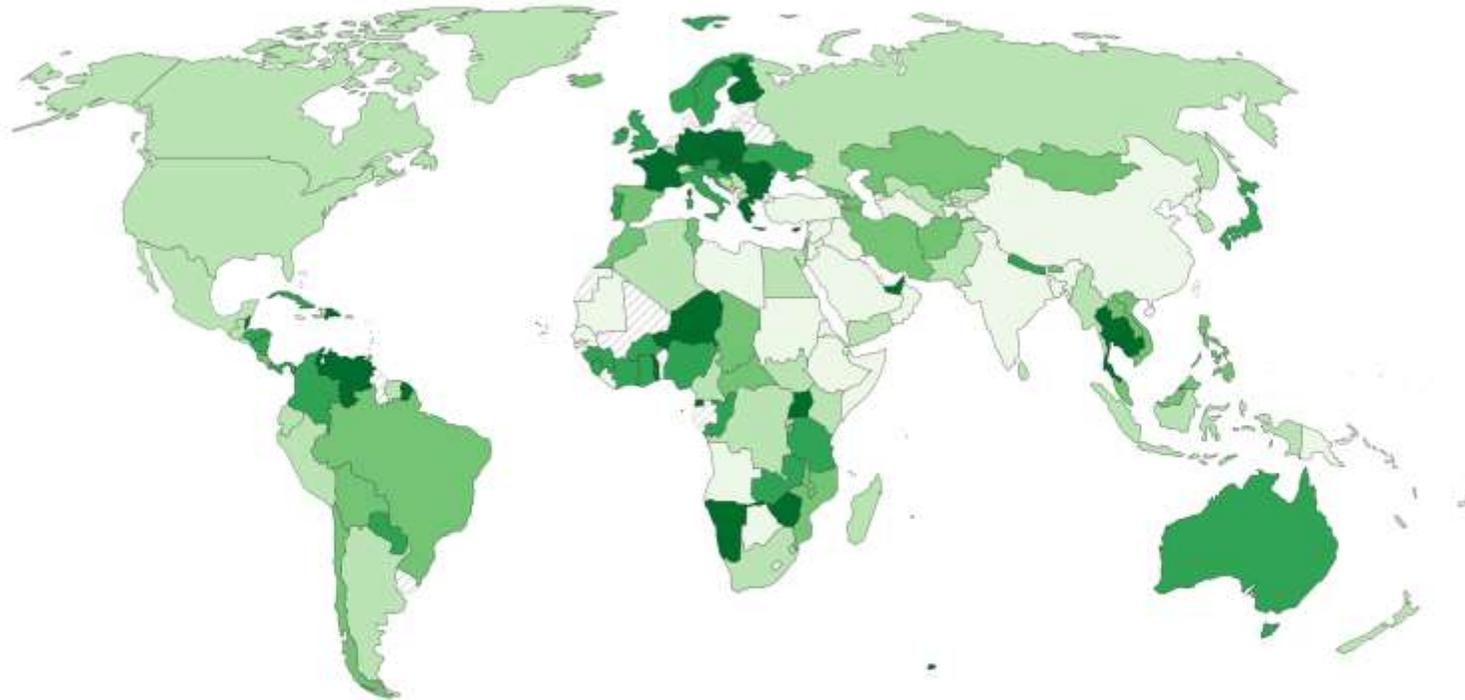
# Services provided



# Coverage of PAs and OECMS (by areas of importance for biodiversity)

## Protected area coverage of mountain key biodiversity areas, 2022

The average share of each mountain Key Biodiversity Area (KBA)<sup>1</sup> that is covered by designated protected areas<sup>2</sup>.

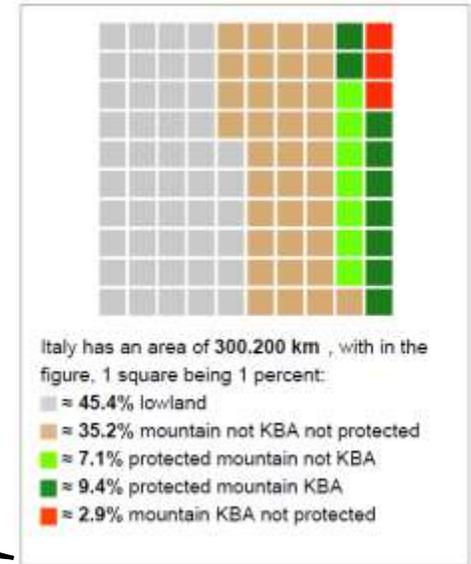
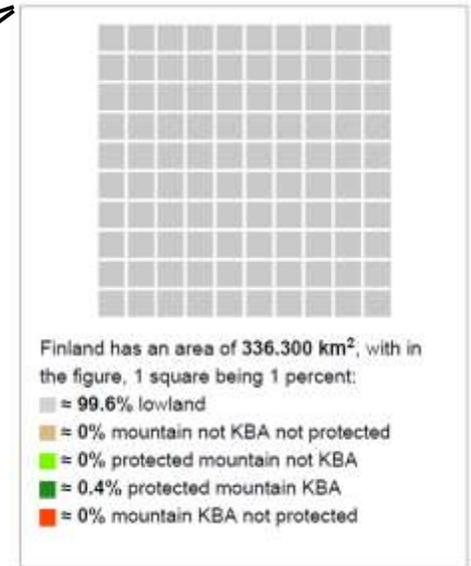
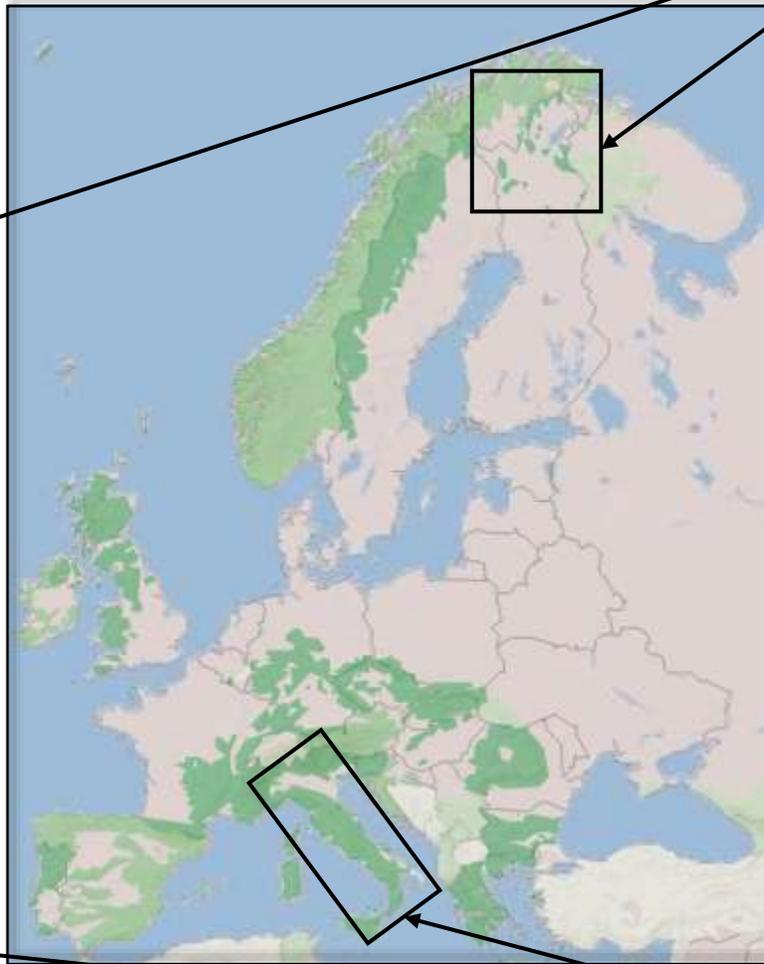
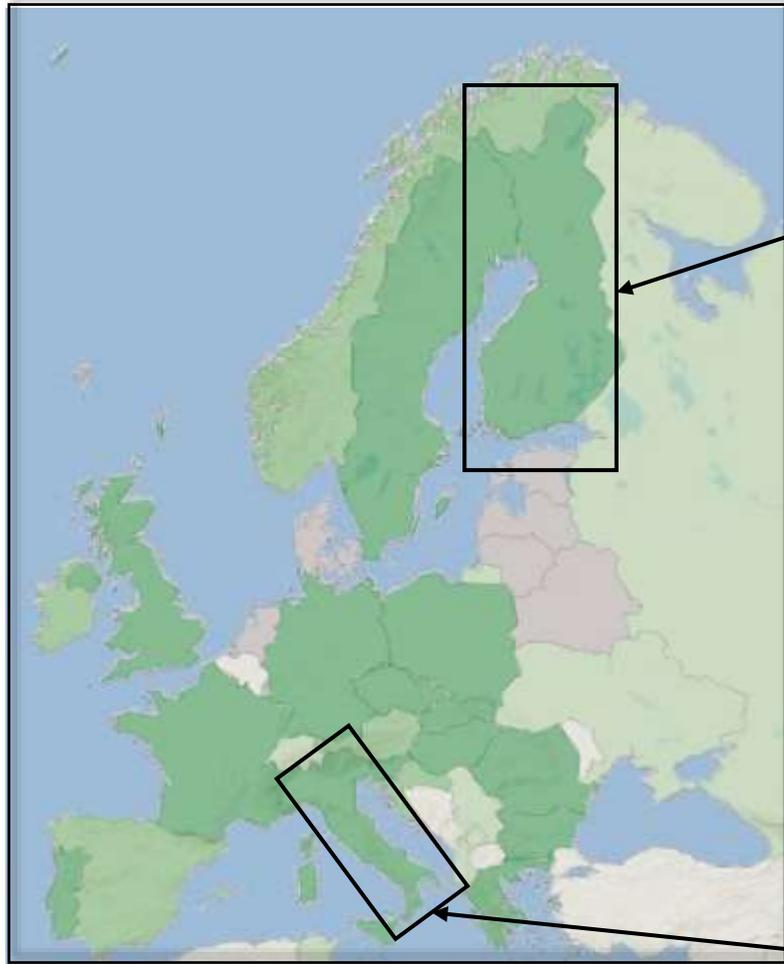


Source: BirdLife International, International Union for Conservation of Nature and United Nations Environment Programme

Note: The indicator shows only coverage of protected areas and does not reflect the effectiveness of protected areas in reducing biodiversity loss, depending on various management and enforcement factors.

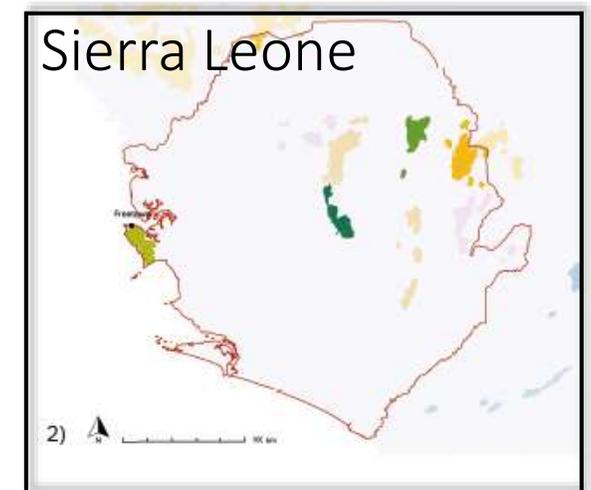
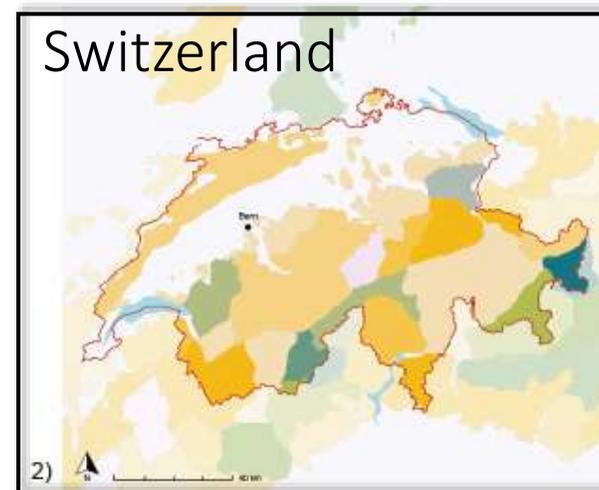
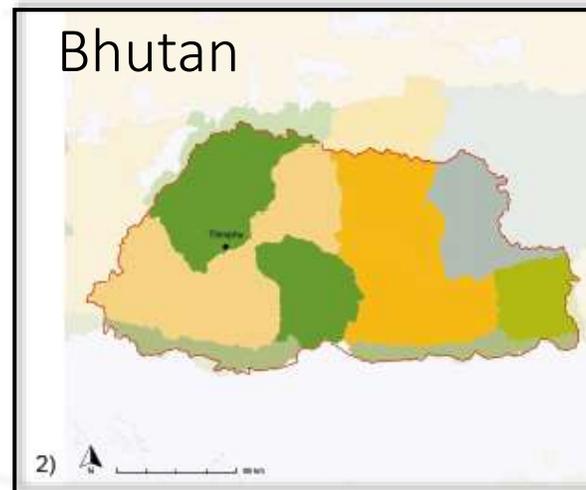
OurWorldInData.org/biodiversity • CC BY

# Coverage of PAs and OECMS

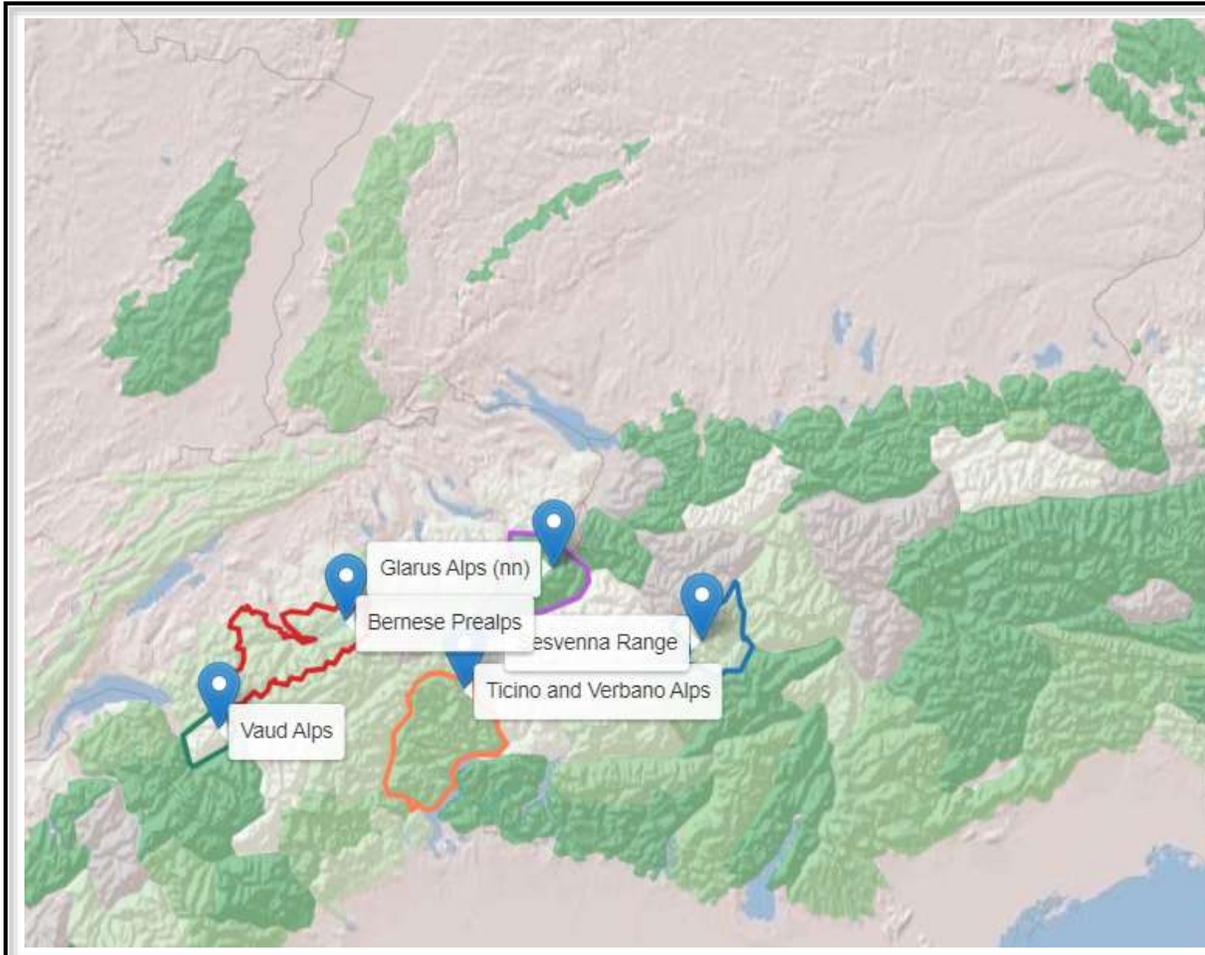


# Coverage of PAs and OECMS

	Total area (km <sup>2</sup> )	Lowlands	Highlands	# mountain ranges	SDG (official)
Belize	22'100	88%	12%	2	88.8
Bhutan	38'800	0%	100%	10	81.7
Switzerland	41'100	32%	68%	34	21.3
Sierra Leone	72'900	95%	5%	10	79.4

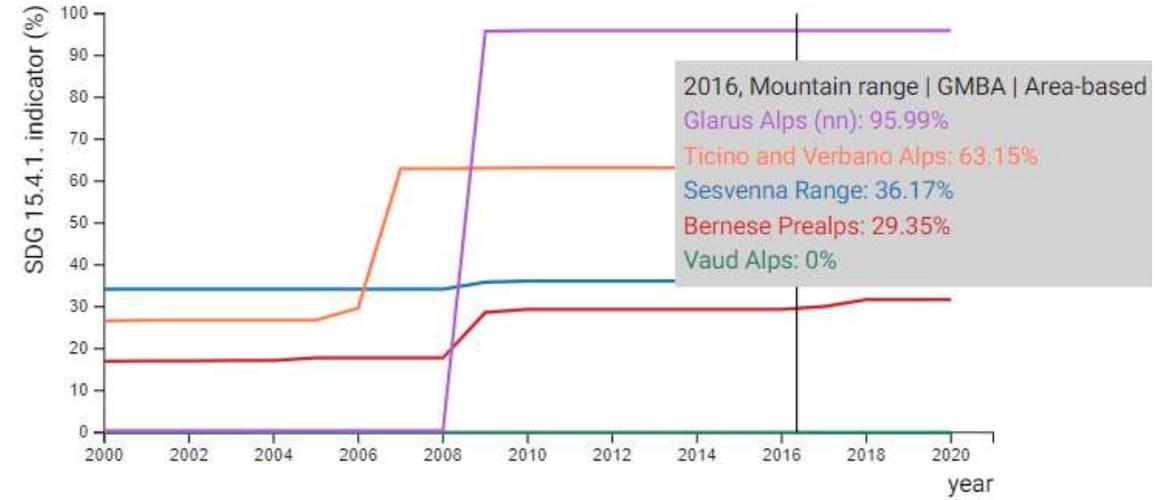


# SDG 15.4.1 by mountain range

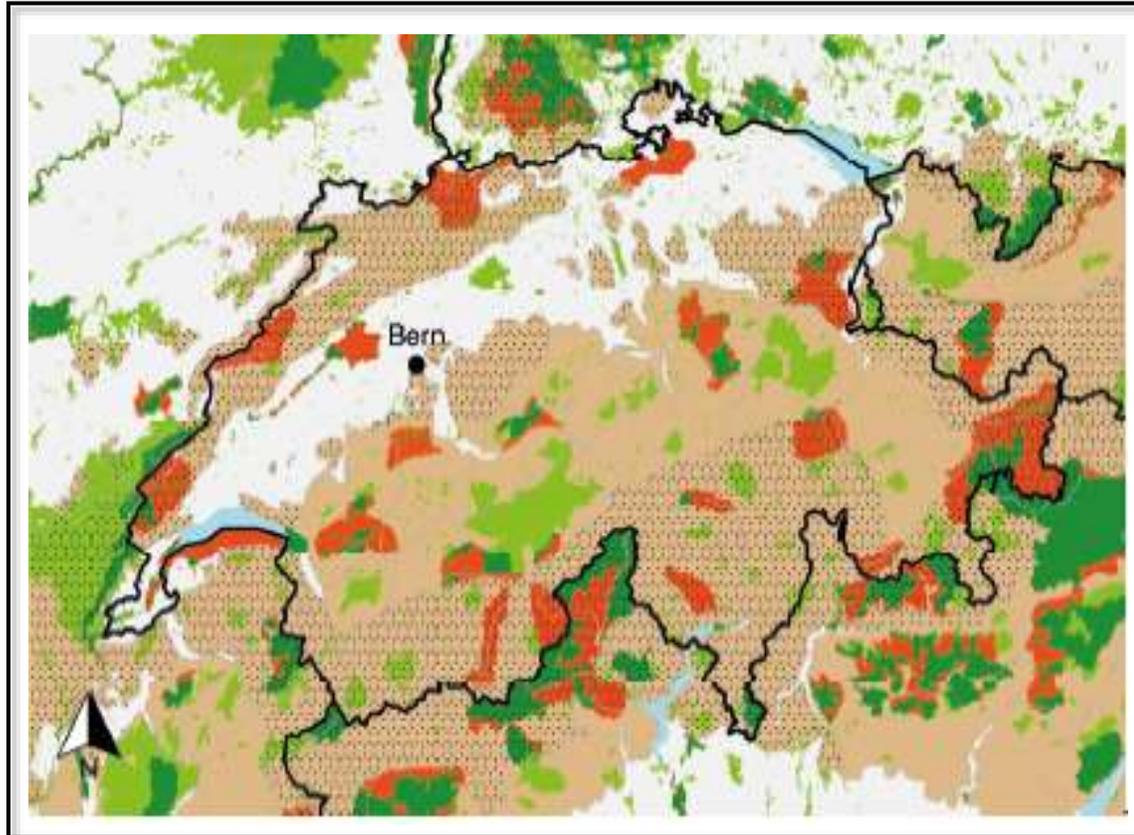


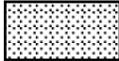
Temporal evolution for selected shape(s)

Temporal evolution of SDG target 15.4.1. indicator for each selected map unit and for the selected calculation option (Mountain range | GMBA | Area-based)

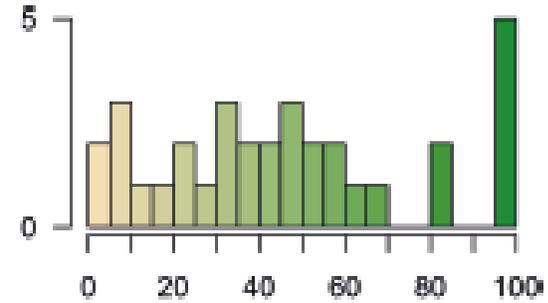
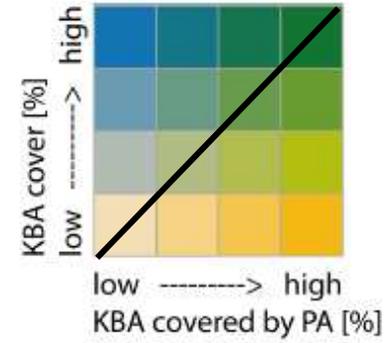
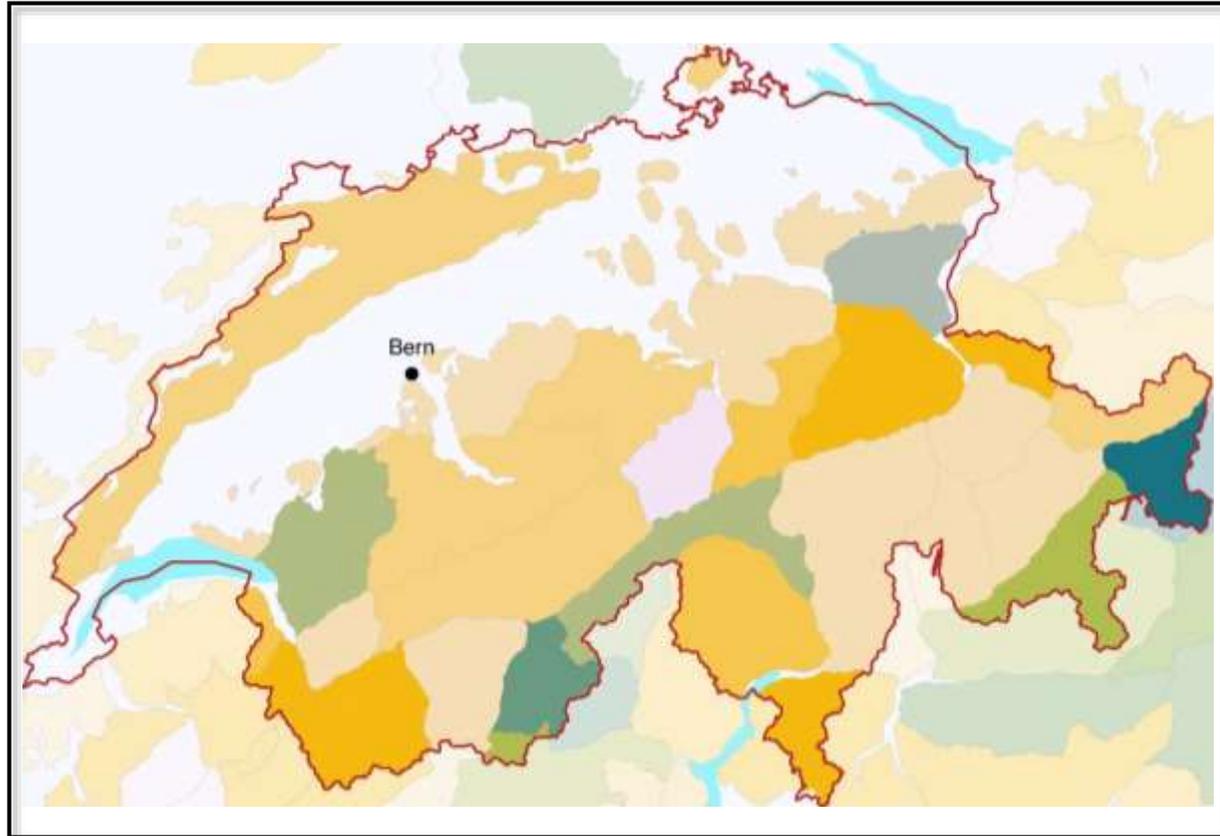


# Coverage of PAs and OECMS of transboundary mountain systems



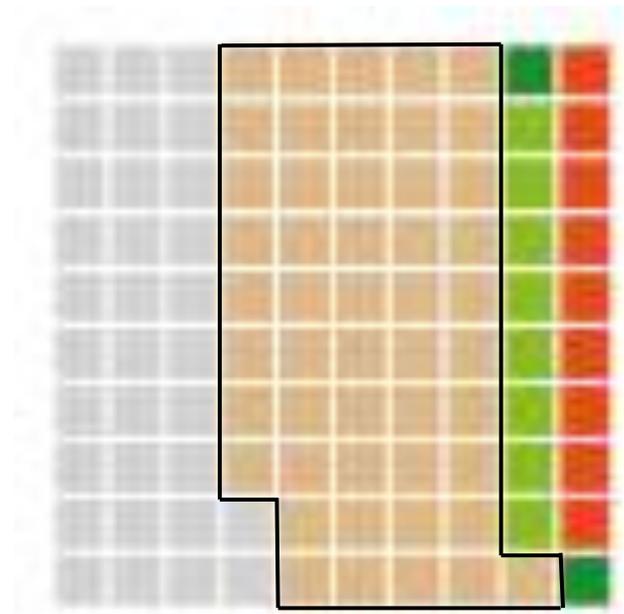
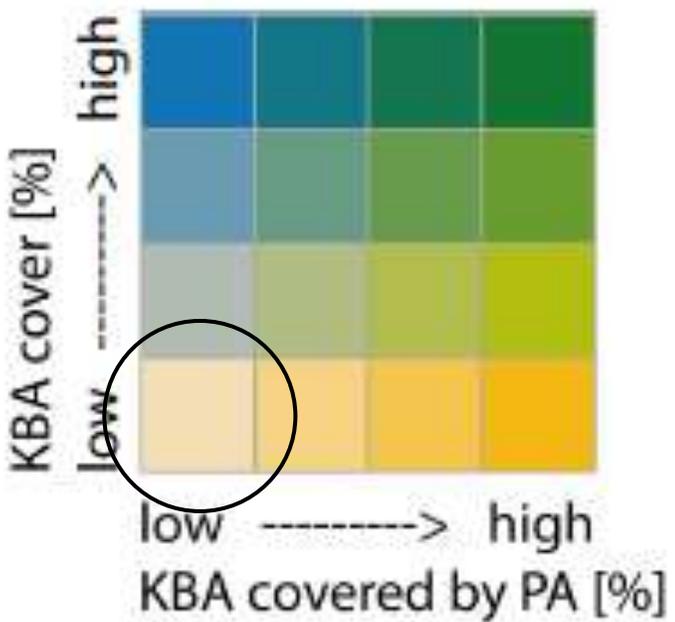
-  Transboundary mountain range
-  Key Biodiversity Area not protected
-  Protected Area
-  Protected Key Biodiversity Area

# SDG 15.4.1 by mountain range





# Key Biodiversity Areas in mountain regions



- Lowland
- Mountain not KBA not protected
- Protected mountain not KBA
- Protected mountain KBA
- Mountain KBA not protected

# Key Biodiversity Areas establishment



ABOUT

EXPLORE

RESOURCES

GET INVOLVED

FR

EXPLORE KBA  
SITE DATA →

# KEY BIODIVERSITY AREAS

Canada's critical places for nature

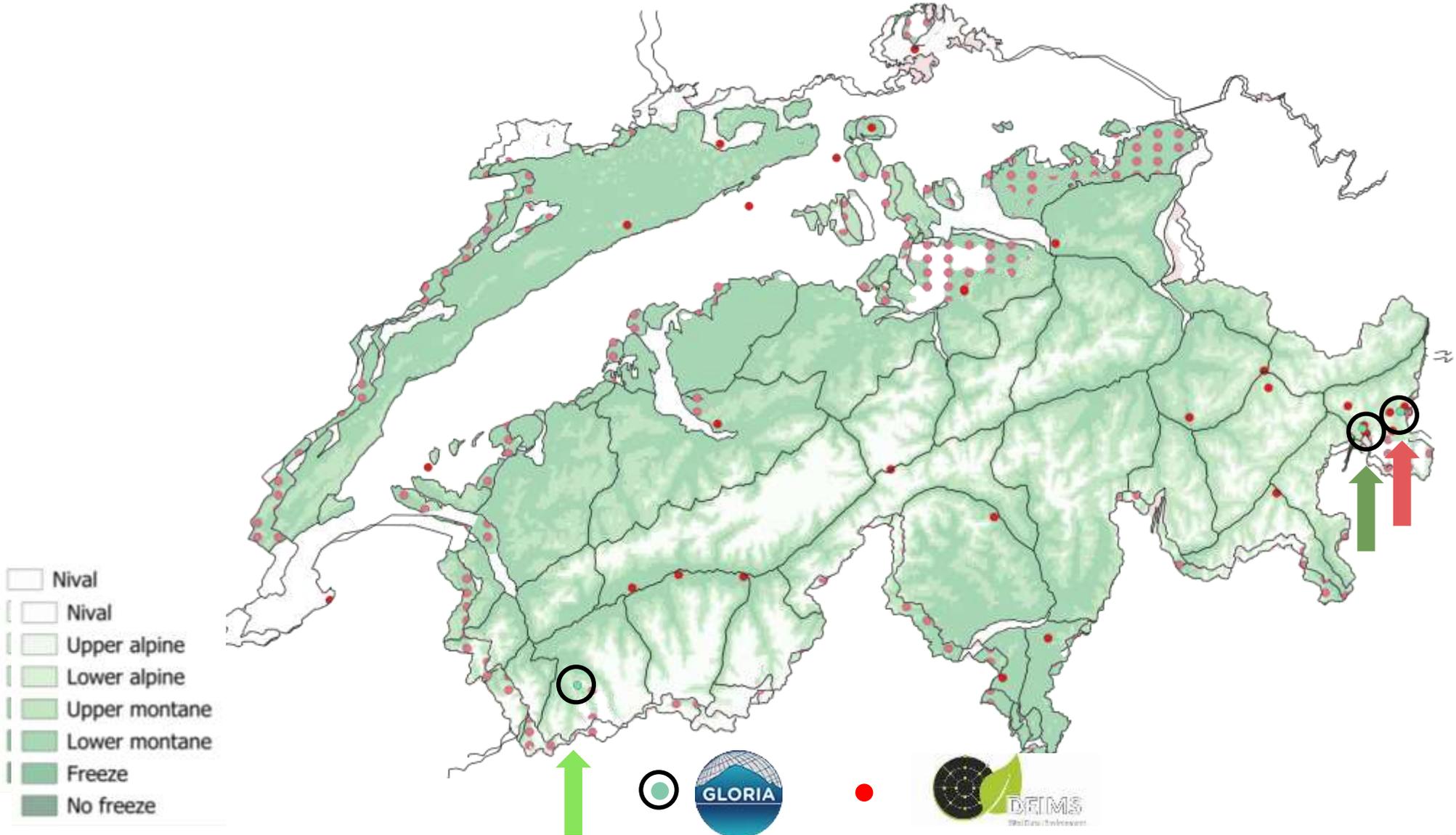
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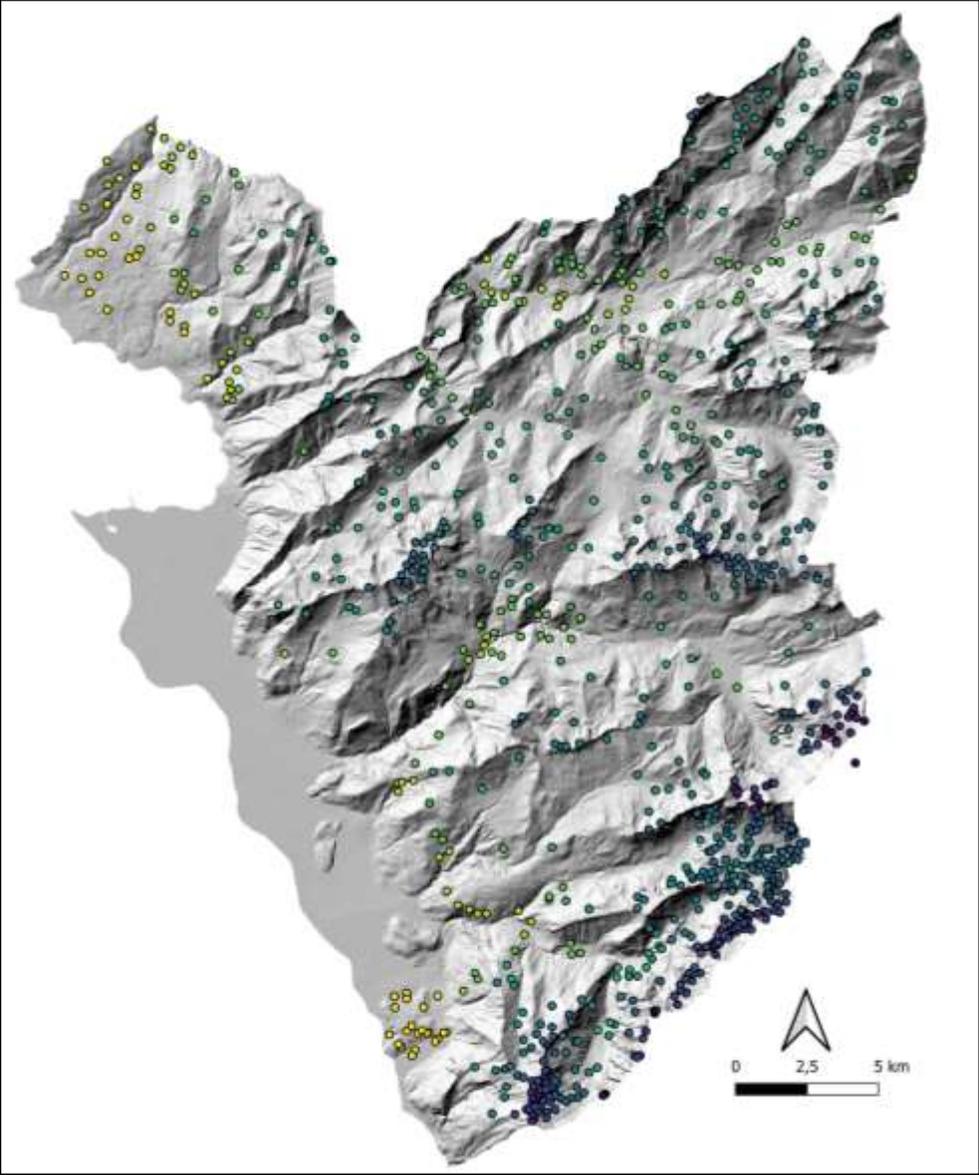
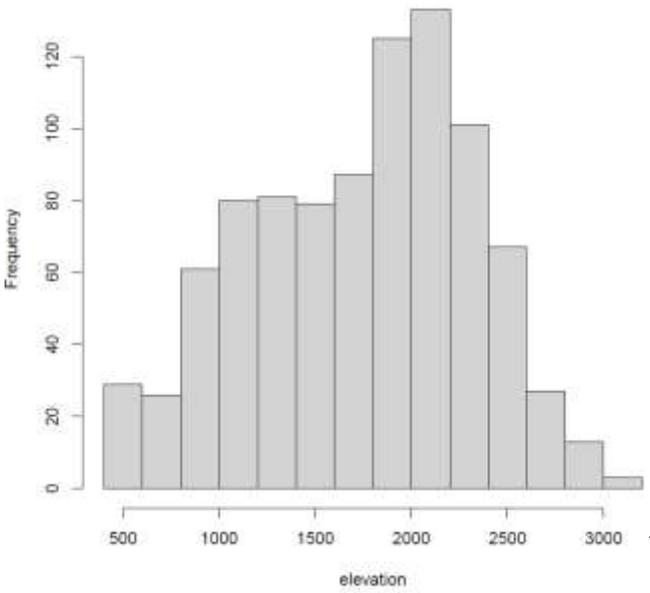
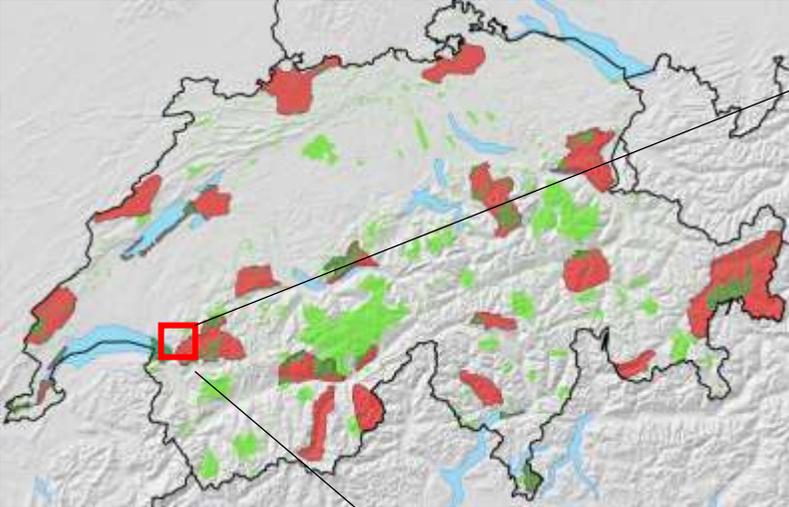
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# Where is the data needed for reporting



# Ecologically representative sampling



- Elevation (m)
- 419 - 688
  - 688 - 957
  - 957 - 1226
  - 1226 - 1495
  - 1495 - 1764
  - 1764 - 2033
  - 2033 - 2302
  - 2302 - 2571
  - 2571 - 2840
  - 2840 - 3109

## Take home messages

- Options & tools to report on mountains within GBF exist
  - Current national and global distribution of datasets and monitoring programs and sites reflects by no means
    - the existing heterogeneity
    - the robust, integrated, and coordinated design that is needed for effectively disentangling and addressing the different causes and consequences of global change across mountains and for understanding global patterns and processes
- We have a unique opportunity to bring together existing efforts and establish baseline for informing the reporting on mountains
  - We are in a position to provide countries with the tools to report on their mountains and take actions to protect them as well as their biodiversity and ecosystems



# Thank you

Amina Ly, Mark Snethlage, Jonas Geschke, Kerrie L. Stauffer, Jasmine Nussbaumer, Dominic Schweizer, Noah S. Diffenbaugh, Markus Fischer



Stanford University



Bern University  
of Applied Sciences



*u<sup>b</sup>*

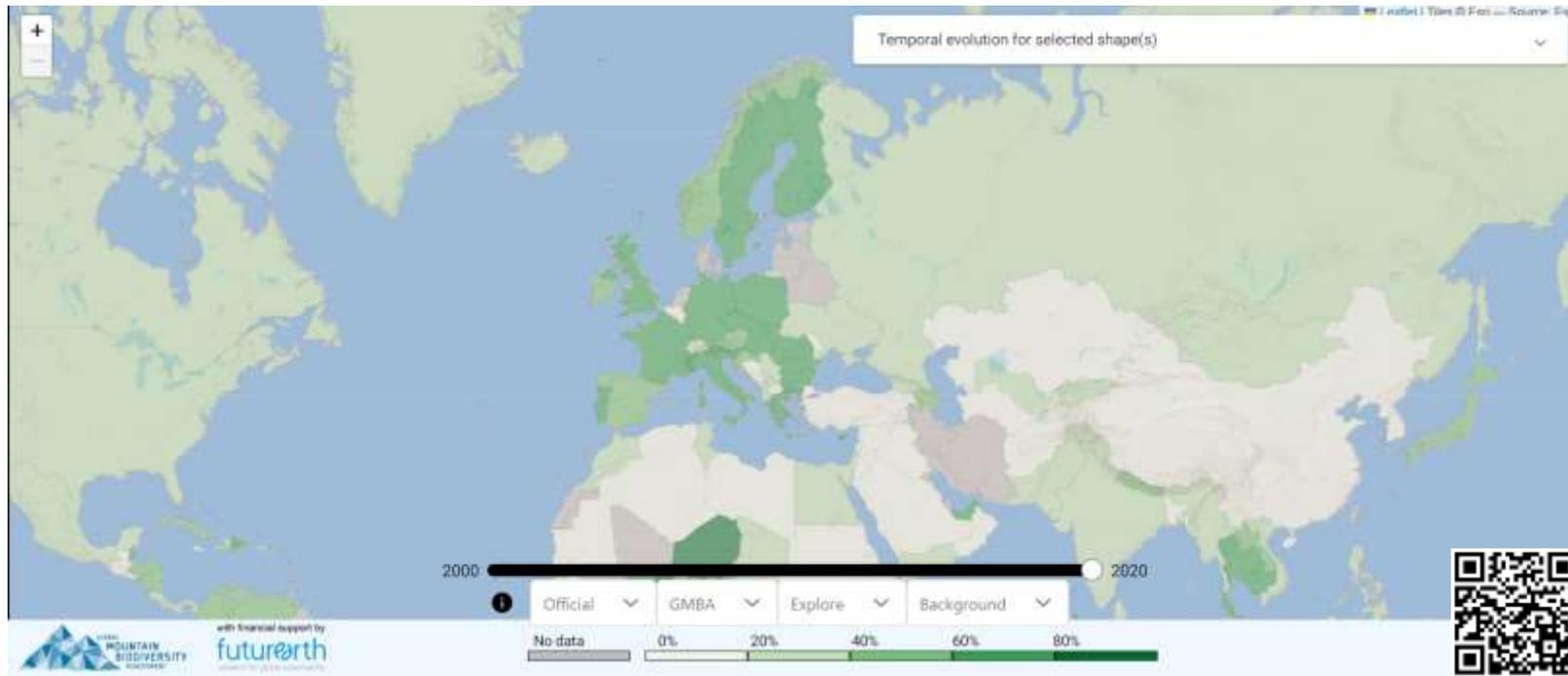
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recherche sur la montagne

futurearth  
research for global sustainability



GMBA one-pager on the coverage of important sites for mountain biodiversity by protected areas

## Switzerland

**Introduction**

Under the United Nations' Agenda 2030, one indicator of progress towards the conservation of mountain ecosystems including their biodiversity (SDG 15.4) is the percentage [%] coverage of important sites for mountain biodiversity (key biodiversity areas, KBAs) by protected areas (PAs) (SDG 15.4.1). KBAs are areas that contribute significantly to the persistence of global biodiversity. Currently, the indicator is hosted by the UN Environment Programme World Conservation Monitoring Centre (WCMC).

**WCMC site-based:** The indicator is officially calculated as the average of the PA coverage of KBAs within a country that are considered mountainous based on the WCMC mountain definition from 2000<sup>1</sup>.

**GMBA area-based:** As an alternative, the Global Mountain Biodiversity Assessment (GMBA) calculates the indicator as the ratio between the total area of protected KBAs and the total area of KBAs in mountains, applying its latest mountain definition from 2022<sup>2</sup>.

Unless mentioned otherwise, the data presented correspond to the GMBA area-based calculation approach.

Switzerland has an area of 41,160 km<sup>2</sup>, from which in the figure, 1 square equals 1 percent:

- 32% lowland
- 49% mountain not KBA not protected
- 8% protected mountain not KBA
- 2% protected mountain KBA
- 9% mountain KBA not protected

**WCMC site-based versus GMBA area-based (temporal comparison)**

**Switzerland in an international context (2020)**

In the left side figure, each point represents one country and its indicator value with both the WCMC site-based and the GMBA area-based calculation approach. Switzerland is marked with the asterisk. Countries close to the diagonal line have a similar indicator value for both calculation approaches, not taking into account the mountain area of a country.

Switzerland, with a GMBA area-based indicator value of 21.3 in 2020, has a value lower than 142 other countries. 52 countries have a value lower than Switzerland.

Looking at the spatial disaggregation of mountains in Switzerland (overleaf), 23 mountain ranges are transboundary and need a cross-border management.

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<sup>1</sup> Kappe et al. (2020) doi:10.1079/9780901394466.0004  
<sup>2</sup> Snelhage et al. (2022) doi:10.1038/s41567-022-01268-9

Mountain inventory: <http://www.earthenv/mountains>

Online tool: [https://www.gmba.unibe.ch/services/indicators/sdg\\_1541](https://www.gmba.unibe.ch/services/indicators/sdg_1541)

One-pagers <https://doi.org/10.5281/zenodo.6626930>

R code: [https://github.com/GMBA-biodiversity/SDG15.4.1\\_Calculator](https://github.com/GMBA-biodiversity/SDG15.4.1_Calculator)

Publication (12.10.23): <https://www.nature.com/articles/s41893-023-01232-3>