proteus

Restoration Opportunities: A new global layer

Proteus Data Forum

2nd December 2025

AGENDA

- Introduction to the Proteus Data Forum series
- Ecosystem restoration: principles, standards and relevance to business
- Restoration opportunities layer: methodology and use
- Discussion and Q&A

SESSION OBJECTIVES

Proteus Data Forum:

- Aiming to increase familiarity with biodiversity data resources and methods, convene data users and technical experts

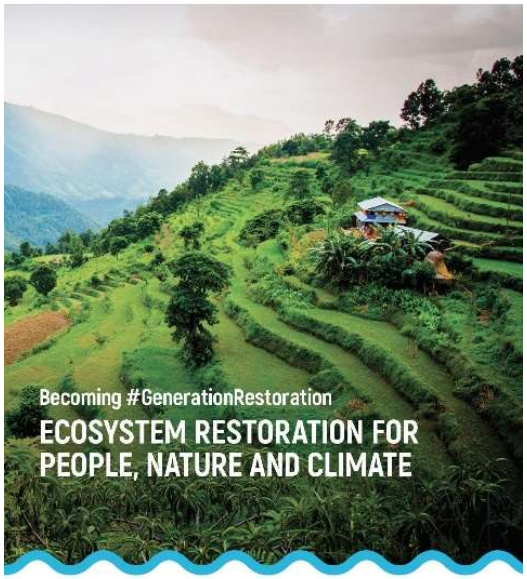
Today's session aims:

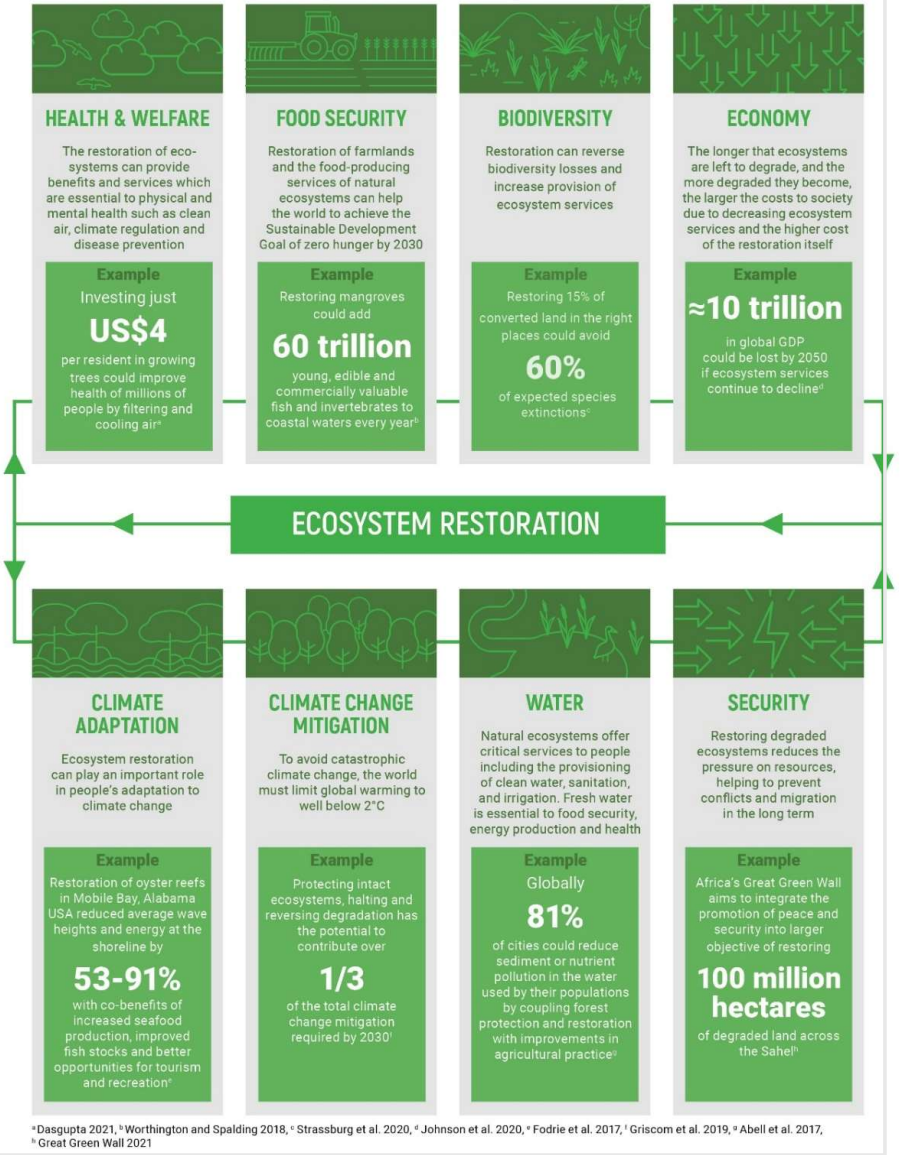
- To introduce the new restoration opportunities layer
- To explore the layer's methodology and underlying data
- To discuss uses of the layer for Proteus partners
- To explore questions and identify support needs from Proteus partners

Ecosystem restoration: principles, standards and relevance to business

Anushree Bhattacharjee, Senior Programme Officer, UNEP-WCMC

HEALTHY, RESTORED ECOSYSTEMS PROVIDE MANY BENEFITS





[a] Dasgupta 2021, [b] Worthington and Spalding 2018, [c] Strassburg et al. 2020, [d] Johnson et al. 2020, [e] Fodrie et al. 2017, [f] Griscom et al. 2019, [g] Abell et al. 2017, [h] Great Green Wall 2021

DEGRADED ECOSYSTEMS AFFECT ESSENTIAL SERVICES

- Negatively affecting well-being of 3.2 billion people
- Loss of biodiversity and ecosystem services = 10% of global GDP

[a] FAO 2016a, [b] Foley et al. 2011, [c] UNCCD 2017, [d] FAO and UNEP 2020, [e] FAO and UNEP 2020, [f] Lehner and Döll 2004, [g] Darrah et al. 2019, [h] Reid et al. 2020, [i] Dudley et al. 2020, [j] UNCCD 2017, [k] Romeo et al. 2020, [l] IPCC 2019, [m] NOAA 2020a, [n] IPBES 2019, [o] FAO 2016b, [p] Joosten 2009; Kirpotin et al. 2021, [q] Bonn et al. 2016, [r] FAO 2020a, [s] UN Habitat 2020, [t] UN-Water, 2021

GLOBAL MOMENTUM FOR RESTORATION

UNITED NATIONS DECADE ON
ECOSYSTEM
RESTORATION
2021-2030

Ecosystem Restoration

"actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits" – UNEA-5, 2022

THE PROBLEM:

The objectives of the 2030 Agenda for Sustainable Development will not be achieved without large-scale restoration of degraded terrestrial, freshwater & marine ecosystems globally.

THE VISION:

A world where – for the health & wellbeing of all life on Earth & that of future generations – we have restored the relationship between humans & nature, by increasing the area of healthy ecosystems, & by putting a stop to their loss, fragmentation & degradation.

GOALS:

1. Enhancing global, regional, national & local commitments & actions to prevent, halt & reverse the degradation of ecosystems

2. Increasing our understanding of the multiple benefits of successful ecosystem restoration

3. Applying knowledge of ecosystem restoration in our education systems & within all public & private sector decision-making

Convention on Biological Diversity

Target 2

Restore 30% of all Degraded Ecosystems

Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

Target 19

Mobilize $200 Billion per Year for Biodiversity From all Sources, Including $30 Billion Through International Finance

Substantially and progressively increase the level of financial resources from all sources, in an effective, timely and easily accessible manner, including domestic, international, public and private resources, in accordance with Article 20 of the Convention, to implement national biodiversity strategies and action plans, by 2030 mobilizing at least 200 billion United States dollars per year,

BUSINESS CASE FOR RESTORATION

Mandatory requirements: compliance with national and international legislation

Environmental compliance (in alignment with the Mitigation Hierarchy)	For social and environmental reporting, including no net loss/ net gain commitments	Access to funding (e.g. guarantees and layered funds)	Generating positive impacts: social, environmental, climate
Mitigate risks associated with dependencies on ecosystems	Contribute to global goals for halting and reversing ecosystem degradation	Opportunities for multistakeholder partnerships	Collaboration opportunities with other actors in a landscape/ seascape
Reputational enhancement	New opportunities associated with restoration projects	Shared responsibility in operational sites and landscapes/ seascapes	Sustainable management of natural resources

The World Economic Forum estimates that roughly half of the world's total GDP, (~ $44trn of economic value) moderately or highly depends on the natural world

AR0

DEMONSTRATION OF GAINS

Source: The Future of Nature and Business WEF Report (2020)

Slide 10

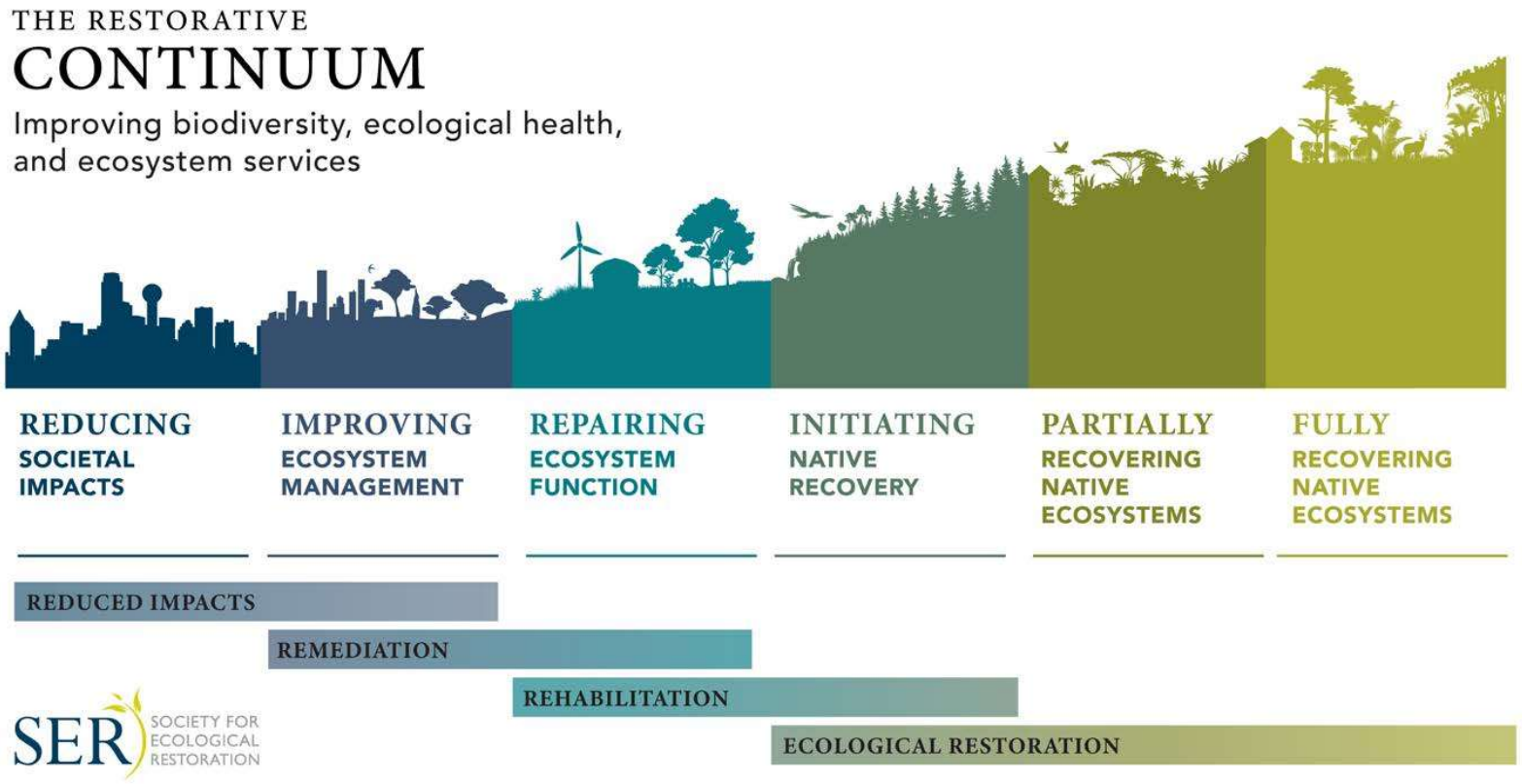
AR0 Hard to read footnotes. Crop them off? Remove the autumnal image to make whole thing bigger?
Alex Ross, 2025-11-28T09:29:20.038

EG0 0 I reckon crop off the footnotes and just explain it out loud. The source bit on the image can definitely get cropped
Elspeth Grace, 2025-11-28T09:48:28.766

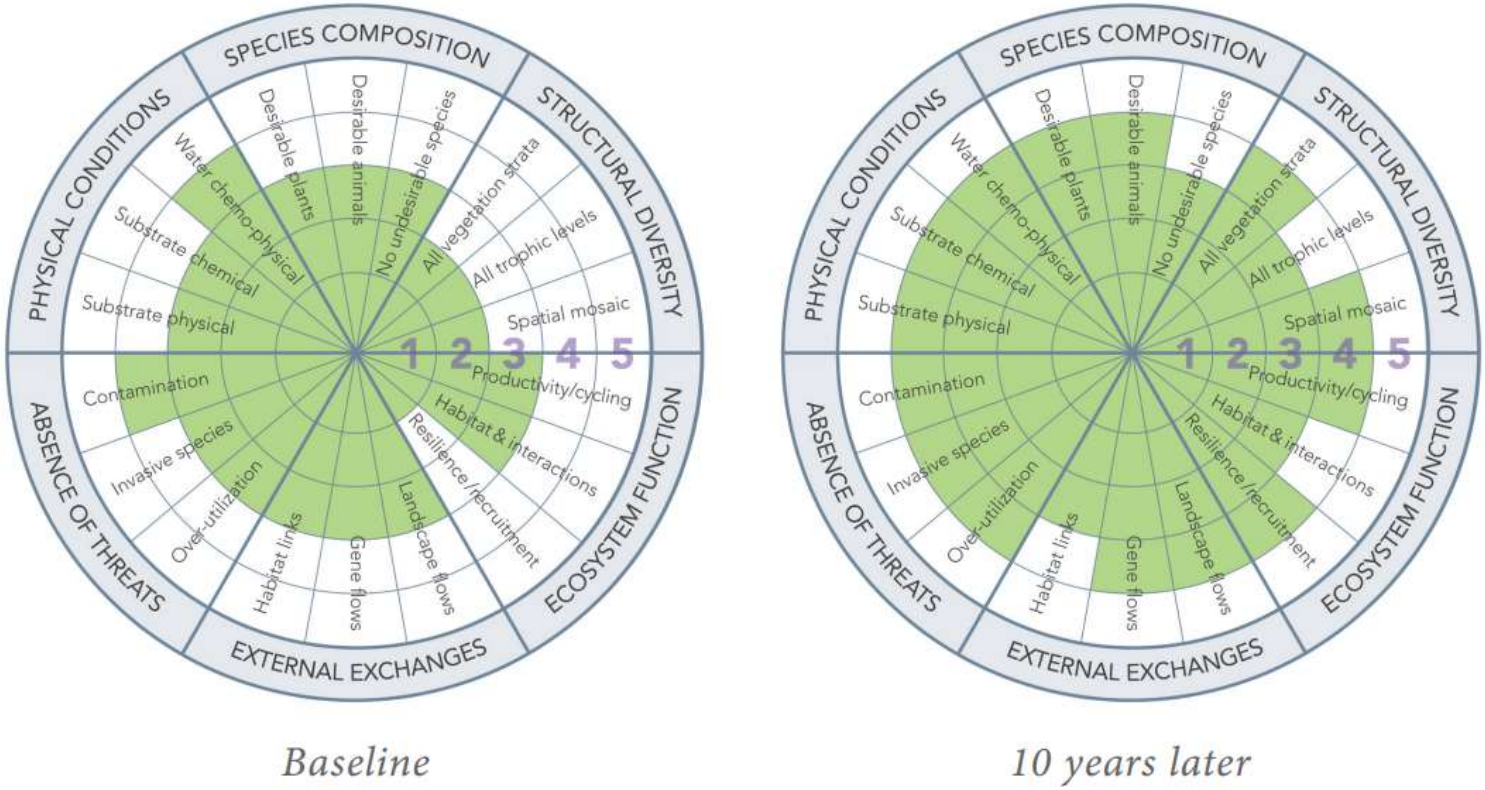
VK0 1 Cropped footnotes, removed filler image and replaced with a higher quality screenshot
Vignesh Kamath, 2025-11-28T10:47:15.419


Eight Principles Underpinning Ecological Restoration
1 ENGAGES STAKEHOLDERS
2 DRAWS ON MANY TYPES OF KNOWLEDGE
3 IS INFORMED BY NATIVE REFERENCE ECOSYSTEMS, WHILE CONSIDERING ENVIRONMENTAL CHANGE
4 SUPPORTS ECOSYSTEM RECOVERY PROCESSES
5 IS ASSESSED AGAINST CLEAR GOALS AND OBJECTIVES USING MEASURABLE INDICATORS
6 SEEKS THE HIGHEST LEVEL OF RECOVERY POSSIBLE
7 GAINS CUMULATIVE VALUE WHEN APPLIED AT LARGE SCALES
8 IS PART OF A CONTINUUM OF RESTORATIVE ACTIVITIES
SER
SOCIETY FOR ECOLOGICAL RESTORATION

ECOSYSTEM RESTORATION IS A CONTINUUM



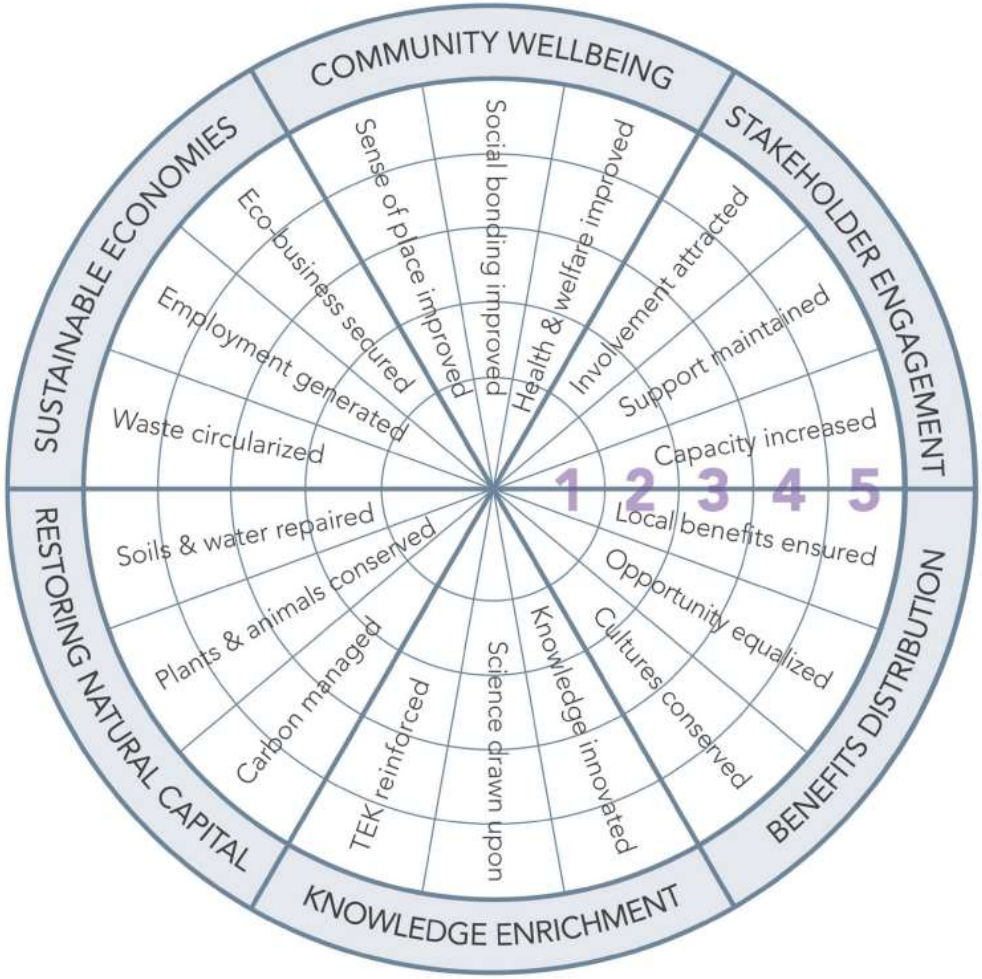
STANDARDS OF ECOSYSTEM RESTORATION



Ecological Recovery Wheel

SOCIAL BENEFITS WHEEL

- Example of a Social Benefits Wheel to assist in tracking the degree to which restoration project is attaining its social development targets and goals
- This can be customized to suit the specific targets and goals of any restoration project



SER FIVE STAR SYSTEM

NUMBER OF STARS	SUMMARY OF RECOVERY OUTCOME
★	Ongoing deterioration prevented. Substrates remediated (physically and chemically). Some level of native biota present; future recruitment niches not negated by biotic or abiotic characteristics. Future improvements for all attributes planned and future site management secured.
★★	Threats from adjacent areas starting to be managed or mitigated. Site has a small subset of characteristic native species and low threat from undesirable species onsite. Improved connectivity arranged with adjacent property holders.
★★★	Adjacent threats being managed or mitigated and very low threat from undesirable species onsite. A moderate subset of characteristic native species is established and there is some evidence of ecosystem function commencing. Improved connectivity at the landscape scale is in evidence.
★★★★	A substantial subset of characteristic biota present (representing all species groupings), providing evidence of developing community structure and of ecosystem processes. Improved connectivity established and surrounding threats being managed or mitigated.
★★★★★	Establishment of a characteristic assemblage of biota to a point where structural and trophic complexity to a level of very high similarity to the reference ecosystem is likely to develop with minimal further restoration interventions. Appropriate cross-boundary flows are enabled and commencing and resilience is restored with return of appropriate disturbance regimes. Long-term management arrangements in place.

RATIONALE BEHIND THE RESTORATION OPPORTUNITIES LAYER

AR0

- Considering restoration in decision making
- Stakeholder engagement and consultation
- Planning and implementation for multiple benefits
- Recognising and addressing trade offs
- Avoiding unintended consequences
- Information and tools
- Data (global, national, local, site)
- **Initial scoping - Europe layer (2023) – Global layer (2025)**

Slide 16

AR0 “Restoration Opportunities” rather than potential, right?
Alex Ross, 2025-11-28T09:31:55.788

VK0 0 Changed
Vignesh Kamath, 2025-11-28T10:37:47.742

Restoration opportunities layer: methodology and use

Vignesh Kamath, Programme Officer, UNEP-WCMC

RESTORATION OPPORTUNITIES

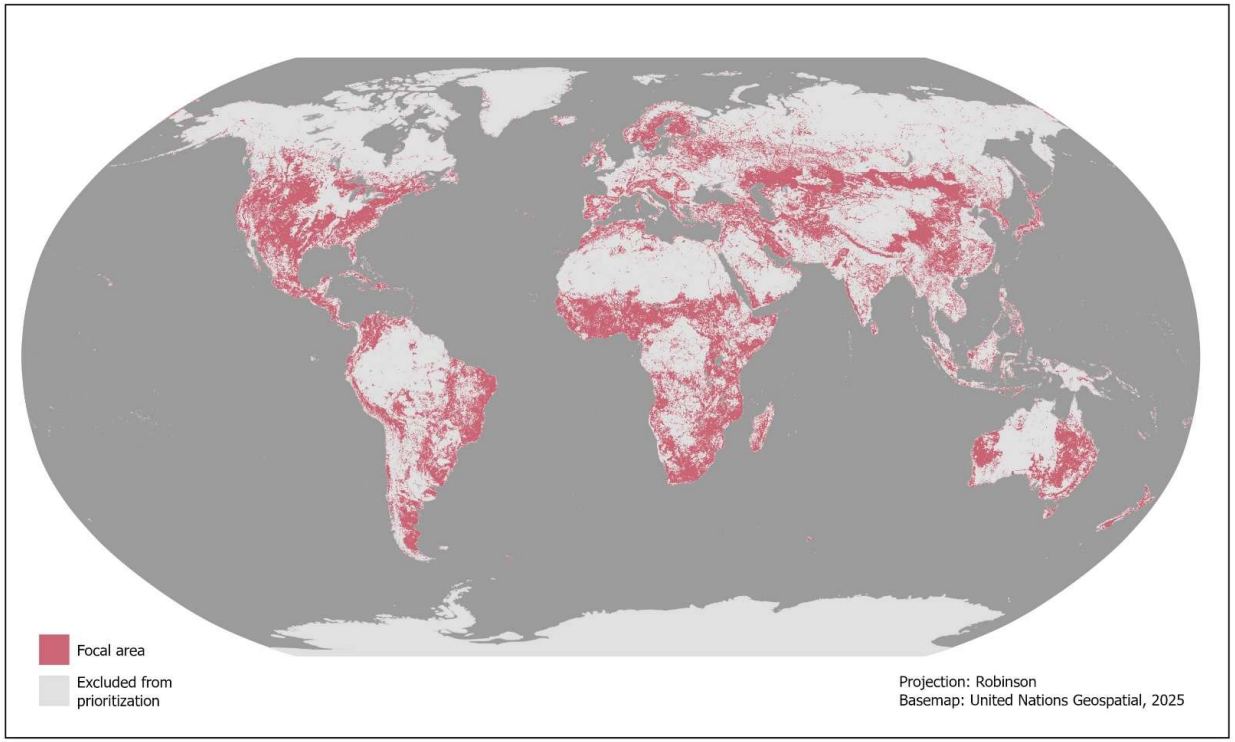
Restoration priority of degraded natural areas based on their potential to maximize co-benefits for nature and people

Shown as a ranking and a map

RESTORATION OPPORTUNITIES LAYER

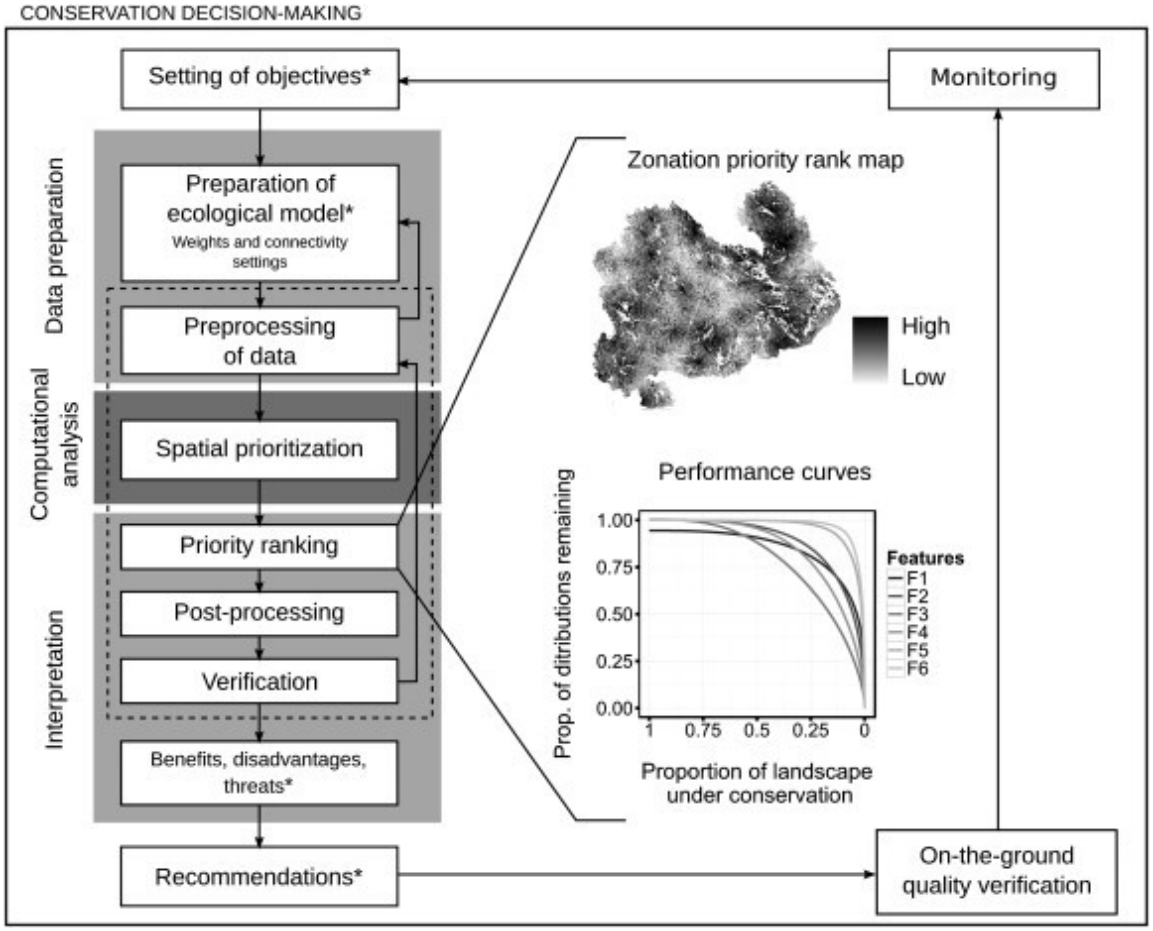
"Restoration priority of degraded natural areas based on their potential to maximize co-benefits for nature and people"

- Focal area: Global land area
- Area not under current anthropogenic use (croplands, plantations, cities, etc), with moderate to high signs of human impact
- Varies spatially, different % in different countries



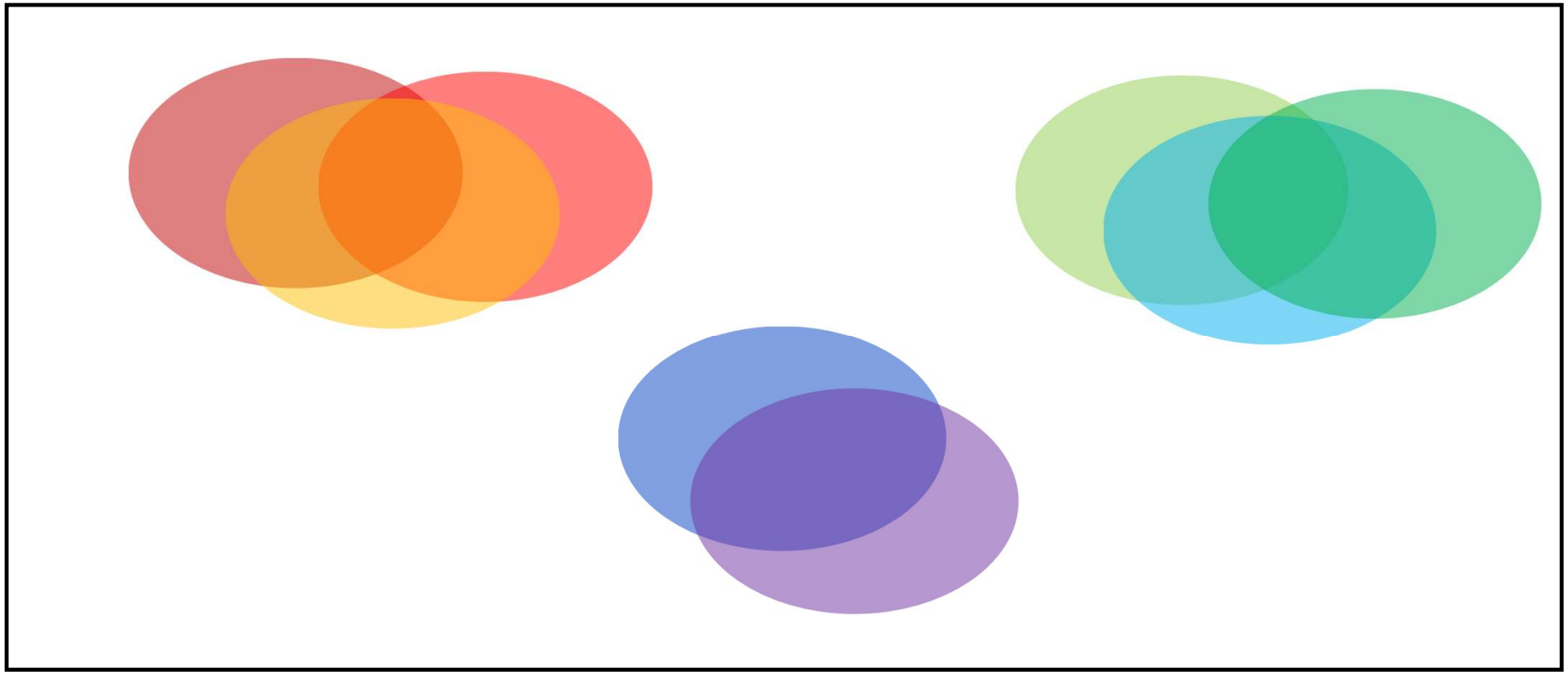
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

SYSTEMATIC CONSERVATION PLANNING PROCESS



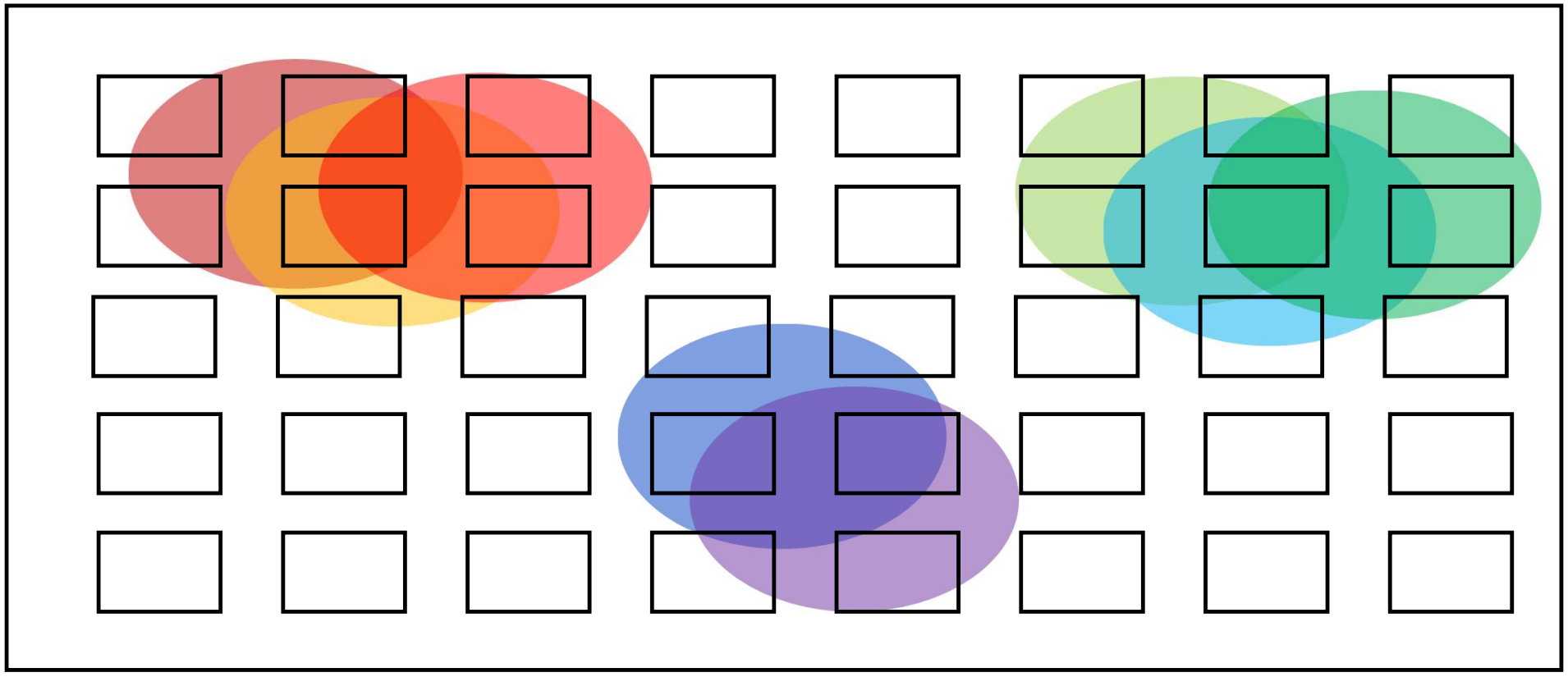
(Lehtomaki & Moilanen, 2013)

Optimizing area selection

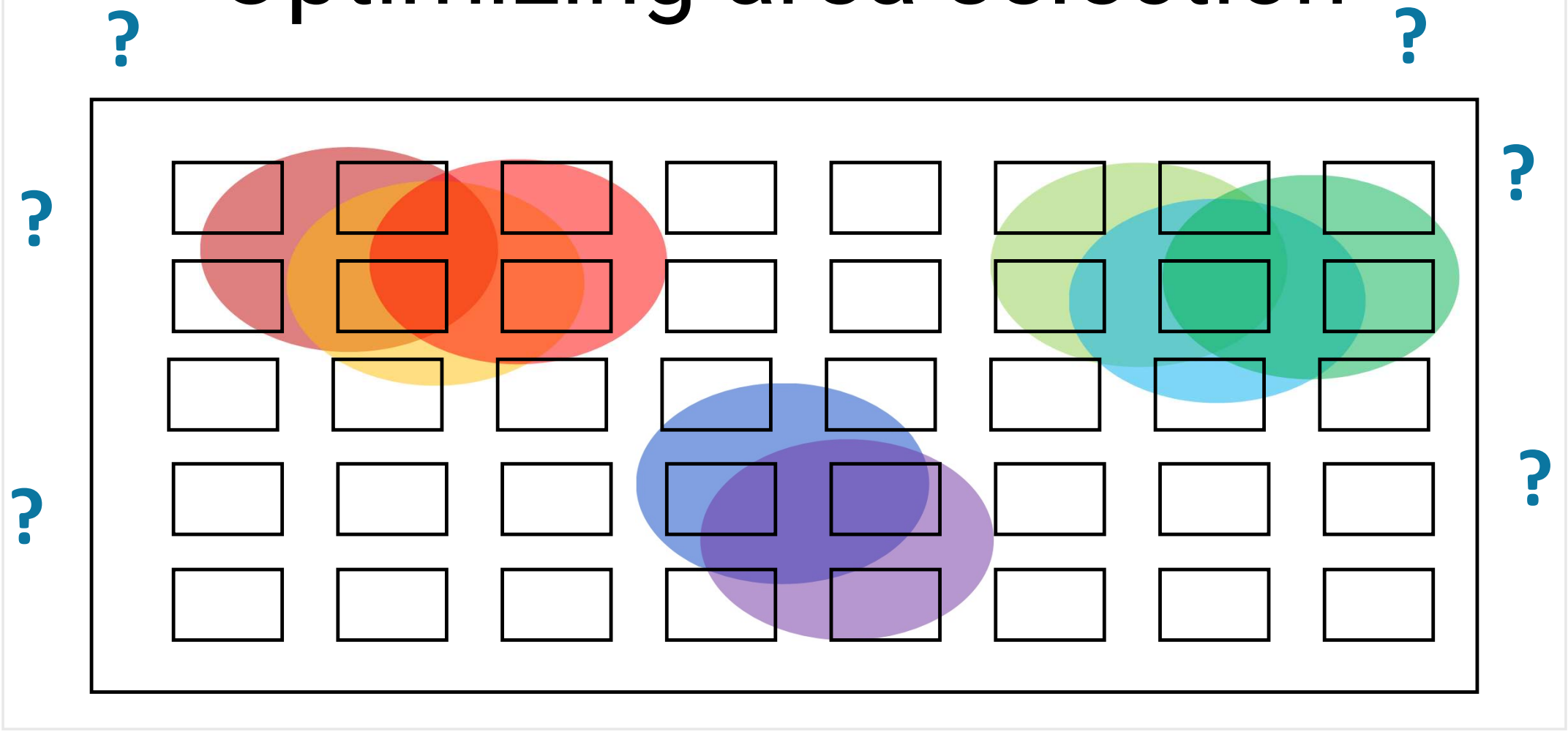


(Jeffrey Hanson and Richard Schuster, ICCB 2021)

Optimizing area selection

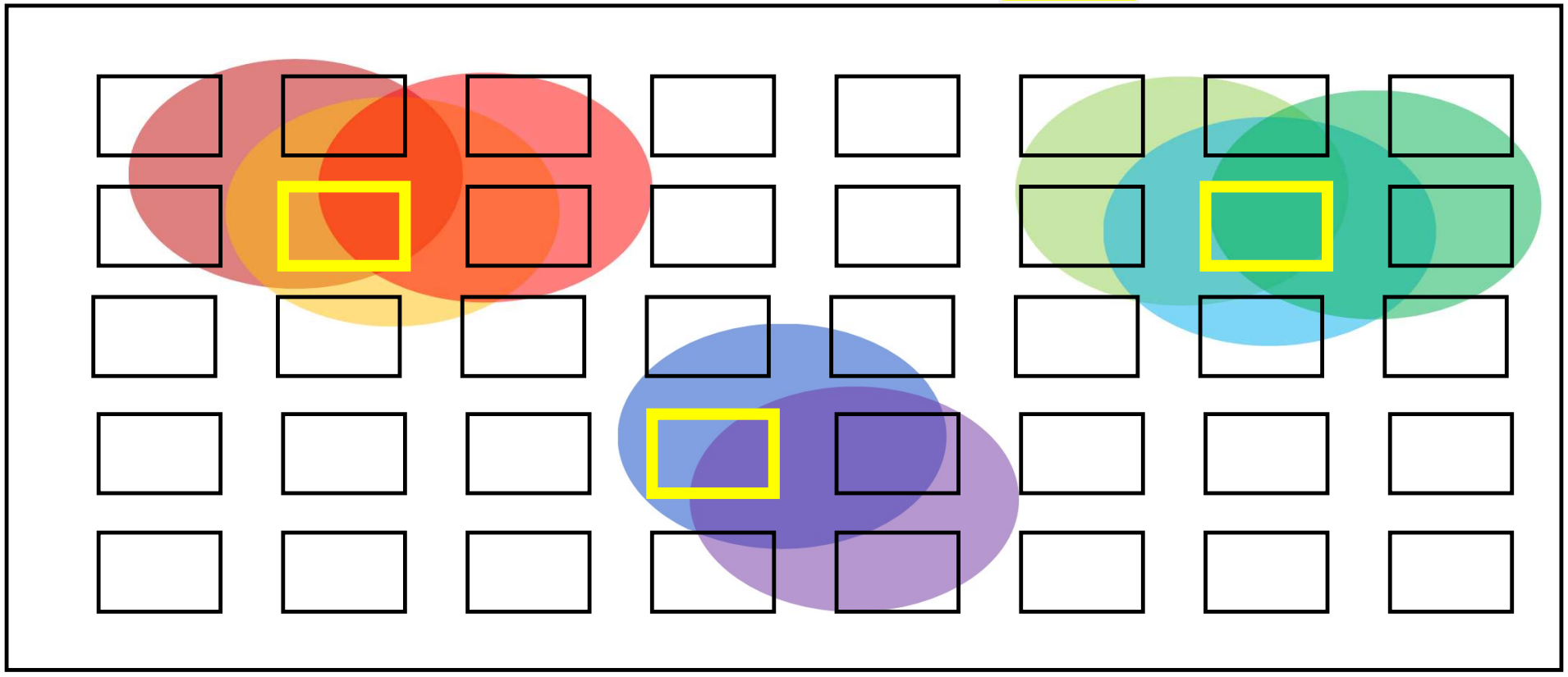


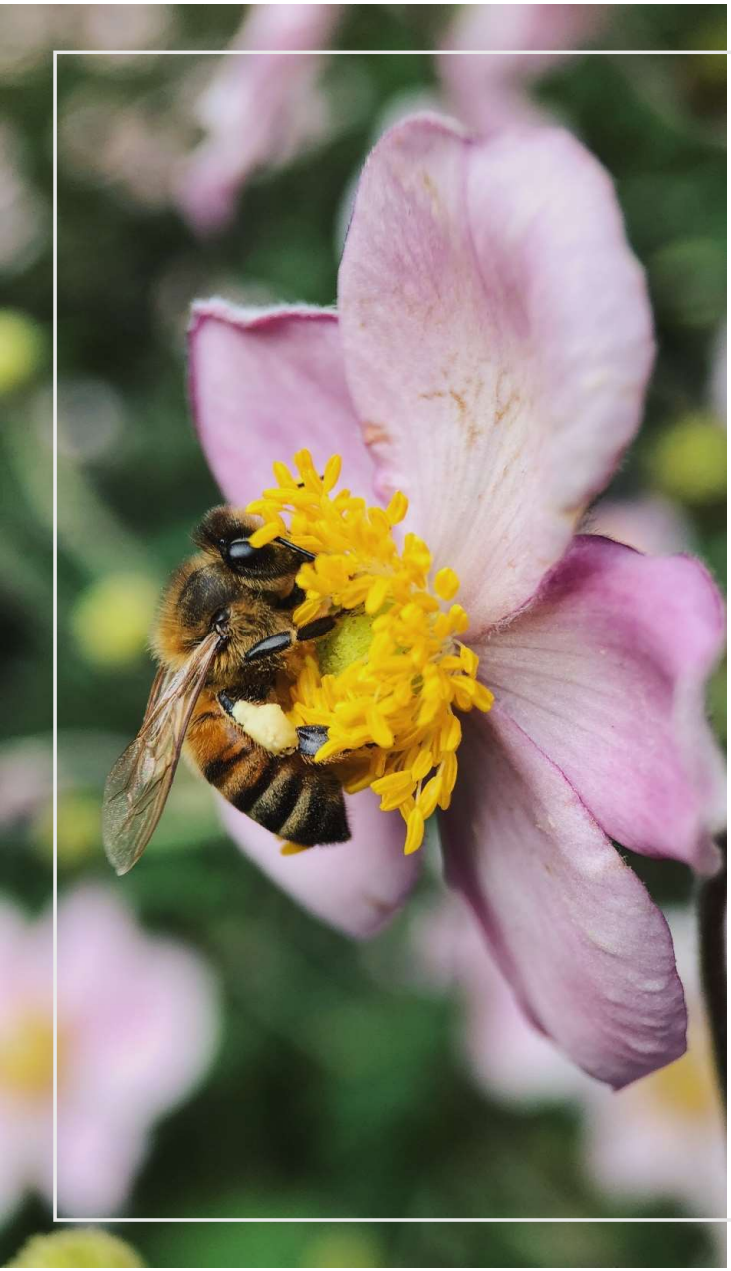
Optimizing area selection



Optimizing area selection

= *Prioritization*





SPATIAL ANALYSIS APPROACH

- Spatial prioritization – Using *Prioritizr* to map the patterns of restoration opportunities

- **General workflow:**

  1. Identify where are the needs to restore biodiversity and NCPs - Data collection
  2. Data preprocess
  3. Set up the prioritization algorithm in *Prioritizr* (define restoration targets, weights, ...)
  4. Map restoration opportunities with *Prioritizr*
  5. Sensitivity tests and rerun analysis
  6. Explore restoration opportunities

DATA - LOCATION OF RESTORATION NEEDS

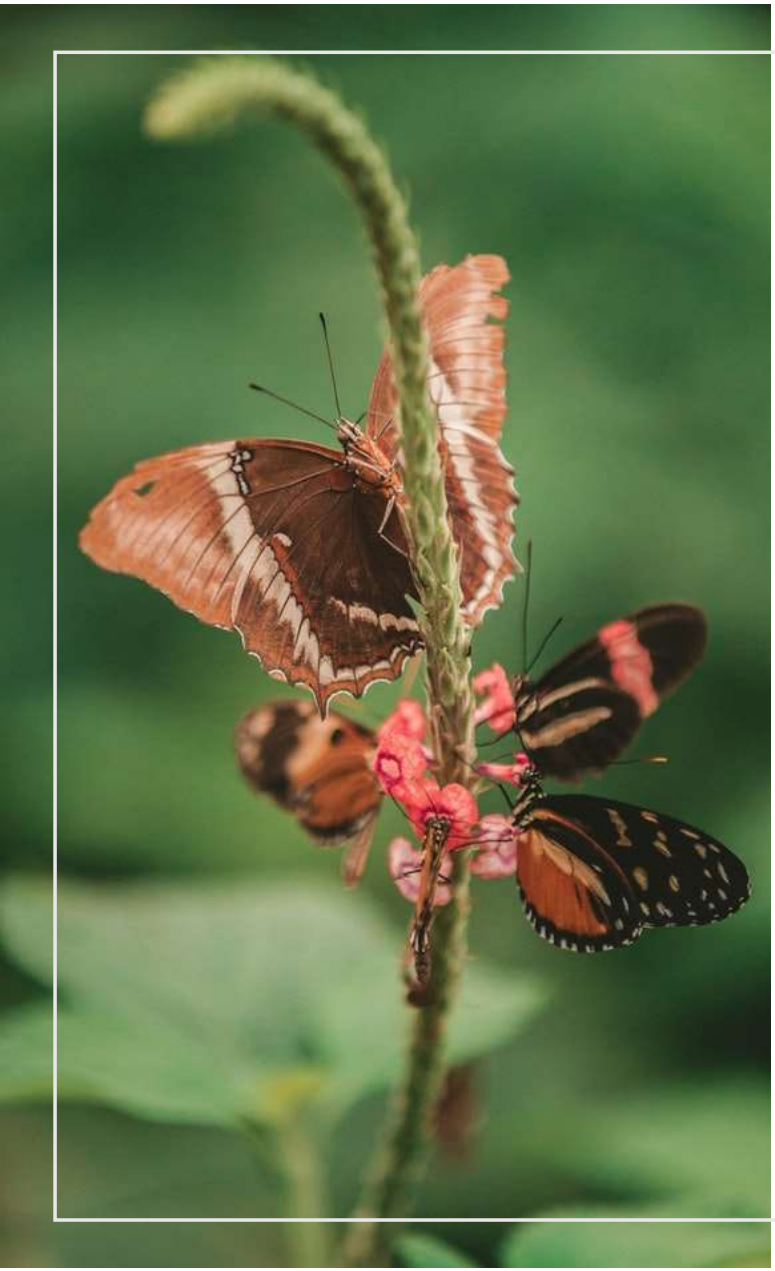
Spatial data to show potential gains from restoration

Gains for biodiversity

- Species conservation: restore areas with highest rarity-weighted **species' richness**
- Ecosystem conservation: restore **ecoregions** with smaller remnant extent
- Key habitat conservation: restore degraded area in **KBAs, Ramsar** sites and **salt marshes**

Gains in nature's contributions to people

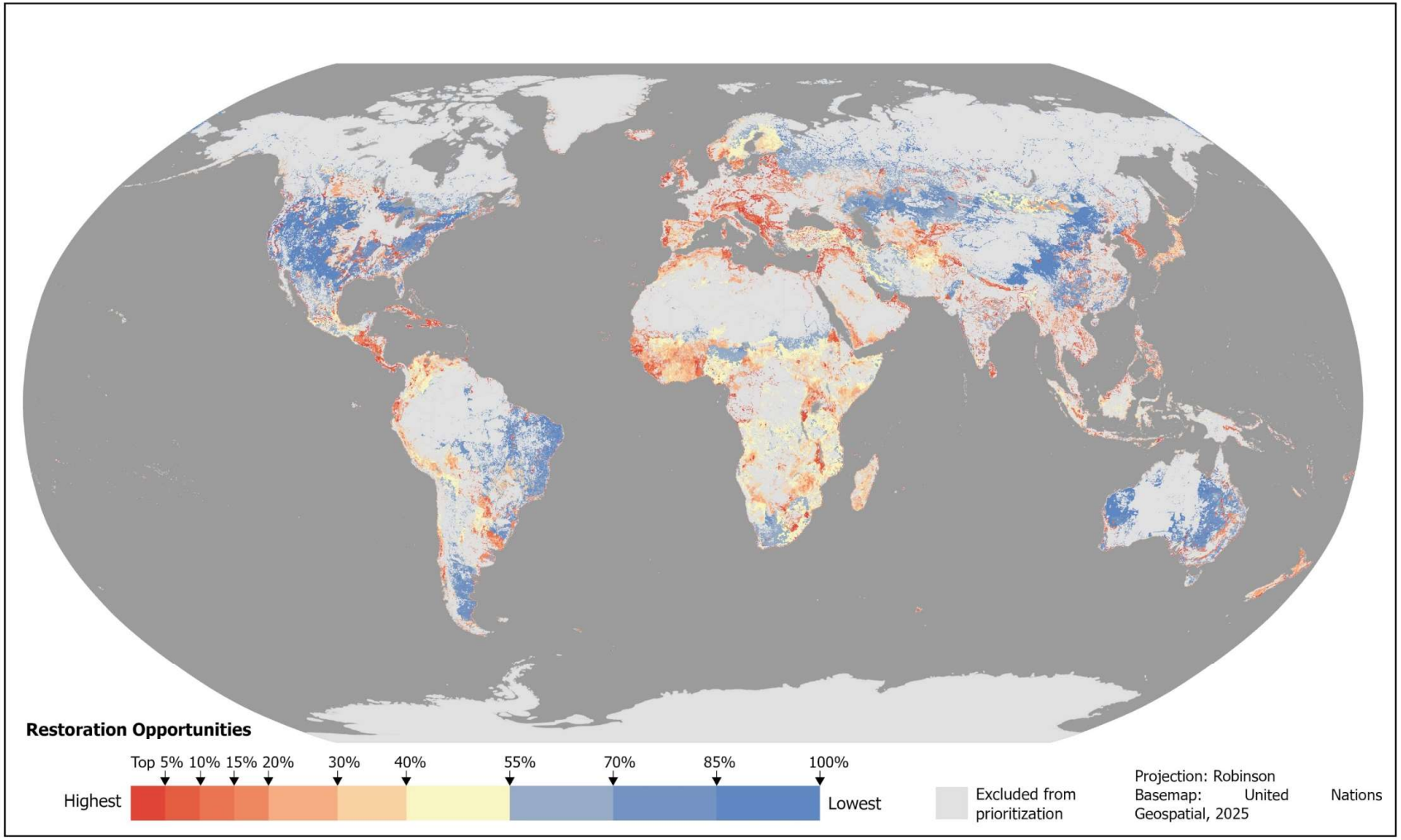
- Climate change mitigation: **carbon in soil and vegetation biomass**
- **Water quality regulation**
- **Coastal protection**
- **Mangrove** extent
- **Plants** used by humans



MAPPING RESTORATION OPPORTUNITIES

- Using spatial prioritization to rank degraded areas according to the potential benefit of restoring them for nature and people.
- **Prioritizr** incorporates an algorithm that analyses all the data simultaneously to identify the areas that, if restored, would deliver the maximal total benefit.
- **Prioritization algorithm settings**: *Minimum shortfall* objective “meet target of species and ecosystems and secure as much as possible from other layers, within an area”.

RANKING OF RESTORATION OPPORTUNITIES



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

WHAT DOES IT SHOW?

- Locations across the world with restoration opportunity, ranging from highest to lowest.
- Highest restoration opportunity means that restoring these areas is most effective towards simultaneously maximizing benefits from biodiversity restoration and enhancing NCP delivery.

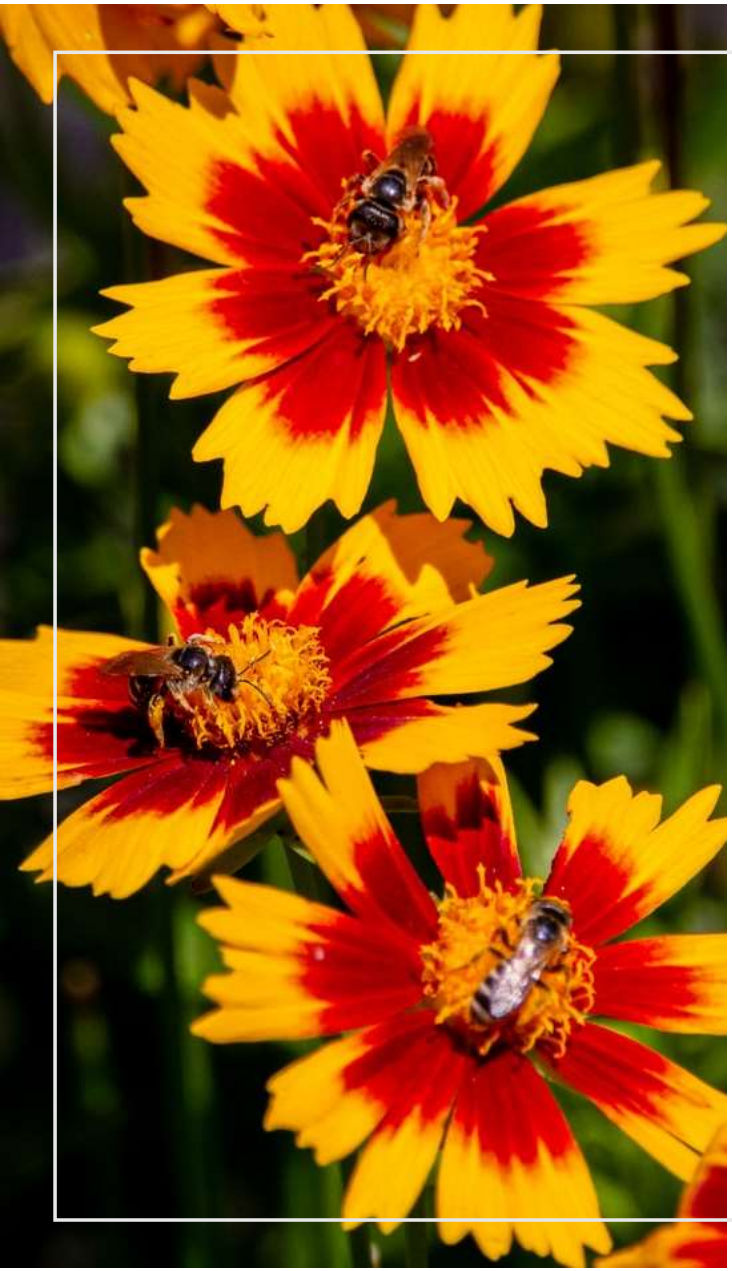
Photo: Maximilian / Adobe Stock

Slide 29

AR0 Are we talking cost-efficient or more like ‘space-efficient’ - i.e. is there a cost of restoring element built into the layer? You might get asked about this.
Alex Ross, 2025-11-28T09:36:39.032

AR0 0 (Generally I like this slide - a nice clear summary of what the layer shows, following the more technical slides before)
Alex Ross, 2025-11-28T09:37:21.469

VK0 1 We haven't factored in restoration costs into our analysis. I meant to say, assuming equal costs to restore any area, the high priority areas would give highest restoration benefits for their investment. However, agree it can be confusing and especially for the business world. I have changed "cost-efficient" to "most effective"
Vignesh Kamath, 2025-11-28T11:01:05.040



CONSIDERATIONS BEFORE USING THE LAYER

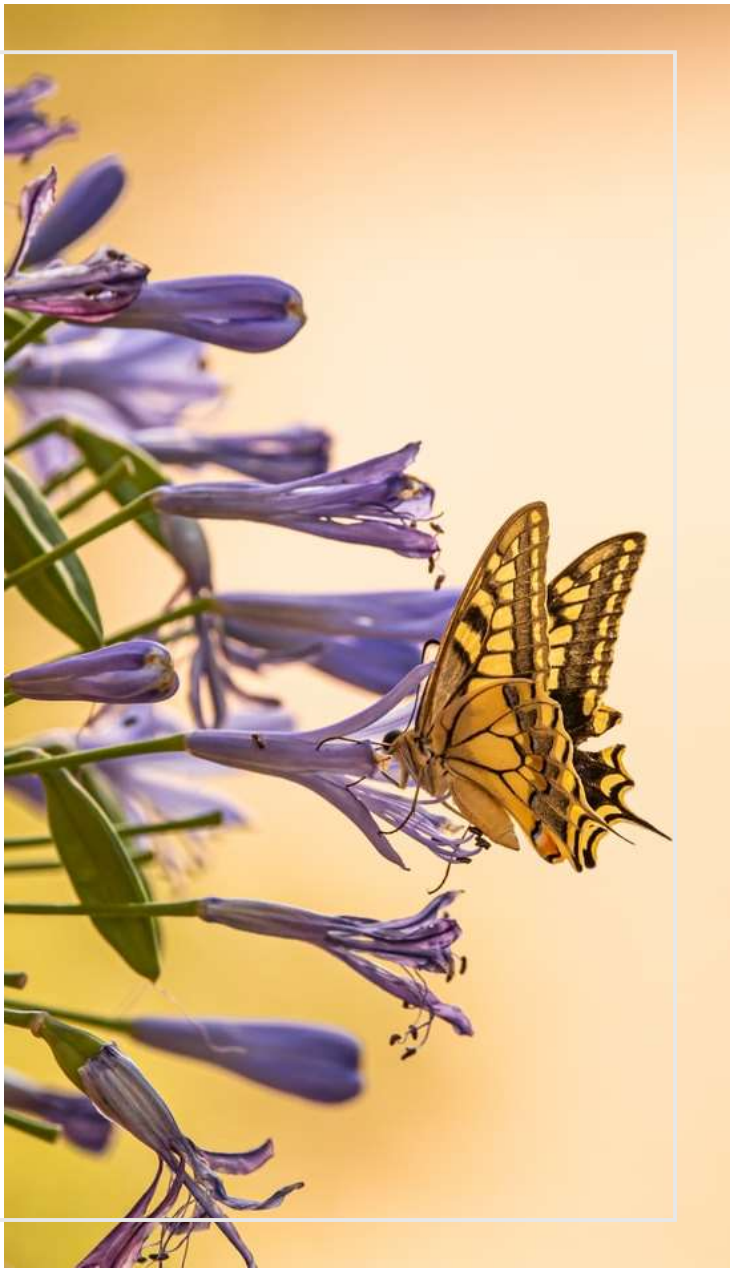
- This layer does not consider land tenure. Land governance should always be considered before decision making.
- The map reflects restoration priorities from a global perspective and needs to be complemented with local information and higher resolution data before actioning.
- Benefits for species are based on rarity weighted richness of species groups (amphibians, birds, crustaceans, fish, mammals and reptiles).
- Coastal areas (salt marshes, mangroves, estuaries) were included (not fully marine habitats).
- Limited consideration of future climate change.

HOW TO USE THIS LAYER?

- The map could be used to identify areas where implementing restoration would deliver **most benefits for nature and people**.
- **Local scale assessments** need to follow to decide restoration site, confirm potential and adapt to local needs, views and consent.

AR0

Link to the map viewer:
https://wcmc.io/RestorationOpportunities_Global_2025



Slide 31

AR0 See comment on slide 27. Are we talking about financial ROI (a likely business default mindset) or more like most conservation benefit from an area of land? Good to be specific about this given the audience 😊

Alex Ross, 2025-11-28T09:40:35.431

VK0 0 Changed ROI to "most benefits for nature and people"

Vignesh Kamath, 2025-11-28T10:50:20.808

HOW TO USE THIS LAYER?

Define impact areas → Identify sites with highest restoration opportunities → Assess ecological condition and degradation causes → Assess social aspects (land tenure, stakeholders, etc) → Develop restoration plan → Implement and monitor

Using Restoration Opportunities layer


Discussion and Q&A


Thank you

UN environment programme

WCMC