Terrestrial biodiversity metrics to support decision-making

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Contents:

Where are metrics needed to support the Kunming-Montreal Global Biodiversity Framework?

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Our Terrestrial Metrics “Database”

Metric	Responsible Institution	Time series (e.g. 1985-2019)	Frequency of update (e.g. annually, monthly)	Static (S) or Temporal (T) Data Layer, or Not Available /Applicable (N	Pressure (P), State(S), Response (R), Benefit (B)	Genes (G), Species (S), Ecosystems, General	Top-down (T), Bottom-up (B), Neither (0), Unknown (U) [State metrics only]	Significance (S), Intactness (I), Neither (0), Unknown (U) [State metrics only]	Business Use	Global indicator can be disaggregated for national use (Y/N)	National data aggregated to form global indicator (Y/N)	National Methodology Available (Y/N)	SDG indicator (Y/N)	CBD GBF indicator (headline, component, complementary)	Indicator used to measure other MEAs or processes (e.g. Ramsar, IPBES, CMS)	Disaggregated by sex or gender-specific	Citation	Resource 1	Resourc
Biodiversity Hotspots Revisited		2016		S	S	S,E	T	S	N					N			Michael Hoffman, Kellee Koenig, Gill Bunting, Jennifer Costanza, & Williams, Kristen J. (2016)	https://zenodo.org/record/3261807#.YIffVyjMKUk	
Biodiversity Impact Metric (BIM)	Cambridge Institute for	-	-	S	S	S,E	T	S,I	Y	N	N	N	N	N	N	N	University of Cambridge	https://www.cisl.ca	https://w
Biodiversity Indicator and Reporting System (BIRS) Index	IUCN	-	-	S	S	GENERAL	B	S,I	Y					N			IUCN (2014). Biodiversity	https://portals.iucn.org/library/r	
Biodiversity Intactness Index	Natural History Museum (UK)	1900-2010 (global) 2000-2014 (tropical forest)	1900-2010 (global) 2000-2014	T	S	S	T	I	Y	Y	N	Y	N	Complementary	IPBES	N	Newbold, T. et al. (2016) 'Has land use pushed terrestrial biodiversity beyond the planetary boundary? A	https://www.sciencedirect.com/science/article/pii/S0065250417300284	https://w indicator ndicators ersity-intactnes
Biodiversity Intactness Index Change 2000-2015	UNEP-WCMC, University College London, Natural History Museum, Imperial College	2000 - 2015	v1	T	S	S,E	T	I	Y					N			Newbold, T., Hudson, L.N., Arnell, A.P., Contu, S., Palma, A.D., Ferrier, S., Hill, S.L.L., Hoskins, A.J.		
Biodiversity Metric 4.0	Natural England & UK	-	-	S	S	S,E	B	I	Y					N			Natural England and oth	https://nepubprod.app	http://ne
Biodiversity Performance Index (BPI)	Center for Sustainable	-	-	S	S	S,E	T	I	Y					N			McElroy, M.W. and A. V	https://www.researchgate.net/p	
Biofuels Development Potential Index		2019		S	P	GENERAL			Y?					N			Oakleaf, James; M. Kennedy, Christina; Baruch-Mordo, Sharon; Gerber, James; C. West, Paul; Johnson	https://doi.org/10.6084/m9.figshare.c.4249532.v2	
Biomass Carbon Stock of Global																	Xia, J. et al. Spatio-Temporal Patterns and		

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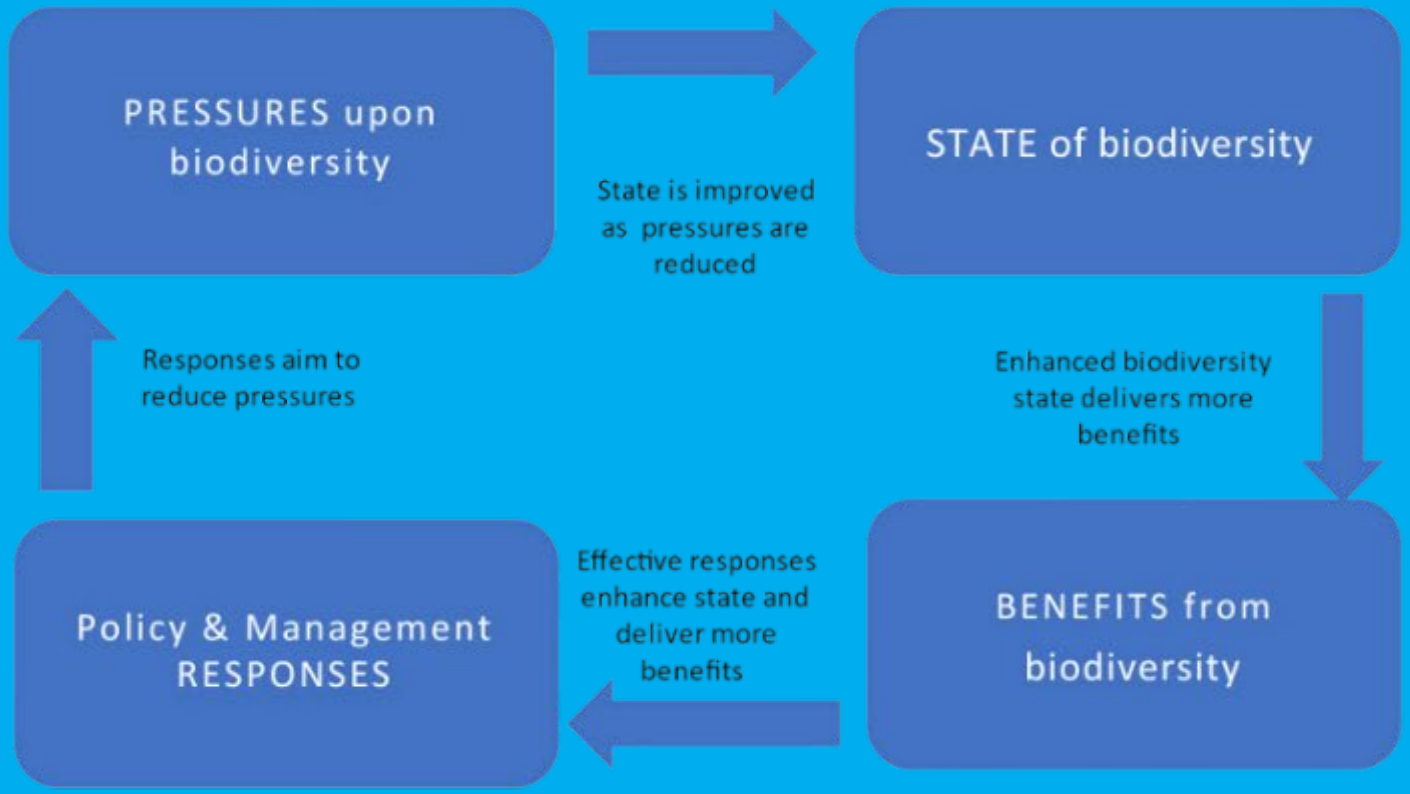
Metrics – We organise using the Pressure, State, Responses, Benefits framework?



And according to the three dimensions of biodiversity

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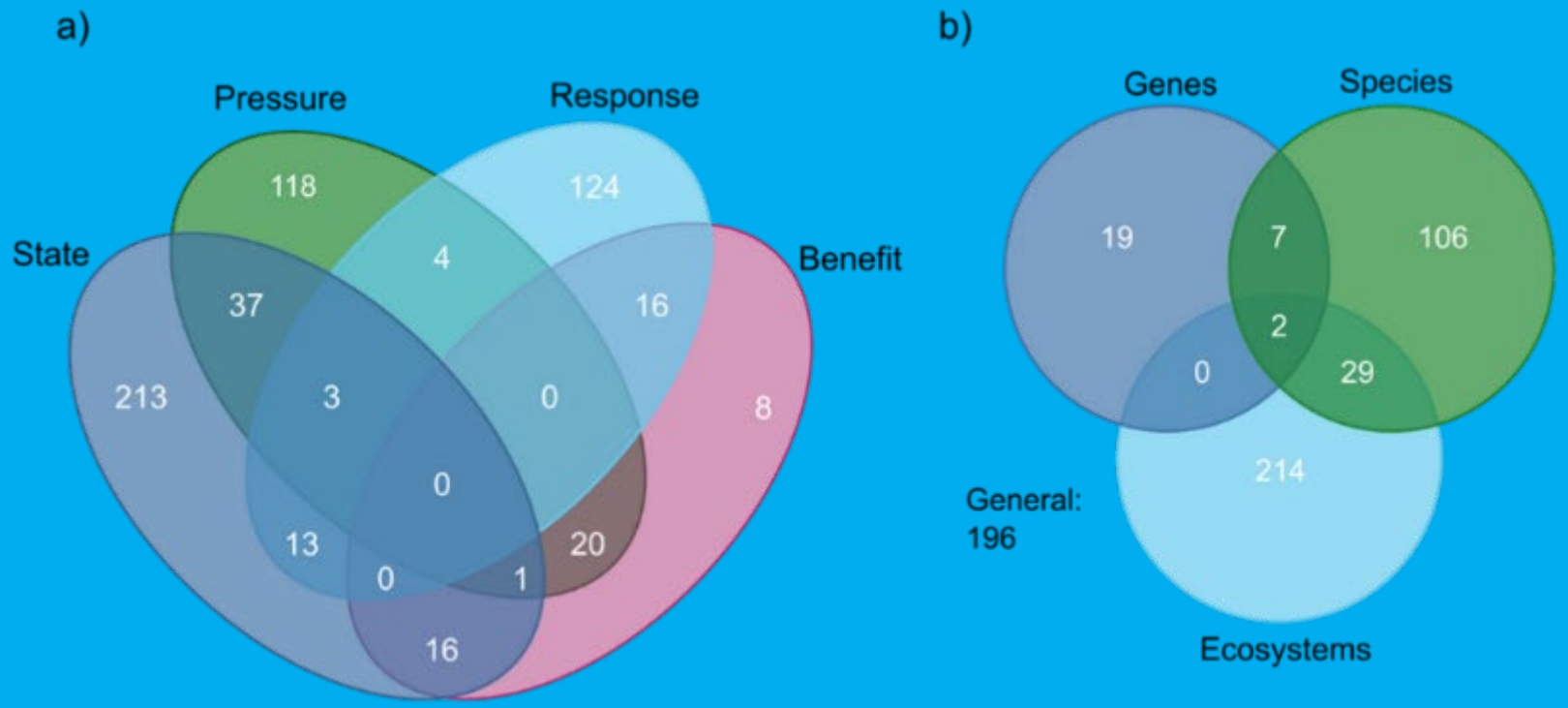
Number of Terrestrial Metrics = 573



From this paper: Global Metrics for Terrestrial Biodiversity | Annual Reviews 2024

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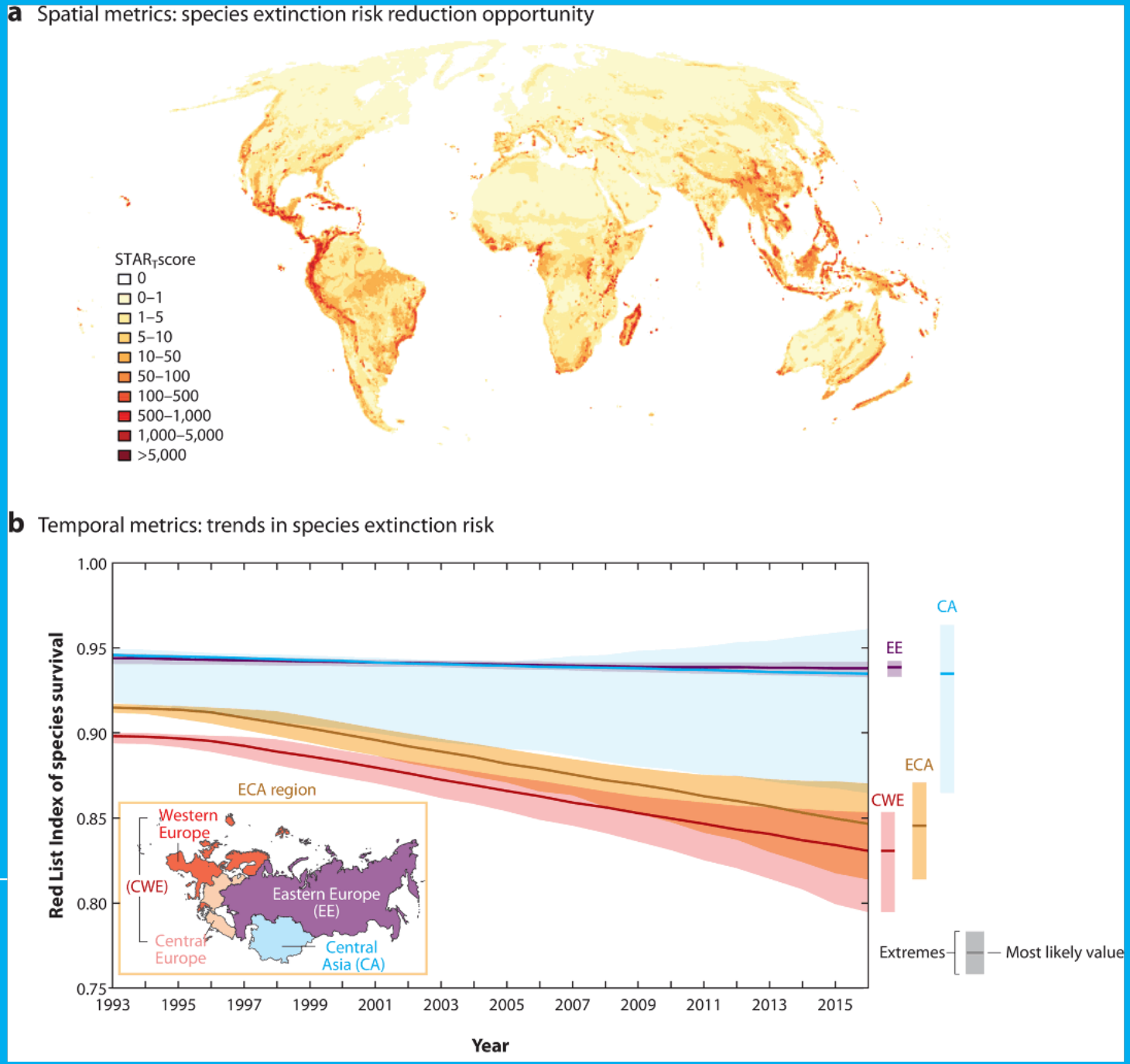
State metrics

Species extinction risk



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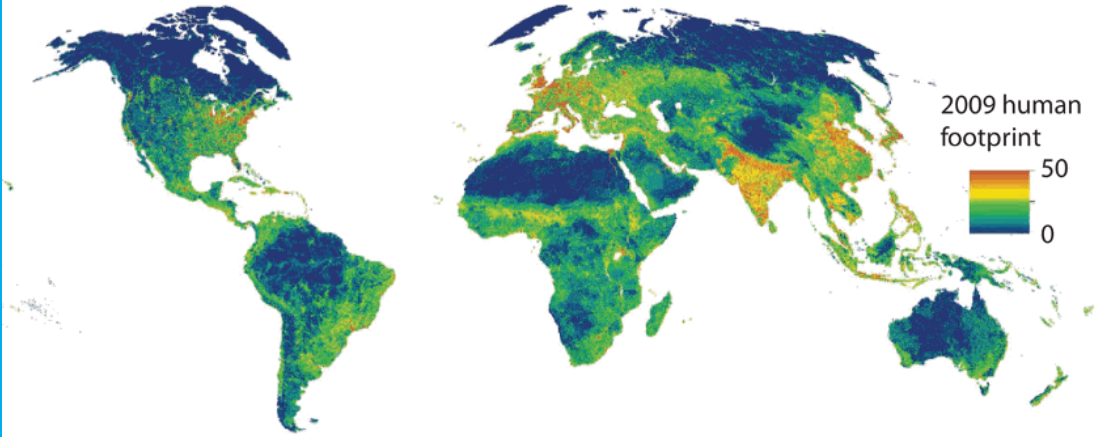
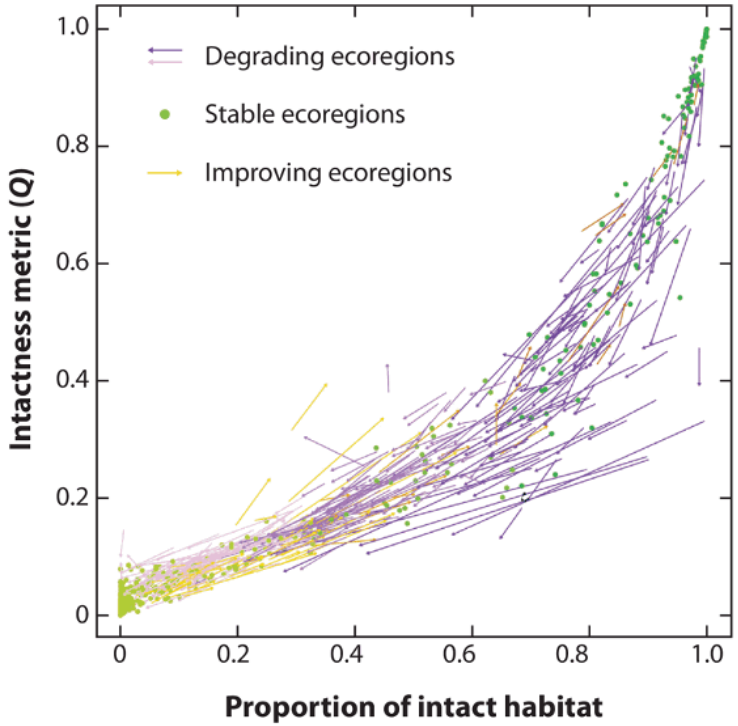
Pressure metrics

Spatial metrics: distribution of Human Footprint Index



Temporal metrics: changes in human footprint within ecoregions



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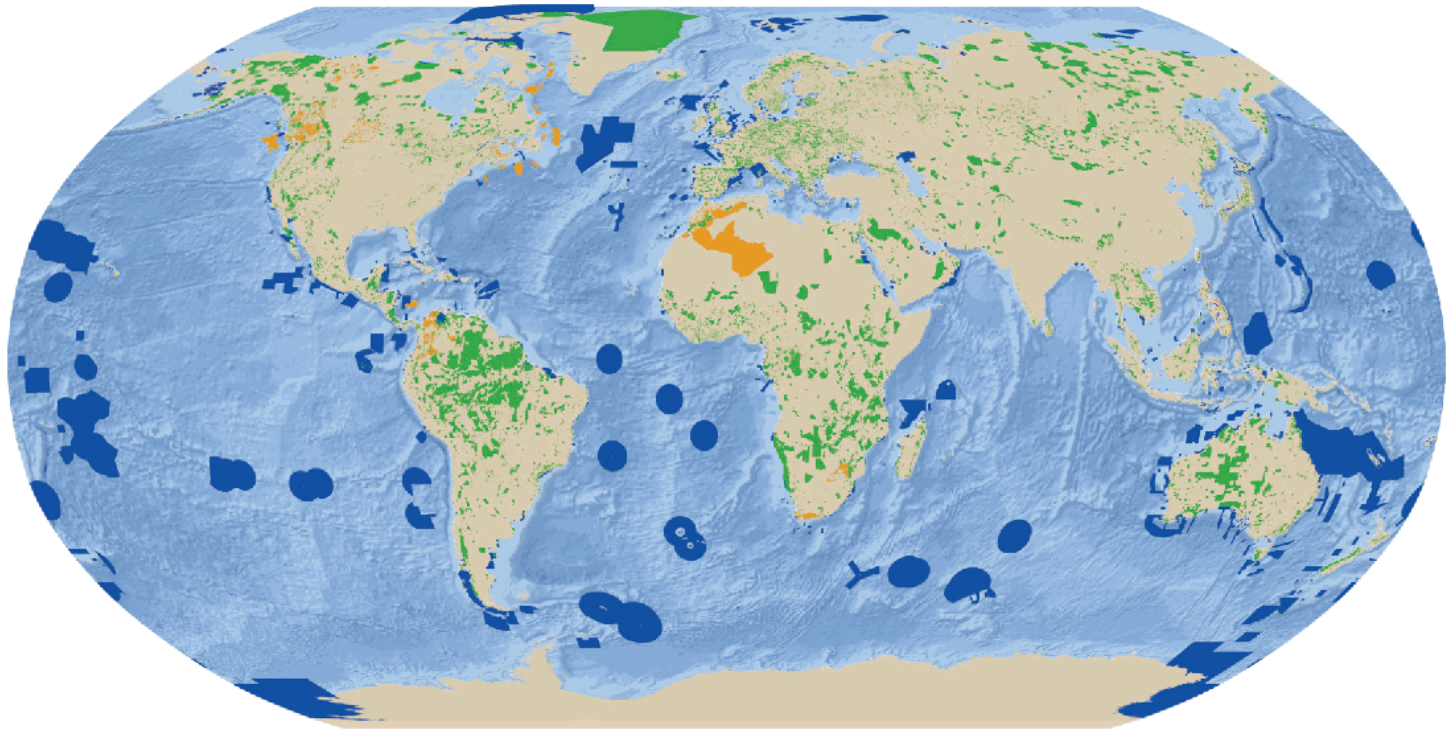
Response metrics

Spatial metrics: protected area on land and in the sea

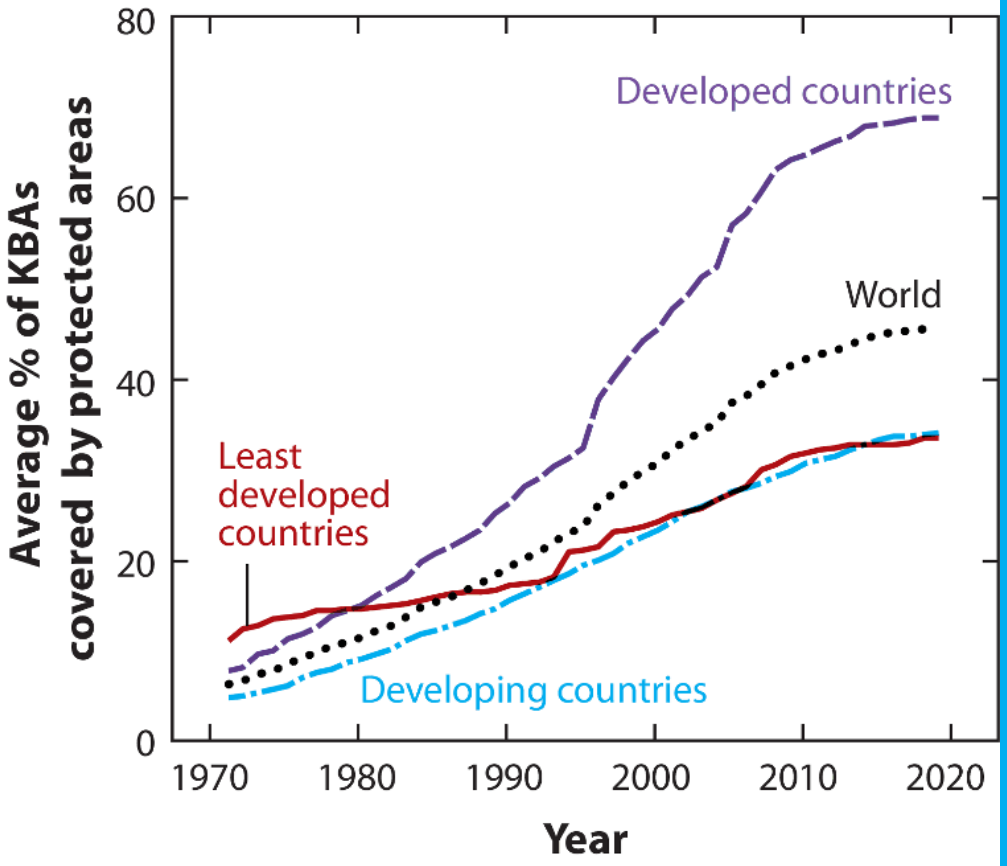


Terrestrial and inland waters protected areas

Marine and coastal protected areas

Other effective area-based conservation measures

Temporal metrics: protected area coverage of KBAs across different regions



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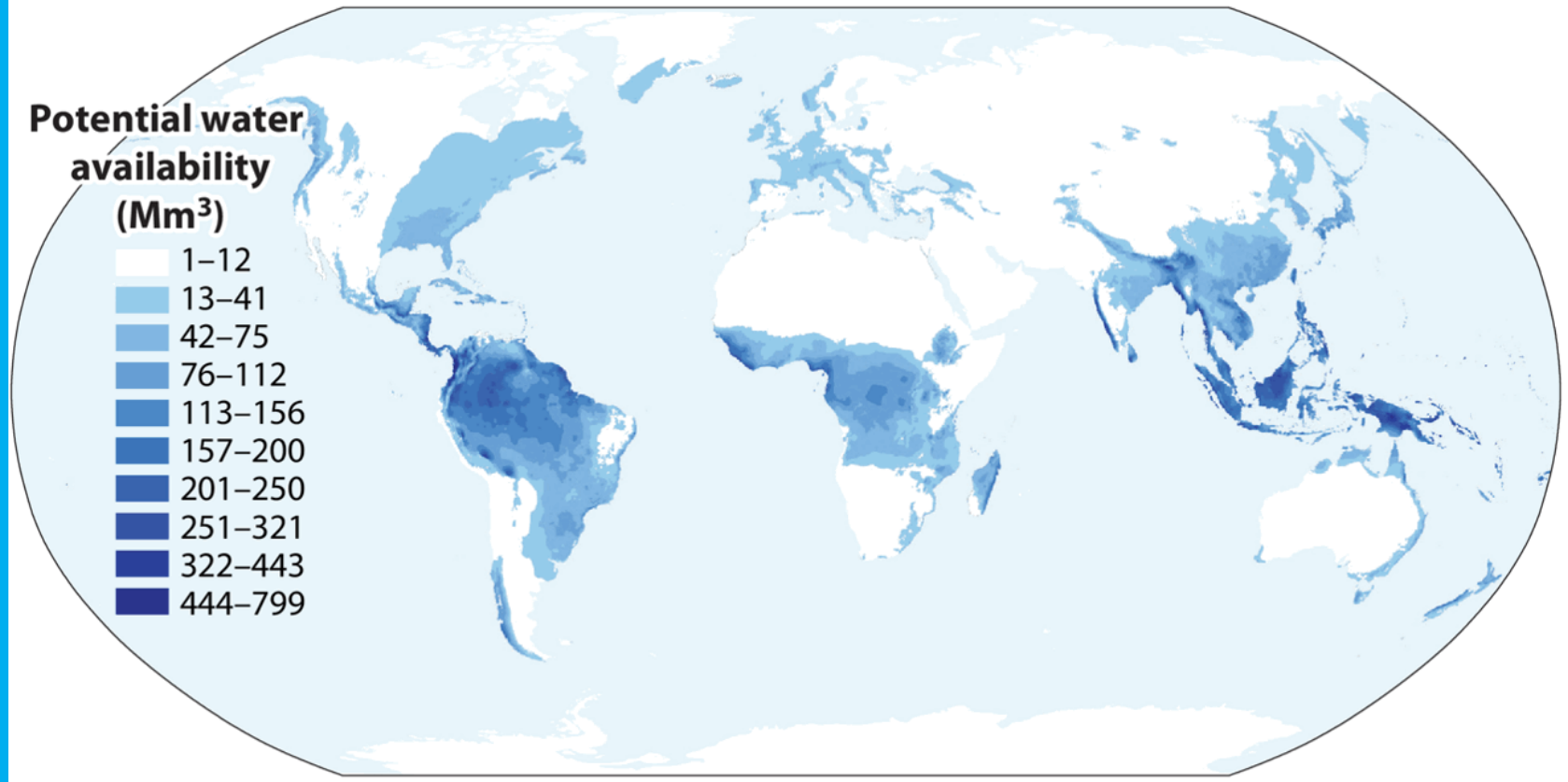
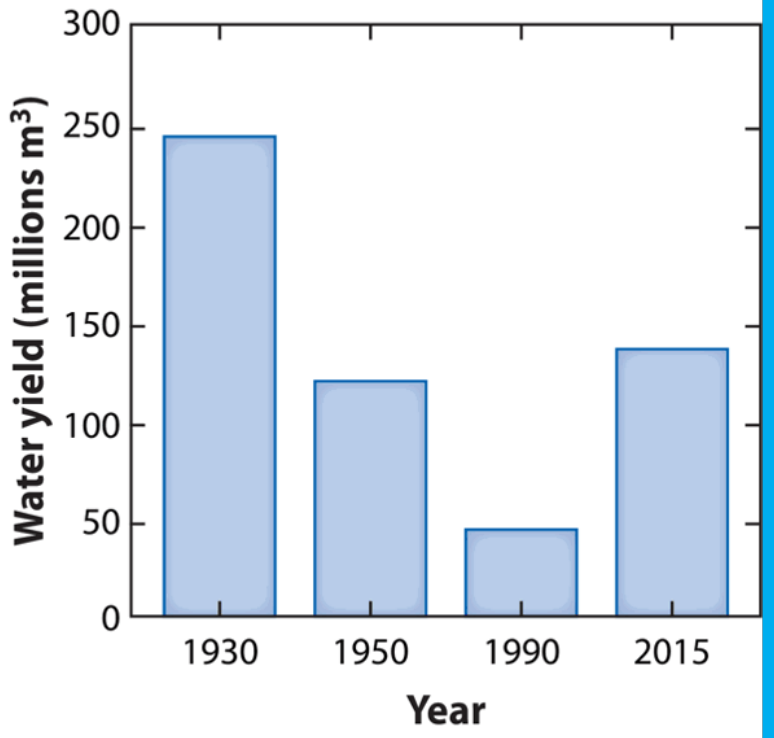
Benefits metrics

Spatial metrics: potential water availability



Temporal metrics: water yield



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There are at least 550 metrics for policy / country / NGO use

These metrics cover

- Pressures on biodiversity
- State of biodiversity
- Responses being taken to conserve biodiversity
- Benefit flows for humans from the use of biodiversity

Key messages: Scientists develop metrics that can help countries and NGOs measure progress towards a policy goal, or the effectiveness of an intervention.

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Metrics : What changes do we envisage in countries through use of metrics

- Understanding of biodiversity trends and ability to take corrective actions
- Measurement of progress towards international or national targets
- Understanding linkages between nature and national development
- Accurate reporting to conventions

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There are at least 23 metrics for business use

Agrobiodiversity Index (ABDI)	Biofuels Development Potential Index	Mean regional bird diversity (cSAR)	Protected area coverage	Change in habitat area
Biodiversity Impact Metric (BIM)	Ecosystem Integrity Index (EII)	Mean Species Abundance (MSA)	Red List Index	Change in habitat condition
Biodiversity Indicator and Reporting System (BIRS) Index	GLAD Deforestation Alerts	NatureMap: Rarity-weighted richness	SEED Biocomplexity Index	
Biodiversity Intactness Index	IFC PS6 Natural and Modified Habitat Screening Layer	Number of companies publishing sustainability reports	Species Threat Abatement and Restoration Metric	Missing
Biodiversity Intactness Index Change 2000-2015	IUCN Rarity-Weighted Richness	Number of companies that have incorporated the BioTrade Principles & Criteria into their business practices	Water Risk Filter	Genetic changes
Biodiversity Performance Index (BPI)	LBI (Long Term Biodiversity index)	Potentially disappeared fraction (PDF)		Benefits to people

Key messages: Scientists can help businesses to understand what metrics are best suited to measuring and managing their nature related risks, the reliability of the data that underpins these metrics, and where new technologies can help address current measurement challenges.

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Metrics : What changes do we envisage in Business through use of metrics

Faster
Better
More Accurate

Understanding of Biodiversity Risk

Enhanced
More Accurate
And more insightful

Understanding of Biodiversity Dependency

Accountability
Transparency
Ambition

Through clear target-setting

Responding
Action
Reporting
Using established guidance

Such as TNFD, SBTN, EUDR

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Translating many to few metrics

Criteria we used to identify small metrics is as follows:

(a) Each metric is ideally included in SDG 14 and 15 indicators and/or GBF headline indicators
(b) the metric is published, with available methodology and data;
(c) data flows exist to update the metric;
(d) one or more responsible institutions have committed to maintaining and updating the metric for at least 10 years;
(e) the metric is available for all countries and is freely accessible for government decision-making; and
(f) there is an established way to use the metric for commercial decision-making.

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Towards a Handful of Terrestrial Metrics for Business and Country use = 16?

	Genes	Species	Ecosystems
State	EDGE	STAR	Extent of natural ecosystems
(significance)		RLI	RLE
e	-	LPI	BII/EII
(intactness)			MSA/ PDF/cSAR
	-	$STAR_T$	HFI
	-	$STAR_{T \text{ and } R}$	PA coverage
Response		GSSI	
nefits	-	-	Forest Carbon Flux

Edge of Existence

Red List of Ecosystems

Red List Index

Biodiversity Intactness Index

Ecological Integrity Index

Living Planet Index

Mean Species Abundance

Potentially Disappeared Fraction

Species Threat Abatement and Restoration metric

countryside Species Area Relationship

Human Footprint Index

Green Status of Species Index

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What next for Metrics?

Increasing importance of national metrics,

Wider uptake of business metrics,

Agreeing a minimum set of metrics for government and business use

Automation of metric calculation through use of technology,

Solving challenge of sustainable funding for metric production and dissemination

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Making metrics available : Ongoing review of all global nature-related online systems

Unique ID	Platform / tool name	Lead organisation	Driver, State, Pressure, Response	Main stated users	Typology (new	URL	Country	Realm	Spatial scale	Year first date available	Update frequency	Free Access	Main type of data	Description
2	Agroideal	The Nature Conservancy, agrosatelite, supernova design, Fundacion ProYungas	P, B	GEN	Decision-s	https://agroideal.org/en/	Brazil, Arg	Terrestria	Regional		Infrequent	Y	Trade	Agroideal is
4	Planetary Computer	Microsoft	GEN	GEN	Flexible a	https://planetarycomputer.microsoft.		All	Global		Regular	Y	Earth obse	The Planetary
5	Allen Coral Atlas	Arizona State University's Center for Global Discovery and Conservation Science.	S,P	GEN	Data source (portal)	https://allencoralatlas.org/		Marine	Global		Regular	Y	Earth obse	The Allen Co
6	Alliance for Zero Extinction (AZE)	GEF, UNEP, American Bird Conservancy, Birdlife Internation, IUCN	S,P	GEN	Decision-s	https://zeroextinction.org/the-allianc		All	Global	2005	Annual	Y	Area-base	joint initiat
7	Amphibian Species of the World	American Museum of Natural History	S	GEN	Libraries/	http://research.amnh.org/vz/herpetol		Terrestria	Global		Regular	Y	Species o	Amphibian
8	AmphibiaWeb	University of California	S,P	GEN	Data sour	https://amphibiaweb.org/		Terrestria	Global		Regular	Y	Species o	AmphibiaW
9	AquaMaps	Quantitative Aquatics, Incorporated (Q-quatics)	S	GEN	Decision-support tool	https://www.aquamaps.org/main/hor		Marine	Global		Regular	Y	Species o	
10	ArcGIS Living Atlas of the World	ESRI	GEN	GEN	Flexible analysis platform	https://livingatlas.arcgis.com/en/		All	Global	2013	Regular	Y	Earth obse	The ArcGIS
11	Arctos Data Portal	Arctos is governed by the Arctos community	S	Museums, GEN	Libraries/	https://arctosdb.org		All	Global	2011	Regular	Y	Species o	Arctos is bo
12	ARIES (Artificial Intelligence for Ecosystem Services)	University of Vermont; Earth Economics; Conservation International	GEN	GEN	Flexible analysis platform	http://aries.integratedmodelling.org/		All	Global	2007	Regular	Y	Natural ca	ARIES is a n
13	Association for Supply Chain Management	The Association for Supply Chain Management (ASCM)	P, B	B	Decision-s	http://www.apics.org/about/overview		All	Global		Regular	N	Trade	The Associa
		Center for International												

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Initial Results: At least 1000 nature related online systems

- Business facing
- Country facing
- Civil society facing
- Trade systems facing
- Academic facing
- General audience

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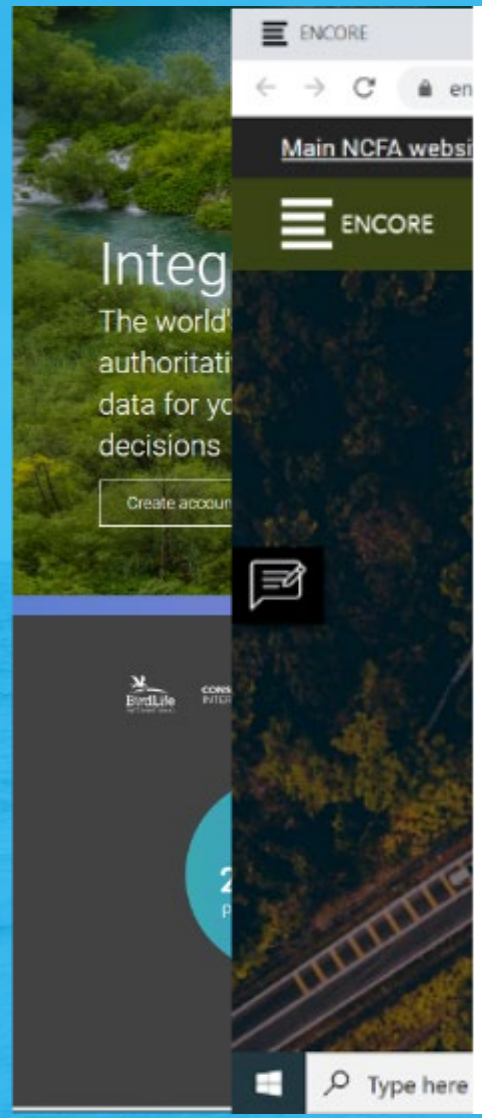
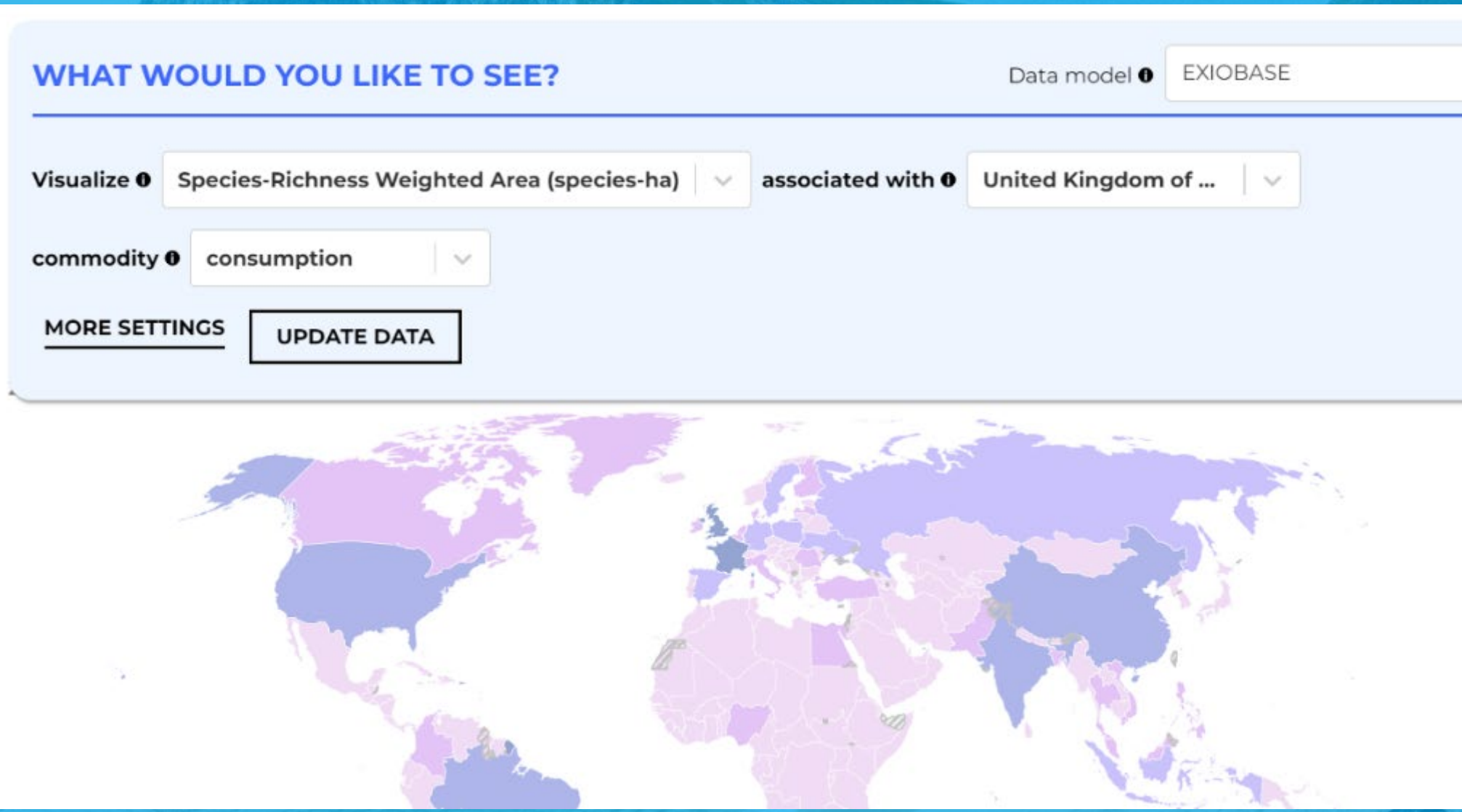
Business platforms





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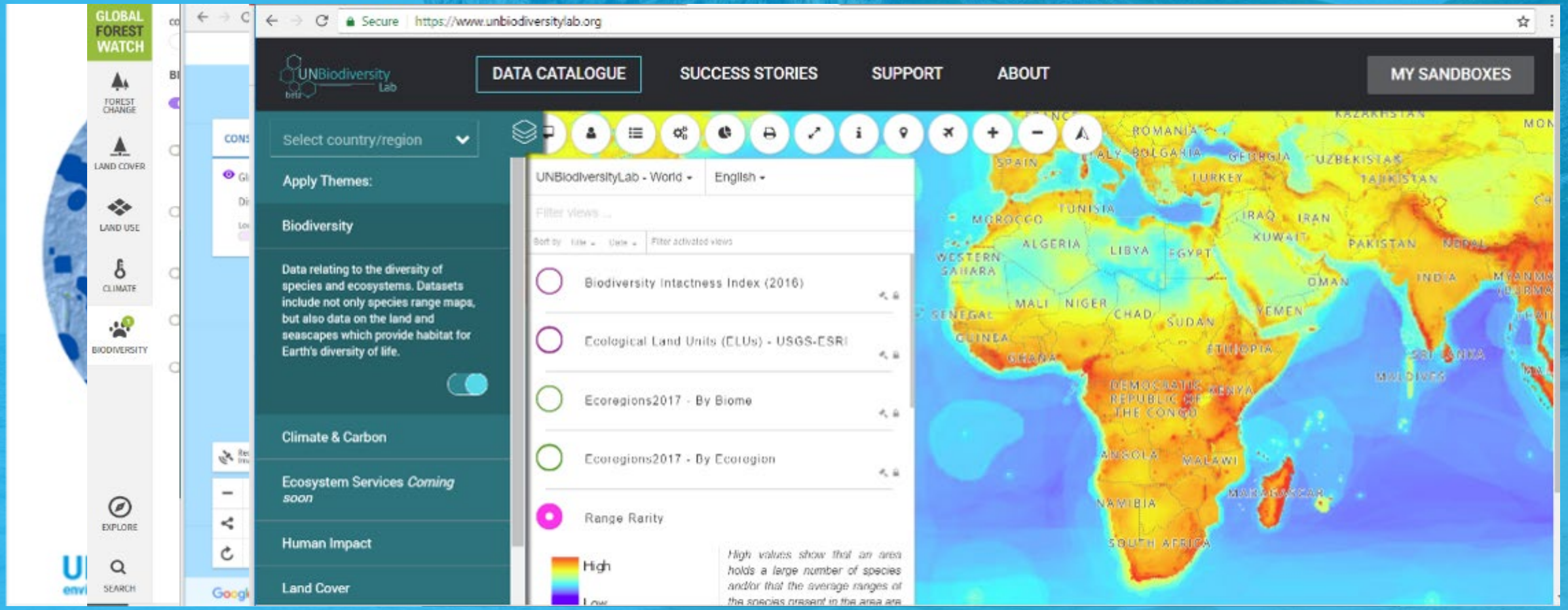
Country and NGO Platforms



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What's next for nature-related online systems?

- Clarity of users and their needs
- Automation of all calculations
- Deploy re-usable technology modules
- Aligning functionality to user-needs
- Sustainable funding models

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