

Supplementary Materials for
**Integrated index-based assessment reveals long-term conservation progress in
implementation of Convention on Biological Diversity**

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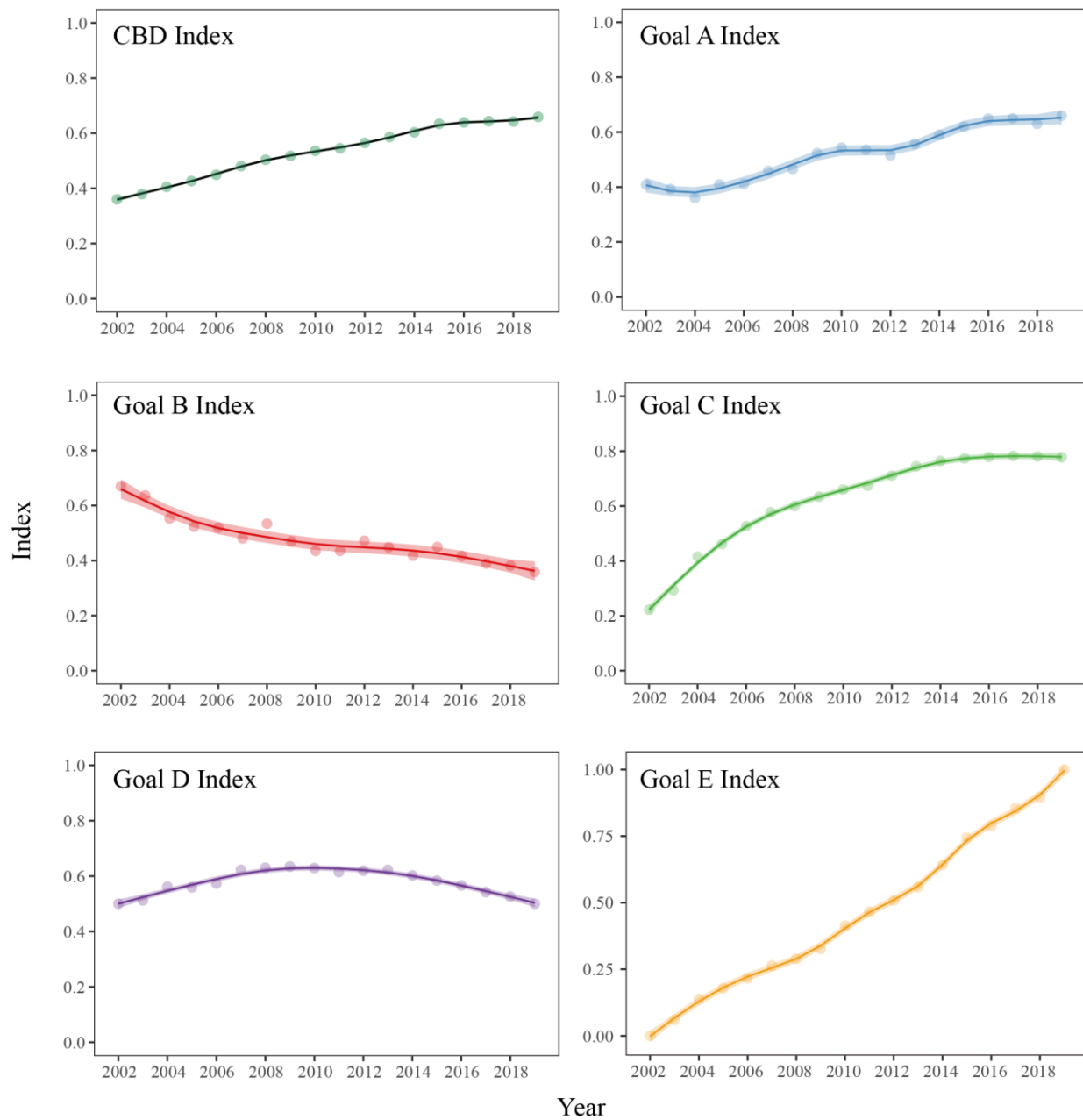
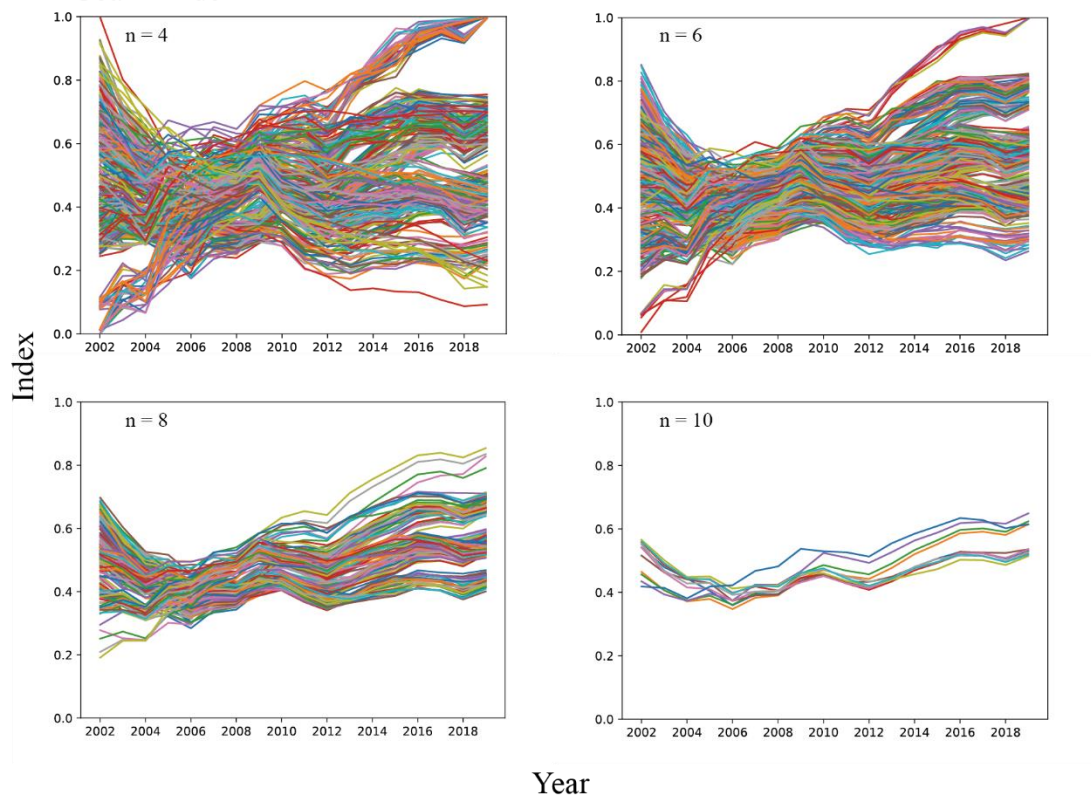
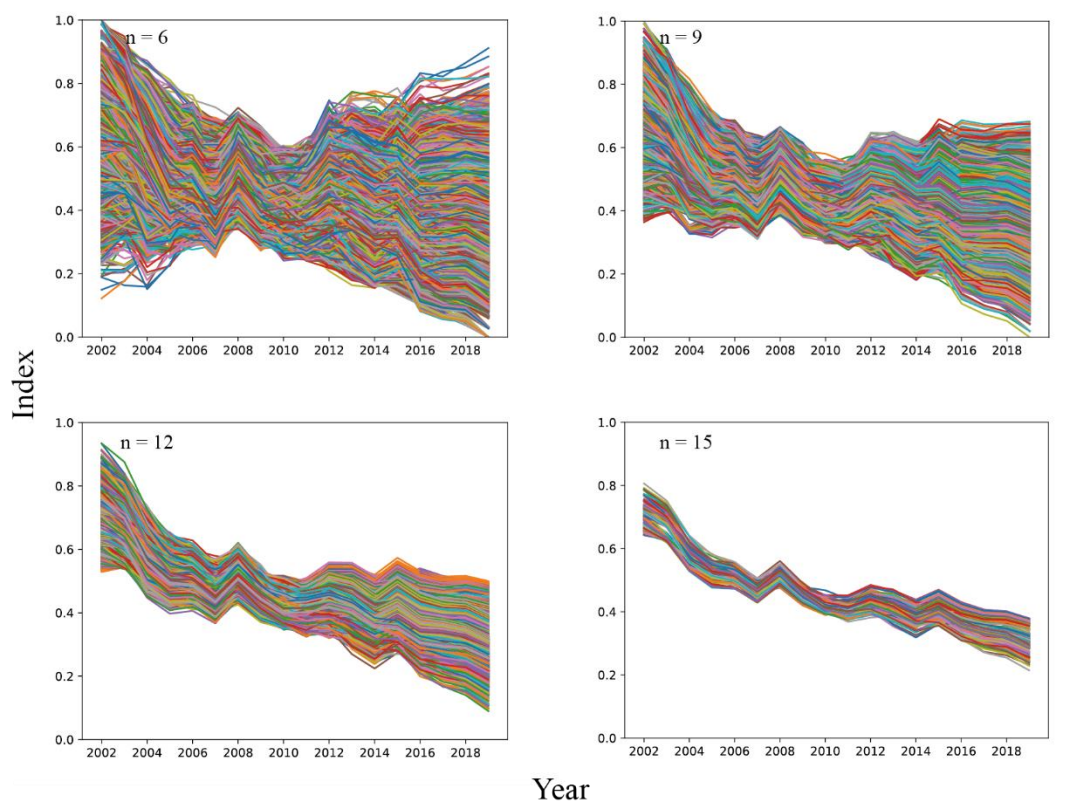


Fig. S1. Robustness test for the weighted approach in building indices. We used the arithmetic mean weighted approach instead of the coefficient of variation weighted approach to calculate five Goal Indices and the CBD Index with 95% confidence intervals and found no significant change in the indices' trends.

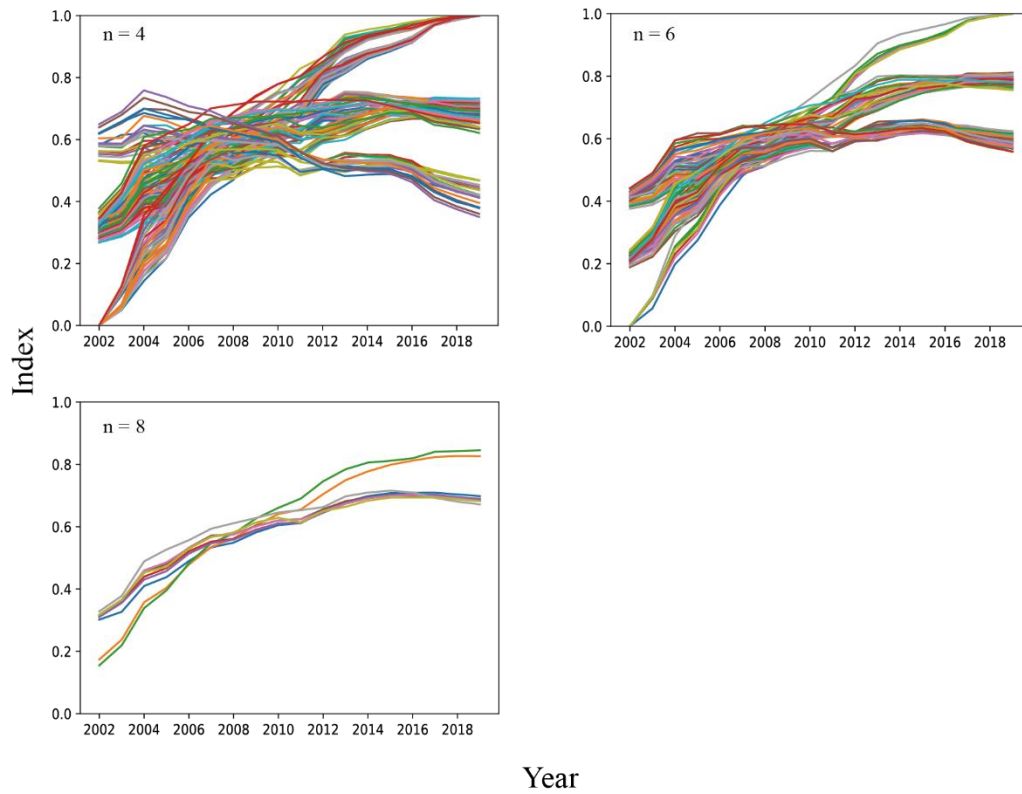
A Goal A Index



B Goal B Index



C Goal C Index



D Goal E Index

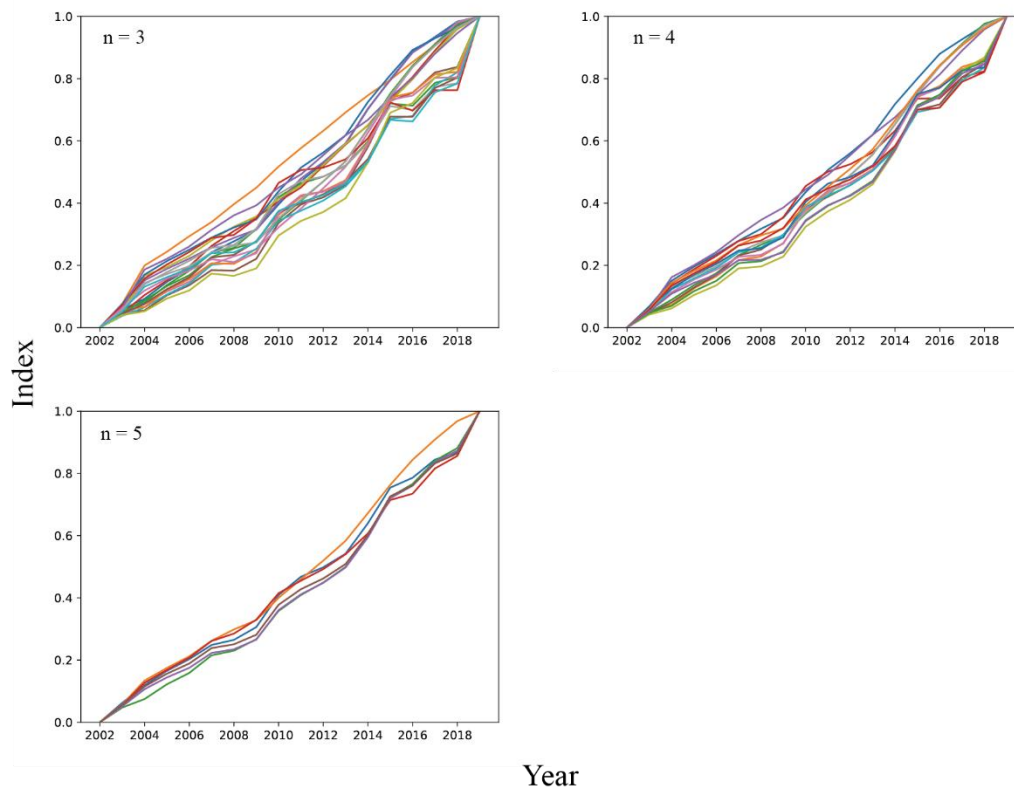


Fig. S2. Robustness test for the number of indicators used in building indices. We calculated each of the Goal Indices using all possible combinations of different numbers of indicators from the full sets of indicators. Results show that with the number of indicators increases, the trajectories tend to converge, which indicates that the number of indicators used in our study is sufficient to construct robust indices. **(A)** Goal A Indices built on all possible combinations of 4, 6, 8, 10 indicators chosen from a list of 11 indicators associated with Goal A. **(B)** Goal B Indices built on all possible combinations of 6, 9, 12, 15 indicators chosen from 17 indicators associated with Goal B. **(C)** Goal C Indices built on all possible combinations of 4, 6, 8 indicators chosen from 9 indicators associated with Goal C. **(D)** Goal E Indices built on all possible combinations of 3, 4, 5 indicators chosen from 6 indicators associated with Goal E. Examination for Goal D Index is excluded due to the limited number of available indicators.

Table S1. Indicators used in the analysis and their sources.

Indicator	Shortened forms used in Figure 3	Positive /Negative	Reference	Source
Online interest in biodiversity	/	+	(8, 20)	Google trend
Number of research studies involving economic valuation	Economic valuation research	+	(8)	Web of Science Core Collection
Number of countries with biodiversity-relevant charges and fees	Biodiversity charges and fees	+	(20, 21)	OECD
Number of countries with biodiversity-relevant taxes	Biodiversity taxes	+	(20, 21)	OECD
Number of countries with biodiversity-relevant tradable permit schemes	Biodiversity tradable permit schemes	+	(20, 21)	OECD
Trends in potentially environmentally harmful elements of government support to agriculture (producer support estimate)	Environmentally harmful elements	-	(20, 21)	OECD
Ecological Footprint	/	-	(8, 20, 21)	Global Footprint Network
Number of MSC Chain of Custody Certification holders	MSC Chain of Custody	+	(21)	Marine Stewardship Council (MSC)
Red List Index (impacts of utilisation)	RLI impacts of utilisation	+	(8, 20, 21)	IUCN, BirdLife International and other Red List Partners
Red List Index (internationally traded species)	RLI internationally traded species	+	(20, 21)	IUCN, BirdLife International and other Red List Partners
Percentage of Parties with legislation in Category 1 under CITES National Legislation Project (NLP)	Category 1 CITES Parties %	+	(8, 20, 21)	CITES
Natural habitat extent	/	+	(8, 20)	FAO
Wetland Extent Index	/	+	(8, 20, 21)	UNEP-WCMC
Red List Index (forest specialist species)	RLI forest specialist species	+	(20, 21)	IUCN, BirdLife International and other Red List Partners

Forest area as a proportion of total land area	Forest area %	+	(20, 21)	FAO
MSC Certified Catch	/	+	(8, 20, 21)	Marine Stewardship Council (MSC)
Red List Index (impacts of fisheries)	RLI impacts of fisheries	+	(20, 21)	IUCN, BirdLife International and other Red List Partners
Global effort in bottom-trawling	/	-	(8, 20)	University of British Columbia Institute for the Oceans and Fisheries
Area of forest under FSC and PEFC forest management certification	Sustainable management of forests	+	(8, 20, 21)	Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification (PEFC)
Area of agricultural land under organic production	Organic agriculture	+	(8, 20)	International Foundation for Organic Agriculture
Wild Bird Index (forest & farmland specialist birds)	Wild Bird Index	+	(8, 20, 21)	BirdLife International, RSPB, EBCC
Insecticide use	/	-	(8, 20)	FAO
Red List Index (impacts of pollution)	RLI impacts of pollution	+	(8, 20, 21)	IUCN, BirdLife International and other Red List Partners
Red List Index (impacts of invasive alien species)	RLI impacts of invasive species	+	(8, 20, 21)	IUCN, BirdLife International and other Red List Partners
Trends in the numbers of invasive alien species introduction events	Invasive species introduction	-	(8, 20, 21)	IUCN ISSG
Glacial mass balance	/	+	(8)	World Glacier Monitoring Service
Mean polar sea ice extent	/	+	(8)	National Snow and Ice Data

				Center
Live coral cover	/	+	(8, 20, 21)	Global Coral Reef Monitoring Network
Percentage of marine and coastal areas covered by protected areas	Marine and coastal PA %	+	(8, 20, 21)	UNEP-WCMC, IUCN
Percentage of terrestrial areas covered by protected areas	Terrestrial PA %	+	(8, 20, 21)	UNEP-WCMC, IUCN
Protected area management effectiveness	PA management effectiveness	+	(8, 20, 21)	UNEP-WCMC
Protected area coverage of marine Key Biodiversity Areas	Marine KBA %	+	(8, 20, 21)	BirdLife International, IUCN, AZE
Protected area coverage of freshwater Key Biodiversity Areas	Freshwater KBA %	+	(8, 20, 21)	BirdLife International, IUCN, AZE
Protected area coverage of terrestrial Key Biodiversity Areas	Terrestrial KBA %	+	(8, 20, 21)	BirdLife International, IUCN, AZE
Red List Index (birds, mammals, amphibians)	RLI birds, mammals, amphibians	+	(8, 20, 21)	IUCN, BirdLife International and other Red List Partners
Living Planet Index	/	+	(8, 20, 21)	WWF, Global footprint Network, ZSL
Number of Contracting Parties to the International Treaty on Plant Genetic Resources for Food and Agriculture	ITPGRFA Parties	+	(21)	FAO
Coverage by protected areas of important sites for mountain biodiversity	Mountain KBA %	+	(20, 21)	BirdLife International, IUCN, AZE
Red List Index (species used for food and medicine)	RLI species as food and medicine	+	(20, 21)	IUCN, BirdLife International and other Red List Partners
Number of countries with developed or revised NBSAPs	NBSAPs	+	(20, 21)	Secretariat of the Convention on Biological Diversity
Number of species occurrence records in the Global Biodiversity	GBIF records	+	(8, 20, 21)	GBIF

Information Facility				
Knowledge transfer	/	+	(8)	Web of Science Core Collection
Proportion of known species assessed through the IUCN Red List	IUCN Red List assessed species	+	(20, 21)	IUCN
Species Status Information Index	/	+	(21)	Map of life
Official development assistance for biodiversity	/	+	(8, 20, 21)	OECD

Table S2. Indicators' weights in building the Goal Indices.

Goal	Target	Indicator	Weight
A	T1	Online interest in biodiversity	0.159
	T2	Number of research studies involving economic valuation	0.088
	T3	Number of countries with biodiversity-relevant charges and fees	0.073
	T3	Number of countries with biodiversity-relevant taxes	0.097
	T3	Number of countries with biodiversity-relevant tradable permit schemes	0.056
	T3	Trends in potentially environmentally harmful elements of government support to agriculture (producer support estimate)	0.058
	T4	Ecological Footprint	0.135
	T4	Number of MSC Chain of Custody Certification holders	0.083
	T4	Red List Index (impacts of utilization)	0.100
	T4	Red List Index (internationally traded species)	0.087
	T4	Percentage of Parties with legislation in Category 1 under CITES National Legislation Project (NLP)	0.064
B	T5	Natural habitat extent	0.043
	T5	Wetland Extent Index	0.052
	T5	Red List Index (forest specialist species)	0.057
	T5	Forest area as a proportion of total land area	0.063
	T6	MSC Certified Catch	0.067
	T6	Red List Index (impacts of fisheries)	0.067
	T6	Global effort in bottom-trawling	0.040
	T7	Area of forest under FSC and PEFC forest management certification	0.047
	T7	Area of agricultural land under organic production	0.063
	T7	Wild Bird Index (forest & farmland specialist birds)	0.049
	T8	Insecticide use	0.054
	T8	Red List Index (impacts of pollution)	0.092
	T9	Red List Index (impacts of invasive alien species)	0.071
	T9	Trends in the numbers of invasive alien species introduction events	0.073
	T10	Glacial mass balance	0.055
	T10	Mean polar sea ice extent	0.058
	T10	Live coral cover	0.047
C	T11	Percentage of marine and coastal areas covered by protected areas	0.139
	T11	Percentage of terrestrial areas covered by protected areas	0.110
	T11	Protected area management effectiveness	0.111
	T11	Protected area coverage of marine Key Biodiversity Areas	0.109
	T11	Protected area coverage of freshwater Key Biodiversity Areas	0.089

	T11	Protected area coverage of terrestrial Key Biodiversity Areas	0.096
	T12	Red List Index (birds, mammals, amphibians)	0.132
	T12	Living Planet Index	0.151
	T13	Number of Contracting Parties to the International Treaty on Plant Genetic Resources for Food and Agriculture	0.063
D	T14	Coverage by protected areas of important sites for mountain biodiversity	0.431
	T14	Red List Index (species used for food and medicine)	0.569
E	T17	Number of countries with developed or revised NBSAPs	0.204
	T19	Number of species occurrence records in the Global Biodiversity Information Facility	0.163
	T19	Knowledge transfer	0.137
	T19	Proportion of known species assessed through the IUCN Red List	0.105
	T19	Species Status Information Index	0.190
	T20	Official development assistance for biodiversity	0.201

Table S3. Indicators' weights in building the Pressure, State, Benefit, Response Indices.

Category	Indicator	Weight
Pressure	Trends in potentially environmentally harmful elements of government support to agriculture (producer support estimate)	0.053
	Ecological Footprint	0.124
	Red List Index (impacts of utilisation)	0.092
	Red List Index (internationally traded species)	0.080
	Red List Index (forest specialist species)	0.082
	Global effort in bottom-trawling	0.058
	Red List Index (impacts of fisheries)	0.096
	Insecticide use	0.078
	Red List Index (impacts of pollution)	0.131
	Red List Index (impacts of invasive alien species)	0.102
	Trends in the numbers of invasive alien species introduction events	0.105
State	Natural habitat extent	0.078
	Wetland Extent Index	0.093
	Forest area as a proportion of total land area	0.112
	Wild Bird Index (forest & farmland specialist birds)	0.088
	Glacial mass balance	0.099
	Mean polar sea ice extent	0.103
	Live coral cover	0.084
	Red List Index (birds, mammals, amphibians and corals)	0.101
	Living Planet Index	0.116
	Species Status Information Index	0.126
Benefit	Red List Index (species used for food and medicine)	1.000
Response	Online interest in biodiversity	0.083
	Number of research studies involving economic valuation	0.046
	Number of countries with biodiversity-relevant taxes	0.050
	Number of countries with biodiversity-relevant charges and fees	0.038
	Number of countries with biodiversity-relevant tradable permit schemes	0.029
	Percentage of Parties with legislation in Category 1 under CITES National Legislation Project (NLP)	0.033
	Number of MSC Chain of Custody Certification holders	0.043
	MSC Certified Catch	0.055
	Area of forest under FSC and PEFC forest management certification	0.039
	Area of agricultural land under organic production	0.051
	Percentage of marine and coastal areas covered by protected areas	0.049
	Percentage of terrestrial areas covered by protected areas	0.039
	Protected area management effectiveness	0.039

	Protected area coverage of marine Key Biodiversity Areas	0.038
	Protected area coverage of freshwater Key Biodiversity Areas	0.031
	Protected area coverage of terrestrial Key Biodiversity Areas	0.034
	Number of Contracting Parties to the International Treaty on Plant Genetic Resources for Food and Agriculture	0.022
	Coverage by protected areas of important sites for mountain biodiversity	0.035
	Number of countries with developed or revised NBSAPs	0.062
	Knowledge transfer	0.042
	Number of species occurrence records in the Global Biodiversity Information Facility	0.049
	Proportion of known species assessed through the IUCN Red List	0.032
	Official development assistance for biodiversity	0.061

Table S4. Segmented linear regression models of (A) Pressure, (B) State, (C) Benefit, and (D) Response Indices. We estimated the breakpoint of the linear regression model of each index and fitted two linear models with data before and after the year nearest to the breakpoint.

Significance code: “.” means $0.05 \leq p\text{-value} < 0.1$, “*” means $0.01 \leq p\text{-value} < 0.05$, “**” means $0.001 \leq p\text{-value} < 0.01$, and “***” means $p\text{-value} < 0.001$.

(A) Pressure Index

	Estimate	Standard Error
Estimated breakpoint	2004.423	0.239

Linear regression model for year 2002–2004:

	Estimate	Standard Error	t-value	p-value	Significance
Intercept	-291.424	25.642	-11.37	0.056	.
Year	0.146	0.013	11.37	0.056	.
Adjusted R-squared	0.985				

Linear regression model for year 2004–2019:

	Estimate	Standard Error	t-value	p-value	Significance
Intercept	-65.655	2.491	-26.35	<0.001	***
Year	0.033	0.001	26.61	<0.001	***
Adjusted R-squared	0.979				

(B) State Index

	Estimate	Standard Error
Estimated breakpoint	2006	1.302

Linear regression model for year 2002–2006:

	Estimate	Standard Error	t-value	p-value	Significance
Intercept	85.360	17.654	4.835	0.017	*
Year	-0.042	0.009	-4.798	0.017	*
Adjusted R-squared	0.846				

Linear regression model for year 2006–2019:

	Estimate	Standard Error	t-value	p-value	Significance
Intercept	41.260	3.691	11.18	<0.001	***
Year	-0.020	0.002	-11.06	<0.001	***
Adjusted R-squared	0.903				

(C) Benefit Index

	Estimate	Standard Error
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Estimated breakpoint	2011.703	0.946
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Linear regression model for year 2002–2012:

	Estimate	Standard Error	t-value	p-value	Significance
Intercept	122.909	0.974	126.2	<0.001	***
Year	-0.061	0.0005	-125.5	<0.001	***
Adjusted R-squared	1.000				

Linear regression model for year 2012–2019:

	Estimate	Standard Error	t-value	p-value	Significance
Intercept	112.564	1.532	73.47	<0.001	***
Year	-0.058	0.0008	-73.35	<0.001	***
Adjusted R-squared	0.999				

(E) Response Index

	Estimate	Standard Error
Estimated breakpoint	2015.533	0.972

Linear regression model for year 2002–2016:

	Estimate	Standard Error	t-value	p-value	Significance
Intercept	-104.071	1.214	-85.69	<0.001	***
Year	0.052	0.0006	86.07	<0.001	***
Adjusted R-squared	0.998				

Linear regression model for year 2016–2019:

	Estimate	Standard Error	t-value	p-value	Significance
Intercept	-79.731	8.819	-9.041	0.012	*
Year	0.400	0.004	9.140	0.012	*
Adjusted R-squared	0.965				