

Evaluating global interest in biodiversity and conservation

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The first target of the Convention for Biological Diversity (Aichi target 1) was to increase public awareness towards the values of biodiversity and actions needed to conserve it - a key prerequisite for other conservation targets. Nevertheless, monitoring success in achieving this target at a global scale is difficult. However, the increased digitization of human life in recent decades offers an insight in people's interests at an unprecedented scale, which allows a more comprehensive evaluation of success towards Aichi target 1 than previously attempted. Here, we used Google search volume data to evaluate global interest in biodiversity and its conservation, and investigated their correlates across countries. We found that during 2013-2020 global searches for biodiversity increased, driven mostly by searches for charismatic fauna. However, searches for conservation actions, driven mostly by searches for national parks, decreased since 2019 likely due to the COVID-19 pandemic. We further found that economic inequality was negatively correlated with interest in biodiversity and conservation, while purchasing power was indirectly positively correlated through increased education and research. Our results suggest partial success towards achieving Aichi target 1, in that interest in biodiversity has increased widely, but not for conservation. We suggest that increased outreach and education efforts towards neglected aspects of biodiversity and conservation are still needed. Popular topics in biodiversity and conservation could be leveraged to increase awareness of other topics, with attention to local socioeconomic contexts.

Introduction

The United Nations Convention on Biological Diversity (CBD) is an international treaty to improve conservation and use of biodiversity. In 2010, the CBD set 20 global conservation targets to be achieved by 2020 (Aichi Biodiversity Targets). At the time, all current United Nations member states were signatories of the CBD, except for Andorra, United States and South Sudan, which was not an independent nation yet. Since then, Andorra and South Sudan have signed the treaty (cbd.int/information/parties.shtml). The first Aichi target, described as a prerequisite for the success of all other targets, was that: "by 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably" (Convention on Biological Diversity 2010). While awareness by itself is insufficient to effect behavior change (Maibach 2019), it is often a necessary condition (Maibach 1993), making information outreach a crucial tool for reverting the current biodiversity crisis. The 2020 Global Biodiversity Outlook report of CBD estimated that none of the Aichi Biodiversity Targets had been fully met in that year (Convention on Biological Diversity 2020). However, the evaluation of Aichi Target 1 was based on insights from few countries and may not be generalizable (Mcowen et al. 2016).

Increased digitization of human life enables quantitative studies of cultural trends using digital data

sources, an approach known as culturomics (Ladle et al. 2016). One of the most important digital data sources is Google search engine, the most visited website globally (alexa.com/topsites), used worldwide to find information on topics of interest. Analyses of search volumes on Google have been used in a variety of fields, including nature conservation (Roll et al. 2016; Correia et al. 2021). In marketing theory, awareness (the realization of the existence of a subject) generally precedes information seeking, and both are considered crucial components of intention and behavior formation (Jansen & Schuster 2011). Thus information seeking behaviors such as internet searches can provide valuable insights pertaining to Aichi target 1. Previous research leveraged search engine data to evaluate progress towards Aichi target 1 (e.g. Cooper et al. 2019; Buchanan et al. 2020). However, these were limited to few search terms (Buchanan et al. 2020, only the term "biodiversity"), and short time scales (Cooper et al. 2019, only a single year). Therefore, an evaluation of Aichi target 1 across all countries, over longer time frames, and with a wider range of search terms is still needed.

Internet search volumes are influenced by various social, economic, and political factors (Jeong & Mahmood 2011). Uncovering which of these factors are more strongly correlated with interest in biodiversity and conservation can help design context-appropriate interventions to increase awareness of biodiversity and conservation where most needed. Nevertheless, no study to-date has formally examined potential drivers correlated with country-level differences in biodiversity awareness and interest. Such an exploration of broad socio-political drivers of interest in biodiversity and its protection can provide important information for conservation policy and planning.

Here, we evaluated progress towards Aichi target 1 by examining Google search volumes for a wide variety of biodiversity and conservation topics across all countries between 2013-2020. We further investigated the association of several country-level factors with progress towards this target. We then used our results to provide recommendation on how information outreach and education campaigns can be more efficient in promoting awareness of biodiversity and conservation.

Methods

We used Google Health Trends API (Application programming interface) to download data on relative search volume (the search volume of a specific term divided by the overall search volume in a region and time period, Zepecki et al. 2020) for biodiversity topics for each of the 193 countries recognized by the United Nations from 2013 to 2020. As opposed to the online Google Trends API, Google Health Trends API does not scale relative search volumes inside each time series, and

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is thus preferable for comparing topics and regions (Zepecki et al. 2020). We used unique identifiers assigned to each search term to enable cross-language comparisons (obtained through “gkgraphR” package, Correia 2021). Our analyses spanned the years 2013-2020 due to the merge between Google Trends and Google Insights for Search in 2012 (Google Inside Search 2012).

We selected biodiversity topics to fit four broad categories: i) the top 500 most viewed taxonomic entities in Wikipedia, plus the top 10 in 320 different languages, altogether 991 search terms, identified using R packages “wikitaxa” (Chamberlain & Welty 2020) and “wikipediatrend” (Meissner 2020); ii) global biomes (15 search terms, Olson et al. 2001); iii) biodiversity concepts (based on CBD's Biodiversity Glossary: 20 terms, Convention on Biological Diversity 2008); iv) conservation actions (based on International Union for Conservation of Nature's Conservation Actions Classification Scheme; 27 search terms, International Union for the Conservation of Nature 2012). The complete list of search terms is presented in Supplementary Material. We define ‘interest in biodiversity’ as the sum of the relative search volumes for the terms in the first three categories, and use it to evaluate the first part of Aichi target 1 (“[awareness of] the values of biodiversity”). We define ‘interest in conservation’ as the sum of the relative search volumes for the terms in the fourth category and use it to evaluate the second part of Aichi target 1 (“[awareness of] the steps they can take to conserve and use it sustainably”).

We calculated the median of aggregated biodiversity and conservation interest for each country, to represent overall levels of interest during the study period. We further used a Bayesian Structural Time Series (BSTS) model to estimate temporal trends in biodiversity and conservation interest (i.e. the median slope coefficient of a linear trend component), using the ‘bsts’ R package (Scott 2022). BSTS is an efficient and flexible algorithm, which allows decomposition of time series to seasonality and trends (Scott & Varian 2014). We used bivariate choropleth maps to visualize trends and overall interest across countries. We also regressed trends against median interest in either biodiversity or conservation across countries to explore associations between overall interest and its temporal trend.

We investigated correlates of trend and median interest in biodiversity and conservation. We assembled 15 country-level variables divided into 7 broad categories (biodiversity, economy, demography, research, education, internet use, and presence of environmental organizations; see complete list of variables and sources in Supplementary Material). We based our choices on previously published research on correlates of internet searches (Jeong & Mahmood 2011). However, we also added to these several correlates pertaining specifically

to biodiversity and conservation. Since there has been no previous study on this topic to support our choice of variables, we rely on personal expertise. Therefore, the choice of variables is subject to our personal biases and should be viewed as an initial exploration of potential candidate factors that should be explored on future analysis more focused on uncovering causal relationships. Our rationale for choosing these variables are as follow: 1) biodiversity – a more diverse and preserved natural environment might generate more interest for biodiversity and conservation; 2) economy – biodiversity and conservation may not be a priority interest in underdeveloped or unequal economies, due to more immediate material needs; 3) demography – urban populations might have less contact with nature, leading to lower interest in biodiversity and conservation; 4 and 5) research and education – higher investment in these areas can indicate higher valuing of scientific topics in general, including biodiversity and conservation; 6) internet use – higher access to internet can lead to a higher volume of searches for biodiversity and conservation; 7) environmental organizations – presence of environmental organizations can lead to actions that increase the awareness of biodiversity and conservation.

We used linear models to test relationships between trends and median interest in biodiversity or conservation and our variables. This was performed within a multi-model inference approach, using package MuMIn (Bartoń 2022). We then performed a path analysis using package plspm (Sanchez et al. 2015) to uncover associations between variables and ultimately, to interest in biodiversity or conservation. We used only those variables selected by MuMIn (with average sum of weights > 0.5) for the path analysis. We set up the path analysis structure, so all variables could directly influence the response variable (trend or median interest in biodiversity or conservation). Economic and demographic variables were also set to influence variables in research, education, internet use, and environmental organizations categories. We then sequentially removed non-significant paths to reach the final structure. These paths can inform us about direct and indirect ways variables act to influence interest in biodiversity and conservation.

Results

Variation in the interest in biodiversity was driven mostly by searches for taxonomic entities (99% of variation in search volumes). This is expected due to the higher number of search terms in this category. The most influential taxa were mammals, with 59% of the variation in interest for taxonomic entities, followed by plants (31%), and invertebrates (8%). All top 10 species with most views on Wikipedia were mammals and six were classified as threatened by the International Union for

Conservation of Nature (Table S1). Interest in conservation was driven mostly by the term “National park” (66% of variation in search volumes). Results for each country can be visualized in our online Shiny app (conservationculturomics.shinyapps.io/aichi1_app/).

Spatio-temporal patterns

Global interest in biodiversity rose steadily during the studied period (Figure 1). When examining the different categories of biodiversity topics, a similar pattern was observed for taxa and biodiversity concepts, but not for biomes, which showed greater variation (Figure 1). Global interest in conservation showed a moderate increase until 2019, followed by a strong decline (Figure 2). Without the dominant search term (“National park”), interest in conservation showed a steady decline throughout the study period (Figure 2). Removing countries that were not CBD signatories in 2010 did not substantially affect the results (Figure S1).

Table S2 summarizes trends in interest across the studied time period for the different countries. These were calculated based on the posterior distribution of the trend coefficients of the Bayesian Structural Time Series models used to evaluate temporal trends in the interest in biodiversity and conservation. 92 countries (out of 193) showed significant increase in interest in biodiversity, while one country (Uzbekistan) showed a significant decrease (Table S2). However, only 21 countries showed significant increases in interest for conservation and 16 countries showed significant decreases (Table S2). Only 12 countries showed increases for both biodiversity and conservation (Bosnia and Herzegovina, China, Algeria, Finland, Croatia, Portugal, Russia, Sweden, Slovakia, Thailand, Turkey, Vietnam, Table S2). By 2020, 86 out of 193 countries had biodiversity search volumes similar to the top 20 countries in 2013. However, for conservation searches, only 8 countries had search volumes in 2020 similar to the top 20 countries in 2013 (animated figure in Supplementary Material).

Across countries, higher median interest in conservation was associated with decreasing temporal trends. No such trend was observed for interest in biodiversity (Figure S2, Table S3). Figure 3 shows substantial intraregional variation in trends and median interest in biodiversity and conservation, with only a few regions presenting consistent patterns for interest in biodiversity (e.g. northwestern Africa and central Europe) and conservation (e.g. southeastern Africa and western Latin America).

Correlates of interest in biodiversity and conservation

As our models describe complex relations between interest and country-level attributes (listed in the methods section), they explained only a moderate proportion of the responses' variance (R^2 between 0.192

and 0.327, Figure S2). Trends in interest in biodiversity and conservation were both mainly associated with education, economy, and research, while trends in interest in biodiversity were also associated with biodiversity variables (Figure S4). Median interest in biodiversity and conservation were both associated with environmental organizations and research variables. Median interest in biodiversity was also associated with internet use, and median interest in conservation with economy and demography variables (Figure S4).

Inequality (Gini Index) had direct and indirect negative effects on trends of interest in biodiversity and conservation. However, it had a positive direct effect in median interest in conservation, and a negative indirect effect through a research variable (Figure 4). Purchasing Power Parity had indirect positive effects on trends of interest in biodiversity and conservation, through research and education variables, respectively (Figure 4). Percentage of urban population had a negative direct effect on median interest in conservation, but positive indirect effects through environmental organizations and research variables (Figure 4).

Number of researchers per million inhabitants had a positive effect on trends of interest in biodiversity and median interest in conservation, but a negative effect on median interest in biodiversity (Figure 4). Biodiversity and internet use variables had positive effects on trends and median interest in biodiversity but were not relevant for interest in conservation (Figure 4). Education variables had a mixed effect, with adult literacy rate being negatively correlated with trends in interest in biodiversity, while tertiary enrollment positively correlated with trends in interest in conservation (Figure 4). Variables related to presence of environmental organizations had a negative effect on median interest in biodiversity and conservation, except in one instance, where the number of IUCN member organizations had a positive effect on median interest in conservation (Figure 4).

Discussion

Our analysis shows partial success for Aichi target 1. Interest in charismatic organisms and general biodiversity topics has increased widely during 2013–2020 (Figure 1). However, interest in conservation has decreased across the board, mostly due to a decrease in searches for national parks after 2019 (Figure 2). This incongruence suggests interest in biodiversity is insufficient to drive interest in its conservation, and that conservation outreach and education need to make a clear link between biodiversity elements and conservation action. Our results likely provide a conservative evaluation of progress towards Aichi target 1, since internet searches for a topic require awareness of it, but

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awareness does not necessarily lead to internet searches. Furthermore, our results do not encompass more informal modes of communication, which might be more relevant in traditional communities without widespread access to the internet. However, there is no other data source on people's interests with a comparable scope in space or time.

Organisms are the most concrete elements of biodiversity, so they are expected to generate more interest than academic topics (but see Lundberg et al. 2020). This interest could be extended to more abstract biodiversity topics, by showing examples of how such concepts are applied to conservation of charismatic species. Interest should also be extended to other species, as excessive focus on flagship species can lead to neglect of less charismatic ones (Colléony et al. 2017). The dominance of the term "National park" in the conservation related terms might merely reflect an interest in tourism, without concern for the conservation aspect of these protected areas. In any case, national park visitors can experience direct contact with nature and conservation outreach initiatives promoted at the parks. Such experiences might increase their appreciation for the value of biodiversity and their interest in conserving it, regardless of their initial intentions. It is thus crucial that protected areas continue receiving support. Future studies should better explore how experiences in protected areas affect interest in biodiversity and how to leverage this influence to increase pro-conservation behavior.

Spatio-temporal patterns

The term 'National park' reversed the overall decline in interest in conservation during 2013-2019 (Figure 2). Interest in conservation abruptly decreased after 2019 (Figure 2), potentially due to worldwide visitation restrictions to national parks during the pandemic (Souza et al. 2021). National parks closure might have substantially contributed to an overall decrease in interest in conservation (Bates et al. 2021).

There was no correlation between trend and median interest in biodiversity (Table S3, Figure S2a), indicating that countries with high medians can still increase their levels of interest. This continued increase indicates these countries have not reached a saturation in interest and could still benefit from outreach efforts focused on biodiversity. In contrast, a negative correlation between median interest and trends was observed for conservation topics (Table S3, Figure S2b), with greatest decreases found in countries with higher median interest. This may be because countries with low median interest in national parks had little room for decrease, thus being less affected by the decline associated with the pandemic. It also indicates a lack of resilience in previously achieved levels of interest in conservation.

Overall, there was a substantial degree of intraregional variation in interest for biodiversity and conservation (Figure 3), indicating a potential influence of processes at the national or sub-national level. Median interest in biodiversity was high in North America, Oceania, Southeast Asia, while other parts of the world generally showed medium to low levels of interest, with few notable exceptions, such as Syria, Iran, Bolivia and Ecuador (Figure 3a). Higher trends were widespread across South America, North and West Africa, Europe and East Asia, with very few countries showing both low medians and low trends (Figure 3a). Altogether, this points to widespread positive results for the first part of Aichi target 1 (increasing awareness of biodiversity), with some countries that could benefit from further outreach efforts, such as Venezuela, Nigeria, and Pakistan.

United States, Australia, and many countries in Southern and Eastern Africa showed high median interest for conservation (Figure 3b). Ecotourism in national parks is an important source of revenue in these areas (Heagney et al. 2015; Snyman et al. 2021; Thomas & Koontz 2021). This interest can be driven both by tourists and local citizens who interact with national parks. Latin America, Europe, Asia, North and West Africa showed moderate to low median interest in conservation, but with high increases observed in many countries such as China, Portugal and Egypt (Figure 3b). Countries that showed both low interest and low increases should be prioritized for outreach and education efforts, especially those with high biodiversity, such as Brazil, Nigeria and Indonesia (Figure 3b).

Correlates of interest in biodiversity and conservation

It should be noted that this initial exploration of correlates of interest in biodiversity and conservation is correlative by nature, not implying any causation. These results should therefore be taken as potential basis for future research that can do a more in depth analysis of the patterns revealed here, which in turn could support conservation decision making.

Higher inequality was associated with lower interest in biodiversity and conservation (Figure 4), suggesting that improving inequality may indirectly promote greater biodiversity conservation. Outreach efforts focusing on synergies between socioeconomic and environmental issues may help increase awareness of the value of biodiversity (Kanagavel et al. 2014), and help underprivileged populations understand long-term benefits of conservation (McDonald et al. 2020). We found that economic variables often acted via education and research variables, which had predominantly positive associations with interest in biodiversity and conservation (Figure 4). Counter-intuitively, variables related to the presence of environmental organizations were often negatively associated with interest in biodiversity and

conservation. However, quantity of environmental or conservation organizations may not reflect their quality or translate to improved conservation outcomes. Alternatively, the effects of environmental organizations may have been already accounted for by other variables. The moderate explanatory power of our models (Figure S3) suggests that unaccounted factors, such as cultural differences could make interventions highly contingent on local contexts (Waylen et al. 2009).

Our results suggest a positive trend towards achieving Aichi target 1. More work must be done to increase interest in non-charismatic biodiversity and conservation globally. Unfortunately, the Global Biodiversity Framework for the next decade will likely not include a direct successor for Aichi Target 1 (awareness is mentioned in target 20, but not as the main focus, Convention on Biological Diversity 2021). This is especially concerning, as Aichi target 1 itself states that: “Understanding, awareness and appreciation of the diverse values of biodiversity, underpin the willingness of individuals to make the necessary changes and actions and to create the ‘political will’ for governments to act”. Further investment in outreach and education efforts is necessary to achieve this goal in the current decade, using evidence-based approaches such as social marketing and constructing solutions with local stakeholders.

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Figures and Tables

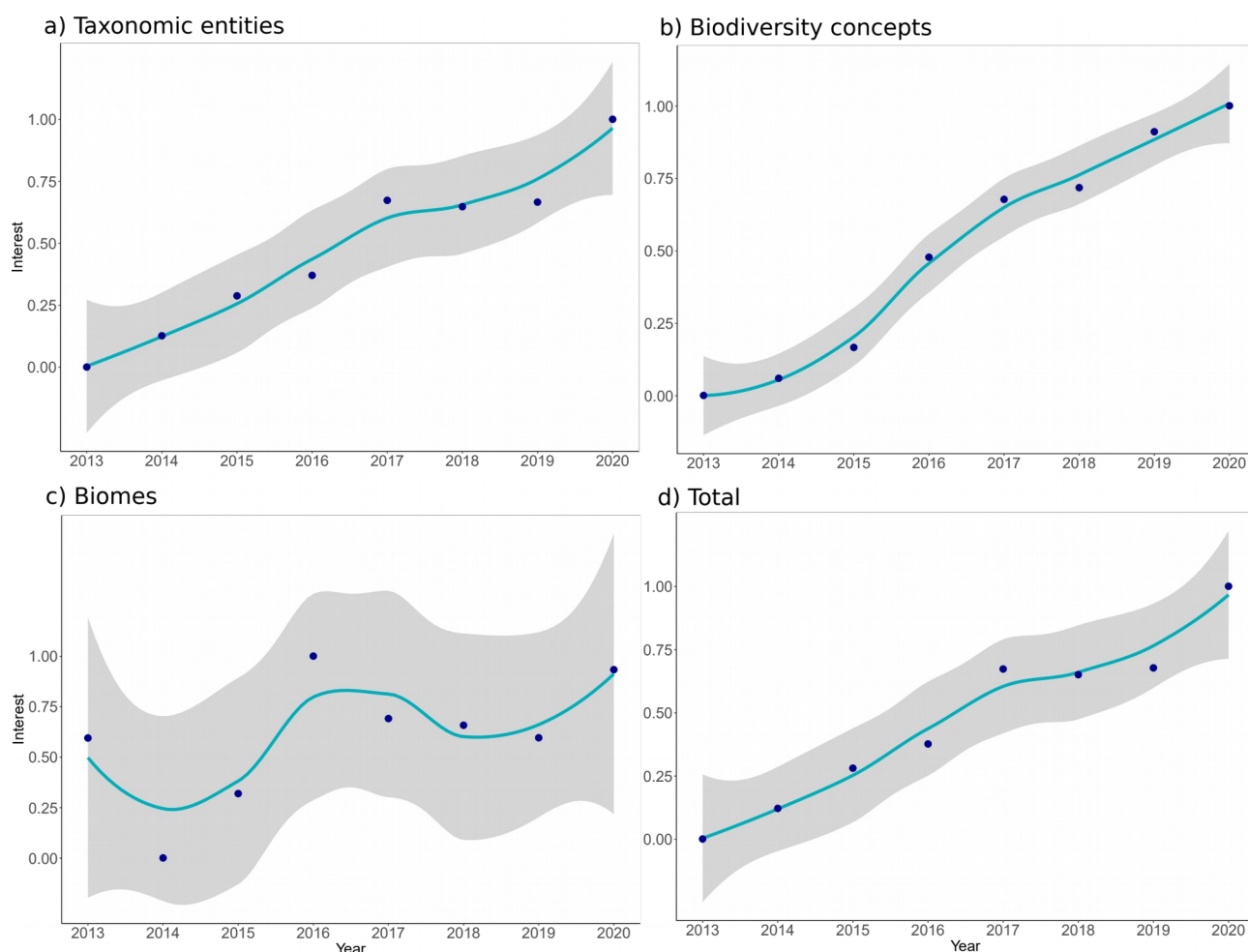


Figure 1. Global aggregate of relative search volumes on Google search engine for search terms related to biodiversity between 2013 and 2020. a) Top 500 most viewed Wikipedia taxonomic entities, plus the top 10 for each language (991 search terms). b) All global biomes (Olson et al. 2001, 15 search terms). c) Biodiversity concepts (based on CBD's Biodiversity Glossary: Convention on Biological Diversity 2008, 20 terms). d) Aggregate of all three previous categories. See complete list of search terms in Supplementary Material. Relative search volumes were scaled between 0 and 1 for display purposes only.

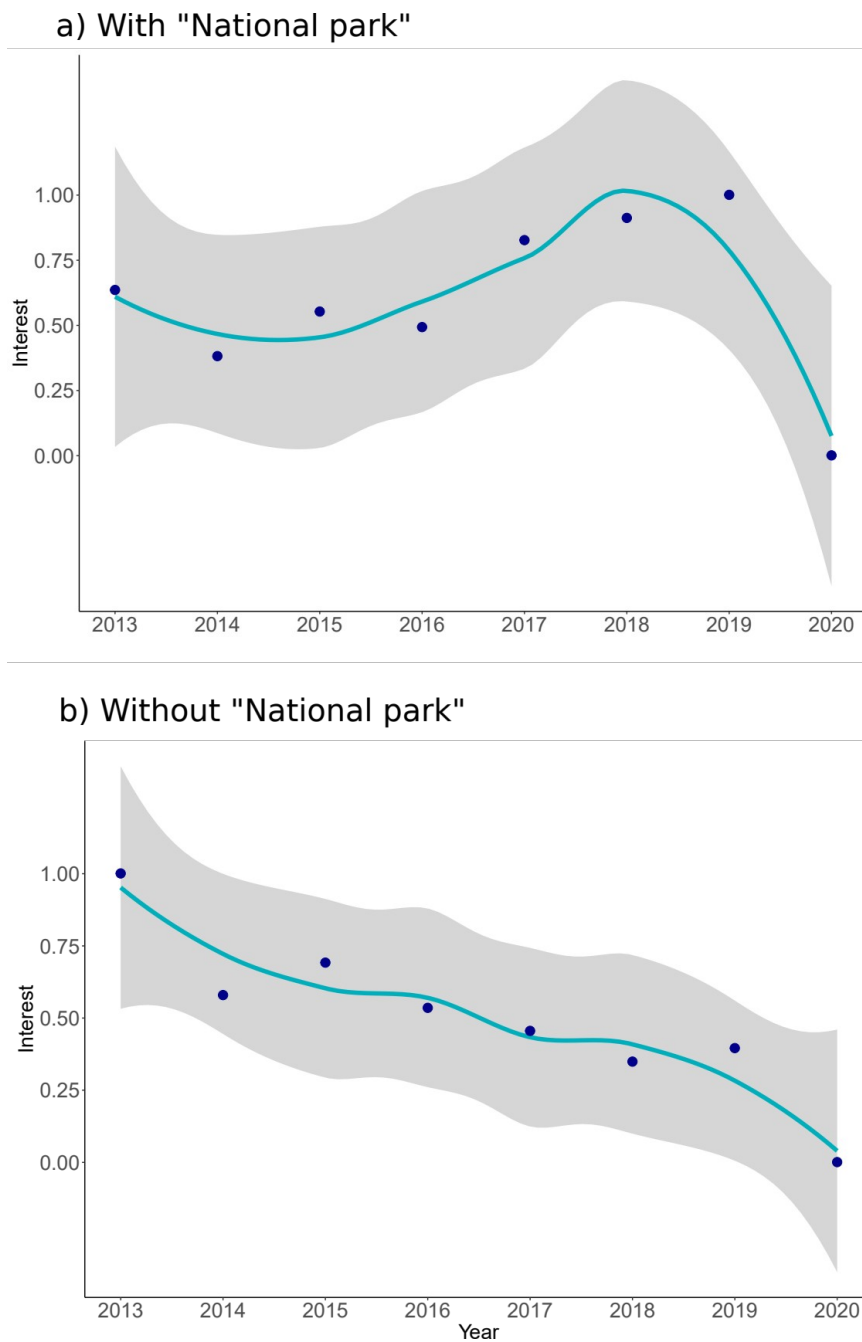
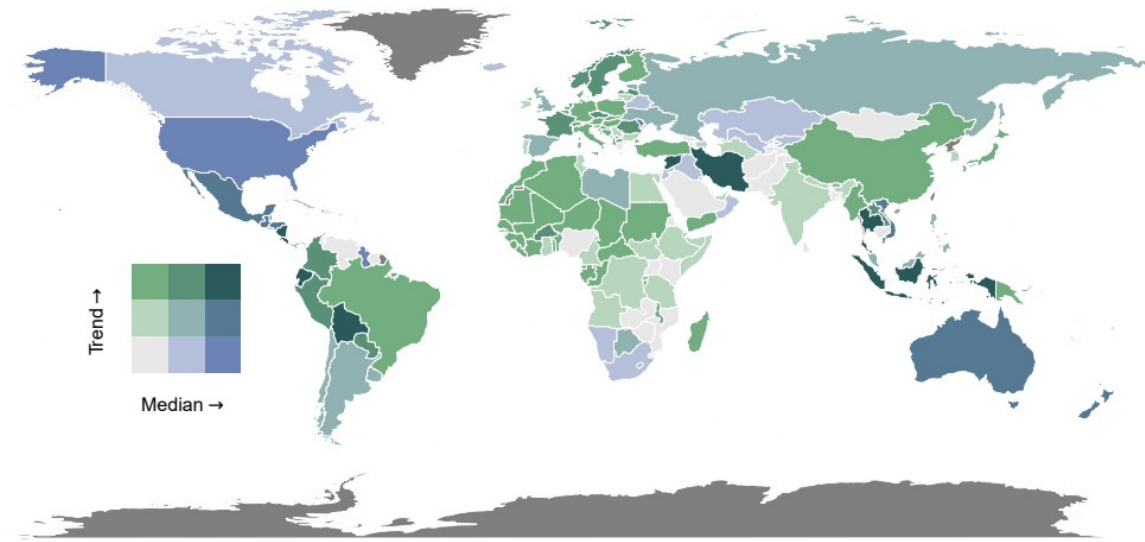


Figure 2. Global aggregate of relative search volumes on Google search engine for search terms related to conservation between 2013 and 2020. Based on International Union for Conservation of Nature's Conservation Actions Classification Scheme (International Union for the Conservation of Nature 2012, 27 search terms). A single search term, "National park", was responsible for 66% of the variation in relative search volume, so we plot the time series both a) with and b) without the inclusion of this term. See complete list of search terms in Supplementary Material. Relative search volumes were scaled between 0 and 1 for display purposes only.

a) Biodiversity



b) Conservation

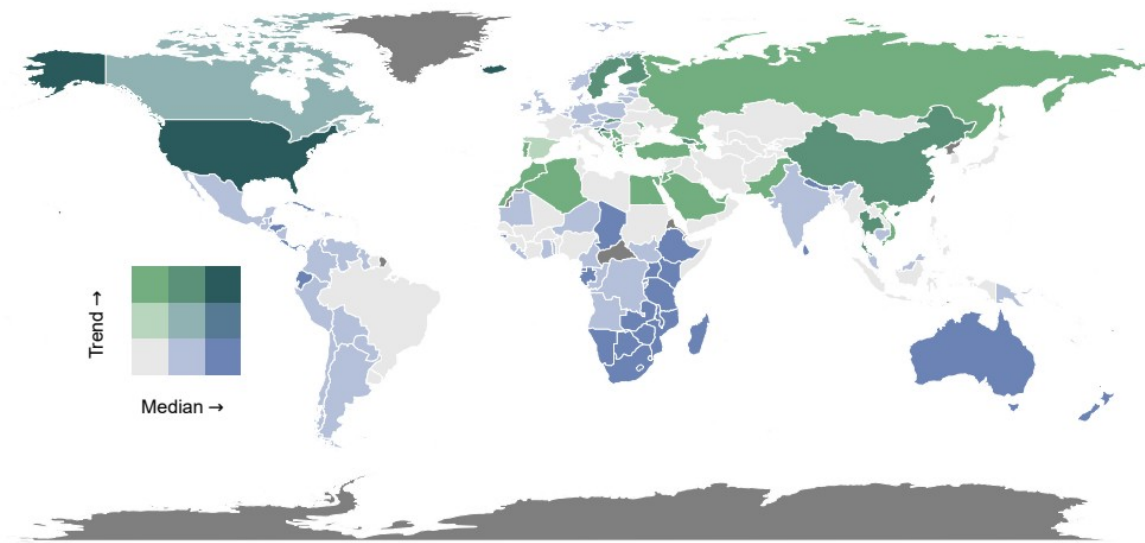


Figure 3. Bivariate choropleths of trend and median interest for a) biodiversity and b) conservation between 2013 and 2020 in 193 United Nations member states. Interest was gauged as relative search volumes at Google search engine. Trend was obtained as the median coefficient for a linear increase in a Bayesian Structural Time Series model (Table S2). Complete list of search terms in Supplementary Material.

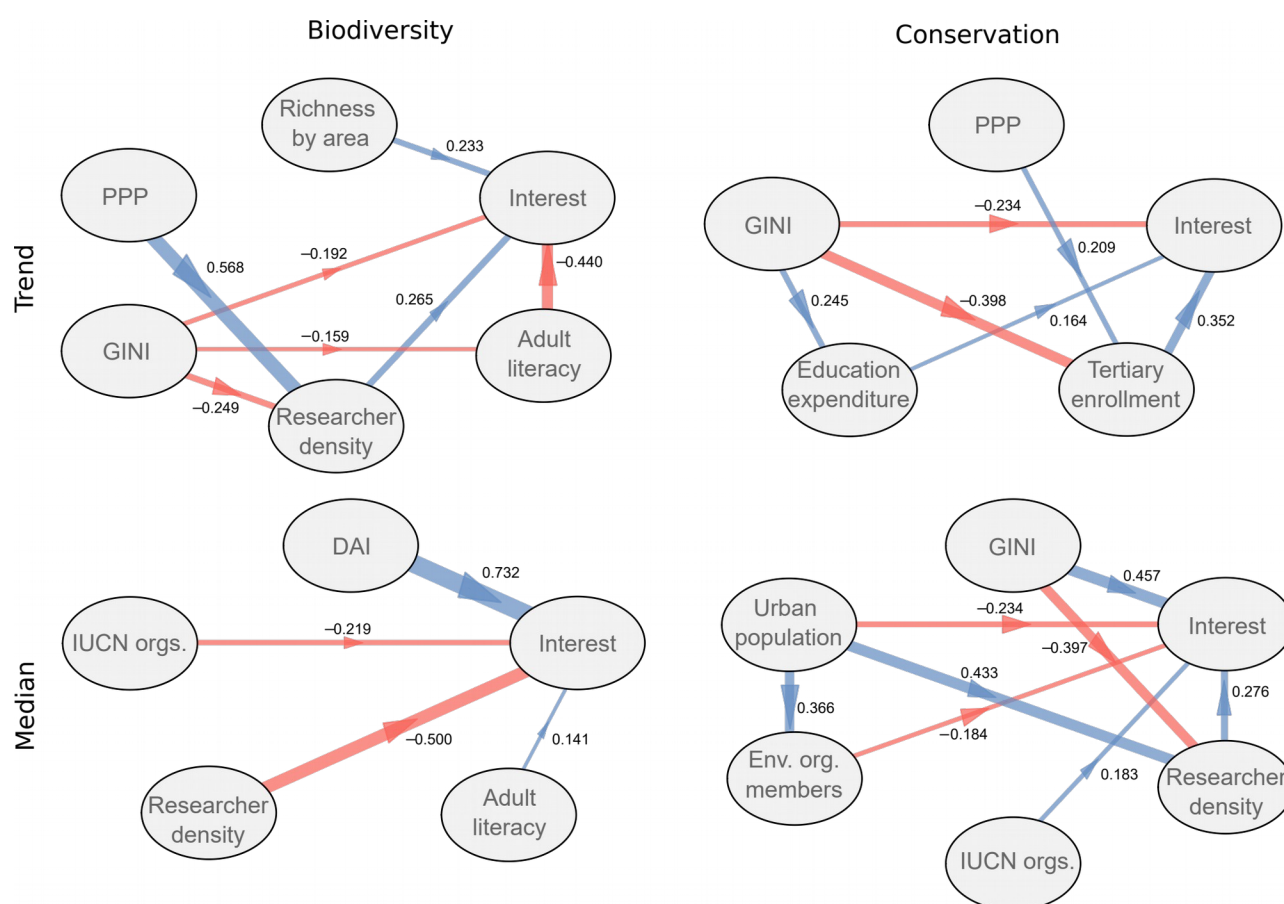


Figure 4. Path diagram of influences on trends and median search volumes for biodiversity and conservation. Regression coefficients are indicated next to each arrow. Richness by area - species richness per country area; PPP - Purchasing Power Parity; GINI - Gini Inequality Index; Urban population - Percentage of Urban Population; Researcher density - Number of researchers per million inhabitants; Adult literacy - Adult literacy rate; Tertiary enrollment - Tertiary enrollment rate; Education expenditure - Expenditure on primary education; DAI - Digital Access Index; IUCN orgs. - Number of IUCN member organizations; Env. org. members - Number of environmental organization members.

Supplementary information

Table S1. 10 most viewed species on Wikipedia. Also included are their threat category on the International Union for the Conservation of Nature Red List of Threatened Species.

Rank	Species	Threat category
1	Lion (<i>Panthera leo</i>)	Vulnerable
2	Tiger (<i>Panthera tigris</i>)	Endangered
3	Grey wolf (<i>Canis lupus</i>)	Least Concern
4	Giant panda (<i>Ailuropoda melanoleuca</i>)	Vulnerable
5	Blue whale (<i>Balaenoptera musculus</i>)	Vulnerable
6	Orca (<i>Orcinus orca</i>)	Data Deficient
7	Polar bear (<i>Ursus maritimus</i>)	Vulnerable

8	Koala (<i>Phascolarctos cinereus</i>)	Vulnerable
9	Platypus (<i>Ornithorhynchus anatinus</i>)	Near Threatened
10	Brown bear (<i>Ursus arctos</i>)	Least Concern

Table S2. Median and 95% confidence intervals for trend coefficient in a Bayesian Structural Time Series models for interest in biodiversity and conservation in 193 United Nations member states from 2013 to 2020.

Interest was gauged as relative search volumes at Google search engine. Complete list of search terms in Supplementary Material. LCI – lower confidence interval; UCI – upper confidence interval. NA was assigned to countries for which models did not converge, due to sparse data.

Country	Biodiversity LCI	Biodiversity Median	Biodiversity UCI	Conservation LCI	Conservation Median	Conservation UCI
Andorra	0.0000	0.0000	0.0013	-0.0022	0.0000	0.0000
United Arab Emirates (the)	0.0000	0.0010	0.0015	0.0000	0.0009	0.0019
Afghanistan	0.0000	0.0000	0.0011	-0.0034	0.0000	0.0000
Antigua and Barbuda	0.0000	0.0000	0.0000	-0.0034	0.0000	0.0000
Albania	0.0011	0.0018	0.0022	0.0000	0.0043	0.0059
Armenia	0.0000	0.0000	0.0000	0.0000	0.0000	0.0025
Angola	0.0000	0.0008	0.0014	-0.0037	0.0000	0.0000
Argentina	0.0010	0.0015	0.0019	0.0000	0.0000	0.0004
Austria	0.0012	0.0018	0.0022	0.0000	0.0000	0.0000
Australia	0.0000	0.0009	0.0013	0.0000	0.0000	0.0003
Azerbaijan	0.0000	0.0007	0.0013	0.0019	0.0040	0.0053
Bosnia and Herzegovina	0.0011	0.0018	0.0023	0.0021	0.0036	0.0045
Barbados	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bangladesh	0.0000	0.0000	0.0007	-0.0008	0.0000	0.0000
Belgium	0.0013	0.0020	0.0024	0.0000	0.0000	0.0000
Burkina Faso	0.0018	0.0028	0.0033	-0.0047	0.0000	0.0000
Bulgaria	0.0006	0.0012	0.0016	0.0000	0.0000	0.0000
Bahrain	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Burundi	0.0000	0.0020	0.0030	-0.0117	-0.0079	-0.0046
Benin	0.0011	0.0019	0.0025	-0.0066	-0.0044	-0.0028
Brunei Darussalam	0.0008	0.0013	0.0017	0.0000	0.0000	0.0000
Bolivia (Plurinational State of)	0.0018	0.0027	0.0033	0.0000	0.0000	0.0000
Brazil	0.0013	0.0020	0.0024	-0.0024	-0.0018	-0.0014
Bahamas (the)	-0.0002	0.0000	0.0000	-0.0059	-0.0031	0.0000
Bhutan	0.0000	0.0016	0.0021	-0.0070	-0.0048	-0.0032
Botswana	0.0000	0.0012	0.0016	-0.0038	0.0000	0.0000
Belarus	0.0000	0.0000	0.0010	0.0000	0.0000	0.0010
Belize	0.0000	0.0000	0.0000	-0.0015	0.0000	0.0000
Canada	0.0000	0.0006	0.0012	0.0000	0.0008	0.0014
Congo (the Democratic Republic of the)	0.0000	0.0015	0.0021	-0.0028	0.0000	0.0000
Central African Republic (the)	0.0000	0.0028	0.0043	NA	NA	NA
Congo (the)	0.0023	0.0036	0.0044	-0.0019	0.0000	0.0000
Switzerland	0.0014	0.0020	0.0024	-0.0014	0.0000	0.0000
Côte d'Ivoire	0.0010	0.0017	0.0022	0.0000	0.0000	0.0000
Chile	0.0008	0.0014	0.0018	0.0000	0.0000	0.0000
Cameroon	0.0006	0.0013	0.0018	-0.0024	0.0000	0.0000
China	0.0033	0.0041	0.0046	0.0025	0.0043	0.0055
Colombia	0.0010	0.0017	0.0021	0.0000	0.0000	0.0000
Costa Rica	0.0011	0.0017	0.0021	0.0000	0.0000	0.0011
Cuba	0.0000	0.0000	0.0012	-0.0093	-0.0069	-0.0053
Cabo Verde	0.0000	0.0010	0.0015	-0.0031	0.0000	0.0000
Cyprus	0.0008	0.0013	0.0017	0.0000	0.0000	0.0000
Czechia	0.0021	0.0028	0.0032	0.0000	0.0000	0.0000
Germany	0.0015	0.0022	0.0026	0.0000	0.0000	0.0000
Djibouti	0.0000	0.0017	0.0024	NA	NA	NA

Denmark	0.0019	0.0026	0.0030	0.0000	0.0000	0.0006
Dominica	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000
Dominican Republic (the)	0.0000	0.0000	0.0011	-0.0015	0.0000	0.0000
Algeria	0.0011	0.0018	0.0022	0.0012	0.0033	0.0044
Ecuador	0.0010	0.0017	0.0021	0.0000	0.0000	0.0006
Estonia	0.0000	0.0010	0.0014	0.0000	0.0000	0.0000
Egypt	0.0000	0.0011	0.0016	0.0055	0.0071	0.0081
Eritrea	0.0000	0.0000	0.0046	NA	NA	NA
Spain	0.0008	0.0014	0.0018	0.0000	0.0007	0.0013
Ethiopia	0.0000	0.0011	0.0016	-0.0009	0.0000	0.0000
Finland	0.0016	0.0023	0.0027	0.0036	0.0044	0.0049
Fiji	0.0000	0.0000	0.0000	-0.0027	0.0000	0.0000
Micronesia (Federated States of)	0.0000	0.0000	0.0000	NA	NA	NA
France	0.0013	0.0019	0.0023	0.0000	0.0000	0.0000
Gabon	0.0011	0.0019	0.0024	-0.0053	-0.0030	0.0000
United Kingdom of Great Britain and Northern Ireland (the)	0.0007	0.0013	0.0017	0.0000	0.0000	0.0000
Grenada	0.0000	0.0000	0.0000	-0.0041	-0.0011	0.0000
Georgia	0.0000	0.0006	0.0012	0.0000	0.0023	0.0032
Ghana	0.0009	0.0015	0.0019	-0.0040	-0.0027	-0.0018
Gambia (the)	0.0030	0.0041	0.0049	-0.0051	0.0000	0.0000
Guinea	0.0021	0.0030	0.0036	-0.0077	0.0000	0.0000
Equatorial Guinea	0.0000	0.0024	0.0038	-0.0022	0.0000	0.0000
Greece	0.0000	0.0000	0.0009	0.0018	0.0026	0.0031
Guatemala	0.0009	0.0016	0.0020	-0.0015	0.0000	0.0000
Guinea-Bissau	0.0000	0.0000	0.0000	-0.0136	0.0000	0.0000

Guyana	0.0000	0.0000	0.0000	-0.0069	-0.0047	-0.0032
Honduras	0.0000	0.0010	0.0015	-0.0021	0.0000	0.0000
Croatia	0.0011	0.0017	0.0022	0.0019	0.0029	0.0036
Haiti	0.0012	0.0019	0.0024	-0.0041	0.0000	0.0000
Hungary	0.0019	0.0026	0.0030	-0.0015	-0.0007	0.0000
Indonesia	0.0011	0.0018	0.0023	0.0000	0.0000	0.0016
Ireland	0.0009	0.0014	0.0018	0.0000	0.0000	0.0015
Israel	0.0000	0.0012	0.0016	0.0016	0.0028	0.0035
India	0.0010	0.0016	0.0020	-0.0008	0.0000	0.0000
Iraq	0.0000	0.0000	0.0000	0.0000	0.0000	0.0037
Iran (Islamic Republic of)	0.0013	0.0020	0.0024	-0.0022	-0.0013	0.0000
Iceland	0.0000	0.0005	0.0012	0.0020	0.0057	0.0076
Italy	0.0021	0.0028	0.0032	0.0000	0.0000	0.0011
Jamaica	0.0000	0.0000	0.0000	-0.0031	0.0000	0.0000
Jordan	0.0000	0.0000	0.0007	0.0025	0.0047	0.0061
Japan	0.0036	0.0045	0.0051	-0.0009	0.0000	0.0000
Kenya	-0.0016	-0.0008	0.0000	-0.0038	-0.0028	-0.0022
Kyrgyzstan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Cambodia	0.0000	0.0000	0.0009	-0.0022	0.0000	0.0000
Kiribati	0.0000	0.0000	0.0000	NA	NA	NA
Comoros (the)	0.0000	0.0000	0.0020	NA	NA	NA
Saint Kitts and Nevis	0.0000	0.0000	0.0000	NA	NA	NA
Korea (the Democratic People's Republic of)	NA	NA	NA	NA	NA	NA
Korea (the Republic of)	0.0009	0.0015	0.0020	-0.0008	0.0000	0.0000
Kuwait	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Kazakhstan	0.0000	0.0000	0.0000	0.0000	0.0000	0.0016
Lao People's Democratic Republic (the)	0.0022	0.0031	0.0037	-0.0043	0.0000	0.0000
Lebanon	0.0000	0.0000	0.0011	0.0000	0.0000	0.0000
Saint Lucia	0.0000	0.0000	0.0006	-0.0060	0.0000	0.0000
Liechtenstein	0.0000	0.0016	0.0022	0.0000	0.0000	0.0000
Sri Lanka	0.0000	0.0000	0.0010	-0.0015	0.0000	0.0000
Liberia	0.0024	0.0038	0.0047	0.0000	0.0000	0.0000
Lesotho	0.0000	0.0000	0.0000	-0.0068	-0.0044	-0.0022
Lithuania	0.0002	0.0012	0.0016	-0.0021	-0.0013	0.0000
Luxembourg	0.0007	0.0013	0.0017	0.0000	0.0000	0.0000
Latvia	0.0011	0.0016	0.0021	0.0000	0.0000	0.0012
Libya	0.0005	0.0015	0.0020	0.0000	0.0000	0.0000
Morocco	0.0011	0.0018	0.0023	0.0000	0.0026	0.0035
Monaco	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Moldova (the Republic of)	0.0000	0.0010	0.0015	0.0000	0.0021	0.0037
Montenegro	0.0007	0.0015	0.0019	0.0000	0.0000	0.0027
Madagascar	0.0011	0.0017	0.0022	-0.0024	0.0000	0.0000
Marshall Islands (the)	0.0000	0.0000	0.0000	NA	NA	NA
Republic of North Macedonia	0.0012	0.0018	0.0023	0.0000	0.0030	0.0044
Mali	0.0035	0.0046	0.0052	-0.0037	0.0000	0.0000
Myanmar	0.0019	0.0026	0.0031	0.0000	0.0000	0.0000
Mongolia	0.0000	0.0000	0.0000	-0.0013	0.0000	0.0000
Mauritania	0.0022	0.0030	0.0035	0.0000	0.0000	0.0016
Malta	0.0000	0.0011	0.0015	0.0000	0.0000	0.0000
Mauritius	0.0000	0.0007	0.0012	0.0000	0.0000	0.0000
Maldives	0.0014	0.0021	0.0026	-0.0023	0.0000	0.0000
Malawi	0.0016	0.0023	0.0028	0.0000	0.0000	0.0000

Mexico	0.0000	0.0012	0.0016	-0.0012	0.0000	0.0000
Malaysia	0.0008	0.0014	0.0018	0.0000	0.0000	0.0000
Mozambique	-0.0006	0.0000	0.0000	-0.0035	-0.0023	-0.0010
Namibia	0.0000	0.0000	0.0013	-0.0005	0.0000	0.0000
Niger (the)	0.0024	0.0034	0.0040	-0.0062	-0.0023	0.0000
Nigeria	0.0000	0.0000	0.0000	-0.0048	-0.0036	-0.0028
Nicaragua	0.0012	0.0018	0.0023	0.0000	0.0000	0.0000
Netherlands (the)	0.0015	0.0022	0.0026	0.0000	0.0000	0.0007
Norway	0.0017	0.0024	0.0028	0.0000	0.0000	0.0013
Nepal	0.0006	0.0013	0.0017	0.0000	0.0000	0.0000
Nauru	-0.0053	0.0000	0.0000	NA	NA	NA
New Zealand	0.0001	0.0012	0.0016	0.0000	0.0000	0.0000
Oman	0.0000	0.0000	0.0008	0.0000	0.0000	0.0001
Panama	0.0000	0.0011	0.0016	-0.0013	0.0000	0.0000
Peru	0.0016	0.0023	0.0028	0.0000	0.0000	0.0000
Papua New Guinea	0.0016	0.0024	0.0030	-0.0017	0.0000	0.0000
Philippines (the)	0.0000	0.0012	0.0016	-0.0012	0.0000	0.0000
Pakistan	0.0000	0.0000	0.0010	0.0009	0.0020	0.0025
Poland	0.0018	0.0025	0.0029	-0.0004	0.0000	0.0000
Portugal	0.0008	0.0013	0.0017	0.0008	0.0016	0.0022
Palau	-0.0021	0.0000	0.0000	NA	NA	NA
Paraguay	0.0011	0.0018	0.0023	-0.0032	-0.0019	0.0000
Qatar	0.0000	0.0000	0.0010	0.0000	0.0000	0.0000
Romania	0.0024	0.0031	0.0036	0.0000	0.0000	0.0016
Serbia	0.0007	0.0013	0.0017	0.0000	0.0017	0.0023
Russian Federation (the)	0.0006	0.0012	0.0015	0.0016	0.0024	0.0028
Rwanda	0.0009	0.0018	0.0023	0.0000	0.0000	0.0000
Saudi Arabia	0.0000	0.0000	0.0000	0.0031	0.0041	0.0048

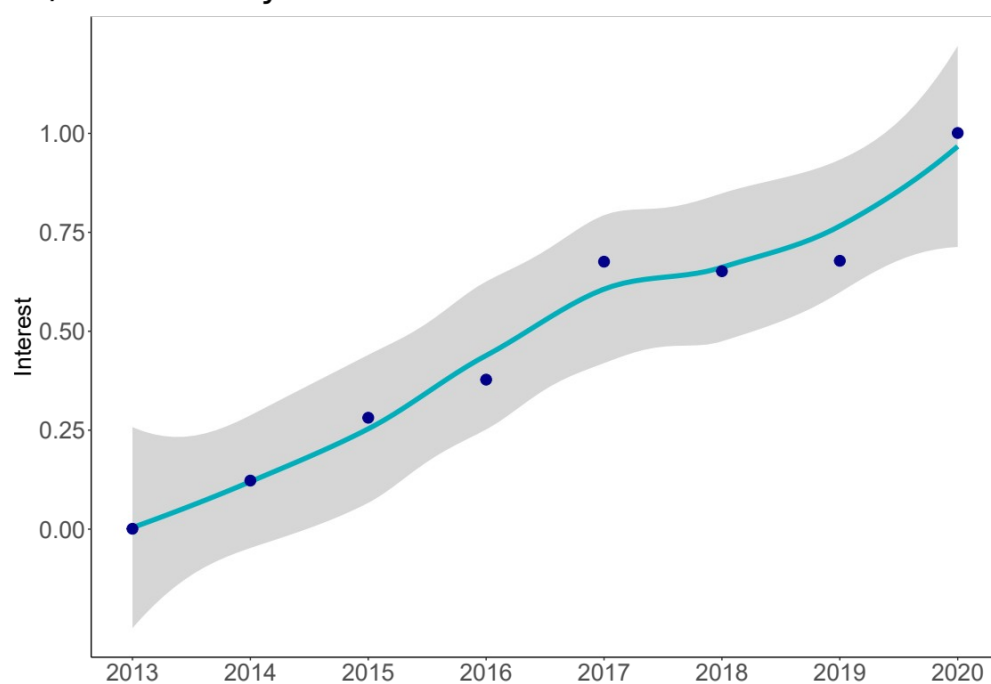
Solomon Islands	0.0000	0.0000	0.0025	-0.0003	0.0000	0.0000
Seychelles	0.0009	0.0018	0.0024	0.0000	0.0000	0.0000
Sudan (the)	0.0014	0.0022	0.0028	0.0000	0.0000	0.0000
Sweden	0.0023	0.0030	0.0034	0.0025	0.0032	0.0037
Singapore	0.0000	0.0007	0.0012	-0.0013	0.0000	0.0000
Slovenia	0.0014	0.0021	0.0025	0.0000	0.0026	0.0036
Slovakia	0.0020	0.0027	0.0031	0.0010	0.0022	0.0029
Sierra Leone	0.0035	0.0049	0.0058	-0.0061	-0.0039	0.0000
San Marino	0.0014	0.0029	0.0038	NA	NA	NA
Senegal	0.0011	0.0017	0.0021	0.0000	0.0000	0.0000
Somalia	0.0007	0.0016	0.0022	-0.0068	0.0000	0.0000
Suriname	0.0000	0.0000	0.0000	-0.0039	0.0000	0.0000
South Sudan	0.0000	0.0007	0.0020	-0.0034	0.0000	0.0000
Sao Tome and Principe	0.0000	0.0000	0.0000	NA	NA	NA
El Salvador	0.0009	0.0016	0.0020	0.0000	0.0000	0.0000
Syrian Arab Republic	0.0011	0.0018	0.0022	0.0000	0.0000	0.0000
Eswatini	0.0000	0.0000	0.0000	-0.0073	-0.0051	-0.0036
Chad	0.0037	0.0050	0.0059	-0.0079	0.0000	0.0000
Togo	0.0022	0.0031	0.0037	-0.0067	-0.0041	0.0000
Thailand	0.0033	0.0042	0.0048	0.0026	0.0035	0.0041
Tajikistan	0.0000	0.0000	0.0000	-0.0055	-0.0032	0.0000
Timor-Leste	0.0000	0.0013	0.0021	-0.0003	0.0000	0.0000
Turkmenistan	0.0010	0.0016	0.0020	-0.0093	-0.0057	0.0000
Tunisia	0.0007	0.0014	0.0018	0.0000	0.0000	0.0000
Tonga	0.0000	0.0000	0.0000	NA	NA	NA
Turkey	0.0035	0.0043	0.0048	0.0058	0.0066	0.0072
Trinidad and Tobago	0.0000	0.0000	0.0000	-0.0030	0.0000	0.0000
Tuvalu	NA	NA	NA	NA	NA	NA

Tanzania, United Republic of	0.0000	0.0011	0.0015	-0.0023	0.0000	0.0000
Ukraine	0.0000	0.0011	0.0015	0.0000	0.0000	0.0000
Uganda	0.0000	0.0000	0.0006	-0.0027	-0.0010	0.0000
United States of America (the)	0.0000	0.0000	0.0010	0.0009	0.0015	0.0019
Uruguay	0.0000	0.0012	0.0016	0.0000	0.0000	0.0000
Uzbekistan	-0.0031	-0.0023	-0.0019	-0.0004	0.0000	0.0000
Saint Vincent and the Grenadines	0.0000	0.0000	0.0002	NA	NA	NA
Venezuela (Bolivarian Republic of)	0.0000	0.0000	0.0012	-0.0032	-0.0022	-0.0015
Viet Nam	0.0007	0.0014	0.0018	0.0011	0.0018	0.0023
Vanuatu	0.0000	0.0028	0.0038	-0.0017	0.0000	0.0000
Samoa	0.0000	0.0000	0.0023	NA	NA	NA
Yemen	0.0015	0.0021	0.0026	0.0000	0.0000	0.0039
South Africa	0.0000	0.0000	0.0000	-0.0029	-0.0021	-0.0016
Zambia	0.0000	0.0000	0.0000	-0.0040	-0.0027	-0.0019
Zimbabwe	0.0000	0.0000	0.0008	0.0000	0.0000	0.0000

Table S3. Regression coefficients between trend and median interest in biodiversity and conservation between 2013 and 2020 for 193 United Nations member states. Interest was gauged as relative search volumes at Google search engine. Trend was obtained as the median coefficient for a linear increase in a Bayesian Structural Time Series model (Table S1). Complete list of search terms in Supplementary Material.

	Estimate	Standard Error	T-value	p-value
<u>Biodiversity</u>				
Intercept	1.659×10^3	3.239×10^4	5.122	< 0.001
Median	-8.638×10^{10}	7.124×10^{10}	-1.213	0.227
<u>Conservation</u>				
Intercept	3.924×10^4	2.288×10^4	1.715	0.088
Median	-5.374×10^8	2.467×10^8	-2.179	0.031

a) Biodiversity



b) Conservation

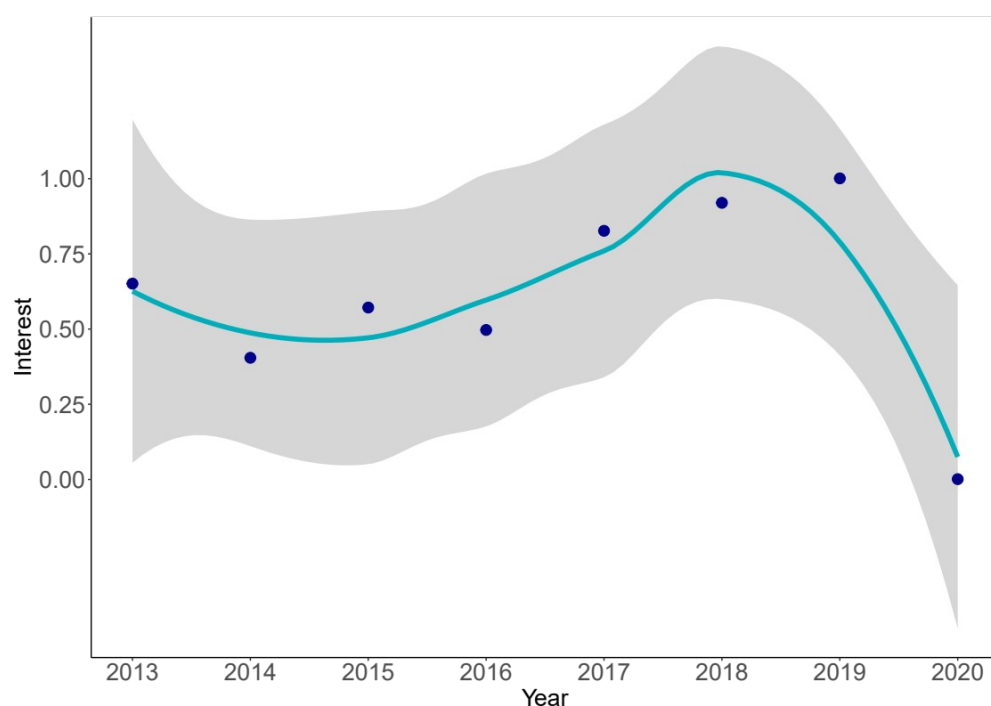
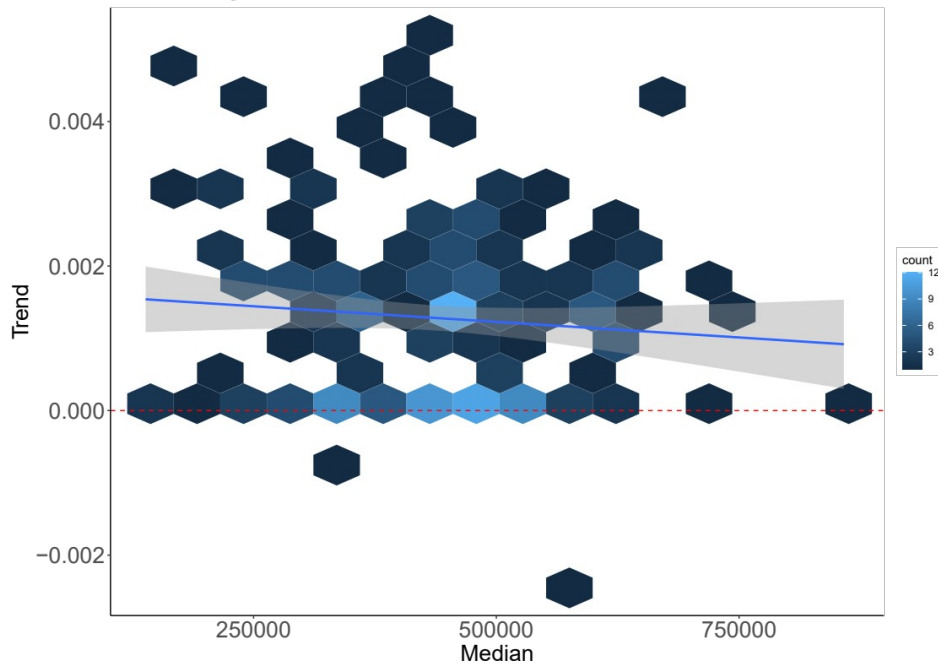


Figure S1. Global aggregate of relative search volume on Google search engine for search terms related to biodiversity (a) and conservation (b) between 2013 and 2020, for all signatories of the Convention on Biological Diversity in the year 2010. See complete list of search terms in Supplementary Material. Relative search volumes were scaled between 0 and 1 for display purposes only.

a) Biodiversity



b) Conservation

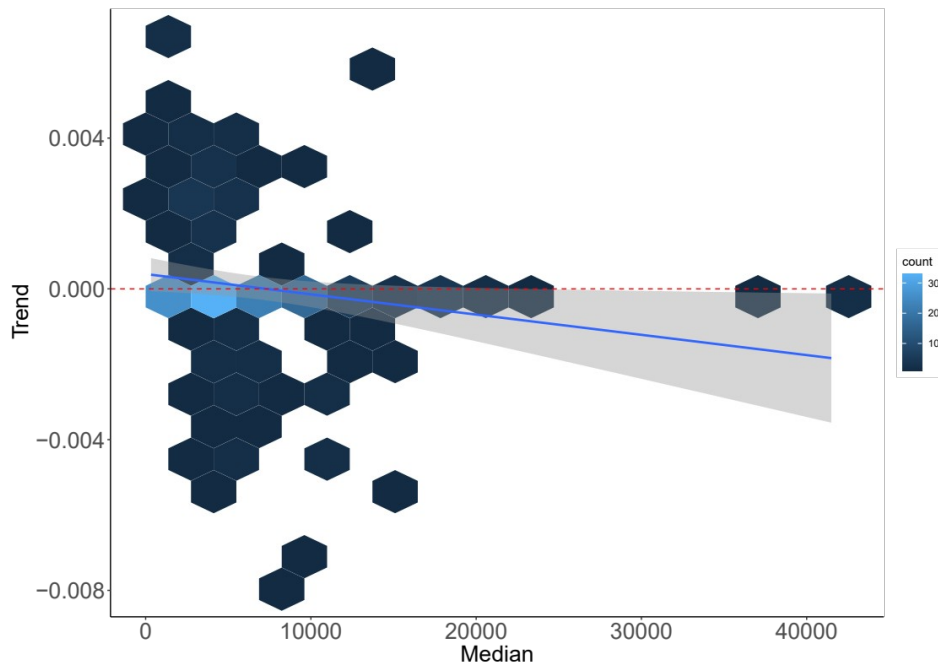


Figure S2. Correlation between trend and median interest in a) biodiversity and b) conservation between 2013 and 2020 for 193 United Nations member states. Blue line represents a linear model regression line, shaded area represents 95% confidence intervals. Hexagon colors represent the count of data points in the hexagon's area. Interest was gauged as relative search volumes at Google search engine. Trend was obtained as the median coefficient for a linear increase in a Bayesian Structural Time Series model (Table S1). Complete list of search terms in Supplementary Material.

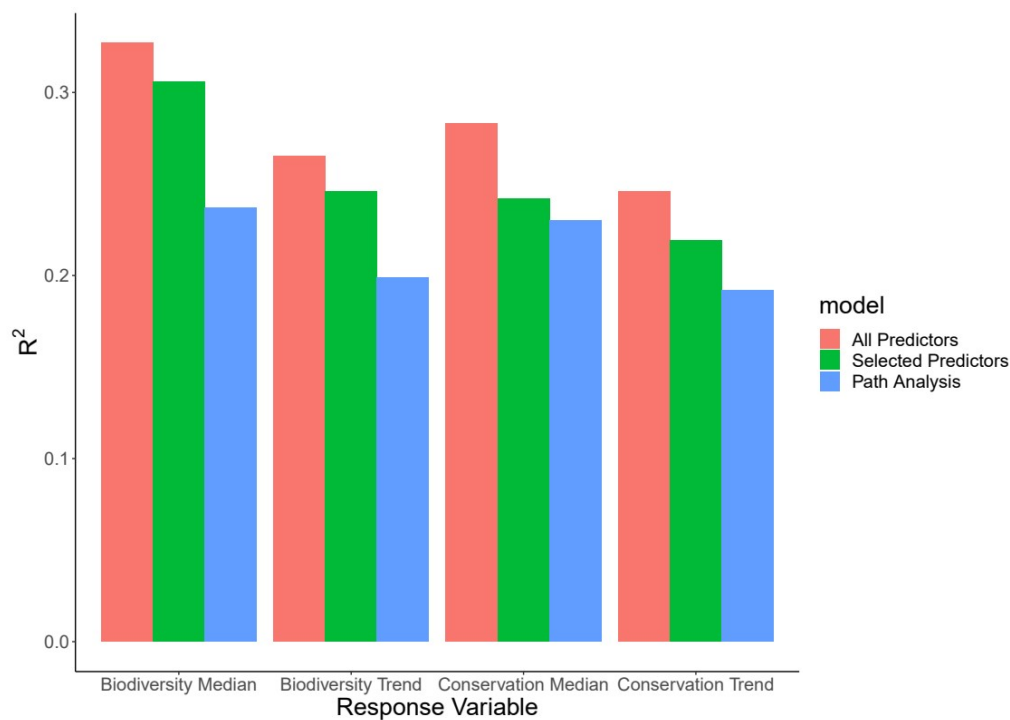


Figure S3. R^2 of three models relating trend and median interest in biodiversity and conservation between 2013 and 2020 for 193 United Nations member states to country-level variables. First model used all available variables. Second model used only variables selected with a multi-model inference approach (Figure S3). Third model was a Path Analysis with only variables that had significant paths (Figure 4). Interest was gauged as relative search volumes at Google search engine. Trend was obtained as the median coefficient for a linear increase in a Bayesian Structural Time Series model (Table S1). Complete list of search terms in Supplementary Material. Complete list of variables and sources in Supplementary Material.

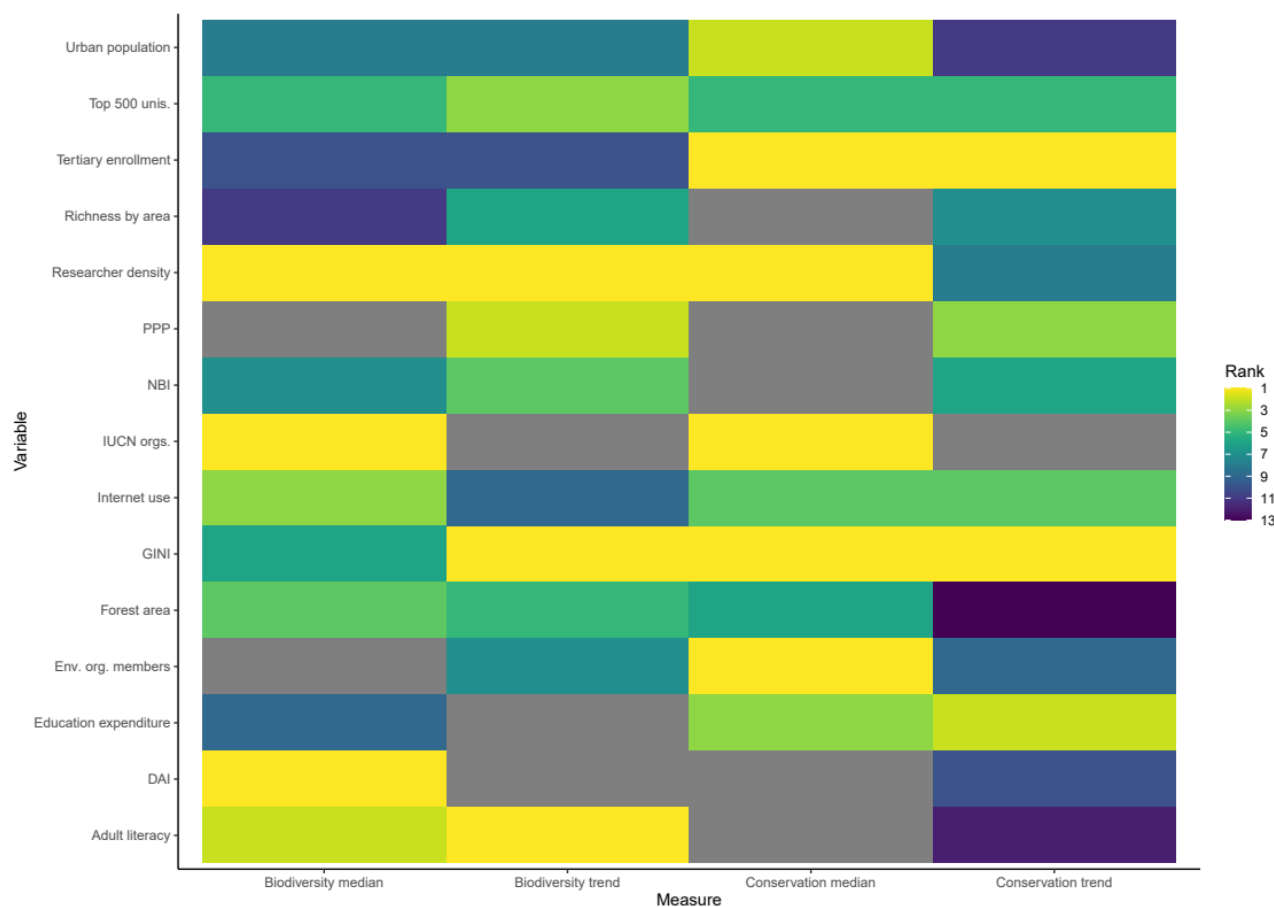


Figure S4. Importance rank of country-level variables for trend and median interest in biodiversity and

conservation between 2013 and 2020 for 193 United Nations member states. Interest was gauged as relative search volumes at Google search engine. Trend was obtained as the median coefficient for a linear increase in a Bayesian Structural Time Series model (Table S1). Variables are labeled as follows: *NBI* - National Biodiversity Index; *Richness by area* - residuals of species richness per country area regression; *Forest area* - Proportion of forested area; *PPP* - Purchasing Power Parity; *GINI* - Gini Inequality Index; *Urban population* - Percentage of Urban Population; *Top 500 Unis.* - Number of Universities in Top 500 rank; *Researcher density* - Number of researchers per million inhabitants; *Adult literacy* - Adult literacy rate; *Tertiary enrollment* - Tertiary enrollment rate; *Education expenditure* - Expenditure on primary education; *Internet use* - Percentage of population using internet; *DAI* - Digital Access Index; *IUCN orgs.* - Number of IUCN member organizations; *Env. org. members* - Number of Environmental Organization Members. Complete list of search terms in Supplementary Material. Complete list of variables and sources in Supplementary Material.

List of search terms by category:

Biomes:

"Tropical and subtropical moist broadleaf forests", "Tropical and subtropical dry broadleaf forests", "Tropical and subtropical coniferous forests", "Temperate broadleaf and mixed forests", "Temperate coniferous forests", "Boreal forests/taiga", "Tropical and subtropical grasslands, savannas, and shrublands", "Temperate grasslands, savannas, and shrublands", "Flooded grasslands and savannas", "Montane grasslands and shrublands", "Tundra", "Mediterranean forests, woodlands, and scrub", "Sclerophyll forests", "Deserts and xeric shrublands", "Mangrove"

Biodiversity Concepts:

"Biodiversity", "Nature", "Natural environment", "Natural resources", "Sustainability", "Biome", "Ecosystem", "Species", "Fauna", "Flora", "Extinction", "Genetic diversity", "Pollution", "Overexploitation", "Habitat loss", "Habitat fragmentation", "Land use change", "Alien species", "Invasive species", "Climate change"

Conservation actions:

"Protected area", "National park", "Nature Reserve", "Wilderness Area", "Natural Monument", "Habitat restoration", "Species reintroduction", "Ex situ conservation", "Captive breeding", "Seed bank", "Environmental education", "Environmental awareness", "Environmental legislation", "Environmental law", "Environmental policy", "Green economy", "Payments for ecosystem services", "Ecotourism", "Protected landscape area", "Marine protected area", "Endangered species recovery plan", "Wildlife conservation", "Wildlife corridor", "Environmental resource management", "Forest management", "Species translocation", "Wildlife management"

Taxa (see spreadsheet "taxa_codes.csv" in electronic supplementary material for more details):

"aardwolf", "abies lasiocarpa", "acanthopteroctetes bimaculata", "acanthurus lineatus", "acari", "accipiter", "acerodon", "acorus calamus", "acragas (spider)", "actinopterygii", "adelomyrmex tristani", "adiantum capillus-veneris", "aedes aegypti", "aedes albopictus", "aenictus dentatus", "aenictus fuscovarius", "aesculapian snake", "african buffalo", "african bush elephant", "african civet", "african elephant", "african fish eagle", "african golden cat", "african golden wolf", "african leopard", "african rock python", "agaricus", "ahaetulla fronticincta", "alexandrine parakeet", "alligatoridae", "aloe", "alosa", "alpaca", "alpine ibex", "amanita muscaria", "amaranth", "amblyopone sakaii", "american bison", "american coot", "american mink", "amphibian", "amphimallon solstitialis", "amur bitterling", "amur leopard", "anatidae", "anchovy", "andean condor", "andrographis paniculata", "angola colobus", "anisakis", "annelid", "anodontostoma chacunda", "anous", "anser (bird)", "anseriformes", "anteater", "antlion", "ape", "apocrita", "arabian leopard", "arabian oryx", "arachnid", "araneus diadematus", "araucaria angustifolia", "araucaria heterophylla", "arctic char", "arctic fox", "arctic tern", "argiope bruennichi", "argyrosomus regius", "armadillo", "arthropod", "ascaris lumbricoides", "ascidiacea", "asian black bear", "asian elephant", "asian giant hornet", "asian golden cat", "asian hornet", "asian palm civet", "asian swamp eel", "asiatic lion", "asplenium dimorphum", "atlantic bonito", "atlantic cod", "atlantic mackerel", "atlantic salmon", "auricularia auricula-judae", "axolotl", "aylacostoma chloroticum", "baboon", "bactrian camel", "baiji", "banded krait", "bandwing", "banteng", "bar-headed goose", "bar-tailed godwit", "barn owl", "basking shark", "bat", "bear", "bearded seal", "bearded vulture", "bedriaga's rock lizard", "bee", "bee hummingbird",

"bee-eater", "beech marten", "beetle", "beluga (sturgeon)", "beluga whale", "bengal tiger", "bird", "bird-of-paradise", "bison", "bitis", "black caiman", "black drongo", "black fly", "black mamba", "black rhinoceros", "black seabream", "black-backed jackal", "black-crowned night heron", "black-tailed godwit", "black-winged stilt", "blackbuck", "blacktip reef shark", "blattodea", "blue bird-of-paradise", "blue duiker", "blue monkey", "blue whale", "blue-ringed octopus", "boa constrictor", "bobcat", "boletus edulis", "bombay duck", "bombyx mori", "bonobo", "bos", "botfly", "bovidae", "bowhead whale", "brazilian porcupine", "broad-billed sandpiper", "bronchocela jubata", "brookesia micra", "brown bear", "brown pelican", "brown rat", "brown recluse spider", "brown trout", "buccinum undatum", "bulbul", "bull shark", "bull-headed shrike", "bumblebee", "buru babirusa", "bushpig", "bustard", "buteo", "caelifera", "camel", "camelidae", "canada goose", "canada lynx", "canidae", "cannonball jellyfish", "cantharellus cibarius", "capelin", "capreolus", "caprimulgus", "capybara", "carabao", "caracal", "Carangidae", "carex", "carpenter ant", "carpenter bee", "caspiian seal", "caspiian tern", "castoridae", "cattle egret", "cedrus", "cedrus libani", "centaurea", "centipede", "cephalopod", "cephalotes rohweri", "cerastes cerastes", "ceratopogonidae", "cervus", "cestoda", "cetacea", "cetoscarus bicolor", "chameleon", "chamois", "channa striata", "charadrii", "cheetah", "chilean recluse spider", "chimpanzee", "chinchilla", "chondrichthyes", "chrysopidae", "chum salmon", "cicada", "cicadidae", "ciconia", "ciconiiformes", "cimex lectularius", "citrus unshiu", "clarias", "clarias gariepinus", "cnidaria", "coccinella septempunctata", "coccinellidae", "cockatiel", "cockchafer", "coconut crab", "coelacanth", "coelenterata", "colombian four-eyed frog", "colorado potato beetle", "colossal squid", "colugo", "columbidae", "common blackbird", "common buzzard", "common carp", "common crane", "common cuckoo", "common cuttlefish", "common eland", "common emerald dove", "common goldeneye", "common kestrel", "common kingfisher", "common ling", "common moorhen", "common octopus", "common ostrich", "common pheasant", "common pochard", "common quail", "common rudd", "common sandpiper", "common swift", "common tern", "common wood pigeon", "conifer", "coraciidae", "coregonus", "coregonus lavaretus", "cougar", "coyote", "coypu", "crab", "crane (bird)", "crane fly", "crataegus", "craterellus tubaeformis", "crested ibis", "crested porcupine", "crocodile", "crocodilia", "crocodylidae", "crossandra infundibuliformis", "crustacean", "ctenophora", "cuckoo", "cupressaceae", "cycas revoluta", "cydalima perspectalis", "cynodon", "cyprinidae", "dacrycarpus imbricatus", "dacrydium cupressinum", "dama (genus)", "damselfly", "daphnia", "dasyuromorphia", "decapodiformes", "deer", "desert death adder", "dhole", "didelphimorphia", "didelphis", "dingo", "diospyros", "diplazium australe", "dodo", "domestic pig", "domestic yak", "dragonfly", "drongo", "drosophila", "dryococelus australis", "dugong", "dynastinae", "eared seal", "earless seal", "earthworm", "eastern chimpanzee", "eastern imperial eagle", "ecdysozoa", "echinoderm", "edible dormouse", "eel", "egretta", "egyptian vulture", "elephant seal", "elephantidae", "elk", "emperor goose", "ephedra (plant)", "equus (genus)", "equus asinus", "erinaceidae", "euarchontoglires", "eunectes", "euphorbiaceae", "eurasian bittern", "eurasian coot", "eurasian eagle-owl", "eurasian hoopoe", "eurasian lynx", "eurasian otter", "eurasian oystercatcher", "eurasian scops owl", "eurasian sparrowhawk", "eurasian teal", "european anchovy", "european badger", "european bee-eater", "european bison", "european eel", "european golden plover", "european hare", "european hedgehog", "european honey buzzard", "european hornet", "european mantis", "european mole", "european nightjar", "european pied flycatcher", "european pine marten", "european polecat", "european pond turtle", "european rabbit", "european shag", "eutropis multifasciata", "even-toed ungulate", "fagopyrum", "falcon", "fallow deer", "felidae", "felis", "fennec fox", "ferret", "figus", "fieldfare", "fiji goshawk", "fiji parrotfinch", "fiji woodswallow", "fir", "fire salamander", "firefly", "flamingo", "flathead grey mullet", "flatworm", "flax", "fly", "flying fish", "flying squirrel", "formica", "formica rufa", "formicidae", "formosan clouded

leopard", "francolinus", "frog", "fruit dove", "fungus", "galliformes", "gambusia", "ganoderma lucidum", "garcinia", "garganey", "gastropoda", "gazelle", "gekkonidae", "giant barb", "giant mottled eel", "giant oarfish", "giant panda", "gibbon", "gilt-head bream", "ginkgo biloba", "giraffe", "gnetum gnemon", "goitered gazelle", "golden eagle", "golden jackal", "golden lion tamarin", "golden mole", "goliath birdeater", "gorilla", "grass snake", "gray whale", "great auk", "great black-backed gull", "great bustard", "great cormorant", "great hornbill", "great indian bustard", "great spotted woodpecker", "great white shark", "greater cane rat", "greater coucal", "greater flamingo", "greater kudu", "green anaconda", "green humphead parrotfish", "green pheasant", "green sea turtle", "green whip snake", "greenland shark", "griffon vulture", "grivet", "grizzly bear", "groundhog", "grouse", "gryllidae", "gryllotalpa gryllotalpa", "guinea pig", "guineafowl", "guppy", "gymnosperm", "Gypinae", "hamlyn's monkey", "hamster", "haplorhini", "harbour porpoise", "harpy eagle", "hawaii mamo", "hawaiian monk seal", "hazel grouse", "helix pomatia", "helmeted guineafowl", "hemibagrus", "hermann's tortoise", "hermit crab", "heron", "heteroptera", "high brown fritillary", "himalayan goral", "himalayan monal", "hominidae", "homo", "honey badger", "honey bee", "hoopoe", "horned lizard", "hornet", "horse-fly", "horseshoe crab", "house mouse", "housefly", "huia", "hummingbird", "hummingbird hawk-moth", "humphead wrasse", "hunterman spider", "hyacinth macaw", "hyalonema", "hydnum repandum", "hyena", "hymenoptera", "hypsogastropoda", "hyrax", "iberian lynx", "iguana", "iguanidae", "ilish", "illicium anisatum", "impala", "indian mackerel", "indian peafowl", "indian pond heron", "indian rhinoceros", "indo-pacific humpback dolphin", "indo-pacific king mackerel", "indochinese leopard", "indri", "insect", "irrawaddy dolphin", "ixodes ricinus", "ixora", "jaguar", "japanese bush warbler", "japanese cormorant", "japanese rat snake", "japanese rhinoceros beetle", "japanese sea bass", "japanese wolf", "javan rhinoceros", "jungle cat", "juniper", "juniperus communis", "kakapo", "kaluga (fish)", "kea", "killer whale", "king cobra", "kingfisher", "kiwi (bird)", "klipspringer", "koala", "koel", "komodo dragon", "kouprey", "l'hoest's monkey", "lactarius deliciosus", "lake trout", "lake whitefish", "lamprey", "larch", "laridae", "latrodectus", "latrodectus mactans", "latrodectus tredecimguttatus", "laughing dove", "layard's parakeet", "least weasel", "leatherback sea turtle", "leech", "lemuriformes", "leopard", "leopard cat", "leopard flounder", "lepidoptera", "leptogenys", "lesser black-backed gull", "lesser mouse-deer", "light-crowned spinetail", "lion", "lipoptena cervi", "little grebe", "llama", "loggerhead sea turtle", "long-tailed duck", "lophius piscatorius", "louse", "lovebird", "lowland anoa", "lowland paca", "lucanus cervus", "lumbricidae", "lumbricus terrestris", "macaque", "mackinlay's cuckoo-dove", "macrolepiota procera", "macropodidae", "magnoliopsida", "mainland serow", "malapterurus electricus", "malayan night heron", "malayan tapir", "maleo", "mallard", "malvaceae", "mamushi", "manatee", "mandarin duck", "mandarin orange", "maned wolf", "manis", "mantis", "mantis shrimp", "marimo", "marmot", "marsupial", "marten", "masked palm civet", "mayfly", "mediterranean recluse spider", "melipona", "melolontha", "merluccius merluccius", "merops (genus)", "microbat", "milkfish", "mojarra", "mole cricket", "mollusca", "momordica charantia", "monarch butterfly", "monitor lizard", "monocotyledon", "monotreme", "moorish idol", "moose", "moose", "moraceae", "morus (plant)", "moschidae", "mosquito", "moss", "mountain gorilla", "mugger crocodile", "mullus barbatus", "muntingia", "muntjac", "muscovy duck", "muskox", "muskrat", "mustelidae", "mute swan", "myrtus communis", "mytilus (bivalve)", "naja", "naked mole-rat", "narwhal", "nauru reed warbler", "nematocera", "nematode", "neoptera", "NewZealandpigeon", "new zealand kaka", "nile crocodile", "nile monitor", "nile tilapia", "north american beaver", "north american porcupine", "northern bobwhite", "northern common cuscus", "northern fulmar", "northern gannet", "northern giraffe", "northern goshawk", "northern pike", "northern pintail", "nudibranch", "nymphaea", "oak processionary", "oceanic whitetip shark", "ocelot", "octopus", "odd-toed ungulate", "odonata", "ohrid trout", "okapi", "old world porcupine", "olive fruit fly",

"ommatrephidae", "onchilla", "ophiocordyceps sinensis", "opiliones", "opossum", "orangutan", "orchidaceae", "oriental stork", "osprey", "osteichthyes", "ostreidae", "ostrich", "ovis aries", "owl", "pacific black duck", "pallas's cat", "palystes superciliosus", "panax", "pangolin", "papilio hospiton", "papilio machaon", "parrot", "passerine", "pelecanidae", "pelican", "penguin", "pentatomoidea", "perch", "peregrine falcon", "pericoma", "persian leopard", "phasianidae", "phasmatodea", "philippine eagle", "philippine tarsier", "phlebotomus", "pholcidae", "phoneutria", "phyllophaga", "picea abies", "Picus", "pied crow", "pig", "pinaceae", "pine", "pine processionary", "pink-backed pelican", "pinniped", "pinus contorta", "pinus gerardiana", "pinus morrisonicola", "pinus peuce", "pinus ponderosa", "pinus sylvestris", "pinworm", "plains zebra", "plant", "platypus", "pleurotus ostreatus", "podocarpus totara", "polar bear", "polynesian rat", "polyrhachis", "pomacanthidae", "porpoise", "portuguese man o' war", "precious coral", "primate", "prionailurus", "proboscidea", "proboscis monkey", "procamburus clarkii", "przewalski's horse", "pseudotolithus", "psidium", "psilocybe cubensis", "psilocybe semilanceata", "psittacidae", "pteridaceae", "pteridophyte", "pteropus", "puff adder", "purple heron", "pyrrhocoris apterus", "pythonidae", "quokka", "raccoon", "raccoon dog", "radiata", "rajiformes", "rattus", "red deer", "red fox", "red imported fire ant", "red junglefowl", "red king crab", "red kite", "red panda", "red panda", "red phalarope", "red squirrel", "red-billed blue magpie", "red-eared slider", "red-headed parrotfinch", "red-necked phalarope", "red-wattled lapwing", "redwing", "reeves's muntjac", "reindeer", "reptile", "rhabdophis tigrinus", "rhinoceros", "rhinopias", "ring-tailed cat", "ringed seal", "roadrunner", "rock dove", "rock ptarmigan", "rodent", "roe deer", "rohu", "rose", "rose-ringed parakeet", "ross's turaco", "roti island snake-necked turtle", "rove beetle", "rubiaceae", "rubroboletus satanas", "ruddy shelduck", "russell's viper", "rusty-necked piculet", "rusty-spotted cat", "saccharomyces cerevisiae", "saimaa ringed seal", "saker falcon", "salamander", "salmonidae", "sand cat", "sandpiper", "sandwich tern", "sarcophaga scabiei", "sarus crane", "scallop", "scalloped hammerhead", "scarabaeidae", "schisandraceae", "schlegel's japanese gecko", "sciaenidae", "sciurus", "scolopendra", "scombridae", "scorpion", "scrub hare", "scutigera coleoptrata", "scutigera", "scutigera", "sea cucumber", "sea turtle", "sea urchin", "seahorse", "sequoia sempervirens", "serinus", "serval", "sesamum", "shark", "sheltopusik", "shiitake", "shikra", "shoebill", "siamese fighting fish", "siberian crane", "siberian jay", "sibynomorphus mikanii", "silurus", "silver gull", "silverfish", "simian", "sirenia", "sitatunga", "skipjack tuna", "sloth", "slow worm", "smalltooth sawfish", "snow leopard", "snowy owl", "southern african hedgehog", "southern screamer", "spectacled bear", "sperm whale", "spermatophyte", "spider", "spiny babbler", "spiny lobster", "sponge", "spotted hyena", "spotted owl", "spruce", "squid", "squirrel", "squirrel cuckoo", "sri lanka spurfowl", "sri lankan junglefowl", "sri lankan leopard", "starfish", "starling", "steller's sea cow", "stenochlaena palustris", "steppe eagle", "stingless bee", "stingray", "stitchbird", "stoat", "stork", "sucking louse", "sugar glider", "suidae", "sumatran tiger", "sun bear", "sunda pangolin", "swallow", "swordfish", "taenia (tapeworm)", "taenia saginata", "taiwan blue magpie", "tamaraw", "tamias", "tanganyika killifish", "tanna fruit dove", "tanna japonensis", "tapirus kabomani", "tarantula", "taraxacum", "tardigrade", "tasmanian devil", "tawny owl", "taxus baccata", "tench", "termite", "tetraodontidae", "theria", "thrush nightingale", "thunnus", "thylacine", "thymallus thymallus", "tibetan blue bear", "tick", "tiger", "tiger shark", "tipuloidea", "tityus serrulatus", "tockus", "tokay gecko", "tongan megapode", "tonguefish", "tortoise", "toucan", "tragelaphus", "treeshrew", "trionychidae", "tropical house gecko", "tropical mockingbird", "true frog", "true owl", "true parrot", "true toad", "tsetse fly", "tuber (fungus)", "tui (bird)", "turbinella pyrum", "turbinidae", "turkey (bird)", "turkey vulture", "turridae", "turtle", "tylopilus felleus", "ural owl", "uromastix", "vanuatu flying fox", "varanus timorensis", "vascular plant", "velella", "venezuelan toupial", "vespidae", "vespinae", "vicuña", "vipera", "vipera ammodytes", "vipera aspis", "vipera berus", "wagtail", "walrus",

"wattled jacana", "weasel", "wedge-tailed shearwater", "weka", "wels catfish", "west african slender-snouted crocodile", "western bearded greenbul", "western black-eared wheatear", "western capercaillie", "western honey bee", "whale shark", "white stork", "white-breasted waterhen", "white-browed robin-chat", "white-cheeked starling", "white-tailed deer", "white-tailed eagle", "white-throated kingfisher", "whitetip reef shark", "whooper swan", "wild boar", "wild goat", "wild horse", "wild turkey", "wild water buffalo", "wild yak", "wildcat", "winter white dwarf hamster", "wolf", "wolf spider", "wolverine", "woodlouse", "woodpecker", "woodwardia radicans", "xenarthra", "yellow perch", "yellow-backed duiker", "yellow-eyed penguin", "yellow-legged gull", "yellowtail amberjack", "yellowtail snapper", "zander", "zanzibar leopard", "zebra"

List of variables by category:

Biodiversity

1. National Biodiversity Index (Convention on Biological Diversity, 2011)
2. Richness~Area residuals (Roll et al, 2009)
3. Proportion of forested area (Food and Agriculture Organization, 2020)

Economy

4. Purchasing Power Parity (World Bank, 2020)
5. Gini Inequality Index (World Bank, 2020)

Demography

6. Percentage of Urban Population (World Bank, 2020)

Research

7. Number of Universities in Top 500 rank (Shanghai ranking, 2020)
8. Number of researchers per million inhabitants (United Nations Educational, Scientific and Cultural Organization, 2018)

Education

9. Adult literacy rate (United Nations Educational, Scientific and Cultural Organization, 2021)
10. Tertiary enrollment rate (United Nations Educational, Scientific and Cultural Organization, 2021)
11. Expenditure on primary education (United Nations Educational, Scientific and Cultural Organization, 2020)

Internet use

12. Percentage of population using internet (International Telecommunication Union, 2015)
13. Digital Access Index (International Telecommunication Union, 2003)

Environmental organizations

14. Number of IUCN member organizations (Yale University, 2005)
15. Number of Environmental Organization Members (Yale University, 2005)