

PERSPECTIVE OPEN ACCESS

Languages of Life: A Global Perspective on Linguistic Priorities for Biodiversity Conservation

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ABSTRACT

Multilateral environmental agreements (MEAs) play a pivotal role in fostering coordinated actions among nations to mitigate biodiversity loss. However, language barriers hamper the participation of actors in policy negotiations and potentially also in the implementation of decisions made internationally. Using IUCN Red List species distribution data, we assessed the relative importance of languages for global biodiversity policy. We found that the most widely distributed species are associated with Spanish, English, Portuguese, French, and Malay, considering the official languages of countries. The pattern differs when examining most spoken languages, with English and French losing importance. Our findings suggest the languages adopted by major MEAs and other global policy fora do not properly cover those spoken where most biodiversity is distributed. We propose a four-tier priority system that can be used to select how MEAs and other fora prioritize key documents for translation into priority languages like Portuguese and Malay, which are currently largely ignored.

1 | Introduction

The natural world does not follow political boundaries, making most of the environmental challenges transboundary (Thool 2022). Accordingly, concerted policies for the conservation of biological diversity across nations are critical to mitigate the current extinction crisis. Multilateral environmental agreements (MEAs) assume a pivotal role in fostering such cooperative and coordinated endeavors among countries (Steiner et al. 2003; Velázquez-Gomar 2016). MEAs, and also other global science, technical, and policy fora, play a crucial role in enhancing accountability regarding political commitments and elevating global standards in biodiversity conservation (Steiner et al. 2003), and often foster the exchange of technical and scientific expertise as well as lessons learned (Koetz et al. 2008).

Regarding these agreements, many of them—for example, the Convention on Biological Diversity (CBD), as well as other international treaties focused on biodiversity, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Migratory Species of Wild Animals (CMS), and the Ramsar Convention on Wetlands—have dedicated technical and scientific bodies that provide advice and guidance to support Parties in interpreting and operationalizing decisions under these agreements. While formal support for implementation is largely coordinated by the MEAs' secretariats, the technical bodies also play a key role in informing implementation resources and practices. MEAs tend to generate a wealth of resources (e.g., handbooks, tools, and guidelines), which are useful to guide in-country planning and implementation by Parties. Of these, CBD—one of the MEAs with the widest

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global membership (196 Contracting Parties)—stands out as the “umbrella” international legal instrument for conservation and sustainable use of biodiversity. It has recently adopted the Kunming–Montreal Global Biodiversity Framework (GBF) (CBD decision 15/4 of 2022), which charts a global vision for living harmoniously with nature by 2050.

Despite formal research into this topic being scarce, it is increasingly acknowledged that the language barriers are a key obstacle to the design and implementation of MEAs (Burgass et al. 2021; Negret et al. 2022; Steiner et al. 2003; United Nations 2023).

Multilingualism is recognized globally as a cornerstone of effective diplomacy, with the UN affirming it as a fundamental value and enabler of multilateral cooperation (United Nations General 2022). This supports the premise that language accessibility is central—not peripheral—to the success of multilateral environmental governance. At the regional level, the Southern African Development Community (SADC) identifies language barriers as impediments to participation in international processes, including MEA-related meetings (SADC 2023). Within MEAs themselves, several have made explicit efforts to overcome such barriers. For instance, CITES has debated expanding its working languages to improve diplomatic engagement and implementation, with a formal decision in 2019 directing the Standing Committee to consider adding Arabic, Chinese, and Russian (CITES 2022). Similarly, the Ramsar Convention adopted a language strategy in 2018 to progressively include Arabic, reflecting growing participation from Arabic-speaking countries (Ramsar Convention 2018). These examples demonstrate that language accessibility is increasingly treated as a structural enabler of participation and effectiveness in MEA governance.

Yet, language-related challenges appear at multiple scales. First, it can hamper the full and informed participation in international negotiations, which impacts the ability of different actors to shape policies. While many international conventions sometimes translate documents in languages other than English and offer simultaneous interpretation during plenary and working group sessions, this service is limited and typically restricted to English, French, or Spanish. Although some exceptions exist—such as the CBD, which uses all six official UN languages—these arrangements still exclude some of the most spoken languages worldwide. Furthermore, a substantial portion of negotiations takes place in informal settings outside these interpreted sessions, including contact groups and “friends of the chair” meetings. These smaller discussions, where English is often the only language used, are where many of the substantive elements of decisions are negotiated. Consequently, countries without English-fluent representatives are effectively excluded from participating fully in these critical stages of the decision-making process, which perpetuates inequalities (Maas et al. 2021; Ramírez-Castañeda 2020). Second, it can pose a barrier to communication between policy makers (Kellenberg and Levinson 2014) as well as between policy makers and scientists, consequently impacting the design of national, evidence-led policy (Rose et al. 2018). Lastly, and arguably more critically, language barriers limit the ability of in-country staff at the national, regional, and local level to understand the technical, scientific, and legal documentation generated by different MEAs, which is crucial for implementation on the ground by Parties (Rose et al. 2018). Beyond practical

challenges for policy implementation, linguistic dominance in multilateral fora reflects deeper structural inequalities. Language regimes shape whose knowledge, perspectives, and priorities are heard and acted upon, making this an issue not only of operational effectiveness but also of equity and justice (Fricker 2007).

The critical importance of successfully navigating the complexities associated with linguistic diversity in international policy has for a long time been acknowledged in diplomatic circles. For instance, during its inaugural session in 1946, the United Nations General Assembly dedicated its second resolution to the vital issue of language, recognizing the integral role that multilingualism plays as both an enabler and a prerequisite for effective multilateralism (United Nations 2023). This commitment was further underscored by the United Nations resolution (A/75/1009) in 2021, which unequivocally affirmed that “*multilingualism is a guarantor of a fair and renewed multilateralism*” (United Nations 2023). The majority of biodiversity-related Conventions operate under the auspices of the United Nations. Consequently, they have overwhelmingly adopted either all of the six UN official languages or the triad of English, Spanish, and French, excluding Russian, Arabic, and Chinese. Following suite, other non-UN global fora tend to use the same set of languages (e.g., IUCN World Conservation Congress). It is worth noting that the set of languages adopted by the Conventions are not necessarily based on their particular objectives or geographical areas covered. Consequently, the official working languages of most MEAs did not take into account the languages spoken in highly biodiverse areas, or those hosting the most threatened taxa.

Using an analysis of the distribution of species and the official and most spoken languages of each country of the globe, this paper assesses the relative importance of different languages for the international biodiversity conservation efforts. We aim to understand if the current official languages of the biodiversity-related Conventions, including the CBD and the new Global Biodiversity Framework, as well as in other global biodiversity-related fora, serve the global conservation community with the appropriate linguistic means to inform and support their effective implementation by national governments.

2 | What Are the Languages of Biodiversity?

We estimated the relative importance of different languages for global biodiversity policy based on the range maps of species from the IUCN Red List (IUCN 2022). We focused on animal taxa with virtually complete Red List assessments: mammals, birds, reptiles, amphibians, and corals ($n = 33,323$), for which there exist relatively accurate distribution maps publicly available. These are the same taxa (excluding reptiles for which the assessment was only recently concluded) used to estimate the Red List Index (RLI) indicator, part of the monitoring of the UN’s Strategic Development Goals (Butchart et al. 2025).

We calculated the proportion of the distribution of each species in each country following the methods used for RLI calculations, which consider both the terrestrial and marine distribution of the species. This approach overlaps the polygons representing the distribution of each species (in shapefile format, obtained from the

IUCN database; <https://www.iucnredlist.org/resources/spatial-data-download>), with the polygons representing the borders of each country (terrestrial borders obtained from GADM layer, freely available at <https://gadm.org/data.html>; Exclusive Economic Zones borders obtained from Flanders Marine Institute, freely available at <https://www.marineregions.org/downloads.php>). The codes used (written in R language) are available at <https://github.com/BirdLifeInternational/rli-codes>.

We then considered the (1) most spoken language (i.e., spoken by the largest percentage of the population) and (2) official language (i.e., used for governmental or legal purposes) of each country, using in both cases the tables provided as supplementary material by Negret et al. (2022) and publicly available at <https://doi.org/10.1371/journal.pone.0267151.s001>. It is worth noting that a country can have more than one official language, but only one as the most spoken as per Negret et al. (2022). We finally estimated the percentage of “species distributions” associated with each language (P_L) by summing the proportion of each species’ range found in all countries where that language is either official or the most widely spoken (spp_c). This was done across all such countries for each language (i.e., $P_L = \sum spp_c$). Therefore, our analyses take into account the relative distribution of a species by different countries, as used to estimate the RLI at the national level (Dias and Simkins 2020; Rodrigues et al. 2014).

Our analysis revealed that globally, and when considering official languages, Spanish and English were associated with the greatest number of species, followed by Portuguese, French, and Malay. Spanish and English cover about 25% of the distribution of the species assessed, followed by Portuguese and French, which cover about 10% of the distribution of the species each, slightly more than Malay. When we consider the most spoken language, both English and French lose substantial importance (even though the latter is likely to be more relevant in a policy context). While English remains the second most important language, French drops to less than 3%, no longer being part of the top five (Figure 1).

When breaking the official languages down by taxa, we see that mammals, birds, reptiles, and amphibians have largely similar patterns, with English and Spanish taking precedence, followed by Portuguese, French, and Malay, albeit in varying order. In contrast, corals exhibit a distinct pattern, being the only group where Latin languages do not hold a prominent position, and where Filipino and Arabic are part of the top five (Figure 2).

3 | Speaking the Language of Biodiversity

Our findings strongly suggest that the set of six languages of countries with the highest biodiversity does not align with either the six official UN languages or those used by other non-UN-related biodiversity Conventions. For instance, Portuguese and Malay surpass Russian and Arabic in terms of relevant languages in countries associated with the most species distributions. This is not surprising, as Portuguese is the official language of nine countries spanning multiple continents, including South America (Brazil), Africa (Angola, Mozambique, Guinea-Bissau, Equatorial Guinea, Cabo Verde, São Tomé, and Príncipe), Europe (Portugal), and Asia (East Timor); Malay, on the other hand,

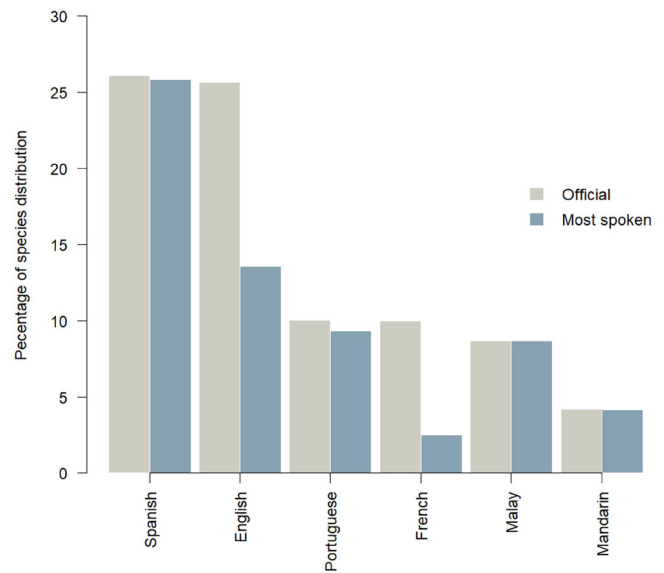


FIGURE 1 | The five languages associated with the global distribution of most species of mammals, birds, reptiles, amphibians, and corals, according to the official and most spoken languages of countries within the species range. These data identify which languages are most frequently associated with species’ distributions and can therefore inform prioritization of language accessibility in biodiversity-related guidance and policy instruments.

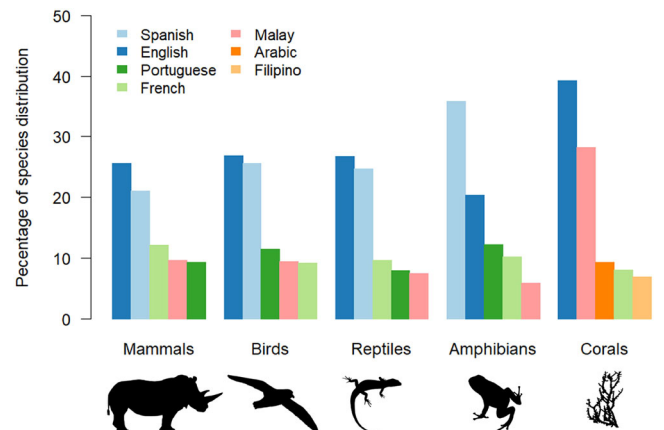


FIGURE 2 | Official languages associated with the most species distributions globally per taxa: mammals, birds, reptiles, amphibians, and corals. The variation across taxa highlights the need for a targeted approach to language accessibility, particularly in technical guidance addressing specific species groups.

is spoken in mega-diverse nations, but these nations are more clustered around the globe. In our analysis, Portuguese outranks even French, one of the three languages often selected as working or official language in biodiversity-related Conventions.

When interpreting the results of our analysis, it is relevant to consider not only the overall uneven distribution of biodiversity worldwide but also the distribution of specific taxa. To illustrate this point, we can examine the distribution of coral species. Coral diversity is notably highest in the Western Pacific Ocean, particularly in a region called the “Coral Triangle,” encompassing

waters from Malaysia, Indonesia, the Philippines, East Timor, and Papua New Guinea. Hence, Malay is highly relevant when considering languages for this group.

Our analyses, based on the species distribution ranges used to produce the IUCN RL of threatened species, show two non-UN system languages as highly relevant for biodiversity: Portuguese and Malay. Moreover, Portuguese was also found to have the third largest academic literature in biodiversity conservation, exhibiting a particularly rapid increase (Amano et al. 2021; Amano et al. 2016). Nonetheless, we note that, this being a global analysis, it does not preclude the importance of languages with narrower distributions that may be important at regional or local scales.

4 | Overcoming Language Barriers

The United Nations, with its near global membership, has a political mandate to foster cooperation, maintain peace, and pursue other laudable objectives. The UN official languages were selected based on a variety of reasons that spanned from a political leadership of member countries to the number of countries using a particular language or the sheer number of speakers (United Nations 2023).

The UN system comprises over 30 affiliated organizations, including funds, programs, and specialized agencies, each with its own specific mandate and focus. As a global organization, it is not surprising that there is a need for the adoption of a rather small selection of languages for efficient operation. Adopting more languages would incur increased financial costs related, among others, to translation, interpretation, or verbatim reporting. Although we appreciate the relation between languages and operational efficiency and costs of an international body, we propose that the selection of language(s) used by an international body, particularly MEAs, could also consider its subject matter and objectives. As our study demonstrates, the languages used in biodiversity-rich countries, both in terms of richness and need for conservation (e.g., RLI of threatened species), do not align with the six languages officially adopted by the UN and the key biodiversity-related Conventions.

We are not necessarily advocating for the addition of working language(s). Instead, we suggest that the political criteria typically used to guide selection of languages for translation or interpretation could be complemented by biodiversity-based considerations, in a tiered system, where, for example, translation of key documents into languages associated with countries or regions that host a disproportionate share of global biodiversity would be also recognized as a need.

To operationalize this system, we suggest a four-tier prioritization model informed by de Swaan (2001): (1) lingua francas such as English and French, (2) UN official or MEA-recognized languages, (3) biodiversity-priority languages like Portuguese and Malay—based on the spatial distribution of species—and (4) local and Indigenous languages critical for subnational implementation. This approach balances geopolitical norms with ecological relevance and practical engagement needs and could

support MEAs and partners in targeting translation efforts more effectively.

For instance, Parties of a biodiversity-related Convention could choose to translate into Portuguese and Malay all or the most critical or taxa-relevant, technical–scientific guidance (e.g., Malay, when addressing coral reefs) produced by or with the participation of that body. Translation responsibilities could be shared across institutional levels: MEA Secretariats may coordinate and/or contribute to the process, while funding could be provided through voluntary Party contributions or earmarked in the official MEA budget. NGOs, national governments, and CBD-selected regional centers or others could support decentralized translation and review, particularly for technical guidance aimed at national implementation.

Biodiversity-related Conventions produce a wealth of guidance, tools, and methodologies (e.g., CBD Technical Series, Ramsar Handbooks for the Wise Use of Wetlands). These materials are not to be solely used by the negotiators who attend policy or scientific meetings of these bodies and who are expected to have a certain level of knowledge of one of the three or six official languages of the treaty. Instead, they are particularly tailored for practitioners working on the ground to contribute to achieve the global biodiversity conservation commitments, as shown by the fact that most literature cited in national biodiversity assessments was in languages other than English (Amano et al. 2023). Hence, it is crucial that key MEA-associated literature is available at least in the most important languages to the countries hosting the greatest share of the biodiversity targeted by the particular MEA. While artificial intelligence and machine translation offer increasingly accessible tools for translating biodiversity policy materials, caution is warranted. Automated translations may misrepresent key scientific or legal concepts, particularly in documents where context is critical, a risk that may be too large to take where precision is critical. Future efforts could explore hybrid approaches that combine AI tools with expert review to enhance both efficiency and reliability in multilingual biodiversity governance. Another option, potentially complementary, is the use of crowd-sourced translations led by local networks. Such approaches can enhance contextual accuracy and promote local ownership, while also building capacity among emerging professionals.

Future research could build on our findings by systematically analyzing the linguistic composition of biodiversity-related national-level policy documents and repositories, in order to assess where language mismatches most critically impede implementation—an approach already illustrated in part by Amano et al. (2023) in the context of national biodiversity assessments. Moreover, while our analysis focuses on national-level official and most spoken languages, this approach necessarily simplifies the more complex linguistic realities within many countries. Megadiverse states can host dozens or even hundreds of regional and Indigenous languages, many of which are used in biodiversity-relevant knowledge systems and community-level governance. In such contexts, national language policy may only partially reflect the linguistic landscape that mediates on-the-ground implementation. Future work could explore how national language strategies interact with subnational linguistic diversity,

including the role of translation, interpretation, and culturally grounded communication in strengthening implementation.

The world is facing a biodiversity and climate crisis with dramatic consequences for human well-being and livelihoods. The rate of loss of biodiversity is higher than at any time in history. As stated in the recently adopted GBF (CBD decision 15/4), the success of the framework “relies on action and cooperation by all levels of government and by all actors of society”—a “whole-of-government and whole-of-society” approach.

The GBF marks a major milestone in the direction of the biodiversity conservation globally for the next decade. Its four goals and 23 actionable targets are expected to halt biodiversity loss and set nature on a path to recovery. Although this new framework contains ambitious targets, there are reasons for caution. Looking back at the Strategic Plan for Biodiversity 2011–2020 and its Aichi Biodiversity Targets, which preceded the current GBF under the CBD, none of the set targets were fully achieved. This failure has been attributed to a myriad of implementation challenges (Secretariat of the Convention on Biological Diversity 2020), with capacity constrains being one of the most significant. Providing practitioners with access to learning resources and fostering exchange opportunities are critical steps to increase capacity nationally and locally. Widening and fine-tuning the set of languages used by MEAs to the most important languages spoken in target countries is likely to empower locals to more effectively engage in biodiversity conservation efforts and, consequently, to support the achievement of global targets. An international conservation arena that truly embraces inclusivity must make greater efforts to acknowledge the rich linguistic diversity of humanity. While it may be unrealistic to expect all languages to have equal representation in materials associated with the most significant MEAs and other global fora, it is undeniable that further measures are needed to mitigate linguistic disparities that impede the attainment of their objectives.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All the data used are publicly available at <https://www.iucnredlist.org/resources/spatial-data-download> (species range maps), <https://gadm.org/data.html> (terrestrial borders of the countries), <https://www.marineregions.org/downloads.php> (marine borders of the countries), and <https://doi.org/10.1371/journal.pone.0267151.s001> (most spoken and official languages of each country). The codes used are publicly available at <https://github.com/BirdLifeInternational/rli-codes>.

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