Mapping monitoring resources to support progress tracking of global biodiversity-related commitments

Authors:

Stefanía Á. Karlsdóttir[1,2,3]*, Éilish Farrelly[1,2]*, Mike Barrett[4], Elsie McDowell[1], E.J. Milner-Gulland[1,2], Thomas B. White[1,2,5]**, Talitha Bromwich[1,2,6]**.

* Joint lead authors

** Joint last authors

Correspondence email: eilish.farrelly@biology.ox.ac.uk

Institutions:

[1] Department of Biology, University of Oxford, Oxford, UK.

[2] Leverhulme Centre for Nature Recovery, University of Oxford, Oxford, UK.

[3] University of Sydney, Sydney, Australia.

[4] WWF-UK, Woking, UK.

[5] The Biodiversity Consultancy, Cambridge, UK

[6] Smith School of Enterprise and the Environment, University of Oxford, Oxford, UK

Key words: Biodiversity commitments; Monitoring landscape; Data accessibility; Kunming-Montreal Global Biodiversity Framework; Sustainable Development Goals; Paris Agreement

Abstract

To address global biodiversity declines, governments have committed to ambitious biodiversity-related international policy goals and targets. In parallel, there has been rapid growth in datasets and monitoring resources, which has collectively increased the capacity to track progress towards these global commitments. However, a clear overview of how resources map to these commitments is lacking, leaving monitoring gaps unidentified and limiting the effective use of existing resources for tracking and assessing progress.

Here we assess coverage of the current monitoring landscape through an evidence map of the grey and scholarly literature, spanning international commitments represented by biodiversity-related goals and targets across the Global Biodiversity Framework (KMGBF), Sustainable Development Goals (SDGs), and Paris Agreement. We collate 1,008 resources, comprising 350 peer-reviewed papers and 658 other monitoring resources – including datasets, information platforms, trackers and reports – and map their relevance to 30 international commitments for biodiversity protection and recovery.

Our analysis reveals that a wealth of diverse monitoring resources exist to support progress tracking and inform decision-making towards global biodiversity-related commitments. All 30 commitments had relevant resources, indicating that a foundation for monitoring exists across all goals and targets. However, resource coverage was highly uneven, ranging from 17 to 554 resources for an individual commitment. Climate-related commitments were associated with the most monitoring resources, while commitments relating to biosafety, gender, incentive reform, and genetic resources were supported by substantially fewer resources.

This uneven distribution, together with varying resource accessibility, and limited standardisation and comparability, suggests disparities in monitoring capability for different policy areas. By presenting the current monitoring landscape in a structured format, our inventory provides a foundation for more effective use of existing resources to support ongoing global monitoring and reporting processes. Additionally, it enables practitioners to rapidly identify resources relevant to specific biodiversity-related commitments and guides future monitoring investment and action.

1. Introduction

Biodiversity continues to decline globally, largely due to human actions including land and sea use change, overexploitation, climate change, and pollution (IPBES, 2019, 2024; WWF, 2024). In response to this decline, governments have agreed to a range of global goals and targets for the protection and recovery of biodiversity through the Kunming-Montreal Global Biodiversity Framework (KMGBF), Sustainable Development Goals (SDGs) and the UNFCCC's Paris Agreement. For brevity, we refer collectively to the associated goals and targets of these internationally agreed frameworks as global biodiversity-related commitments.

Effectively tracking progress towards global biodiversity-related commitments requires structured metrics and monitoring resources - including standardised indicators, datasets, and tracking tools - that are explicitly linked to individual commitments. The KMGBF and SDGs are accompanied by monitoring frameworks that specify indicators for tracking progress towards their commitments and assessing implementation. The Paris Agreement instead relies on national reporting via the Enhanced Transparency Framework and a periodic Global Stocktake, with the temperature goal monitored scientifically. Alongside these frameworks, the past decade has seen a rapid growth in biodiversity monitoring initiatives and datasets. This has substantially improved our capacity to monitor progress against these indicators (Burgess et al., 2024; Demirel et al., 2026; Stephenson & Stengel, 2020). Progress has also been facilitated by advances in technology, availability of online data platforms, citizen science data (Danielsen et al., 2024), and has also included the application of Artificial Intelligence (AI) for data capture and processing (Pollock et al., 2025; Speaker et al., 2022; Sutherland et al., 2026).

Although the KMGBF, SDGs, and Paris Agreement differ substantially in their reporting systems, data governance arrangements, and approaches to compiling, validating, and incorporating evidence into assessments, the proliferation of biodiversity monitoring resources has strengthened the evidence base for assessing their progress. These assessments are reported through the Convention on Biological Diversity's (CBD) Global Report on Collective Progress, the United Nations' (UN) Sustainable Development Report, and the Paris Agreement's Global Stocktake (under the United Nations Framework Convention on Climate Change, UNFCCC), respectively. However, the most recent global assessments for both the KMGBF and SDGs show that while implementation of global commitments is underway, progress remains uneven across commitments and countries (CBD, 2026; UN, 2026). Persistent limitations in the monitoring landscape for the KMGBF are also highlighted, including incomplete data coverage, uneven national monitoring capacity, and indicators and datasets that remain under development or insufficiently comparable, limiting robust assessment of progress across many commitments (Affinito et al., 2024; CBD, 2026; A. C. Hughes & Grumbine, 2023; IPCC, 2023; UN, 2026).

One reason for these limitations in monitoring capability is that the growth in monitoring has occurred in a fragmented manner, with resources distributed across scientific publications, institutional reports, datasets and online tools, limiting their discoverability and integration (Nesshöver et al., 2016; Stephenson et al., 2017; Stephenson & Stengel, 2020). This fragmentation also extends to monitoring approaches that sit outside conventional scientific data infrastructures, including citizen science initiatives, community-based monitoring systems, and Indigenous and local knowledge (ILK) systems (Johnson et al., 2021). Such approaches can generate important observations and insights but may be documented, governed, and shared through diverse institutional agreements, making them more difficult to identify and integrate within conventional scientific review methods (Danielsen et al., 2024; Farhan Ferrari et al., 2015). An additional challenge is that some resources – such as the WWF's NBSAP tracker, Open SDG, and the Climate Action Tracker (*Climate Action Tracker*, n.d.; *Open SDG*, n.d.; WWF, n.d.) – have been developed for specific international frameworks and agreements (the KMGBF, SDGs or Paris Agreement respectively), despite considerable overlap in monitoring needs and indicators.

As a result of this complexity, policymakers and practitioners may struggle to identify which resources are available to support, or calculate indicators that allow, progress-tracking towards specific global commitments (Griffith et al., 2026), especially if the preferred data are generated, validated, and maintained through national systems. The recent suggestion of a globally standardised monitoring framework for biodiversity (Gonzalez et al., 2026), offer a promising pathway towards greater consistency across monitoring efforts for biodiversity in future. Although previous efforts have collated various biodiversity-related data systems , there remains a need for a structured overview of existing resources including an assessment of their relevance for supporting monitoring towards each global biodiversity-related commitment. This would facilitate the effective use of existing monitoring resources in supporting implementation and reporting progress across all biodiversity-related global commitments. It would also identify opportunities for coordination to avoid duplication of effort and inform future investment towards the areas where monitoring capacity is most limited.

Beyond reporting, the distribution of monitoring resources also matters because it shapes which aspects of biodiversity can be robustly assessed, compared, and analysed to inform decision-making (Nicholson et al., 2021). Persistent monitoring gaps can limit the effective implementation of global biodiversity-related commitments and may inadvertently – or deliberately – be used to justify policy inaction. A more comprehensive understanding of the current monitoring landscape is therefore essential to guide evidence-based decision making and ensure that conservation action is directed where it is most needed.

In this paper, we systematically review monitoring resources across both grey and scholarly literature and assess their capacity to support progress tracking for biodiversity-related commitments across the KMGBF, SDGs, and the climate target of the Paris Agreement. In doing so, we compile a comprehensive snap-shot inventory of peer-reviewed publications, reports, datasets, and tracking tools, assess their distribution across biodiversity-related commitments, and identify strengths and gaps in the current monitoring landscape. Our review provides an evidence base to support future monitoring, implementation and reporting of biodiversity-related targets across interconnected biodiversity, climate and sustainable development agendas (Baldwin-Cantello et al., 2023).

2. Methodology

To assess the coverage of the current monitoring landscape for global biodiversity goals and targets, we reviewed monitoring resources within both the grey and scholarly literature. We defined "monitoring resources" broadly, to include socio-economic and ecological datasets, trackers, reports, academic papers, and other relevant tools or materials that could be used to help track progress towards biodiversity-related commitments at the global level.

We supplemented our systematic search by consulting experts and cross-checking our results against a recent database of online biodiversity knowledge systems constructed using different methods to ours (Kemp et al., in press). Our systematic search focused on monitoring resources with global scope or relevance to tracking global biodiversity-related commitments; resources restricted to less than five countries or a single continent were excluded. We then mapped each data source against global biodiversity-related commitments within the KMGBF, SDGs, and the Paris Agreement, marking monitoring resources as "Relevant" or "Not Relevant" for each global commitment based on whether they addressed indicators which were formally listed as applicable to the commitment concerned.

2.1 Identification of global biodiversity-related commitments

Before beginning the systematic search, we reviewed existing global goals and targets with relevance to biodiversity to identify commitments for inclusion in this study. All targets from the KMGBF were automatically included, as this framework provides the policy architecture for achieving the global vision of "living in harmony with nature" by 2050. We also included the Paris Agreement temperature goal, as tackling climate change is fundamental to addressing biodiversity loss, and vice versa (Pettorelli et al., 2021; Turney et al., 2020) noting that the Paris Agreement's monitoring architecture (national reporting via the Enhanced Transparency Framework and collective assessment via the Global Stocktake) differs from the target-indicator frameworks of the KMGBF and SDGs.

From the SDGs, we included goals and targets on climate, energy, and nature, including all targets under SDG goals 7, 9, 13, 14, and 15 (see Supplementary Materials for the full list of included commitments). Although biodiversity underpins progress across all of the SDGs, we restricted our analysis to global commitments with explicit links to biodiversity, climate, natural resources, or key drivers of biodiversity change, to maintain a focused and transparent scope. Initially, commitments under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Conservation of

Migratory Species of Wild Animals (CMS) were also considered for inclusion. However, given the breadth of commitments across international environmental agreements and frameworks, along with practical constraints, we limited the analysis to the KMGBF, Paris Agreement, and selected SDG targets. This decision was also supported by the fact that many of the conservation objectives addressed by CMS and CITES are reflected in the included commitments.

2.2 Systematic search and screening process

Monitoring resources were identified through an evidence map of both grey and scholarly literature following established guidelines (Liberati et al., 2009; Pullin & Stewart, 2006).

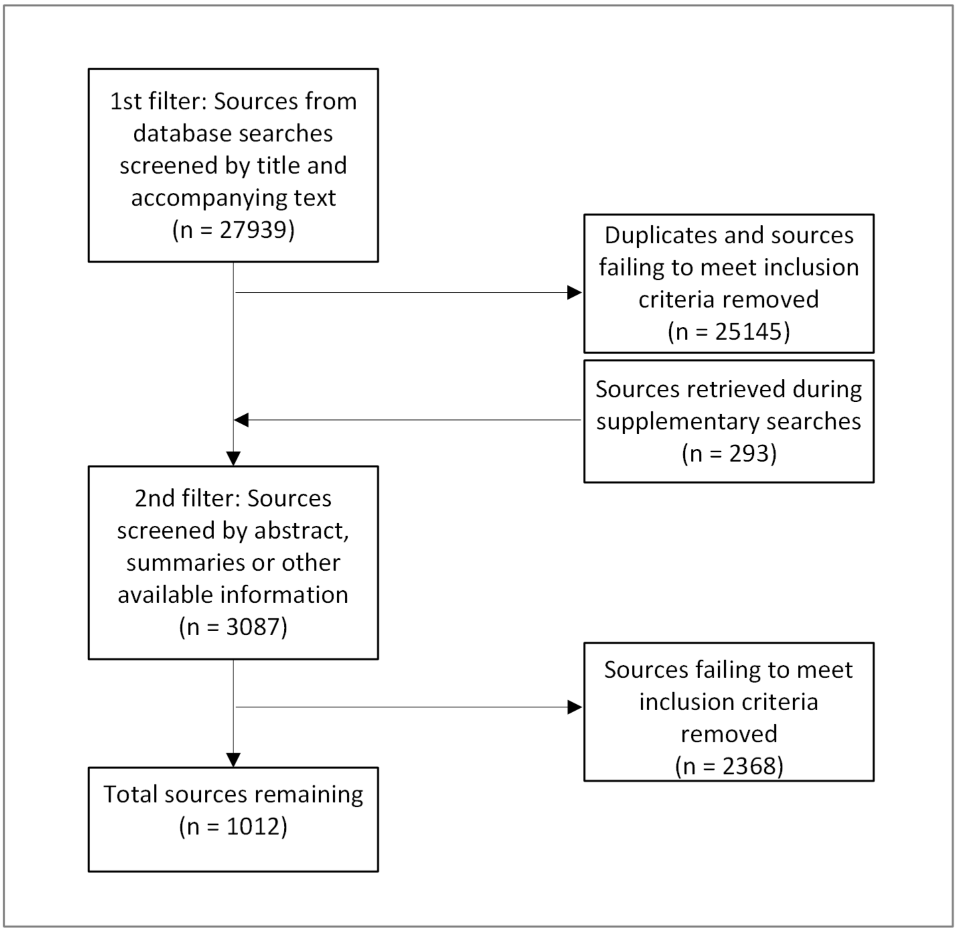

Figure 1. Overview of the screening process for the evidence map of grey and scholarly literature to identify monitoring resources relevant to tracking progress towards global biodiversity- related commitments.

We searched the Web of Science, Scopus, and Google between March and August 2025, using 257 sets of keywords for each search engine (see SM for details). Search strings were validated against ten well-established monitoring resources to ensure that these resources were retrieved consistently (demonstrating that the search strings were fit for purpose). The final search strings used were divided into three categories (see SM for all search strings used):

i) General search-strings (21 total) constructed around the names and key areas of the KMGBF, SDGs, and the Paris Agreement.

Example: (“GLOBAL BIODIVERSITY FRAMEWORK” OR GBF) AND (TRACK* OR MONITOR* OR GLOBAL* OR DATA* OR MAP* OR INDEX* OR METRIC* OR MEASURE OR PROGRESS)

ii) Theme-specific search-strings (38 total) constructed around cross-cutting themes we identified across the KMGBF, SDGs, and the Paris Agreement, based on the topics covered by each commitment and indicators suggested within their respective monitoring frameworks (see SM for details).

Example: SPECIES AND (CONSERVATION OR EXTINCTION OR POPULATION) AND (TRACK* OR MONITOR* OR GLOBAL* OR DATA* OR MAP* OR INDEX* OR METRIC* OR MEASURE OR PROGRESS)

iii) Indicator-based keywords (198 total) constructed around the headline indicators provided in monitoring frameworks associated with the KMGBF and SDGs, and the UNFCCC.

Example: (“INVASIVE SPECIES” OR “ALIEN SPECIES” OR IAS) AND MANAGE* AND (TRACK* OR MONITOR* OR GLOBAL* OR DATA* OR MAP* OR INDEX* OR METRIC* OR MEASURE OR PROGRESS)

We used a page-based search strategy, stopping after the first 100 results (10 pages) for each search string if relevance was declining (Godin et al., 2015; Ojanen et al., 2014; Pullin & Stewart, 2006; Smart & Burling, 2001, 2001). Where relevance had not declined after 10 pages, screening continued until that point was reached.

Results were screened against the eligibility criteria in Table 1 in two stages. First, we screened titles and accompanying text for each result across all three scholarly literature search platforms, recording potentially relevant monitoring resources in a pre-organised spreadsheet. Second, resources passing initial screening were reviewed in greater detail, including abstracts, executive summaries, tables of contents, or equivalent – to confirm they met our criteria (Table 1). Resources passing this second stage were recorded in a separate tab within the spreadsheet, along with information about the primary responsible institution(s) for grey literature and the first author's institution for scholarly literature. Additionally, where resources provided links or references to other monitoring resources, these were included in the final spreadsheet granted they met our eligibility criteria.

Table 1 Eligibility criteria used to determine the relevance of a peer-reviewed paper, or other data, information or monitoring resource for inclusion in the evidence map

Inclusion criteria
1. Available in English. 2. Published/available online in 2015 or later. 3. Contains data that can be used to track progress toward at least one global biodiversity-related commitment in scope. 4. Designed for global-scale tracking (data covers 5+ countries across 2+ continents).

Exclusion criteria
1. Excludes: Guidance reports, research institution websites, and blog posts. 2. Excludes resources relevant to less than 5 countries or a single continent. 3. Excludes perspectives on trends in progress unless supported by primary data or operationalisation of that data. 4. Unavailable in English.

2.3 Additional monitoring resource identification

To supplement the systematic search, we surveyed experts and asked them to identify resources they considered important for tracking progress towards global biodiversity-related commitments. After completing the systematic search, we also added to our findings with a recent database of online global biodiversity systems (Kemp et al., in press), which was constructed using different methods (combination of expert knowledge and AI) and therefore captured resources not identified through our search. Any additional monitoring resources identified through these steps were screened following the same criteria and process described above for the systematic search.

2.4 Mapping monitoring resources against global biodiversity-related commitments

Following the screening process, the resources were assessed for their relevance to progress tracking against the biodiversity-related commitments of each global monitoring framework or agreement (KMGBF, SDGs and Paris Agreement). This step was designed to identify which monitoring resources could be used to help support progress in tracking towards each target or goal, and to characterise the current monitoring landscape, highlighting where resources are concentrated, and where they are comparatively scarce. Although this analysis does not assess the quality or effectiveness of individual monitoring resources, it provides an indication of how monitoring effort has been distributed across the biodiversity-related commitments, and where potential gaps in monitoring coverage warrant further investigation.

Although we recognise that relevance exists on a continuum, for the purposes of this study we operationalised it as a binary variable ("Relevant"/ "Not relevant"). A "Relevant" score was assigned if the resource addressed the indicators formally agreed as part of the monitoring framework for a particular goal or target. In the case of the KMGBF we used associated 'headline' or 'component' indicators, for the SDGs the 'global indicators' and for the Paris Agreement temperature goal we used the Global Climate Indicators and subsidiary indicators used in the World Meteorological Organization's Statement of the State of the Global Climate. "Not relevant" was the default score. Where multiple resources were managed by one primary initiative or organisation (e.g. WWF, FAO, and UNEP-WCMC), these were grouped as one resource in our spreadsheet (e.g. as 'WWF resources'), with any specific monitoring resources we identified listed in a separate column. This approach was adopted because these organisations produced too many reports for it to be feasible to map each one individually. However, we made an exception where a specific monitoring resource was both identified through our systematic search and highlighted as relevant by experts. These resources were listed separately because their identification through both sources suggested that they were particularly relevant to progress monitoring (e.g. the Living Planet Index (WWF, n.d.)).

The mapping of monitoring resources onto commitments was conducted by SÁK and ÉF with each author independently mapping a subset of resources. To assess consistency in the application of the mapping criteria, an 8% sample of resources was selected and independently mapped by both authors (SÁK and ÉF). Consistency was assessed using the Prevalence-Adjusted Bias-Adjusted Kappa (PABAK) statistic. PABAK is a measure of inter-rater agreement and was selected in preference to Cohen's kappa, as Cohen's kappa is sensitive to imbalances in category prevalence i.e., where categorisations are not evenly distributed across the dataset (Yayama et al., 2026). This approach was appropriate for this mapping exercise, as each resource was expected to be relevant to only a small proportion of goals and targets and not relevant to the majority.

2.5 Statistical analysis

To examine whether commitments with a larger monitoring evidence base also had a greater representation of peer-reviewed literature, we fitted a generalised linear model across the 30 global biodiversity-related commitments. The response variable was the proportion of relevant monitoring resources that were peer-reviewed, and the explanatory variable was the total number of relevant monitoring resources identified for each commitment. A quasibinomial distribution was used to account for overdispersion in the proportional response. Model coefficients are reported on the log-odds scale. All statistical analyses were conducted in R version 4.5.1 (R Core Team, 2025), with the model fitted using the glm() function in the stats package.

3. Results

3.1 Overview of identified monitoring resources

Across the review and supplementary searches, we identified 1,008 monitoring resources relevant to tracking progress towards global biodiversity-related commitments, comprising 350 peer-reviewed papers and 658 other monitoring resources (including datasets, information platforms, and online tools).

The complete results, available as an inventory, including each resource and its relevance to individual global biodiversity-related commitments, are openly available in Zenodo at https://doi.org/10.5281/zenodo.21511595.

Resources were identified through four complementary search pathways (Fig. 2a). 53 resources were nominated by consulted experts, 236 were found through systematic searches of the scholarly literature (Web of Science and Scopus), 513 through Google searches of the grey literature, and 363 through other supplementary sources, including the biodiversity knowledge systems database compiled by Kemp et al. (in press). As many resources were identified through more than one search pathway, these totals are not mutually exclusive.

The "Academic literature" category in Figure 2a refers to the search pathway through which resources were identified rather than the resource type. All resources retrieved through the Web of Science and Scopus searches were peer-reviewed papers, but additional peer-reviewed papers were identified through expert consultation, Google searches, and other supplementary sources. Consequently, the academic literature search pathway contributed 236 resources, whereas the final dataset contained 350 peer-reviewed papers overall.

The systematic searches of the grey and scholarly literature identified 727 relevant resources, 101 of which overlapped with those included in the Kemp et al. (in press) database (Figure 2b). Consequently, the systematic search contributed 626 resources that were not included in the Kemp et al., database, while the Kemp et al. database provided a further 259 resources not retrieved through our searches. Expert consultation added 22 unique resources and a further 31 resources that overlapped with one or both other approaches.

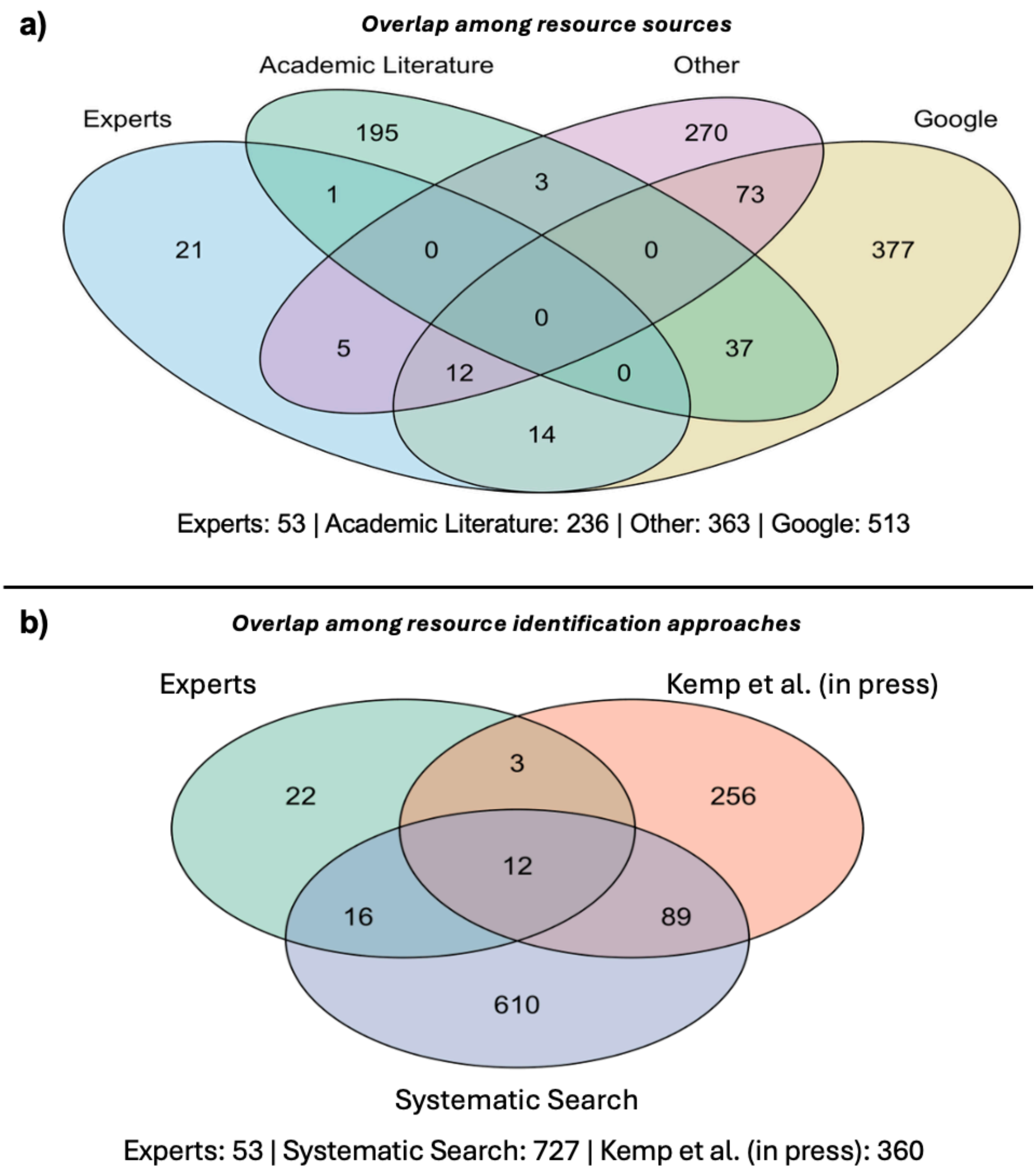

Figure 2. Comparison of resource identification pathways and approaches. ***a)*** *Overlap among the sources used to identify resources relevant to tracking progress towards global biodiversity-related commitments. "Experts" refers to resources nominated by consulted experts. "Academic literature" refers to resources identified through systematic searches of Web of Science (WoS) and Scopus. "Other" includes resources identified through the biodiversity knowledge systems Kemp et al. (in press) dataset and additional links found on resource or tool webpages. "Google" refers to resources identified through the grey literature search.* ***(b)*** *Overlap among the three approaches used to identify resources: expert consultation, the systematic search conducted in this study, and the biodiversity knowledge systems database of Kemp et al. (in press), which was used for cross-checking.*

3.2 Overview of coverage across global biodiversity-related commitments

Relevant monitoring resources were identified for all 30 global biodiversity-related commitments included in our analysis, although coverage varied considerably among commitments (Fig. 3). The number of relevant resources ranged from 17 for KMGBF Target 17 (Biosafety) to 554 for KMGBF Target 8 (Climate). The mean number of resources per commitment was 199, compared with a median of 129.5, reflecting the uneven distribution in which a small number of commitments were associated with substantially more resources than most.

Overall, climate-related commitments were among the best represented. The three climate commitments - KMGBF Target 8 (Climate), SDG 13 (Climate Action), and the Paris Agreement - had a particularly large number of resources, with 554, 463, and 436 relevant resources, respectively (Fig. 3). Resource coverage was also high for commitments relating to terrestrial ecosystems and biodiversity conservation: SDG 15 (Life on Land) had the second-highest number of relevant resources (469) across all commitments, while SDG 14 (Life Below Water) was associated with 362 relevant resources.

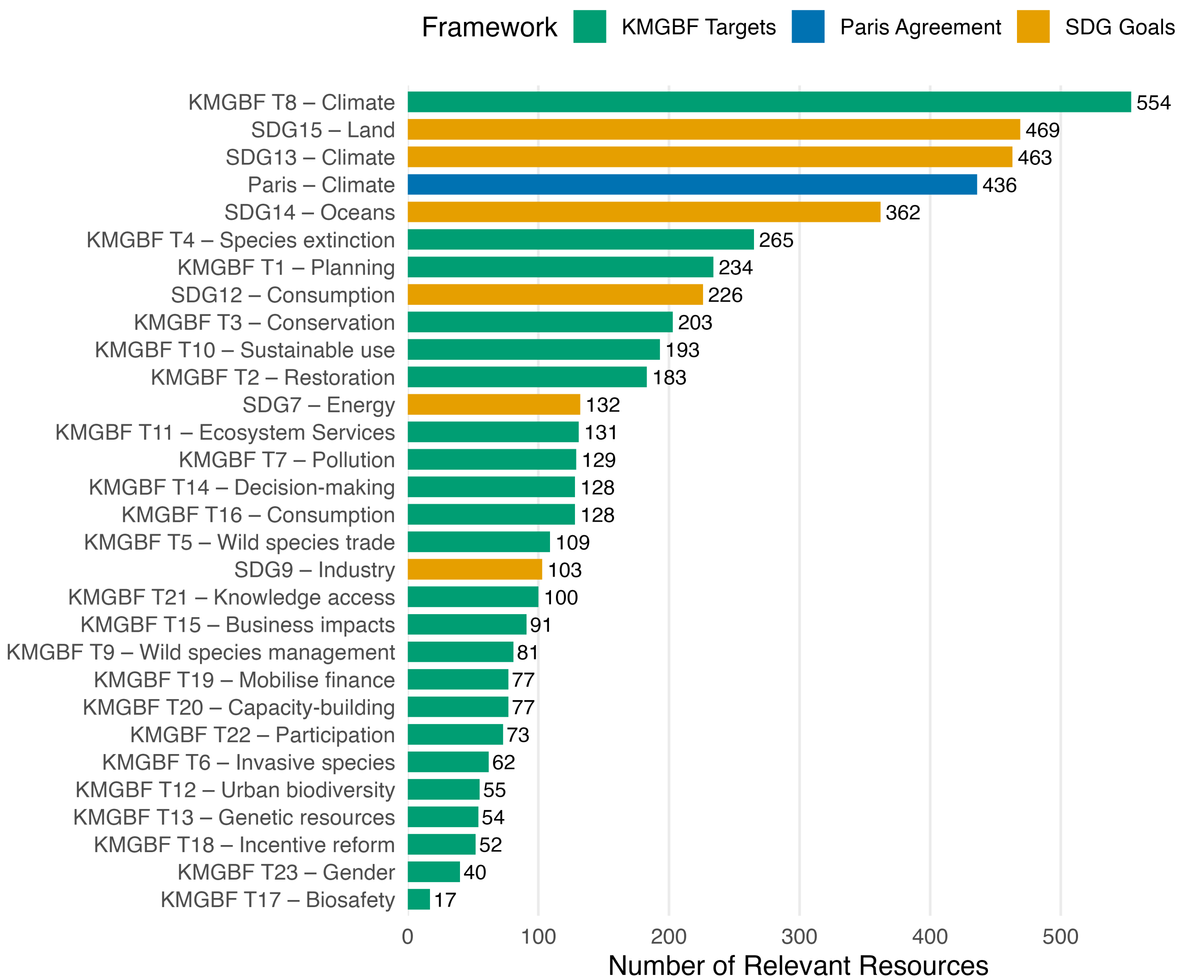

Figure 3. *Bar plot showing the number of monitoring resources identified for each global biodiversity-related commitment included in the analysis. Green bars represent Kunming–Montreal Global Biodiversity Framework (KMGBF) targets, orange bars represent Sustainable Development Goals (SDGs), and the blue bar represents the Paris Agreement. Individual monitoring resources could be classified as relevant to more than one commitment; therefore, the totals across commitments exceed the 1,008 unique resources identified.*

Although coverage was lower for several commitments, every commitment was represented by at least 17 monitoring resources (Fig. 3). The fewest relevant monitoring resources were identified for KMGBF Target 17 (Biosafety; 17 resources), followed by Target 23 (Gender; 40), Target 18 (Incentive reform; 52), Target 13 (Genetic resources; 54), and Target 12 (Urban biodiversity; 55).

Agreement between reviewers when assigning resources to commitments was generally high. Prevalence-Adjusted Bias-Adjusted Kappa (PABAK) scores indicated almost perfect agreement for 26.8% of commitments, substantial agreement for 65.9%, and moderate agreement for 7.3% of commitments. High agreement was observed for some commitments with relatively few associated resources, including KMGBF Target 17 on biosafety and Target 23 on gender. The lowest agreement was found for broader and less clearly bounded commitments such as the general SDG Goal 15 for life on land (PABAK = 0.58), and KMGBF Target 2 (PABAK = 0.58) on restoration of degraded areas. Relatively low agreement was also reached for commitments including KMGBF Target 20 on capacity-building (PABAK = 0.70), KMGBF Target 21 on knowledge access, and KMGBF Target 14 on mainstreaming biodiversity in decision-making (PABAK = 0.70).

3.3 Composition of monitoring resources

Of the 1,008 monitoring resources identified, approximately one-third were peer-reviewed papers (350) and two-thirds were other monitoring resources (658). However, the relative contribution of these resource types varied substantially among commitments (Fig. 4). Across all commitments, other monitoring resources – including socio-economic and ecological datasets, trackers and reports – comprised the majority of identified resources, with the proportion of peer-reviewed resources ranging from 2.5% to 30.1%.

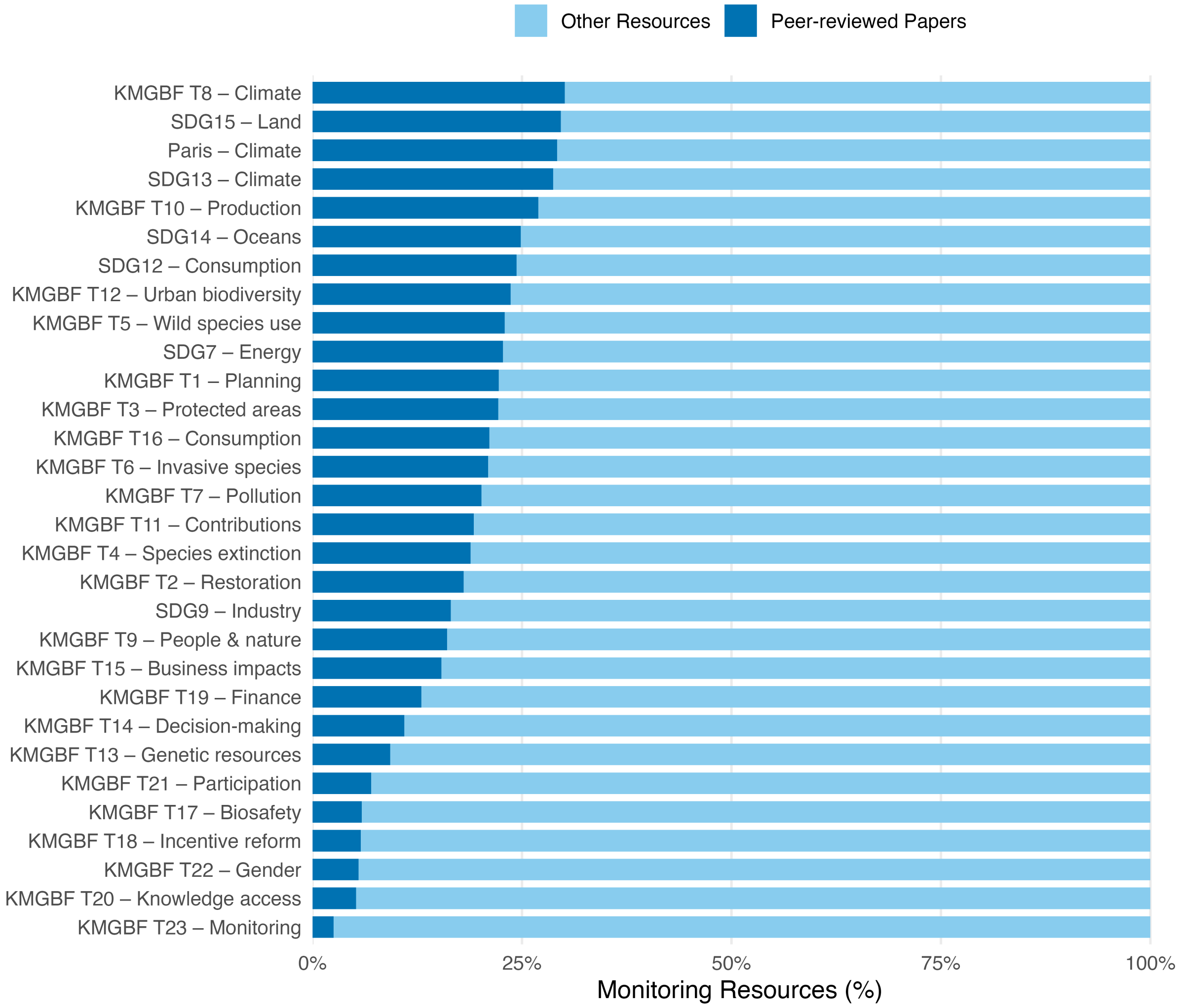

***Figure 4**: Proportion of monitoring resources classified as peer-reviewed papers versus other data, information, or online monitoring resources for each global biodiversity-related commitment. Percentages represent the relative contribution of each resource type within each commitment.*

The proportion of peer-reviewed resources increased significantly with the total number of relevant resources identified for each commitment (quasibinomial GLM: $\beta = 0.00161 \pm 0.00033$ SE, $t = 4.86$, $P < 0.001$), with an estimated dispersion parameter of 2.74 indicating substantial overdispersion in the proportional response. This corresponds to an approximately 17% increase in the odds that a relevant resource was peer-reviewed for every additional 100 relevant resources. So, commitments with larger evidence bases overall tended to not only have more peer-reviewed resources in absolute terms but also a greater relative representation of peer-reviewed literature. The positive relationship remained when the total number of resources was log-transformed, suggesting the pattern was not dependent on the few commitments with very large evidence bases.

The highest proportions of peer-reviewed resources were observed for commitments with extensive evidence bases, including KMGBF Target 8 (Climate; 554 resources, 30.1% peer-reviewed), SDG 15 (Life on Land; 469 resources, 29.6%), SDG 13 (Climate Action; 463 resources, 28.7%), and the Paris Agreement (436 resources, 29.2%). In contrast, commitments with fewer overall resources generally had lower proportions of peer-reviewed literature, with several governance- and enabling-condition commitments - including KMGBF Targets 17 (Biosafety), 18 (Incentive reform), 20 (Knowledge access), 22 (Gender), and 23 (Monitoring) - having fewer than 10% peer-reviewed resources (Fig. 4).

4. Discussion

This study provides an inventory of monitoring resources relevant to major global biodiversity-related commitments, spanning the KMGBF, SDGs and the Paris Agreement. We identified a substantial body of resources across all 30 commitments analysed, where even commitments with the lowest coverage had some relevant resources, reinforcing earlier assessments that a diverse evidence base already exists to support biodiversity monitoring and decision-making (Gonzalez et al., 2023; Kemp et al., in press; Stephenson & Stengel, 2020). At the same time, this landscape remains fragmented, uneven and difficult to compare across sources, suggesting real differences between policy areas in the maturity, standardisation and accessibility of relevant monitoring data (Gonzalez et al., 2026). This fragmentation creates substantial challenges in identifying and synthesising the available and relevant resources. For example, compiling this dataset required approximately one year of effort from two research assistants. This effort highlights the need for a central, standardised inventory of monitoring resources relevant to global biodiversity commitments to organise future monitoring efforts (Gonzalez et al., 2026).

The central challenge for global biodiversity monitoring may therefore lie less in the existence of monitoring resources and data, and more in the ability to identify, access, evaluate, and effectively use existing resources in relation to different goals and targets (Griffith et al., 2026). This has implications not only for tracking progress towards existing commitments, but also for determining which aspects of biodiversity receive attention in future monitoring efforts. The latter arises because gaps in the availability, accessibility and comparability of monitoring resources can influence which aspects of biodiversity are assessed and the evidence available to inform policy decisions. By collating and presenting the current monitoring landscape in a structured form, this inventory provides a practical foundation for improving the use and coordination of existing resources to track biodiversity-related commitments, while helping to identify monitoring priorities as resources and policy frameworks evolve. It should therefore support nations in making progress towards achieving global biodiversity-related goals and targets.

4.1 The monitoring landscape is extensive but uneven

Resources were identified for every commitment, but their distribution was uneven. Climate-related commitments and broad ecosystem goals were linked to considerably more resources than areas such as biosafety, benefit sharing, and capacity development. This mirrors previous assessments showing that biodiversity monitoring has developed unevenly across taxa, ecosystems and thematic areas (Gonzalez et al., 2023; Navarro et al., 2017). Our results also align with analyses of national targets set for KMGBF implementation, where most national targets were set for area-based conservation and land use, with fewer national commitments focussed on the indirect drivers of loss, or human-focussed topics in the KMGBF (Immerzeel et al., 2026).

Several factors may help explain these differences. Some commitments have benefited from decades of methodological development and sustained funding: climate indicators, land cover products and protected area databases have more established methods and internationally agreed metrics and are backed by large collaborative initiatives (e.g. *Climate Action Tracker*, n.d.; Copernicus, n.d.; IUCN, 2026; UNEP-WCMC & IUCN, 2026; Zanaga et al., 2022), making them comparatively easy to quantify and track over time. Other commitments may be harder to operationalise because they are broad in scope and lack more narrowly defined indicators, or address concepts that are inherently difficult to measure. This was particularly apparent for broad commitments such as SDG 15 which is expansively on “Life on Land”, and cross-cutting commitments such as capacity-building (KMGBF Target 20), access to knowledge (KMGBF Target 21), and the integration of biodiversity into decision-making (KMGBF Target 14). Here, determining the relevance of individual monitoring resources required greater reviewer judgement. These commitments had lower inter-reviewer agreement than those supported by more established or narrowly defined indicators, such as biosafety (KMGBF Target 17); where resource relevance was comparatively easier to identify. This variation might reflect a wider difficulty in translating some global policy commitments into measurable objectives (Affinito et al., 2024; Hughes & Grumbine, 2023).

Crucially, the number of resources identified per commitment in this study should not be read as a measure of monitoring adequacy. Our aim was to characterise where monitoring effort has concentrated, not to judge whether existing resources are sufficient. A few highly relevant resources may be enough to assess progress on one commitment, whereas a long list elsewhere may represent either complementary datasets or substantial duplication. The uneven distribution observed here may therefore reflect a combination of evidence gaps, varying levels of monitoring maturity, and differences in how readily existing information can be linked to specific policy commitments.

The observed relationship between number of monitoring resources and proportion of peer-reviewed papers related to a particular biodiversity-related commitment raises important questions about whether evidence generation is evenly distributed across these global commitments. One explanation for this pattern might be the presence of reinforcing feedbacks among the availability of existing datasets and monitoring resources, research funding and user interest, and the production of research outputs (Bol et al., 2018; Guénard et al., 2025; Merton, 1968). Commitments that are already well monitored might attract greater investment, established research communities, and scholarly attention, thereby further increasing the evidence available. Conversely, peer-reviewed studies might themselves provide foundational evidence through generating new primary data, analyses, and interpretations that inform the development of additional monitoring resources. As a result, commitments receiving greater research attention might have access to a larger, and potentially stronger, evidence base for guiding policy, assessing progress, and identifying future priorities.

4.2 Making better use of existing monitoring resources

Monitoring resources vary in accessibility and formats, which makes it hard for practitioners and policymakers to bring them together and interpret them consistently.

Online databases and dedicated monitoring portals are usually straightforward to access, whereas data contained within academic literature (a substantial proportion of the resources identified in this study) are often harder to locate and are frequently behind paywalls. Comparable challenges have been noted in previous assessments of biodiversity monitoring and reporting systems (Kemp et al., in press; McGowan et al., 2024).

The distinction between genuine evidence gaps in reporting and weaknesses in the system that connects evidence to its users and policy relevance has practical consequences. Improving standardised metadata, adopting common reporting frameworks and harmonising data could go a long way without the need for new monitoring programmes. Recent initiatives such as the Biodiversity Monitoring Standards Framework (Gonzalez et al., 2026) and GEOBON's efforts to standardise measurement variables and generate standardised indicator workflow (Griffith et al., 2026), provide a useful foundation for this kind of consistency. Efforts to integrate and systematise resources should also be led by policy and management needs, so that outputs are directly relevant to implementation rather than simply adding to the volume of available data.

The range of actors contributing data is also expanding, including through the growing availability of large-scale citizen science datasets such as eBird and iNaturalist (Sutherland et al., 2026). By contrast, while the Indigenous Navigator provided one notable exception (*Indigenous Navigator*, n.d.), relatively few resources in our review appeared to be Indigenous-led or designed around the knowledge of indigenous peoples and local communities. Such knowledge may nevertheless inform larger monitoring platforms, but tracing these contributions was beyond the scope of our analysis. Therefore, it would be valuable for future research to examine more systematically how well participatory, bottom-up and traditional knowledge systems are represented in global biodiversity monitoring (Danielsen et al., 2024; Dawson et al., 2021).

4.3 Scope and constraints of this analysis

Several limitations should be considered when interpreting the findings presented here. First, the review was restricted to English-language sources; an important gap, given growing evidence that a large body of conservation knowledge lies outside the English-language literature (Amano et al., 2021). Second, even with extensive searching, it is unlikely that every relevant monitoring resource was captured, particularly given the rapid pace at which new monitoring initiatives, academic papers, databases and analytical tools continue to emerge. This inventory is best viewed as a snapshot of the current landscape rather than an exhaustive catalogue, which we hope can continue to be updated in future.

The relationship between the number of monitoring resources and the proportion that were peer-reviewed should be interpreted cautiously. Resources often mapped to multiple commitments and were therefore not fully independent. In addition, larger and more established policy areas may have been easier to capture because they have clearer terminology and more extensive indexed literatures. Their apparently higher share of peer-reviewed resources may therefore reflect greater discoverability, rather than solely a stronger genuine evidence base.

Mapping resources to commitments also involved expert judgement. Agreement between reviewers was substantial or almost perfect for most commitments; the lower agreement for a handful reflects both the subjectivity of the task and the absence of comprehensive indicators for some targets (Affinito, et al., 2024). Continued refinement of global monitoring frameworks should hopefully improve the consistency with which resources can be linked to policy objectives.

This study recorded whether monitoring resources aimed at global coverage exist, excluding resources restricted to a single country or a single continent. Assessing resource reliability, relevance and comprehensiveness represents an important next step (Christie et al., 2023). Comparing resource quantity with measures of quality and complementarity would help determine whether commitments with few resources are under-served, and whether targets with many monitoring resources are adequately covered or instead reflect substantial overlap among existing resources. Indeed, many resources draw on the same underlying datasets (such as the IUCN Red List) and Protected Planet (UNEP-WCMC & IUCN, 2026)), so a long list of resources for a commitment is not necessarily evidence of multiple independent data sources. Future work should therefore examine not just how many resources exist, but how far they provide complementary evidence for tracking progress.

4.4 Toward a more integrated and decision-relevant monitoring landscape

This inventory does more than map where coverage varies; it provides practitioners with a single place to look when they need to find resources relevant to a particular commitment. This could help actors within nations assess and evaluate their country's progress towards different commitments and provide a useful resource for state actors seeking to identify relevant resources to enhance national biodiversity monitoring systems, calculate standardised indicators and assess progress towards their national and international targets. Bringing diverse resources together into an evidence base of this kind can help inform future monitoring, as well as support implementation and reporting of biodiversity-related targets across the interconnected KMGBF, the SDGs and the Paris Agreement.

The value of this inventory would grow if it were maintained as a living resource. A curated, regularly updated platform (coordinated, for instance, through an international body or collaborative initiative such as UNEP-WCMC) would let new resources be added as they emerge while keeping existing information discoverable. Advances in AI-assisted literature discovery, information extraction and database maintenance may make continuously updated inventories more feasible, though expert oversight will remain essential to provide clear inclusion criteria, robust standardisation and comparability protocols, and quality checks covering completeness, accuracy, temporal consistency and methodological transparency (Jaffer et al., 2025; Reynolds et al., 2026; Sutherland et al., 2026).

Harmonising existing evidence through shared measurement variables, monitoring standards, indicator calculation pipelines, and transparent metadata would make it easier to find, compare and use, while showing more clearly where new evidence to support global commitments is genuinely needed (Gonzalez et al., 2026). Making better use of existing evidence, together with a sharper view of what is missing, will be essential if the ambitions of global frameworks like the KMGBF, SDGs and Paris Agreement are to be realised.

5. References

Affinito, F., Butchart, S. H. M., Nicholson, E., Hirsch, T., Williams, J. M., Campbell, J., Ferrari, M. F., Gabay, M., Gorini, L., Kalamujic Stroil, B., Kohsaka, R., Painter, B., Pinto, J. C., Scholz, A. H., Straza, T. R. A., Tshidada, N., Vallecillo, S., Widdicombe, S., & Gonzalez, A. (2024). *Assessing coverage of the Monitoring Framework of the Kunming-Montreal Global Biodiversity Framework and opportunities to fill gaps*. Ecology. https://doi.org/https://doi.org/10.1038/s41559-025-02718-3

Amano, T., Berdejo-Espinola, V., Christie, A. P., Willott, K., Akasaka, M., Báldi, A., Berthinussen, A., Bertolino, S., Bladon, A. J., Chen, M., Choi, C.-Y., Bou Dagher Kharrat, M., De Oliveira, L. G., Farhat, P., Golivets, M., Hidalgo Aranzamendi, N., Jantke, K., Kajzer-Bonk, J., Kemahlı Aytekin, M. Ç., … Sutherland, W. J. (2021). Tapping into non-English-language science for the conservation of global biodiversity. *PLOS Biology*, *19*(10), e3001296. https://doi.org/10.1371/journal.pbio.3001296

Baldwin-Cantello, W., Tickner, D., Wright, M., Clark, M., Cornelius, S., Ellis, K., Francis, A., Ghazoul, J., Gordon, J. E., Matthews, N., Milner-Gulland, E. J., Smith, P., Walmsley, S., & Young, L. (2023). The Triple Challenge: Synergies, trade-offs and integrated responses for climate, biodiversity, and human wellbeing goals. *Climate Policy*, *23*(6), 782–799. https://doi.org/10.1080/14693062.2023.2175637

Bol, T., De Vaan, M., & Van De Rijt, A. (2018). The Matthew effect in science funding. *Proceedings of the National Academy of Sciences*, *115*(19), 4887–4890. https://doi.org/10.1073/pnas.1719557115

CBD. (2026). *Global report on collective progress in the implementation of the Kunming-Montreal Global Biodiversity Framework*. https://www.cbd.int/gbf/implementation/globalreview

Christie, A. P., Morgan, W. H., Salafsky, N., White, T. B., Irvine, R., Boenisch, N., Chiaravalloti, R. M., Kincaid, K., Rezaie, A. M., Yamashita, H., & Sutherland, W. J. (2023). Assessing diverse evidence to improve conservation decision-making. *Conservation Science and Practice*, *5*(10), e13024. https://doi.org/10.1111/csp2.13024

Climate Action Tracker. (n.d.). Retrieved 25 July 2026, from https://climateactiontracker.org/

Copernicus. (n.d.). *CORINE Land Cover—Copernicus Land Monitoring Service*. Retrieved 29 July 2026, from https://land.copernicus.eu/en/products/corine-land-cover

Danielsen, F., Ali, N., Andrianandrasana, H. T., Baquero, A., Basilius, U., De Araujo Lima Constantino, P., Despot-Belmonte, K., Frederiksen, P. O., Isaac, M., Jakobsen, P., Klimmek, H., Mapendembe, A., Meng, H., Schmidt-Vogt, D., Sophat, S., Sulyandziga, R., Virnig, A. L. S., Zhang, D., & Burgess, N. D. (2024). Involving citizens in monitoring the Kunming–Montreal Global Biodiversity Framework. *Nature Sustainability*, *7*(12), 1730–1739. https://doi.org/10.1038/s41893-024-01447-y

Dawson, N. M., Coolsaet, B., Sterling, E. J., Loveridge, R., Gross-Camp, N. D., Wongbusarakum, S., Sangha, K. K., Scherl, L. M., Phan, H. P., Zafra-Calvo, N., Lavey, W. G., Byakagaba, P., Idrobo, C. J., Chenet, A., Bennett, N. J., Mansourian, S., & Rosado-May, F. J. (2021). The role of Indigenous peoples and local communities in effective and equitable conservation. *Ecology and Society*, *26*(3), art19. https://doi.org/10.5751/ES-12625-260319

Demirel, N., Hughes, A. C., Barnes, D. K. A., Miloslavich, P., Muller, F. E., Lara-Lopez, A., Ahlquist, I. H., McMahon, C. R., Taylor, C., Szopa-Comley, A., Davis, F., McOwen, C., Richardson, K., Wisz, M. S., & Burgess, N. D. (2026). *1 Marine biodiversity indicators and online data knowledge systems*.

Farhan Ferrari, M., de Jong, C., & Belohrad, V. S. (2015). Community-based monitoring and information systems (CBMIS) in the context of the Convention on Biological Diversity (CBD). *Biodiversity*, *16*(2–3), 57–67. https://doi.org/10.1080/14888386.2015.1074111

Godin, K., Stapleton, J., Kirkpatrick, S. I., Hanning, R. M., & Leatherdale, S. T. (2015). Applying systematic review search methods to the grey literature: A case study examining guidelines for school-based breakfast programs in Canada. *Systematic Reviews*, *4*(1), 138. https://doi.org/10.1186/s13643-015-0125-0

Gonzalez, A., August, T., Bailey, S., Bobiwash, K., Boersch-Supan, P. H., Burgess, N. D., Daru, B. H., Elphick, C. S., Freckleton, R. P., Frick, W. F., Hughes, A. C., Isaac, N. J. B., Jones, J. P. G., Lambertini, M., Mac Aodha, O., Madhavapeddy, A., Milner-Gulland, E. J., Purvis, A., Salafsky, N., … Williams, D. R. (2026). From data to decisions: Toward a Biodiversity Monitoring Standards Framework. *Proceedings of the National Academy of Sciences*, *123*(10), e2519347123. https://doi.org/10.1073/pnas.2519347123

Gonzalez, A., Vihervaara, P., Balvanera, P., Bates, A. E., Bayraktarov, E., Bellingham, P. J., Bruder, A., Campbell, J., Catchen, M. D., Cavender-Bares, J., Chase, J., Coops, N., Costello, M. J., Czúcz, B., Delavaud, A., Dornelas, M., Dubois, G., Duffy, E. J., Eggermont, H., … Torrelio, C. Z. (2023). A global biodiversity observing system to unite monitoring and guide action. *Nature Ecology & Evolution*, *7*(12), 1947–1952. https://doi.org/10.1038/s41559-023-02171-0

Griffith, J., Lord, J.-M., Catchen, M. D., Arce-Plata, M. I., Blanchet, F. G., Chandramohan, M., Diaz-Corzo, M. C., Gravel, D., Gutiérrez, C., Helfenstein, I. S., Hoban, S., Kass, J. M., Laikre, L., Larocque, G., Leigh, D. M., Leung, B., Mastretta-Yanes, A., Millette, K. L., Berbeo, M. A. M., … Gonzalez, A. (2026). BON in a Box: An Open and Collaborative Platform for Biodiversity Monitoring, Indicator Calculation, and Reporting. *BioScience*, *76*(4), 345–358. https://doi.org/10.1093/biosci/biaf189

Guénard, B., Hughes, A. C., Lainé, C., Cannicci, S., Russell, B. D., & Williams, G. A. (2025). Limited and biased global conservation funding means most threatened species remain unsupported. *Proceedings of the National Academy of Sciences*, *122*(9), e2412479122. https://doi.org/10.1073/pnas.2412479122

Hughes, A. C., & Grumbine, R. E. (2023). The Kunming-Montreal Global Biodiversity Framework: What it does and does not do, and how to improve it. *Frontiers in Environmental Science*, *11*, 1281536. https://doi.org/10.3389/fenvs.2023.1281536

Hughes, A. C., Marshall, B. M., Challender, D. W. S., Edwards, D. P., Eskew, E. A., Lockwood, J. L., Morton, O., Malsch, K., Fukushima, C., Nijman, V., Meiri, S., Baruch-Mordo, S., Tlusty, M. F., Jürgens, J., Pironon, S., Pavitt, A. T., Demirel, N., Tallowin, O. J. S., Friedman, K., … Burgess, N. D. (2026). *The true scope of global wildlife trade is obscured by data gaps*. https://doi.org/https://doi.org/10.32942/X2T66D

Hughes, A., Demirel, N., Barnes, D., Ahlquist, I., Ondo, I., Guralnick, R., Hirsch, T., Enquist, B., Merow, C., Kaschner, K., Reygondeau, G., Egorova, Y., Orr, M., Qiao, H., Stephenson, P., Waller, J., & Burgess, N. (2025). *Understanding the adequacy and representativeness of species distribution data*. Ecology and Evolutionary Biology. https://doi.org/10.32942/X28S82

Immerzeel, R., Kok, M., Troost, S., & Krüger, C. (2026). *From global ambition to national commitments: National target setting under the Global Biodiversity Framework* (No. 5896). PBL Netherlands Environmental Assessment Agency.

Indigenous Navigator. (n.d.). Retrieved 29 July 2026, from https://indigenousnavigator.org/

IPBES. (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (E. Brondizio, S. Diaz, J. Settele, & H. T. Ngo, Eds; Version 1). Zenodo. https://doi.org/10.5281/ZENODO.3831673

IPBES. (2024, December 20). *Thematic Assessment Report on the Underlying Causes of Biodiversity Loss and the Determinants of Transformative Change and Options for Achieving the 2050 Vision for Biodiversity | IPBES secretariat*. https://www.ipbes.net/transformative-change-assessment

IPCC. (2023). *Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (1st edn). Cambridge University Press. https://doi.org/10.1017/9781009157896

IUCN. (2026). *The IUCN Red List of Threatened Species*. Retrieved 1 September 2025, from https://www.iucnredlist.org

Jaffer, S., Morgan, W., Reynolds, S., Christie, A., Madhavapeddy, A., & Sutherland, W. (2025). *AI-assisted Living Evidence Databases for Conservation Science*. Earth and Environmental Sciences. https://doi.org/10.33774/coe-2025-rmsqf

Johnson, N., Druckenmiller, M. L., Danielsen, F., & Pulsifer, P. L. (2021). The Use of Digital Platforms for Community-Based Monitoring. *BioScience*, *71*(5), 452–466. https://doi.org/10.1093/biosci/biaa162

Kemp, H., Cierna, A., Hughes, A., Arcangeli, A., Van Soesbergen, A., Hargey, A., Taylor, C., Taylor, C., Degano, M. E., Buschke, F., Tin, F., Sihvonen, H., Weatherdon, L., Stephenson, P. J., Blanqué, V., Sica, Y., Thatey, Z., & Burgess, N. D. (in press). *The Past, Present, and Future of Online Biodiversity Knowledge Systems*. Annu. Rev. Environ. Resour.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gotzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: Explanation and elaboration. *BMJ*, *339*(jul21 1), b2700–b2700. https://doi.org/10.1136/bmj.b2700

McGowan, P. J. K., Hutchinson, A., Brooks, T. M., Elliott, W., Hoffmann, M., Mair, L., McDougall, A., Raimondo, D. C., & Butchart, S. H. M. (2024). Understanding and achieving species elements in the Kunming–Montreal Global Biodiversity Framework. *BioScience*, *74*(9), 614–623. https://doi.org/10.1093/biosci/biae065

Merton, R. K. (1968). *The Matthew Effect in Science*. *159*.

Navarro, L. M., Fernández, N., Guerra, C., Guralnick, R., Kissling, W. D., Londoño, M. C., Muller-Karger, F., Turak, E., Balvanera, P., Costello, M. J., Delavaud, A., El Serafy, G., Ferrier, S., Geijzendorffer, I., Geller, G. N., Jetz, W., Kim, E.-S., Kim, H., Martin, C. S., … Pereira, H. M. (2017). Monitoring biodiversity change through effective global coordination. *Current Opinion in Environmental Sustainability*, *29*, 158–169. https://doi.org/10.1016/j.cosust.2018.02.005

Nesshöver, C., Livoreil, B., Schindler, S., & Vandewalle, M. (2016). Challenges and solutions for networking knowledge holders and better informing decision-making on biodiversity and ecosystem services. *Biodiversity and Conservation*, *25*(7), 1207–1214. https://doi.org/10.1007/s10531-016-1124-8

Nicholson, E., Watermeyer, K. E., Rowland, J. A., Sato, C. F., Stevenson, S. L., Andrade, A., Brooks, T. M., Burgess, N. D., Cheng, S.-T., Grantham, H. S., Hill, S. L., Keith, D. A., Maron, M., Metzke, D., Murray, N. J., Nelson, C. R., Obura, D., Plumptre, A., Skowno, A. L., & Watson, J. E. M. (2021). Scientific foundations for an ecosystem goal, milestones and indicators for the post-2020 global biodiversity framework. *Nature Ecology & Evolution*, *5*(10), 1338–1349. https://doi.org/10.1038/s41559-021-01538-5

Ojanen, M., Miller, D. C., Zhou, W., Mshale, B., Mwangi, E., & Petrokofsky, G. (2014). What are the environmental impacts of property rights regimes in forests, fisheries and rangelands? A systematic review protocol. *Environmental Evidence*, *3*(1), 19. https://doi.org/10.1186/2047-2382-3-19

Open SDG. (n.d.). Retrieved 25 July 2026, from https://open-sdg.org/

Pettorelli, N., Graham, N. A. J., Seddon, N., Maria Da Cunha Bustamante, M., Lowton, M. J., Sutherland, W. J., Koldewey, H. J., Prentice, H. C., & Barlow, J. (2021). Time to integrate global climate change and biodiversity science-policy agendas. *Journal of Applied Ecology*, *58*(11), 2384–2393. https://doi.org/10.1111/1365-2664.13985

Pollock, L. J., Kitzes, J., Beery, S., Gaynor, K. M., Jarzyna, M. A., Mac Aodha, O., Meyer, B., Rolnick, D., Taylor, G. W., Tuia, D., & Berger-Wolf, T. (2025). Harnessing artificial intelligence to fill global shortfalls in biodiversity knowledge. *Nature Reviews Biodiversity*, *1*(3), 166–182. https://doi.org/10.1038/s44358-025-00022-3

Pullin, A. S., & Stewart, G. B. (2006). Guidelines for Systematic Review in Conservation and Environmental Management. *Conservation Biology*, *20*(6), 1647–1656. https://doi.org/10.1111/j.1523-1739.2006.00485.x

Reynolds, S., Kaunain, N. N., Coad, L., Johnston, C., Rutenberg, I., Abdullahi, Z. O., El Bizri, H. R., Kenyon, M., Mtenga, N. C., Silva, E., Tegang, R. P., Ugarte, C. S., Hinsley, A., & Sandbrook, C. (2026). *Principles for navigating responsible use of AI for conservation*. Earth and Environmental Sciences. https://doi.org/10.33774/coe-2026-5lcdd

Smart, J. M., & Burling, D. (2001). Radiology and the Internet: A Systematic Review of Patient Information Resources. *Clinical Radiology*, *56*(11), 867–870. https://doi.org/10.1053/crad.2001.0738

Speaker, T., O'Donnell, S., Wittemyer, G., Bruyere, B., Loucks, C., Dancer, A., Carter, M., Fegraus, E., Palmer, J., Warren, E., & Solomon, J. (2022). A global community-sourced assessment of the state of conservation technology. *Conservation Biology*, *36*(3), e13871. https://doi.org/10.1111/cobi.13871

Stephenson, P. J., Bowles-Newark, N., Regan, E., Stanwell-Smith, D., Diagana, M., Höft, R., Abarchi, H., Abrahamse, T., Akello, C., Allison, H., Banki, O., Batieno, B., Dieme, S., Domingos, A., Galt, R., Githaiga, C. W., Guindo, A. B., Hafashimana, D. L. N., Hirsch, T., … Thiombiano, A. (2017). Unblocking the flow of biodiversity data for decision-making in Africa. *Biological Conservation*, *213*, 335–340. https://doi.org/10.1016/j.biocon.2016.09.003

Stephenson, P. J., & Stengel, C. (2020). An inventory of biodiversity data sources for conservation monitoring. *PLOS ONE*, *15*(12), e0242923. https://doi.org/10.1371/journal.pone.0242923

Sutherland, W. J., Burgess, N. D., Edwards, S. V., Jones, J. P. G., Soltis, P. S., Tilman, D., Allen, J. M., Andrianandrasana, H. T., Armour, C. J., August, T., Bawa, K. S., Bailey, S., Birch, T., Boersch-Supan, P. H., Cavender-Bares, J., Blaxter, M., Chaplin-Kramer, R., Daru, B. H., De Palma, A., … Robinson, G. E. (2026). Nine changes needed to deliver a radical transformation in biodiversity measurement. *Proceedings of the National Academy of Sciences*, *123*(10), e2519345123. https://doi.org/10.1073/pnas.2519345123

Theis, S., Burgess, N., Van Soesbergen, A., Egan, K., & Gonzalez, A. (2026). *Measuring Nature's Contributions to People – what data do we have?* Life Sciences. https://doi.org/10.32942/X2137M

Turney, C., Ausseil, A.-G., & Broadhurst, L. (2020). Urgent need for an integrated policy framework for biodiversity loss and climate change. *Nature Ecology & Evolution*, *4*(8), 996–996. https://doi.org/10.1038/s41559-020-1242-2

UN. (2026). *The Sustainable Development Goals Report 2026*.

UNEP-WCMC, & IUCN. (2026). *Protected Planet*. Protected Planet. Retrieved 1 September 2025, from https://www.protectedplanet.net/en

WWF. (n.d.). *NBSAP tracker: Check your country's nature progress*. Retrieved 8 September 2025, from https://wwf.panda.org/act/nbsap_tracker_check_your_countrys_nature_progress

WWF Living Planet Report 2024 A system in peril. (2024). WWF Deutschland.

Yayama, S., Ohashi, A., Mitsui, A., & Yamamoto, K. (2026). Inter-Rater Reliability in a Pre-Graduation Nursing Objective Structured Clinical Examination: A Kappa and Prevalence-Adjusted Bias-Adjusted Kappa Comparison of Technical Skill and Communication Items. *Sage Open Nursing*, *12*, 23779608261417794. https://doi.org/10.1177/23779608261417794

Zanaga, D., Van De Kerchove, R., Daems, D., De Keersmaecker, W., Brockmann, C., Kirches, G., Wevers, J., Cartus, O., Santoro, M., Fritz, S., Lesiv, M., Herold, M., Tsendbazar, N.-E., Xu, P., Ramoino, F., & Arino, O. (2022). *ESA WorldCover 10 m 2021 v200* (Version v200) [Data set]. Zenodo. https://doi.org/10.5281/ZENODO.7254221

6. Data availability

All data supporting the findings of this study are openly available in Zenodo at https://doi.org/10.5281/zenodo.21511594.

7. Acknowledgements

SK, TBW and TB were supported by funding from the Leverhulme Trust, as part of the Leverhulme Centre for Nature Recovery. EF was supported by WWF-UK funding. We are grateful to Neil D. Burgess for sharing his expertise and thoughtful feedback, which helped shape this work.