BIODIVERSITY BUILDING BLOCKS FOR POLICY

MS30 List of indicators and data sets to be used in the case study I “Global Case Study on RAMSAR Sites”

30/10/2025

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Funded by the European Union

This project receives funding from the European Union’s Horizon Europe Research and Innovation Programme (ID No 101059592). Views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the EU nor the EC can be held responsible for them.

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Summary

This milestone (MS30) details the initial methodology, datasets, and indicators selected for the **Global Case Study on RAMSAR Sites** (Wetlands of International Importance). This use case, falling under **Work Package 6** (WP6), is designed to validate the relevance, usability, and impact of the **B-Cubed** (B3) indicator workflow in a high-stakes global policy context.

The study focuses on assessing the capacity of open-access species occurrence data (GBIF) to monitor the biodiversity component of Ramsar's 'ecological character' at a global scale. The analysis is structured in two phases: first, a global data sufficiency assessment across all RAMSAR sites using simple metrics to identify data gaps and trends in data coverage; second, a more comprehensive analysis of European RAMSAR sites to assess biodiversity trends at continental and national levels; and third, a site-level ecological deep dive employing more specialized indicators, including phylogenetic and invasive impact metrics on sites with robust data coverage.

The outputs of this case study will inform the Ramsar Convention Secretariat and national signatories by establishing a measurable baseline for open data reporting capacity. It will quantify the extent to which B3 indicators can streamline national reporting on biodiversity trends, particularly regarding endangered and invasive species, thereby assessing the utility of B3 tools for global biodiversity policy alignment.

List of abbreviations

b3gbi	B-Cubed: General Biodiversity Indicators
EICAT	Environmental Impact Classification for Alien Taxa
EU	European Union
GBIF	Global Biodiversity Information Facility
IUCN	International Union for Conservation of Nature
OBIS	Ocean Biodiversity Information System
OTL	Open Tree of Life

1. Data sets

The **M30 Global Case Study on RAMSAR Sites** focuses on the analysis of open access data sufficiency and biodiversity trends within RAMSAR sites (Wetlands of International Importance). These sites are designated under the Convention on Wetlands (1971) due to their ecological significance in supporting vulnerable, endangered, or highly diverse wildlife populations, or due to their size (Ramsar Convention Secretariat, 2012). The treaty promotes the conservation and wise use of these sites, including the maintenance of their 'ecological character', which is defined as the combination of ecosystem components, processes, and benefits/services, focusing here on the biodiversity component (Convention on Wetlands, 2005).

This case study will involve tiered analysis across three scales:

1. **Global Analysis**: A global assessment to determine the data sufficiency of each RAMSAR site for reliable analysis of biodiversity trends. This includes a comparative analysis of data coverage trends across continents and countries since the Convention's inception.
2. **Continental Analysis (Europe)**: Focused analysis within Europe, where data availability is highest. This will analyse trends at continental and (where data allows) national levels to understand biodiversity change within RAMSAR sites.
3. **Site-Level Deep Dive**: Application of complex indicators on selected sites deemed to have sufficient data.

Given the global nature of the study, the primary biodiversity data source will be the Global Biodiversity Information Facility (GBIF). For a select group of sites used in the deep dive, Red List range data (polygons) on endangered species will be spatially overlapped with RAMSAR site boundaries to determine species of conservation interest.

1.1. Taxonomic groups

The main data sufficiency analysis will utilize all available taxonomic groups present in the occurrence data to provide the broadest possible assessment of data coverage.

For specific, downstream analysis (applied to sites with sufficient data), the focus will be on:

- **Threatened Species**: Analysis of trends of threatened and endangered species whose IUCN Red List range data overlap with RAMSAR sites.
- **Invasive Species**: Analysis of alien taxa to quantify the magnitude and mechanisms of their environmental impact using the Environmental Impact Classification for Alien Taxa (EICAT) framework.

1.2.Temporal and spatial scale

Scale	Temporal Span	Spatial Coverage	Data Source / Access	Stakeholder
Global & Continental	1900 – Present	All RAMSAR sites globally, or within the European continent	GBIF: Publicly open species occurrence data accessed via web downloads. Ramsar RSIS: Publicly open spatial data (site boundaries) accessed by web download.	GBIF (Aggregator), Data Publishing Institutions (e.g., museums, universities, citizen science platforms)
Local	1900 - Present	Select individual RAMSAR sites	IUCN Red List: Publicly open spatial data (species range boundaries) accessed by web download. EICAT: Open access ecosystem status/threat data. OTL (Open Tree of Life): Open access phylogenetic trees.	IUCN, EICAT

The Global Biodiversity Information Facility (GBIF) is selected as the primary data source due to its ability to provide high-volume, standardized species occurrence data globally.

This choice is rationalized by three key factors:

1. **Global Scope:** GBIF records enable comparative analysis across the entire Ramsar Site Network, which is necessary for assessing the convention's global goals.
2. **Comparative Analysis:** The use of standardized occurrence records is essential for conducting a comparative analysis of data sufficiency across sites.
3. **Project Alignment (B3):** This case study is specifically designed to test the utility of tools and species occurrence cubes produced by the B3 project

2. Indicators to be used

2.1.Indicators to be used

The analysis is structured into two phases based on data availability. All indicators are sourced from the B3 indicator toolset to ensure technical alignment with WP4 / WP5 developments.

Phase 1: Indicators Applied on All RAMSAR Sites (Data Sufficiency Assessment):

These indicators use raw data counts and simple aggregations, minimizing data requirements. They will be used to assess which sites meet minimum data thresholds for further analysis, as well as to identify data gaps and trends in data coverage.

- Observed Richness
- Total Occurrences
- Cumulative Richness
- Density of Occurrences
- Mean Year of Occurrence

Phase 2: Indicators Applied on Selected RAMSAR Sites (Ecological Analysis):

These indicators require a minimum level of sampling effort and data completeness, and will be applied only on sites that meet a minimum threshold of data sufficiency established in phase 1. They will be used to quantify temporal changes in the structure and composition of the biodiversity community.

- Pielou's Evenness
- Williams' Evenness
- Estimated Species Richness
- Hill-Shannon Diversity
- Hill-Simpson Diversity
- Area-Based Rarity
- Abundance-Based Rarity
- Occupancy Turnover
- Taxonomic Distinctness

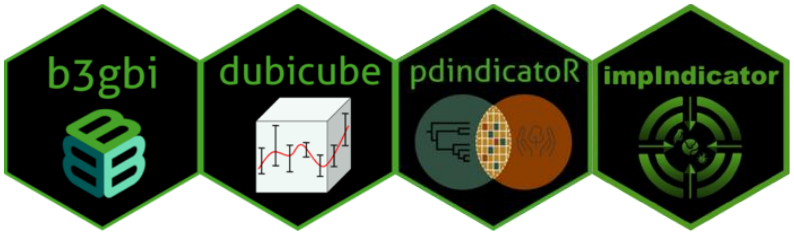
Additionally, cross-validation will be performed in phase 2 using the `dubicube` package to quantify the robustness of calculated biodiversity metrics.

Due to the constraints of obtaining global complementary data, indicators requiring external datasets (`pdindicatoR` and `impIndicator`) will be applied only on a small, targeted scale.

2.2.WP4/WP5 developments applied

This case study will utilize occurrence data cubes generated from the GBIF primary data source. The following B3 packages will be employed to calculate the necessary metrics:

- `b3gbi`: Applied to calculate the core biodiversity metrics (richness, diversity, rarity, turnover, etc.).
- `dubicube`: Applied to assess the robustness of the biodiversity indicators.
- `pdindicatoR`: Applied for phylogenetic diversity analysis on a smaller, targeted scale.
- `impIndicator`: Applied for Environmental Impact Classification for Alien Taxa (EICAT) analysis on a smaller, targeted scale.



3. Policy question(s)

This case study directly targets the RAMSAR Convention by assessing the effectiveness of its implementation and whether there is sufficient data availability to monitor this effectiveness at a global scale.

Policy-Relevant Questions:

1. **Data Coverage and Sufficiency**: What is the current state of open-access biodiversity data coverage (species occurrences via GBIF) across the global RAMSAR site network, and which countries/regions demonstrate the highest and lowest open data sufficiency for monitoring ecological character?
2. **Indicator Utility and Goal Alignment**: To what degree can the B3 indicator workflow quantify biodiversity trends (richness, evenness, turnover) using open-access occurrence data within RAMSAR sites, and how do these trends align with the Convention's goals of maintaining 'ecological character'?
3. **National Reporting Capacity**: How can the spatial and temporal output of B3 indicators, based on open data, inform and streamline national reporting obligations under the Ramsar Convention, particularly concerning the monitoring of specific endangered and invasive species?

Rationale and Policy Support:

The case study workflow will directly support the monitoring requirements of the Ramsar Strategic Plan (e.g., Target 4, on monitoring and inventorying wetlands) and aid signatories in fulfilling their national reporting obligations regarding the ecological status of their designated sites.

This analysis establishes a baseline for open data usage and identifies where relying solely on globally accessible, published data (GBIF) may create monitoring data gaps. This insight helps signatories understand the effort required to leverage national (non-open) data sets to meet full monitoring requirements.

4. References

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