BIODIVERSITY BUILDING BLOCKS FOR POLICY

D1.8 Sustainability report

29/08/2025

Author(s): Jonas Depecker, Laura Abraham, Stefaan Pijls, Maarten Trekels, Nikol Yovcheva, Quentin Groom

Funded by the European Union

Prepared under contract from the European Commission
Grant agreement No. 101059592
EU Horizon Europe Research and Innovation Action

Project acronym:	**B3**
Project full title:	**Biodiversity Building Blocks for policy**
Project duration:	01.03.2023 – 31.08.2026 (42 months)
Project coordinator:	Dr. Quentin Groom, Agentschap Plantentuin Meise (MeiseBG)
Call:	HORIZON-CL6-2021-GOVERNANCE-01
Deliverable title:	Sustainability report
Deliverable n°:	D1.8
WP responsible:	WP1
Nature of the deliverable:	Report
Dissemination level:	Public
Lead partner:	MeiseBG
Recommended citation:	Depecker, J. *et al*. (2025). ***Sustainability report***. B3 project deliverable D1.8
Due date of deliverable:	Month 30
Actual submission date:	Month 30

Deliverable status:

Version	Status	Date	Author(s)
1.0	Draft	24 April 2025	Jonas Depecker (MeiseBG)
1.1	Draft	26 June 2025	Jonas Depecker, Laura Abraham, Stefaan Pijls, Maarten Trekels, Quentin Groom (MeiseBG), Nikol Yovcheva (Pensoft)
1.2	Draft review	28 July 2025	Nikol Yovcheva (Pensoft)
1.3	Review	18 August 2025	Peter Desmet (EV INBO), Duccio Rocchini (UNIBO)
1.4	Final review	28 August 2025	Quentin Groom (MeiseBG)
1.4	Final	29 August 2025	Jonas Depecker (MeiseBG)

Table of contents

Key takeaway messages

- To ensure long-term sustainability and maximise the impact of its outputs, the B3 project has developed a dedicated sustainability report.
- The sustainability report consists of six main sections - setting the scene of sustainability (Chapter 2), governance and stakeholder roles (Chapter 3), project outputs to sustain (Chapter 4), sustainability plan per output type (Chapter 5), sustainability actions (Chapter 6), and monitoring and risk management (Chapter 7).
- The B3 outputs to sustain can be categorised into eight main output types: (i) analyses, (ii) briefs, reports, and publications, (iii) infrastructure, (iv) software packages, (v) specifications, (vi) training, (vii) tutorials, and (viii) websites.
- The various output types are divided into primary, secondary, and complimentary sustainability levels, each accompanied by a dedicated plan and specific actions to support their long-term sustainability.
- Post-project monitoring will be ensured through a set of well-defined KPIs and proactive risk management, including appropriate mitigation measures.

Executive summary

The D1.8 Sustainability Report outlines the long-term strategy to ensure the continued use, accessibility, and impact of the B3 (Biodiversity Building Blocks for policy) project outputs beyond the project's end in August 2026. Developed under Task 1.8 within Work Package 1, this deliverable identifies key project outputs and provides tailored sustainability plans that span scientific, technical, and financial dimensions.

The B3 project aims to modernise biodiversity monitoring by developing cloud-based tools, workflows, and indicators. To preserve the relevance of these outputs, the report defines a unified sustainability vision based on stakeholder consultation, a consortium-wide questionnaire, and a dedicated workshop.

Currently, a total of 148 project outputs were identified and classified into primary (e.g., infrastructure, software packages, specifications, and analyses), secondary (e.g. tutorials, training, and websites), and complementary (e.g. briefs, reports, and publications) categories, with specific sustainability actions assigned to each type. Notably, primary outputs like infrastructure and software packages will receive prioritised support, with maintenance ensured through open-source practices, long-term archiving, and community engagement. Key outputs will remain accessible on platforms such as GitHub, Zenodo, and institutional websites.

The report emphasises collaborations—with sister projects like AD4GD and FAIRiCUBE, and platforms such as GEO BON and the European Green Deal Data Space—as vital to ensuring the integration and discoverability of B3 outputs. Risk management strategies are also detailed, covering issues such as personnel turnover and technical obsolescence (e.g., link rot, software dependencies), with mitigation through version control, persistent identifiers, and containerisation.
A monitoring framework supported by Key Performance Indicators (KPIs) will help track sustainability post-project, and the report will be updated near the project's conclusion to reflect further developments and partnerships.

Non-technical summary

The B3 Sustainability Report outlines how the project's results will remain useful, accessible, and impactful even after the project ends in August 2026. The B3 project (Biodiversity Building Blocks for policy) focuses on improving how biodiversity is monitored by developing online tools, data workflows, and indicators that can help inform policies.

This report was created to make sure that the tools and knowledge developed by B3 will not be lost but continue to benefit researchers, policymakers, and other users. To do this, the project team collaborated with stakeholders and experts through a survey and workshop to develop a shared plan for sustainability.

Currently, a total of 148 project outputs have been identified and categorized into the following groups:

1) Primary outputs: infrastructure, software packages, specifications, and analyses;

2) Secondary outputs: tutorials, training materials, and websites.

3) Complementary outputs: briefs, reports, and publications

Each type of output has a specific plan to ensure it remains accessible and up-to-date. Primary outputs, such as software packages, will receive higher priority for maintenance. Many of these tools will stay available on platforms like GitHub, Zenodo, and university or research institute websites.

The report also highlights the importance of collaborating with other projects and platforms, such as AD4GD, FAIRiCUBE, GEO BON, and the European Green Deal Data Space, to help make B3's outputs easier to find and use in the future.

To address possible risks—such as changes in staff or outdated technology—the project is taking steps like using permanent links, tracking software versions, and storing environments in a way that others can reuse.

Lastly, a set of Key Performance Indicators (KPIs) will be used to monitor the continued use and impact of B3's outputs after the project ends. The report will also be updated near the end of the project to reflect new partnerships and sustainability efforts.

List of abbreviations

AD4GD	All Data 4 Green Deal
API	Application Programming Interface
B3	Biodiversity Building Blocks for policy
BMD	Biodiversity Meets Data
CBD	Convention on Biological Diversity
DMP	Data Management Plan
DOI	Digital Object Identifier
EBVs	Essential Biodiversity Variables
eDNA	Environmental DNA
eLTER	Long-Term Ecosystem Research in Europe
ESA	European Space Agency
EU	European Union
FAIR	Findable, Accessible, Interoperable, Reusable
FAIRiCUBE	F.A.I.R. Information Cubes
GBIFS	Global Biodiversity Information Facility
GEO BON	Group on Earth Observations - Biodiversity Observation Network
GRIIS	Global Research Infrastructure for Scientific Support
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
(EV) INBO	(Own Capital of the) Research Institute for Nature and Forest
KPIs	Key Performance Indicators
MeiseBG	Meise Botanic Garden
OneSTOP	OneBiosecurity Systems and Technology for People, Places and Pathways
PEDCOM	Exploitation, Dissemination, and Communication Plan
PENSOFT	Pensoft Publishers
SQL	Structured Query Language
USAGE	Urban Data Space for Green Deal
VITO	Flemish Institute for Technological Research
WP	Work Package

1. Introduction

1.1. Project

Biodiversity is changing more rapidly than ever before, increasing the urgency for reliable, up-to-date information to support decision-makers in evaluating policy options. Effective biodiversity monitoring is essential to address this need (Niemelä, 2000).

The project Biodiversity Building Blocks for Policy (henceforth B3) seeks to transform biodiversity monitoring from a disconnected, labour intensive activity into an agile, rapid, and responsive process at a global level. This transformation will be achieved by providing easy access to tools in a cloud computing environment, in real-time, and on-demand, with state-of-the-art prediction models of biodiversity, that will output models and indicators of biodiversity status and change. In order to do so, B3 will develop the infrastructure, workflows, tools, knowledge products, and indicators for biodiversity monitoring. Importantly, these outputs will be built with long-term sustainability in mind, ensuring they remain impactful, functional, accessible, and maintainable long after the project concludes.

1.2. Scope and objectives of the deliverable

To ensure the long-term sustainability of the outputs, the continued functionality, accessibility, and maintainability and impact of the outputs have been explicitly defined as a strategic objective of the B3 project (cf. objective 1.6). To reach the set objective, deliverable “D1.8 Sustainability Report” of the B3 project was developed under Task 1.8 “Sustainability Report” led by MeiseBG within work package 1 (WP1) “Stakeholder engagement, communication and dissemination" which is led by Pensoft, and was due in Month 30 (August 2025) of the project.

1.3. Task planning and execution

The sustainability report was developed following the timeline outlined in figure 1 and was based on a consortium-wide consultation process. A detailed sustainability questionnaire of 18 questions (available in Annex) was distributed to B3’s partners. The questionnaire collected information on how sustainability is defined, addressed during the project, maintained after the project, and the broader implementation context. Partners contributed to the establishment of the sustainability report by submitting thorough answers to the questions asked in the questionnaire, and by identifying project outputs. The questionnaire had nine respondents distributed among six project partners. Furthermore, the questionnaire formed the base for a two-hour workshop (summary available in Annex) centred around the sustainability of the project, organised on the 21st of May 2025. The workshop had 17 attendees from nine project partners. Following the workshop, an overview of the different B3 outputs was compiled and shared with the partners, along with a request to complete the columns on: “sustainability level”, “horizon of time to maintain”, “best solution to maintain”, and “risk of disappearing”. Once completed, the overview was reviewed and discussed in a follow-up meeting attended by 11 participants from six project partners. Prior to its submission, the sustainability report was shared with all 12 project partners for review. The initial version was submitted in Month 30 of the project (August 2025). A revised version will be submitted toward the end of the project.

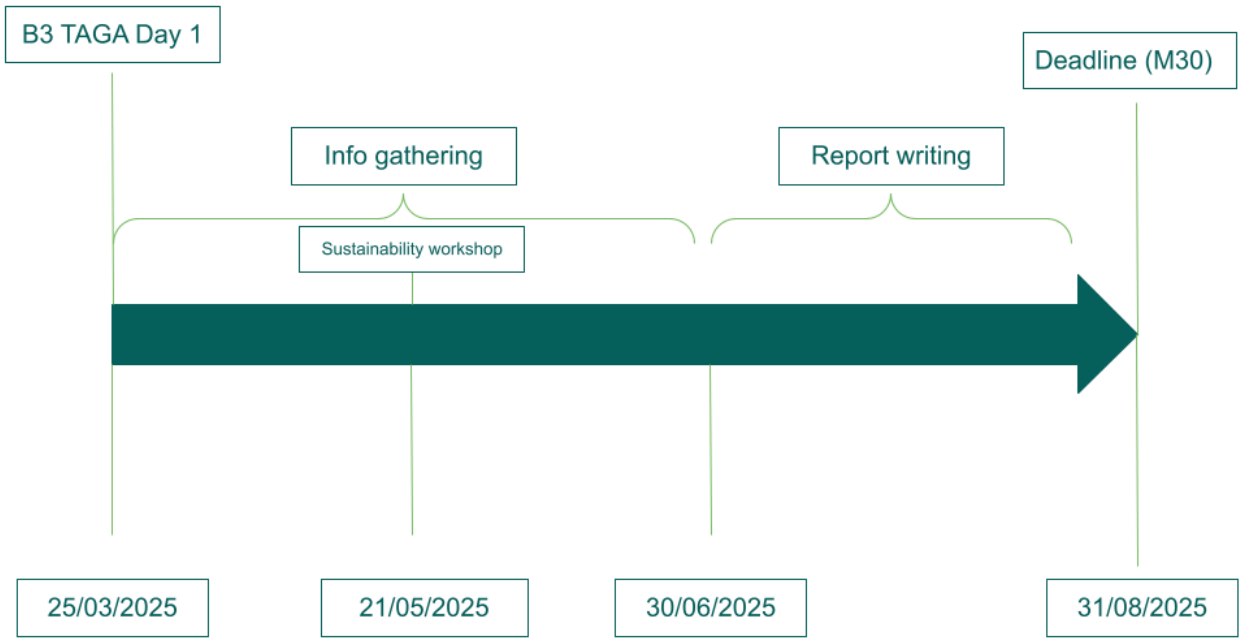

Figure 1: Timeline of Task 1.8 - sustainability report. The timeline begins with “B3 TAGA Day 1,” the first day of the third Annual General Assembly in Leipzig, which served as the informal kick-off for Task 1.8.

1.4. Relation to other tasks and deliverables

Deliverable 1.8, the “Sustainability Report,” builds upon the outcomes of the various work packages (WPs) within B3 and is therefore inherently connected to all B3 WPs, deliverables, and tasks. However, the sustainability report has particularly strong ties to three key deliverables in WP1: D1.2 “Plan for Exploitation, Dissemination and Communication,” D1.3 “Data Management Plan,” and D1.9 “Updated Plan for Exploitation, Dissemination and Communication.” and one key deliverable in WP3: D3.3 “FAIR data products and interoperability with the Essential Biodiversity Variables Data Portal.”. While the sustainability report provides a comprehensive view of all B3 outputs, certain sustainability aspects are already addressed in the aforementioned deliverables.

1.4.1. D1.2 and D1.9 Plan for Exploitation, Dissemination and Communication

The Exploitation, Dissemination, and Communication Plan (PEDCOM) was initially developed in Month 6 of the project as Deliverable D1.2 under WP1 (Yovcheva & Metodiev, 2023). It was subsequently revised in Month 22 as Deliverable D1.9 within the same WP (Yovcheva, 2024). The primary objective of the PEDCOM is to maximise the impact of the B3 project outcomes and facilitate long-term knowledge exchange by providing a strategic framework for dissemination, exploitation, and communication activities. This framework plays a crucial role in ensuring stakeholders are aware of the project’s activities, receive its results in a timely and appropriate manner, and have the potential to offer feedback and exploit them.

The PEDCOM contains detailed information on:

- Stakeholder groups
- B3's Key Exploitable Results
- Tools and channels for exploitation, dissemination, and communication
- An implementation plan, including KPIs

1.4.2. D1.3 Data Management Plan

The Data Management Plan (DMP) was initially developed in Month 6 of the project as Deliverable D1.3 under WP1 and subsequently updated in Month 26 (Yovcheva *et al.*, 2023). The primary objective of the DMP is to ensure the findability, accessibility, interoperability, and reusability of the B3 research data and other research outputs. This plan thereby contributes to the aim of B3 to promote the transparent and collaborative nature of scientific research by making research data openly available to the scientific community and society at large. It further serves as the sustainability framework for the data generated and utilised in the B3 project, providing a complementary contribution to the overarching sustainability report

The DMP contains detailed information on:

- Data collected, generated, and reused in B3
- FAIR (Findable, Accessible, Interoperable, Reusable) data
- Allocation of resources
- Data security
- Intellectual property management
- Ethics

1.4.3. D3.3 FAIR data products and interoperability with the Essential Biodiversity Variables Data Portal

The report on FAIR data products and interoperability with the Essential Biodiversity Variables Data Portal was developed in Month 30 of the project as Deliverable 3.3 under WP3 (Estupinan-Suarez *et al.*, 2024). The primary objective of this deliverable is to improve the FAIRness of B3 geospatial outputs. In addition, it provides insights on strengthening B3's future development and data-sharing practices, highlighting how the B3 approach supports greater interoperability across research domains. Finally, the report examines the contribution of B3 outputs to the development of the European Green Deal Data Space.

The report contains detailed information on:

- Increasing interoperability between the essential biodiversity variables data ecosystem and species occurrence cubes products
- Data mobilisation workflow
- Consolidating the B3 FAIR approach
- FAIR awareness within B3
- Future perspectives

1.5. Document structure

The sustainability report begins with a brief introduction to the B3 project, outlining the report's scope and objectives, and clarifying its role as Deliverable 1.8 within the broader framework of project tasks and deliverables. The introduction is followed by a presentation of the project's sustainability vision and a definition of sustainability in relation to the B3 outputs. The report then explains how the sustainability approach is adapted to align with the various governance structures and stakeholder roles involved. Subsequent sections provide a detailed description of the project's outputs, each accompanied by a tailored sustainability plan. The report also outlines specific sustainability actions, as well as mechanisms for monitoring and risk management, including the use of KPIs to track progress and ensure accountability.

2. Setting the scene of sustainability

2.1. Vision and definition of sustainability for the B3 outputs

Sustainability refers to the capacity of B3 products, services, and outcomes to remain scientifically relevant, technically functional, and financially supported over time, thereby ensuring their long-term use, accessibility, and impact for at least five years after the project's end.

2.1.1. B3's scientific sustainability

Scientific sustainability is achieved by:

- Enabling reproducible, peer-validated research through version-controlled, well-documented workflows, and data products.
- Integrating evolving scientific standards (e.g., EBVs) and new data sources (e.g., eDNA) into interoperable frameworks.
- Ensuring products are reused and built upon by both internal teams and external stakeholders, including future projects.
- Regularly updating products based on new research, feedback, and software/tooling advances.

2.1.2. B3's technical sustainability

Technical sustainability is achieved by:

- Developing open-source and FAIR-compliant software
- Designing modular software with clear APIs and scalable architecture
- Maintaining robust documentation, onboarding resources, and user support (e.g., GitHub Issues and forums).
- Ensuring long-term maintainability through automated testing, containerisation (e.g., Docker).
- Tracking and analysing software usage to inform future developments.

2.1.3. B3's financial sustainability

Financial sustainability is secured through:

- Embedding maintenance roles within partner institutions and ensuring diversified funding sources (e.g., institutional budgets, grants, service contracts, and training).
- Incorporating B3 products into long-term institutional monitoring/reporting workflows.
- Creating cost-sharing agreements and contingency budgeting mechanisms.
- Actively pursuing follow-up funding (e.g., EU grants and COST actions) and low-cost maintenance strategies.

Alternative funding models—including in-kind contributions as well as national and international funding—were considered to support the scientific and technical sustainability of the B3 project, but were ultimately not pursued. A second approach based on revenue generation was also explored, but was deemed unsuitable because it largely conflicts with B3's open science principles and the expectations of the community. Research funding continues to be the primary source of support.

3. Governance and stakeholder roles

During the development of the PEDCOM, six key stakeholder groups were identified: policy and governance, organisations, the scientific community, data collectors, industry and practitioners, and the general public (Yovcheva & Metodiev, 2023). A comprehensive description of these stakeholder groups is provided in Yovcheva and Metodiev (2023). While the dissemination, exploitation, and communication of the various B3 outputs should be tailored to each stakeholder group, the sustainability of these outputs is primarily determined by their nature and content, rather than by the specific stakeholders they target. Although various stakeholder-specific sustainability pathways were considered during the workshop, it was ultimately concluded that a single, unified sustainability approach is suitable for all stakeholder groups.

4. Project outputs to sustain

Before developing the plan to ensure the long-term sustainability of the B3 outputs, it was first necessary to identify and categorise all relevant outputs. Through a consortium-wide consultation process, a comprehensive overview was compiled, currently identifying a total of 148 distinct outputs. This overview is a living document, which will be regularly updated as new outputs are produced and validated. The complete document is available to all project partners, while a snapshot for stakeholders may be accessed in the annex. The overview includes, for each output, descriptors covering: the responsible party, the type of output, current maintenance status, publication status on the documentation website, (expected) delivery date, source code URL, documentation URL, assessed sustainability level, expected maintenance horizon, recommended archiving solution for the source code or output, and the best approach for continued maintenance beyond the project's duration. Table 1 presents the definitions and explanations for each of these descriptors.

4.1. Description of the project's outputs

Based on their nature and content, the B3 project outputs can be categorised into eight main categories:

1) Analyses: processes of systematically inspecting, cleaning, transforming, and modeling data to discover useful information, draw conclusions, and support decision-making, including the development of workflows;

2) Infrastructure: set of foundational software components, systems, and services that are essential for building, running, managing, and maintaining software applications. It forms the technological backbone that supports the functioning and development of higher-level software;

3) Software packages: software applications and structured collection of functions, datasets, documentation, and sometimes compiled code that extends the functionality of a programming language (e.g. R and Python);

4) Specifications: resources that outline best practices, guidelines, standards, or other high-level instructions for the project. These are typically static and do not include executable code but may include links or references to repositories or tools;

5) Training: recorded video or audio sessions that capture live demonstrations, discussions, or knowledge-sharing events. These may also include accompanying materials like slides or links to tools;

6) Tutorials: step-by-step guides or procedures designed to achieve a specific outcome. These can be project-specific workflows or generalised tutorials that teach users how to perform a task;

7) Websites: collection of related web pages and digital content that are hosted on a server and accessible via the internet through a web address (URL).

8) Briefs, reports, and publications: formal written outputs that communicate the progress, findings, methods, or outcomes, including deliverable and milestone reports, policy briefs, and scientific publications.

Table 1: Definitions and explanations for all descriptors used in the B3 outputs overview.

Descriptor	Definition
Title	Title/description of the output
Responsible	Who is the responsible for the output post-project
Secondary point of contact	Indication of the secondary point of contact
Type	Categorisation of the type of output
Maintenance status	Indication of development status per output, and therefore its usability and support
Published on the documentation website	Indication whether the output is published on the documentation website
(Expected) delivery date	(Expected) date of the delivery of the output
Source code URL	Link to the source code
Documentation website URL	Link to the landing page of the output on the documentation website
Sustainability level	Classification of the output's sustainability level as primary (driving change in secondary outputs), secondary (typically not initiating any changes in other output), or complimentary (formal written outputs that communicate the progress, findings, methods, or outcomes).
Horizon of time to maintain	Indication of the maintenance time horizon for the output
Best solution to archive the source code or output	Proposed best practice for archiving the source code/output
Best solution to further maintain the code or output post-project	Proposed best practice for ongoing maintenance of the code/output post-project

4.1. Description of the project's outputs

Based on their nature and content, the B3 project outputs can be categorised into eight main categories:

9) Analyses: processes of systematically inspecting, cleaning, transforming, and modeling data to discover useful information, draw conclusions, and support decision-making, including the development of workflows;

10) Infrastructure: set of foundational software components, systems, and services that are essential for building, running, managing, and maintaining software applications. It forms the technological backbone that supports the functioning and development of higher-level software;

11) Software packages: software applications and structured collection of functions, datasets, documentation, and sometimes compiled code that extends the functionality of a programming language (e.g. R and Python);

12) Specifications: resources that outline best practices, guidelines, standards, or other high-level instructions for the project. These are typically static and do not include executable code but may include links or references to repositories or tools;

13) Training: recorded video or audio sessions that capture live demonstrations, discussions, or knowledge-sharing events. These may also include accompanying materials like slides or links to tools;

14) Tutorials: step-by-step guides or procedures designed to achieve a specific outcome. These can be project-specific workflows or generalised tutorials that teach users how to perform a task;

15) Websites: collection of related web pages and digital content that are hosted on a server and accessible via the internet through a web address (URL).

16) Briefs, reports, and publications: formal written outputs that communicate the progress, findings, methods, or outcomes, including deliverable and milestone reports, policy briefs, and scientific publications.

Additionally, the maintenance status of each output has been described following a standardised development and usability status (repostatus.org, 2025):

1) Concept: minimal or no implementation has been done yet, or the repository is only intended to be a limited example, demo, or proof-of-concept;

2) WIP: initial development is in progress, but there has not yet been a stable, usable release suitable for the public;

3) Suspended: initial development has started, but there has not yet been a stable, usable release; work has been stopped for the time being but the author(s) intend on resuming work;

4) Abandoned: initial development has started, but there has not yet been a stable, usable release; the project has been abandoned and the author(s) do not intend on continuing development;

5) Active: the project has reached a stable, usable state and is being actively developed;

6) Inactive: the project has reached a stable, usable state but is no longer being actively developed; support/maintenance will be provided as time allows;

7) Unsupported: the project has reached a stable, usable state but the author(s) have ceased all work on it. A new maintainer may be desired;

8) Moved: the project has been moved to a new location, and the version at that location should be considered authoritative. This status should be accompanied by a new URL.

5. Sustainability plan per output type

As previously mentioned, the sustainability of the B3 outputs is primarily determined by their nature and content, supported by a unified sustainability approach applicable to all stakeholder groups. However, the sustainability plan is customised for each output type. Depending on the type, each output is assigned one of three sustainability levels.

1) Primary output: products that mainly offer new functionality or information. While they often rely on (external) dependencies, their main driver for change are decisions/insights by their contributors.This level generally includes outputs such as infrastructure, software packages, specifications, and analyses. Primary outputs are the main focus of the sustainability plan, as they can provide new and long-term value.

2) Secondary output: products that are mainly referencing or clarifying primary output. These products mainly undergo changes or updates when the associated primary product is modified. This level generally includes outputs such as training, and tutorials, and websites.

3) Complimentary output: products that enhance, disseminate, or communicate the value of primary and secondary outputs, without necessarily being directly required for their function. These outputs support understanding, awareness, and broader impact of the project's work. This level generally outputs such as reports, scientific publications, policy briefs, and other dissemination materials.

5.1. Primary outputs

In general, primary outputs are the main focus for sustainability after the project concludes. However, within this category, outputs can be prioritised based on their relative importance. The infrastructure is considered the highest-priority output and will receive the most attention in terms of post-project maintenance, followed closely by software packages, specifications, and analyses. The following sustainability plan outlines the maintenance approach for each output, based on input provided by developers and contributors who were actively involved with these outputs.

5.1.1. Infrastructure

Within the B3 project, there is one main output characterised as “infrastructure” which is the Species Occurrence Cube download service (Blisset *et al.*, 2025). This output has been integrated into GBIF’s data infrastructure as a service that is accessible in the user interface and in the API, and powered by a SQL download function. Being part of the core GBIF infrastructure ensures long-term sustainability, provided GBIF continues, with the service expected to be supported for ten years or more. Its maintenance, and by extension, the maintenance of the B3 output, will be managed by the GBIF Secretariat as part of the core GBIF work programme. Additionally, both the source code and the output are archived on Zenodo, guaranteeing open access for all stakeholders. Within WP2 of the B3 project, the software has been demonstrated to be portable, as demonstrated on the Microsoft Azure public cloud with a generic Spark cluster, further mitigating risk and providing opportunity for another provider to continue the service should GBIF cease to exist.

5.1.2. Software packages

The majority of the B3 outputs are classified as “software packages”, with for example the gcube R package (Langeraert, 2025), pygbif in Python (pygfib, 2025), and the B3 general biodiversity indicators Graphical User Interface (b3gbi-gui, 2025). The source code for these packages, developed during the B3 project, has been and will continue to be archived on Zenodo for long-term preservation. Code that is intended for ongoing use and development is, and will continue to be, published in public repositories on GitHub, where it will be maintained for at least five years. Maintenance of these outputs will follow an open source approach, grounded in transparency, community involvement, and collaborative development. This includes public issue tracking, open contributions, updates in response to dependency changes, and open licensing, ensuring the software remains accessible, reusable, and adaptable by the broader scientific and technical community. Furthermore, the b3verse is a modular suite of nine R packages developed within the B3 project to support biodiversity indicator workflows based on occurrence cubes, covering data acquisition, cube simulation, processing, indicator calculation, and uncertainty assessment (Langeraert *et al.*, 2025). It is openly available via a dedicated R-universe and GitHub, with snapshot versions archived on Zenodo, and includes the b3data package providing example datasets in Frictionless Data Package format for accessibility and sustainability (Langeraert *et al.*, 2025).

5.1.3. Specifications

Outputs of the B3 project that are categorised as “specifications” include specifications on invasibility and suitability (Cortès Lobos *et al*., 2024), dissimilarity (MacFadyen *et al*., 2024a) and invasibility (MacFadyen *et al*., 2024b) cubes and their production. Since these specifications are primarily text-based and any errors do not affect system functionality, they do not require ongoing maintenance. All specifications produced during the project will remain accessible to stakeholders. The reference version of each specification will be archived on Zenodo and made available via the official B3 websites to ensure long-term accessibility.

5.1.4. Analyses

Outputs of the B3 project that are categorised as “analyses” include scripts to explore the conditions that determine the reliability of models, trends, and status comp-unstructured-data and workflows for using B3 for deep learning (comp-unstructured-data, 2025; Ryckewaert, 2025). These outputs are regarded as complete upon delivery, having achieved their intended results, and do not require ongoing maintenance after the project concludes. However, to ensure reproducibility, limited maintenance, such as updating dependencies, may be necessary and will be the responsibility of the designated responsible. If such updates are not feasible, appropriate mitigation strategies (cf. snapshots) for managing outdated dependencies will be implemented. Furthermore, within five years post-project, additional analyses may be produced if necessary and feasible, based on the monitoring of the primary outputs. The source code will be available on GitHub and the outputs will be archived on Zenodo, ensuring accessibility for all stakeholders.

5.2. Secondary outputs

Similar to the primary outputs, secondary outputs can also be prioritised according to their relative importance. In this context, websites are considered the highest-priority secondary outputs, followed by tutorials and training. Yet, these outputs should only be revised when the associated primary outputs require it.

5.2.1. Websites

Within the B3 projects, two main outputs were identified as "website". The first is the general B3 website (https://b-cubed.eu/). At the conclusion of the project, this website will be transitioned into a legacy version that summarises the main results and provides redirects to relevant publications and repositories. The legacy website will remain accessible under the same domain name to ensure continuity and ease of access. It will require minimal maintenance, which will be handled by Pensoft for at least five years after the end of the project.

The second website is the B3 documentation site (https://docs.b-cubed.eu/). As a technical reference and educational resource for the B3 project, it will require more ongoing maintenance than the general B3 website, as it may need to incorporate new information, updated specifications, tutorials, and technical documentation even after the project has concluded. This maintenance will be handled by MeiseBG and INBO. However, the process remains straightforward, as the site is hosted for free and indefinitely on GitHub Pages.

5.2.2. Tutorials

Outputs of the B3 that are categorised as “tutorial” include introductions to spatial data analysis and species distribution modeling, and data mobilisation from GBIF to the EBV data portal (Estupinan-Suarez & Quoss, 2024; MacFadyen, 2024a; MacFadyen, 2024b).These tutorials are maintained for the same period as their corresponding primary outputs. They do not need regular updates and should only be revised when changes to the primary outputs make it necessary. Nevertheless, their ongoing functionality will be monitored. Each tutorial’s reference version will be archived on Zenodo and GitHub, with redirects provided via the B3 websites to ensure continued access for all stakeholders.

5.2.3. Training

The B3 project outputs classified as "training" include both courses and workshops. These trainings are time-bound and only conducted during the B3 project period due to pragmatic implementation constraints. As a result, they do not require ongoing maintenance after the project concludes. However, all training materials delivered during the project will remain accessible for all stakeholders. The courses are hosted on YouTube, which offers indefinite video storage, while the workshops are archived on GitHub, also ensuring long-term availability. The B3 website will provide redirects to the training materials, as well as other relevant resources, to improve discoverability by all stakeholders. Additionally, this is complemented by formal B3 reporting under WP1, which documents training and outreach activities and ensures they align with the project's long-term sustainability objectives.If deemed necessary and feasible, a new training, either as a course or a workshop, can be developed and made available, rather than updating existing ones. However, we anticipate that the updated specifications and tutorials will adequately address all future needs.

5.3. Complimentary outputs

The B3 project outputs classified as "complementary outputs" include deliverable and milestone reports[1] (e.g., Abraham *et al*., 2024), scientific publications (e.g., Kumschick *et al*., 2025), policy briefs (e.g,. Schleidt *et al*., 2025), and other dissemination material (e.g., Hui *et al*., 2024). These outputs are considered complete upon delivery and do not require active maintenance after the project's conclusion. Accessibility should, however, be guaranteed for all stakeholders. This is guaranteed through archiving these documents in a designated collection on Zenodo, and publishing in bioRxiv (e.g., Langeraert *et al*., 2024), and scientific journals (e.g., Keet & Hui, 2025). Additionally, redirects via the B3 websites will ensure continued access for all stakeholders.

6. Sustainability actions

As outlined above, the sustainability of B3 outputs is supported by a community-driven model, with ongoing maintenance ensured through an open source approach. In this context, fostering an active and engaged community is essential to achieving long-term sustainability.

6.1. Actions already taken

From the very beginning, the B3 project has aimed to foster an active and engaged community through effective exploitation, dissemination, and communication of the B3 outputs, and by nurturing collaborations.

6.1.1. Exploitation, dissemination, and communication

A strategic framework for the dissemination, exploitation, and communication of B3 outputs has been established by the PEDCOM (cf. section 1.4.1.), to which we refer to for more details.

[1] For a more detailed overview of the PEDCOM, the DMP, and the report on FAIR data products and their interoperability with the Essential Biodiversity Variables Data Portal, please refer to Section 1.4.

6.1.2. Collaborations

During the B3 project, regular meetings were held with coordinators from sister projects such as AD4GD, FAIRiCUBE, and USAGE, to ensure alignment within the context of the European Green Deal Data Space. In addition, collaboration also extended to more regional initiatives within MeiseBG, including DiSSCo Flanders 2.0. These collaborations played a crucial role in supporting the sustainability of B3's outputs by fostering (i) knowledge exchange, (ii) network expansion, and (iii) increased visibility and credibility. Firstly, regular exchanges with sister projects enabled the sharing of best practices, lessons learned, and technical expertise. Implementing these best practices enhanced product maintainability, which in turn improved their sustainability. Secondly, close collaboration significantly broadened the network of stakeholders involved with B3. This expanded community not only provided valuable feedback, but also strengthened engagement and support around the project's results. Finally, these partnerships significantly enhanced the visibility and credibility of B3's outputs, helping to attract new stakeholders and potential investments. Such broadened engagement is vital for sustaining outputs developed through an open-source approach, where active community involvement is key to ensuring continued relevance and long-term impact.

6.2. Future plans

The deliverable D1.8 "Sustainability Report" for the B3 project was due in Month 30 (August 2025). However, with 12 months of project time remaining beyond this deadline, actions and developments related to sustainability are still actively progressing. This ongoing work provides an opportunity to further refine the sustainability plan and update the report towards the end of the project.

6.2.1. Accessibility on a long-term

During the remaining project period, greater emphasis will be placed on enhancing the discoverability of the B3 project and its outputs. This will include thorough documentation of all outputs, with comprehensive README files, accessible code snippets, and clearly defined procedures for both archiving and continued maintenance. In addition, project websites will be transitioned into legacy versions to ensure long-term accessibility. These efforts are essential to ensure that outputs remain easily discoverable, both through conventional search methods and modern tools such as Artificial Intelligence.

6.2.3. Functionality, maintainability and impact on a long term

The remaining project time will also be used to integrate the B3 project and its outputs into larger initiatives and broader strategic frameworks, ensuring alignment within the context of the European Green Deal Data Space. To this end, other Horizon European projects such as OneSTOP (OneSTOP, 2025) and BMD (BMD, 2025) are already incorporating B3 outputs into their activities. In addition, coordination meetings will be scheduled with VITO to explore how B3 results can be integrated into TERRASCOPE, Belgium's national Copernicus data and processing platform. Further discussions with ongoing Horizon Europe projects, such as OBSGESSION and SAGE, will ensure that the methodologies and biodiversity knowledge of B3 are taken into account in future developments. In parallel, discussions will be pursued to align B3 outputs with the goals and infrastructure of GEO BON, as well as integrate the developed FAIR workflows into the CBD and IPBES reporting. These efforts aim to strengthen the positioning of the B3 project, not only within the context of the European Green Deal Data Space, but also in international reporting and assessment of biodiversity. Additionally, work will be undertaken to frame and adapt the B3 outputs for integration into more commercially oriented platforms, such as Google Earth Engine and the Microsoft Planetary Computer, resulting in a potential bigger uptake of B3 products and results.

7. Monitoring and risk management

The sustainability of B3 outputs can only be ensured if both the outputs and sustainability measures are monitored after the project's completion, supported by effective risk management.

7.1 Monitoring

To support the sustained monitoring of B3 outputs, a post-project checklist has been developed as a living document through a consortium-wide consultation process. For each output, the checklist includes descriptors specifying: the responsible party, potential risks of maintenance loss, presence of a maintainer, availability of the source code, whether the source code is archived, the functionality of the repository URL after the project, and the operational status of the software post-project. Table 2 provides definitions and explanations for each of these descriptors.

7.1.1. KPIs

The post-project checklist can also be translated into a clearly defined set of KPIs, outlined in table 3, to support the ongoing monitoring of B3 outputs after the project's conclusion. Each KPI is also coupled to one of three strategic objectives: (i) accessibility, (ii) functionality, and (iii) maintainability and impact. As with the PEDCOM, the KPIs for the sustainability of B3 were selected based on the S.M.A.R.T. criteria (Doran, 1981):

- Specific: is the KPI specific enough?
- Measurable: do we have a way of measuring it?
- Achievable: do we have the resources to achieve it?
- Realistic: is it a sound goal?
- Timely: what is the expected timeline?

Table 2: Definitions and explanations for the descriptors in the post-project checklist.

Descriptor	Definition	Usage
Title	Title/description of the output	
Responsible	Who is the responsible for the output post-project	Evaluation column. Should be used as a checklist per year
Status of responsible	Did the actual person confirm the identity of the responsible party?	Evaluation column. Should be used as a checklist per year
Risk of maintenance loss	Estimation of the risk of maintenance loss, from low to high	Evaluation column. Should be used as a checklist per year
Is there a maintainer?	Status indicating whether a designated maintainer exists for the output	Evaluation column. Should be used as a checklist per year
Is the source code available?	Status indicating whether the source code is available in a repository	Evaluation column. Should be used as a checklist per year
Is the source code archived?	Status indicating whether the source code is archived	Evaluation column. Should be used as a checklist per year
Is the website URL still functional post-project?	Status indicating whether the URL to the website for each output is still active	Evaluation column. Should be used as a checklist per year
Is the software still functional post-project?	Status indicating whether the software is currently functional or non-functional based on test case results	Evaluation column. Should be used as a checklist per year

Table 3: Set of Key Performance Indicators (KPIs) for the monitoring of the sustainability of the B3 outputs.

KPI	Description	Target	Strategic objective
Availability of project outputs online	Tracks whether tools, data, and documentation remain accessible via repositories or websites	100% availability maintained	Accessibility
Archival completeness	Percentage of outputs properly archived with metadata and persistent identifiers	100% of outputs archived	Accessibility
Link stability	Percentage of functional links of outputs	≥ 95% valid links annually	Accessibility
Responsibility	Percentage of outputs with a designated responsible	100% of outputs have a designated responsible	Functionality
Uptime of hosted services	Monitors the availability and performance of any hosted tools or services	≥ 99% uptime	Functionality
Functionality of the software	Percentage of software still functional post-project, verified by executing test cases	≥ 90% of the software is functional post-project	Functionality
Limited high risk of maintenance loss	Percentage of outputs with high risk of maintenance loss	≤ 5% with high risk of maintenance loss	Maintainability and impact.
Number of use cases	Measures the ongoing use of B3 tools, datasets, or platforms through citations, references, GBIF metrics, and downloads	≥ 50 use cases annually	Maintainability and impact.
Number of contributions from external users (i.e. non-project partners)	Tracks open-source contributions or community feedback through GitHub and GBIF metrics	≥ 25 contributions annually across all outputs	Maintainability and impact.

7.2. Risk management

The sustainability of B3 outputs is subject to several key risks, especially after the conclusion of the funding period. These include the risk of loss of maintenance responsibility as well as various technical challenges that may affect long-term accessibility, usability, and impact of the B3 outputs.

7.2.1. Maintenance risks

An important risk to the sustainability of the B3 outputs is the potential loss of maintenance due to changes in personnel or individuals leaving the institution. As outlined in the post-project checklist, B3 outputs can be classified into three main categories based on their risk of maintenance loss: low, medium, and high. The risk is considered low when maintenance responsibility is community-based; medium when it is institutionally based; and high when it depends on an individual. These risks can be mitigated by implementing appropriate backup solutions at the institutional or project level, thereby supporting the long-term sustainability of the outputs.

7.2.2. Technical risks

Other risks to the sustainability of the B3 outputs are more technical, including link rot and the decay of dependencies. Firstly, link rot – the process by which hyperlinks become inaccessible or no longer lead to the originally intended content over time – represents a significant potential risk to the long-term sustainability of B3 outputs. However, this risk is mitigated through the use of persistent identifiers (such as DOIs) and by archiving the outputs. Additionally, regular reviews using the post-project checklist, combined with timely updates of links, further reduce the impact of link rot. Secondly, the decay of dependencies – the process by which external components (such as software libraries) that an output relies on become outdated, unsupported, incompatible, or no longer maintained over time – represents a considerable potential risk to the long-term sustainability of B3 outputs. However, this risk is mitigated by archiving working environments using containers (such as Docker), selecting carefully considered and reliable dependencies, and thoroughly documenting all dependencies along with their specific versions.

8. Outlook

In conclusion, the B3 sustainability report presents a clear and well-structured strategy to support the long-term preservation and impact of the project's outputs beyond the end of the funding period. It defines a coherent vision of sustainability specific to the B3 outputs, identifies which outputs should be sustained, and outlines tailored sustainability actions for each output type. The report also provides an outlook on future opportunities for continued collaboration. To ensure its continued relevance and effectiveness, the sustainability report will be updated toward the end of the project, offering a more detailed overview of planned collaborations with other initiatives.

9. Acknowledgements

We would like to thank the researchers who actively participated in the making of the sustainability report for the B3 project. Great appreciation goes to the reviewers of the task.

10. References

Abraham, L., Hendrickx, L., Groom, Q., Yovcheva, N., Langeraert, W., Rocchini, D., Dove, S. (2024). Hackathon results. B3 project deliverable D1.7.

b3gbi-gui. (2025). https://github.com/b-cubed-eu/b3gbi-gui

Blisset, M., Robertson, T., and Desmet, P. (2025). Occurrence cube functions (cube-0.3.1). Zenodo. https://doi.org/10.5281/zenodo.14973380

BMD – Biodiversity Meets Data. (2025). https://doi.org/10.3030/101181294

comp-unstructured-data. (2025). https://github.com/b-cubed-eu/comp-unstructured-data

Cortès Lobos, R.B., Di Musciano, M., Martini, M., and Rocchini, D. (2024). Specification for suitability cubes and their production. https://docs.b-cubed.eu/guides/suitability-cube/

Doran, G. T. (1981). There's a S.M.A.R.T. Way to Write Management's Goals and Objectives. Management Review, 70, 35-36

Estupinan-Suarez, L. M., and Quoss, L. (2024). EBVcube/B-Cubed_data_mobilisation: B-Cubed data mobilisation for species listed in EU regulations (v1.0.0). Zenodo. https://doi.org/10.5281/zenodo.13798783

Estupinan-Suarez, L. M., Quoss, L., Langer, C., Oceguera, E. and Pereira, H. M. (2024) FAIR data products and interoperability with the Essential Biodiversity Variables Data Portal. B3 project deliverable D3.3.

Global Biodiversity Information Facility (GBIF). https://gbif.org

GitHub. https://github.com

Hui C., MacFadyen S., Visser V., Groom Q., and Isaac N.J.B. (2024). Editorial: Biodiversity informatics: building a lifeboat for high functionality data to decision pipeline. *Frontiers in Ecology and Evolution*.12:1386917. https://doi.org/10.3389/fevo.2024.1386917

Keet, J-H., and Hui, C. (2025). One-hectare fine-scale dataset of a fynbos plant community in the Cape Floristic Region. *Data in Brief*. 59. 111334. https://doi.org/10.1016/j.dib.2025.111334

Kumschick, S., Journiac, L., Boulesnane-Genuant, O., Botella, C., Pouteau, R., and Rouget, M. (2025). Mapping potential environmental impacts of alien species in the face of climate change. *Biological Invasions*. 27:43. https://doi.org/10.1007/s10530-024-03490-4

Langeraert, W. (2025). gcube: Simulating Biodiversity Data Cubes (1.3.7). Zenodo. https://doi.org/10.5281/zenodo.15390043

Langeraert, W. Breugelmans, L., Desmet, P., Dove,S., Kumschick, S., MacFadyen, S., Seebens, H., Trekels, M., Yahaya, M.M., Van Daele, T. (2025). MS29: Version 0.1 of the b3verse R package suite publicly available. https://b-cubed-eu.r-universe.dev/builds

Langeraert, W., Barhdadi, W., Brosens, D., Cortès, R., Desmet, P., Di Musciano, M., Earl, C., Govaert, S., Huybrechts, P., Martini, M., Rodrigues A.V., Veeken, A., Yahaya, M.M., and Van Daele, T. (2024). Unveiling ecological dynamics through simulation and visualization of biodiversity data cubes. https://doi.org/10.37044/osf.io/vcyr7

MacFadyen, S. (2024a). An introduction to spatial data analysis for conservation ecology in R. https://docs.b-cubed.eu/tutorials/spatial-data-analysis-r/

MacFadyen, S. (2024b). An introduction to species distribution modelling in R. https://docs.b-cubed.eu/tutorials/species-distribution-modelling-r/

MacFadyen, S., Trekels, M., Yahaya, M., Landi, P., and Hui, C. (2024a). Specification for dissimilarity cubes and their production. https://docs.b-cubed.eu/guides/dissimilarity-cube/

MacFadyen, S., Yahaya, M., Landi, P., and Hui, C. (2024b). Specification for invasibility cubes and their production. https://docs.b-cubed.eu/guides/invasibility-cube/

Niemelä, J. (2000). Biodiversity monitoring for decision-making. Annales Zoologici Fennici pp. 307-317.

OneSTOP – OneBiosecurity Systems and Technology for People, Places and Pathways. (2025). https://doi.org/10.3030/101180559

pygbif. (2025). https://pygbif.readthedocs.io/en/latest/index.html

Repostatus.org. A system for describing the status of software repositories. Available at: https://www.repostatus.org

Ryckewaert, M. (2025). DeepMaxent - A neural networks using maximum entropy principle for Species Distribution Modelling. https://github.com/RYCKEWAERT/deepmaxent

Schleidt, K., Serral, I., de la Vega, D., Maso, J., Jetschny, S., Groom, Q., Beber, R., Bastin, L., Estupinan-Suarez, L. M., and Matheus, A. (2025). Policy Brief: Unlocking The Full Potential Of The Green Deal Data Space. Zenodo. https://doi.org/10.5281/zenodo.15649164

Yovcheva, N. et al. (2023). Data Management Plan. B3 project deliverable D1.3.

Yovcheva, N., and Metodiev, T. (2023). Plan for Exploitation, Dissemination and Communication. B3 project deliverable D1.2.

Yovcheva, N. (2024). Updated Plan for Exploitation, Dissemination and Communication (PEDCOM). B3 project deliverable D1.9.

Zenodo. https://zenodo.org

11. Annex

11.1. Questionnaire 1

Table S1: overview of the questions in the questionnaire

Question number	Question
Q1	What is the horizon of time in mind for the sustainability of the B3 products?
Q2	Provide a list of bullet points on how you define sustainability. This in scientific, technical, and financial terms.
Q3	Provide a list of headings on how you envision the outline of the sustainability report.
Q4	Please provide a list of the projects and outcomes that your institution has created and are responsible for, which are not yet included in the products list available.
Q5	From these outcomes, which are the key points to be maintained?
Q6	How can the dissemination/awareness of the community on the functionality that B3 represents be maintained at the moment?
Q7	For each product, what do you think is the best practice to guarantee sustainability?
Q8	How can continuing usability of the software be ensured? What do you assess as the main risks and how should this be managed? How can the compatibility of software with new versions of OS, libraries,... be ensured?
Q9	How can the application of the B3 outcomes be broadened?
Q10	How can the functionality of the software be maintained? Will it be possible for users to request enhancements?
Q11	How to track the use of the B3 outcomes?
Q12	Do we need to ensure that the hardware during the project is available after the project?
Q13	Do we need someone who is responsible for the sustainability of the outcomes post-project?
Q14	Please provide a list of bullet points on what you consider as the main hurdles for the sustainability of the outcomes post-project
Q15	How can the dissemination/awareness of the community on the functionality that B3 represents be maintained post-project?
Q16	Please provide your point of view on extra funding or other projects to continue the development of the outcomes
Q17	Should there be a difference in the way we support endusers? Scientific community, international organisation, policymakers, private, and commercial...
Q18	What is your point of view on commercial options? For example paid-for services such as consulting, training, subcontracting, and implementation of special features.

11.2. Summary of the workshop

When: Wednesday 21/05/2025 13h - 15h
Where: online
Attendance: 17 participants

11.2.1. Overview of the workshop

Time	Theme
13:00 - 13:05	Introduction
13:05 - 13:15	Brief review of the questionnaire
13:13 - 14:30	Discussion centred around 4 main topics
14:30 - 15:00	Conclusion

11.2.2. Introduction

B3 will create a large number of workflows, software and other outputs that should remain applicable and relevant after the project ends. We will create a plan for the long term (5-10y) technological and scientific sustainability of B3 outputs (Task 1.8). Each of the partners involved will support the creation of a common vision and document of how the software and workflows are to be maintained. The result will be captured in a deliverable, D1.8, named sustainability report, of type document, report, with the dissemination level public and due Month 30 of the project. In coordination with the lead of WP1, Nikol Yovcheva, the leaders of Task 1.8, Stefaan Pijls and Jonas Depecker, have established a timeline for the task's completion. This timeline is presented in Figure S1. Following the timeline, a first workshop on the sustainability of B3 was organised on May 21st 2025 and which was based on a questionnaire sent out two weeks before. The workshop started off with an introduction in which sustainability was defined and the workplan of the task was outlined.

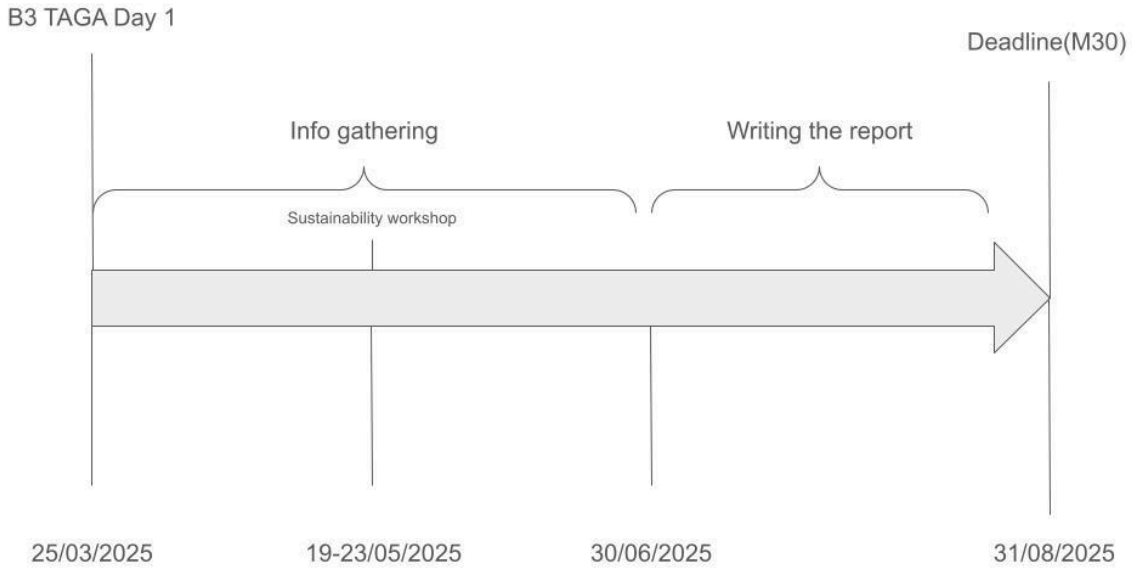

Figure S1: Timeline for the completion of Task 1.8, Sustainability Report

11.2.3. Brief review of the questionnaire

The second part of the workshop focussed on reviewing the answers collected from the questionnaire. The answers can be found via the following link: link to answers of the questionnaire. The main trends were outlined and further discussed. During this discussion, the need to identify which products actually have to be sustained was highlighted. This list of products will serve as the foundation for determining the most suitable sustainability approach for each item, as well as the appropriate time horizon for its support. Furthermore, this list of products will be one of the main components of the sustainability report. During the discussion, following additional points were raised:

- Integration of cloud components and storage of cubes.
- Possible workflows to provide analysis ready cubes.
- Consideration of sustainability in different scenario's. For example, what if a product becomes highly popular.

11.2.4. Discussion

The discussion part of the workshop was centred around four main topics and was completed with two additional topics.

First topic

“How can the dissemination/awareness of the community on the functionality that B3 represents be maintained at the moment and how does this link to post-project (academic and policy)?”.

Following points were raised during the discussion of the first topic:

- The dissemination, communication, documenting, and publishing will be established during the project and will still all be there when the project ends. Continuation will depend on future projects.
- Part of maintenance and dissemination is and will be done by GBIF as they offer the service.
- GBIF already has a community that they engage with.
- There is an element of sustainability in the services provided by GBIF that is captured in the way that GBIF functions as an organisation.
- The need of a graphical representation of the different products was highlighted
- The case studies will be the hardest to maintain.

For now, the efforts made toward awareness and dissemination are considered sufficient. Several projects are already utilising various components of the B3 products. These components will continue to be used and integrated into different projects. While the B3 name may eventually fade, its products will persist. In most cases, their use and impact will remain trackable.

Second topic

“For each product, what do you think is the best practice to guarantee sustainability? And outcomes to be maintained.”.

Following points were raised during the discussion of the second topic:

- R dependencies do not govern a major risk as snapshots can be made that will guarantee sustainability. This is if you can't remake the results.
- If you want to reuse the workflows, authors will have to be contacted to fix issues with dependencies.
- All products should be properly archived.
- Discoverability is a key element and can be aided through the B3 website.
- Documentation is also key, also through non-technical papers and output.

Third topic

“How to track the use of the B3 outcomes?”.

Points raised during the discussion of the third topic:

- Interactions with the users through github requests, or github issues popping up.
- GBIF will keep an eye on metrics and will track B3 output.
- People really reaching out is more important and interesting.

Fourth topic

“Do we need someone who is responsible for the sustainability of the outcomes post-project? What is your point of view on commercial options? For example paid-for services such as consulting, training, subcontracting, and implementation of special features.”.

Points raised during the discussion of the fourth topic:

- Not possible to provide in-kind.
- Per product, one contactpoint should be assigned together with an overall contactpoint.
- A project-level or institutional-level back-up is desired.
- Collaborations and new projects will be key for sustainability

11.2.5. Conclusion and Actionpoints

Based on the discussion during the workshop following action points were raised to be key for the establishment of the sustainability report:

- Make a graph visualising the linkages between the different products.
- Make a spreadsheet outlining the different products, with columns indicating the contactpoint and the risk of losing.
    - check in with Laura on the existing table
    - check in with INBO for reference format example
- Define criteria for sustainability.
- Get a better insight in the global case study

11.3. Overview of outputs

WP + task	Title	Responsible	Secondary point of contact	Type [1]	Maintenance status [2]	Published on the documentation website? (yes/no) [3]	(Expected) delivery date	Source code URL	Documentation website URL	Sustainability level	Horizon of time to maintain	Best solution to archive the source code / output	Best solution to further maintain the code / output post-project
WP3 T3.1	B-Cubed software development guide	Desmet P.	Groom Q.	Specifications	Inactive	Yes	delivered	https://github.com/b-cubed-eu/documentation/blob/main/src/content/docs/guides/software-development.md	https://docs.b-cubed.eu/guides/software-development/	Primary	5 years	Publication in RIO	open source approach
WP2 T2.1	Specification for species occurrence cubes and their production	Desmet P.	Groom Q.	Specifications	Inactive	Yes	delivered	https://github.com/b-cubed-eu/documentation/blob/main/src/content/docs/guides/occurrence-cube.md	https://docs.b-cubed.eu/guides/occurrence-cube/	Primary	5 years	Zenodo, either seperately or as part of the documentation website	open source approach
WP2 T2.2	GBIF SQL download API	Blisset M.	Groom Q.	Infrastructure	Active	Yes	delivered	https://github.com/gbif/occurrence-cube	https://docs.b-cubed.eu/software/gbif-api/	Primary	10 years	Zenodo: https://doi.org/10.5281/zenodo.10607133	Infrastructure can only be maintained by GBIF Secretariat
WP1 T1.4	FAQ helpdesk	Abraham L.	Groom Q.	Training	WIP	No	31/07/2026			Secondary			open source approach
WP4 T4.5	gcube R package	Langeraert W.	Groom Q.	Software package	Active	Yes	delivered	https://github.com/b-cubed-eu/gcube/	https://docs.b-cubed.eu/software/gcube/readme/	Primary	5 years	Zenodo: https://doi.org/10.5281/zenodo.14038996	open source approach
WP1 T1.4	An introduction to spatial data analysis for conservation ecology in R	MacFadyen S.	Groom Q.	Tutorial	Active	Yes	delivered	https://docs.b-cubed.eu/tutorials/spatial-data-analysis-r/	see source	Secondary	2 years	Github	open source approach
WP1 T1.4	An introduction to species distribution modelling in R	MacFadyen S.	Groom Q.	Tutorial	Active	Yes	delivered	https://docs.b-cubed.eu/tutorials/species-distribution-modelling-r/	see source	Secondary	2 years	Github	open source approach
WP1 T1.4	An introduction to ecological modelling with Google Earth Engine	MacFadyen S.	Groom Q.	Tutorial	Active	Yes	delivered	https://docs.b-cubed.eu/tutorials/ecological-modelling-google-earth-engine/	see source	Secondary	2 years	Github	open source approach
WP4 T4.1	Suitability cube	Cortès Lobos R,B,	Groom Q.	Analysis	Active	Yes		https://github.com/b-cubed-eu/virtual-suitability-cube		Primary			open source approach
WP4 T4.1	Specification for suitability cubes and their production	Cortès Lobos R,B,	Groom Q.	Specifications	Active	Yes	30-11-2025	https://docs.b-cubed.eu/guides/suitability-cube/	see source	Primary	5 years	Github	open source approach
WP4 T4.1	Specification for dissimilarity cubes and their production	MacFadyen S.	Groom Q.	Specifications	Active	Yes	30-11-2025	https://docs.b-cubed.eu/guides/dissimilarity-cube/	see source	Primary	5 years	Github	open source approach
WP4 T4.1	Specification for invasibility cubes and their production	MacFadyen S.	Groom Q.	Specifications	Active	Yes	30-11-2025	https://docs.b-cubed.eu/guides/invasibility-cube/	see source	Primary	5 years	Github	open source approach
WP4 T4.2	dissMapR for the production and analysis of dissimilarity cubes	MacFadyen S.	Groom Q.	Software package	Active	No	30-6-2025	https://macsands.github.io/dissmapr/	https://docs.b-cubed.eu/guides/dissimilarity-cube/	Primary	5 years	Github	open source approach
WP4 T4.3	invasiMapR for the production and analysis of network invasibility cubes	MacFadyen S.	Groom Q.	Software package	Active	No	31-7-2025	https://macsands.github.io/invasimapr/	https://docs.b-cubed.eu/guides/invasibility-cube/	Primary	5 years	Github	open source approach
WP4 T4.4	Using B3 for deep learning	Marcos D.	Groom Q.	Analysis	Active	No		https://github.com/RYCKEWAERT/deepmaxent	https://github.com/RYCKEWAERT/deepmaxent	Primary	5 years	github	open source approach
WP3 T3.3	Data mobilisation from GBIF to the EBV data portal	Estupinan-Suarez L.	Groom Q.	Tutorial	Active	Yes	31-8-2024	https://github.com/EBVcube/B-Cubed_data_mobilisation	https://github.com/EBVcube/B-Cubed_data_mobilisation	Secondary	2 years	GitHub Zenodo	open source approach
WP4 T4.5	Scripts to explore the conditions that determine the reliability of models, trends and status comp-unstructured-data	Langeraert W.	Groom Q.	Analysis	Active	No	24-12-2025	https://github.com/b-cubed-eu/comp-unstructured-data		Primary	0 years	Zenodo	open source approach
WP5 T5.1	b3gbi	Dove S.	Groom Q.	Software package	WIP	Yes	delivered	https://github.com/b-cubed-eu/b3gbi	https://b-cubed-eu.github.io/b3gbi/	Primary	5 years	Zenodo, contact: Shawn Dove	open source approach
WP5 T5.2	pdindicatoR	Breugelmans L.	Groom Q.	Software package	WIP	No	delivered	https://github.com/b-cubed-eu/pdindicatoR		Primary	5 years	Zenodo (done)	open source approach
WP5 T5.3	impIndicator	Yahaya M.	Groom Q.	Software package	WIP	No	delivered	https://github.com/b-cubed-eu/impIndicator	see source	Primary	5 years	Zenodo (done)	open source approach
WP5 T5.4	dubicube	Langeraert W.	Groom Q.	Software package	Active	Yes	27-2-2026	https://github.com/b-cubed-eu/dubicube	https://docs.b-cubed.eu/software/dubicube/readme/	Primary	5 years	Zenodo: https://doi.org/10.5281/zenodo.14850237	open source approach
WP1 T1.4	Courses on YouTube Empowering Biodiversity Monitoring through Data Cubes: Techniques & Applications for Open Science	MacFadyen S.	Groom Q.	Training	Active	No	delivered	https://www.youtube.com/watch?v=a-YFt1vIXbE&list=PLE9Qrf4CJnRGlWLYViwWPIdbAxS1qOrtu&index=2	see source	Secondary	0 years	Github and YouTube	NA
WP3 T3.3	Go see a Docker! First help with containerizing	Van Neste C.	Groom Q.	Tutorial	Inactive	Yes		https://github.com/AgentschapPlantentuinMeise/dockshop		Secondary	0 years	GitHub (done), contact Christophe Van Neste	open source approach
WP4 T4.5	Unveiling Ecological Dynamics Through Simulation and Visualization of Biodiversity Data Cubes	Langeraert W.	Groom Q.	Tutorial	Active	Yes		https://github.com/b-cubed-eu/b-cubed-workshops/blob/main/workshops/02		Secondary	0 years		open source approach
WP4 T4.5	Targets workshop	Langeraert W.	Groom Q.	Tutorial	Active	Yes		https://github.com/wlangera/targets-workshop-2025		Secondary	0 years		open source approach
WP1 T1.4	EBVCube: Enhancing Biodiversity Data Sharing with Interoperable Geospatial Standards	Estupinan-Suarez L.	Groom Q.	Tutorial	Inactive	No		https://github.com/EBVcube/ebv-workshop2024	https://github.com/EBVcube/ebv-workshop2024	Secondary	0 years	GitHub	open source approach

WP + task	Title	Responsible	Secondary point of contact	Type [1]	Maintenance status [2]	Published on the documentation website? (yes/no) [3]	(Expected) delivery date	Source code URL	Documentation website URL	Sustainability level	Horizon of time to maintain	Best solution to archive the source code / output	Best solution to further maintain the code / output post-project
WP1 T1.4	How to Package YouR Functions: From Standalone to R Packages	Oldoni D.	Groom Q.	Tutorial	Inactive	No		https://github.com/b-cubed-eu/b-cubed-workshops/tree/main/workshops/04 [4]		Secondary	5 years		open source approach
	Databricks webinar	Groom Q.	Groom Q.	Tutorial	Active	No		https://techdocs.gbif.org/en/data-use/b-cubed/generate-cube-databricks#generating-a-data-cube-using-microsoft-azure-databricks		Secondary			open source approach
WP3 T3.2	How to build a species occurrence cube from a GBIF checklist	Oldoni D.	Groom Q.	Tutorial	Inactive	Yes		https://github.com/b-cubed-eu/documentation/blob/main/src/content/docs/tutorials/cube-from-checklist.md	https://docs.b-cubed.eu/tutorials/cube-from-checklist/	Secondary	5 years	Zenodo, as part of documentation website	open source approach
WP1 T1.6	Policy brief on FAIR indicators	Sica Y.	Groom Q.	Specifications	Active	Yes	delivered	https://zenodo.org/records/13912947		Primary			open source approach
WP6 T6.1	Trends and status of biodiversity at Ramsar sites	Dove S.	Groom Q.	Analysis	WIP	No	end of project	https://github.com/b-cubed-eu/muddymetrics		Primary	0 years	Zenodo	open source approach
WP5 T5.5	b3verse	Langeraert W.	Groom Q.	Specifications	Active	Yes	delivered	https://github.com/b-cubed-eu/b-cubed-eu.r-universe.dev	https://docs.b-cubed.eu/guides/b3verse/	Primary	5 years	Zenodo: https://doi.org/10.5281/zenodo.15781060	open source approach
WP5 T5.5	b3data	Langeraert W.	Groom Q.	Software package	WIP	Yes	delivered	-	https://docs.b-cubed.eu/guides/b3data/	Primary	2 years	Zenodo: https://doi.org/10.5281/zenodo.15181097	open source approach
WP5 T5.5	Scripts used to create the b3data frictionless data package	Langeraert W.	Groom Q.	Analysis	WIP	Yes	delivered	https://github.com/b-cubed-eu/b3data-scripts/	https://docs.b-cubed.eu/guides/b3data/	Primary	2 years	Zenodo: https://doi.org/10.5281/zenodo.15190796	open source approach
WP5 T5.5	b3verse: A collection of R packages to work with occurrence cubes	Langeraert W.	Groom Q.	Tutorial	Active	Yes	delivered	https://github.com/b-cubed-eu/documentation/blob/main/src/content/docs/guides/b3verse.Rmd	https://docs.b-cubed.eu/guides/b3verse/	Secondary	5 years	Zenodo, as part of documentation website	open source approach
WP5 T5.5	b3data: Data resources for the b3verse	Langeraert W.	Groom Q.	Tutorial	Active	Yes	delivered	https://github.com/b-cubed-eu/documentation/blob/main/src/content/docs/guides/b3data.Rmd	https://docs.b-cubed.eu/guides/b3data/	Secondary		Zenodo, as part of documentation website	open source approach
WP3 T3.2	Download a species occurrence cube from GBIF.org	Desmet P.	Groom Q.	Tutorial	Inactive	Yes	delivered	https://github.com/b-cubed-eu/documentation/tree/main/src/content/docs/tutorials	https://docs.b-cubed.eu/tutorials/download-a-cube-from-gbif/	Secondary	3 years	Zenodo, as part of documentation website	open source approach
	Converting GBIF data cubes in cloud-native data formats	Trekels M.	Groom Q.	Tutorial	Active	No		https://docs.b-cubed.eu/tutorials/conversion-cube-to-zarr/	see source	Secondary			open source approach
WP3 T3.2	B-Cubed documentation website	Desmet P.	Groom Q.	Website	Active	Yes	delivered	https://github.com/b-cubed-eu/documentation	https://docs.b-cubed.eu/	Secondary	5 years	NA	Maintained by MeiseBG and INBO
WP3 T3.2	b3doc	Govaert S.	Groom Q.	Software package	Active	Yes	delivered	https://github.com/b-cubed-eu/b3doc	https://docs.b-cubed.eu/software/b3doc/readme/	Primary	5 years	Zenodo: https://doi.org/10.5281/zenodo.15649519	open source approach
	Living Planet Symposium 2025 demo	Estupinan-Suarez L.	Groom Q.	Tutorial	Active	No	delivered	https://github.com/b-cubed-eu/lps25-demo		Secondary			open source approach
	BioSpace25 demo	Trekels M.	Groom Q.	Tutorial	Active	No	delivered	https://github.com/b-cubed-eu/biospace25-demo	see source	Secondary			open source approach
WP1 T1.4	b-cubed-workshops	Groom Q.	Groom Q.	Training	Active	No		https://github.com/b-cubed-eu/b-cubed-workshops		Secondary	0 years	Github	NA
WP4 T4.5	Scripts that compare aggregated cubes with structured monitoring schemes in South Africa	Faulkner K.	Groom Q.	Analysis	Active	No		https://github.com/b-cubed-eu/rsa-unstructured-data-comp		Primary			open source approach
WP5 T5.4	Scripts to explore calculation, interpretation and visualisation of uncertainty related to indicators based on biodiversity data cubes	Langeraert W.	Groom Q.	Analysis	Active	No	27-2-2026	https://github.com/b-cubed-eu/indicator-uncertainty		Primary	0 years	Zenodo: https://doi.org/10.5281/zenodo.14754768	open source approach
WP6 T6.1	Generalized Additive Models (GAMs) for raccoon in Europe	Oldoni D.	Groom Q.	Analysis	Inactive	No	delivered	https://github.com/b-cubed-eu/euroraccoon		Primary	0 years	Zenodo	open source approach
WP6 T6.1	Workflow to create an EUropean GRIIS checklist based on national GRIIS checklists	Oldoni D.	Groom Q.	Analysis	Abandoned	No	delivered	https://github.com/b-cubed-eu/griis-eu		Primary	0 years	Zenodo	open source approach
WP1 T1.7	B-Cubed Hackathon	Abraham L.	Groom Q.	Training	Inactive	No		https://github.com/b-cubed-eu/hackathon-projects-2024		Secondary			open source approach
	B-Cubed General Biodiversity Indicators Graphical User Interface	Dove S.	Groom Q.	Software package	WIP	No		https://github.com/b-cubed-eu/b3gbi-gui		Primary	2 years	Zenodo	open source approach
WP5 T5.5	Scripts to explore the streamlining and integration of software (with focus on R packages) related to the calculation of indicators based on biodiversity data cubes	Langeraert W.	Groom Q.	Analysis	WIP	No	27-2-2026	https://github.com/b-cubed-eu/integrate-indicator-software		Primary	0 years	Zenodo	open source approach
	fowlplay	Groom Q	Groom Q.	Analysis	Active	No		https://github.com/b-cubed-eu/fowlplay		Primary		Zenodo (done)	open source approach
	GBIF-Cubes: Species Occurrence Cube Portability	Khan T.	Groom Q.	Software package	Active	No		https://github.com/b-cubed-eu/project9		Primary			open source approach

WP + task	Title	Responsible	Secondary point of contact	Type [1]	Maintenance status [2]	Published on the documentation website? (yes/no) [3]	(Expected) delivery date	Source code URL	Documentation website URL	Sustainability level	Horizon of time to maintain	Best solution to archive the source code / output	Best solution to further maintain the code / output post-project
	Interoperable eLTER Standard Observation variables for Biosphere	Serra I.	Groom Q.	Software package	Active	No		https://github.com/b-cubed-eu/hackathon-project-7		Primary			open source approach
WP1 T1.2	B-Cubed website	Yovcheva N.	Groom Q.	Website	Active	Yes	delivered	https://b-cubed.eu/	https://docs.b-cubed.eu/	Secondary	5 years	NA	Maintained by Pensoft
	ebvcube	Oceguera E.	Groom Q.	Software package	Active	Yes		https://github.com/EBVcube/ebvcube	https://portal.geobon.org/downloads/pdf/how_to_ebv-portal.pdf	Primary	5 years	GitHub	open source approach
	rgbif	Walter J.	Groom Q.	Software package	Active	Yes		https://github.com/ropensci/rgbif/		Primary		Zenodo (done)	open source approach
	pygbif	Walter J.	Groom Q.	Software package	Active	Yes		https://github.com/gbif/pygbif		Primary			open source approach
WP6 T6.1	trias	Oldoni D.	Groom Q.	Software package	Active	No	delivered	https://github.com/trias-project/trias		Primary	5 years	Zenodo: https://doi.org/10.5281/zenodo.15115213	open source approach
	Unlocking The Full Potential Of The Green Deal Data Space	Schleidt K.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.5281/zenodo.15	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M19. Preliminary criteria for data quality and species characteristics for estimating species status and trends	Cartuyvele E.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/libraryhttps://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D5.3 Indicators on Impacts of Alien Taxa	Yahaya M	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/libraryhttps://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M21. Code to calculate general indicators of biodiversity change	Dove S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/libraryhttps://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M12. Code testing for predictive habitat suitability modelling	Cortès Lobos R.B.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D1.3 Data management plan.v2	Yovcheva N.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M28. Design of R packages for indicator calculation	Langeraert W	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M2. Training Materials	Abraham L	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M9. Searchable and versioned documentation website	Quintin Groom	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://docs.b-cubed.eu/	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D4.2 Report on deep learning development	Joly A.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M26. Design of data and indicator robustness measures	Langeraert W.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D2.3 Occurrence cube service	Blissett M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	One-hectare fine-scale dataset of a fynbos plant community in the Cape Floristic Region	Keet J.-H.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1016/j.dib.2025.111334	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Applying the maximum entropy principle to neural networks enhances multi-species distribution models	Ryckewaert M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.48550/arXiv.2412.19217	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D1.9 Updated Plan for Exploitation, Dissemination and Communication (PEDCOM)	Yovcheva N.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M7. First quality assessment report of B3 software	Breugelmans L.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M18. Selection of the monitoring and inventory projects: selection of species (groups), spatial and temporal extent	Langeraert W.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M20. Established list of essential biodiversity variables and indicators to be implemented	Dove S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M17. Deep learning algorithms for deep learning using B3 and associated open data	Joly A.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M11. Code development for predictive habitat suitability modelling	Cortès Lobos R.B.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Mapping potential environmental impacts of alien species in the face of climate change	Kumschick S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1007/s10530-024-03490-4	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M23. Code to calculate the indicators of phylogenetic diversity	Hendrickx L.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://github.com/b-cubed-eu/pdindicatoR/	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M5. Software has been tested by partners and feedback is collected	Desmet P.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M6. First user generated species occurrence cube is available and citable	Blissett M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication

WP + task	Title	Responsible	Secondary point of contact	Type [1]	Maintenance status [2]	Published on the documentation website? (yes/no) [3]	(Expected) delivery date	Source code URL	Documentation website URL	Sustainability level	Horizon of time to maintain	Best solution to archive the source code / output	Best solution to further maintain the code / output post-project
	M1. Delivery of a training strategy for B3	Kumschick S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D1.7 Hackathon results	Abraham L.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D5.2 Phylogenetic Diversity	Breugelmans L.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Effective biodiversity monitoring requires FAIR data and FAIR models for FAIR indicators (Findable, Accessible, Interoperable, and Reusable)	Sica Y.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.5281/zenodo.13912946	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Unveiling ecological dynamics through simulation and visualization of biodiversity data cubes	Langeraert W.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.37044/osf.io/vcyr7	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M10. Interoperability strategy document	Estupinan-Suarez L.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Extinction potential from invasive alien species	Philippe-Lesaffre M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1101/2024.09.01.610685	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Under the mantra: 'Make use of colorblind friendly graphs'	Rocchini D.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1002/env.2877	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	An analysis of sex ratios using a biodiversity data cube	Groom Q.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.37044/osf.io/9kcfx	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	On the mathematical properties of spatial Rao's Q to compute ecosystem heterogeneity	Rocchini D.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1007/s12080-024-00587-3	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D1.5 Alignment of B3 with European Biodiversity Initiatives: Insights from EU policy	Estupinan-Suarez L.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Mapping impacts of alien species on biodiversity in the face of climate change	Kumschick S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.21203/rs.3.rs-4437291/v1	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Phenological Diversity Trends with Remote Sensing Datacubes	Shayle E.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.37044/osf.io/pqfws	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D1.6 International Science-Policy Landscape Analysis	Sica Y.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	A kernel integral method to remove biases in estimating trait turnover	Latombe G.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1111/2041-210X.14246	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D3.1 Quality requirements for software	Huybrechts P.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D2.2 Occurrence cube implementation	Blissett M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Editorial: Biodiversity informatics: building a lifeboat for high functionality data to decision pipeline	Hui C.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.3389/fevo.2024.1386917	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Considerations for developing and implementing a safe list for alien taxa	Kumschick S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1093/biosci/biad118	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Occurrence cube functions	Blissett M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://zenodo.org/records/10607134	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Occurrence cubes for non-native taxa in Belgium and Europe	Oldoni D.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://zenodo.org/records/10527772	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M22. Design of the phylogenetic indicators	Hendrickx L.,	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	IPBES Invasive Alien Species Assessment: Summary for Policymakers	Roy H. E.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.5281/zenodo.7430692	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	M38. Code of Conduct for meetings	Abraham L.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	A quixotic view of spatial bias in modelling the distribution of species and their diversity	Rocchini D.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1038/s44185-023-00014-6	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	USE it: Uniformly sampling pseudo-absences within the environmental space for applications in habitat suitability models	Daniele Da Re	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1111/2041-210X.14209	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D1.1 Promotional material	Yovcheva N.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D1.2 Plan for Exploitation, Dissemination and Communication	Yovcheva N.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	D1.3 Data Management Plan	Yovcheva N.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	B-Cubed: Leveraging analysis-ready biodiversity datasets and cloud computing for timely and actionable biodiversity monitoring	Groom Q.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.3897/biss.7.110734	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication

WP + task	Title	Responsible	Secondary point of contact	Type [1]	Maintenance status [2]	Published on the documentation website? (yes/no) [3]	(Expected) delivery date	Source code URL	Documentation website URL	Sustainability level	Horizon of time to maintain	Best solution to archive the source code / output	Best solution to further maintain the code / output post-project
	D2.1 Specification for species occurrence cubes and their production	Desmet P.,	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Disentangling the relationships among abundance, invasiveness and invasibility in trait space	Hui C.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1038/s44185-023-00019-1	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	A kernel integral method to remove biases in estimating trait turnover	Latombe G.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1101/2023.03.28.534538	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	The status of biological invasions and their management in South Africa in 2022	Zengeya T.A.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://zenodo.org/records/8217182	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	DASCO: A workflow to downscale alien species checklists using occurrence records and to re-allocate species distributions across realms	Seebens H.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.3897/neobiota.74.81082	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Policy-relevant indicators for invasive alien species assessment and reporting	McGeoch M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://www.biorxiv.org/content/10.1101/2021.08.26.457851v1	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	A Regional Earth System Data Lab for Understanding Ecosystem Dynamics: An Example from Tropical South America	Estupinan-Suarez L.M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.3389/feart.2021.613395	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Holistic understanding of contemporary ecosystems requires integration of data on domesticated, captive and cultivated organisms	Groom Q.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.3897/BDJ.9.e65371	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Data integration enables global biodiversity synthesis	Heberling M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1073/pnas.2018093118	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	A global-scale screening of non-native aquatic organisms to identify potentially invasive species under current and future climate conditions	Vilizzi L.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://doi.org/10.1016/j.scitotenv.2021.147868	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	The Status of Biological Invasions and their Management in South Africa in 2019	Zengeya T.A.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Convolutional neural networks improve species distribution modelling by capturing the spatial structure of the environment	Deneu B.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	A workflow for standardising and integrating alien species distribution data	Seebens H.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Earth system data cubes unravel global multivariate dynamics	Mahecha M. D.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Occurrence cubes: a new paradigm for aggregating species occurrence data	Oldoni D.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Occurrence Cubes: A new way of aggregating heterogeneous species occurrence data	Oldoni D.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Horizon Scanning to Predict and Prioritize Invasive Alien Species With the Potential to Threaten Human Health and Economies on Cyprus	Peyton J.M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Appropriate uses of EICAT protocol, data and classifications	Kumschick S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Challenges in producing policy-relevant global scenarios of biodiversity and ecosystem services	Rosa I.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	How citizen scientists contribute to monitor protected areas thanks to automatic plant identification tools	Bonnet P.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	A conceptual map of invasion biology: Integrating hypotheses into a consensus network	Enders M.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Achieving the Full Vision of Earth Observation Data Cubes	Kopp S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Empowering Citizens to Inform Decision-Making as a Way Forward to Support Invasive Alien Species Policy	Groom Q.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Improved standardization of transcribed digital specimen data	Groom Q.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication

WP + task	Title	Responsible	Secondary point of contact	Type [1]	Maintenance status [2]	Published on the documentation website? (yes/no) [3]	(Expected) delivery date	Source code URL	Documentation website URL	Sustainability level	Horizon of time to maintain	Best solution to archive the source code / output	Best solution to further maintain the code / output post-project
	Consistency of impact assessment protocols for non-native species	González-Moreno P	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Essential biodiversity variables for mapping and monitoring species populations	Jetz W.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Participatory coastal management through elicitation of ecosystem service preferences and modelling driven by coastal squeeze	Martínez-López J.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	How to predict fine resolution occupancy from coarse occupancy data	Groom Q.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Indicators for monitoring biological invasions at a national level	Wilson J.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Building essential biodiversity variables (EBVs) of species distribution and abundance at a global scale	Kissling D.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Tracking Invasive Alien Species (TrIAS): Building a data-driven framework to inform policy	Vanderhoeven S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Seven Recommendations to Make Your Invasive Alien Species Data More Useful	Groom Q.J.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Working with population totals in the presence of missing data comparing imputation methods in terms of bias and precision	Onkelinx T.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	No saturation in the accumulation of alien species worldwide	Seebens H.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	A Catalogue of Marine Biodiversity Indicators	Teixeira H.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication
	Mapping the impact of alien species on marine ecosystems: the Mediterranean Sea case study	Katsanevakis S.	Groom Q.	Briefs, reports, and publications	Inactive	Yes	delivered	https://b-cubed.eu/library	https://b-cubed.eu/library	Complimentary	0 years	Archiving on Zenodo	Publication