

GBIF CESP PROJECT 2023-010

BEST PRACTICES GUIDE

**how to make National Portals
address National Challenges**



GBIF - CESP PROJECT 2023-010

National portals addressing national challenges

Partner Nodes

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SiB Ecuador
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Good Practices Guide

How to make national portals respond to national challenges?

1. Introduction

Context

This guide is based on the results of the GBIF "Capacity Enhancement Support Programme" project titled *National Portals to Address National Challenges (CESP 2023-010)*. It captures the experiences of the nodes from Colombia, Ecuador, Spain, and Guatemala in managing their biodiversity data portals, supported by GBIF's Living Atlases¹ y Hosted Portals² technologies. The efficiency and success of a data portal begin with identifying the needs it aims to address, the human and financial resources available, and the capacity to maintain and support it over time. Based on these considerations, it is essential to carefully choose the appropriate technologies and tools for its design, development, and deployment.

The first part of this guide explores the advantages and disadvantages of the Living Atlases and Hosted Portals platforms, offering recommendations for their implementation and proper use based on each node's needs.

The second part highlights the crucial role of national biodiversity data portals in providing integrated and organized access to biodiversity data. These portals not only facilitate evidence-based decision-making but also address national challenges related to conservation, sustainability, and the development of environmental policies.

What are the Living Atlases?

Living Atlases are based on developments from the *Atlas of Living Australia (ALA)*, an informatics infrastructure designed to aggregate biodiversity data. This technology has been adapted by several GBIF national nodes to manage their own biodiversity data.

This robust and highly flexible technological solution allows for the integration, visualization, and analysis of large volumes of biological and spatial data. Living Atlases are used by nodes seeking advanced solutions for biodiversity data management, particularly in countries with high technical capacity, where spatial analysis, large-scale data integration, and system customization are key aspects. More information on the [Living Atlases](https://living-atlases.gbif.org/) community.

What are the Hosted Portals?

A *Hosted Portal* is a service offered by GBIF to support access to and use of biodiversity data at national, institutional, regional, and thematic scales. These portals aim to assist participating nodes and their partners by providing a stable informatics infrastructure

¹ Véase: <https://living-atlases.gbif.org/>

² Véase: <https://www.gbif.org/hosted-portals>

hosted by GBIF for deploying a fully customizable website that displays a specific subset of data shared through this global biodiversity information network.

One of the main objectives of Hosted Portals is to reduce the technical burden on nodes, facilitating access to biodiversity data through a national portal, allowing nodes to focus on data mobilization (publication) efforts. For more information about this initiative and how to apply it, visit the [website](#)

Scope of the Guide

This guide provides specific guidance and recommendations to ensure the successful implementation of national biodiversity portals by comparing the two most widely adopted platforms in GBIF's network of national nodes: Living Atlases (based on the [Atlas of Living Australia](#)) and GBIF Hosted Portals. Additionally, the guide illustrates how various local, regional, and national challenges can be addressed by implementing these platforms.

Target Audience

This guide is primarily intended for GBIF national node managers and their teams, as well as users of national portals. Its goal is to facilitate the identification of challenges and propose solutions using tools and functions applicable to different contexts.

2. How to choose the optimal Data Portal for your objectives

2.1. Why Do I Need a Biodiversity Data Portal?

After completing these two steps, a comparison of needs versus capabilities can be conducted to prioritize what is feasible to develop or implement in the short to medium term. One of the hallmarks of a successful node is sustainability and maximizing usage at all possible levels. It is essential that the portal is both necessary and relevant to a country's decision-making processes. Key questions to guide this process include:

- **What data do you need to publish or share?** Consider the types of data required, such as species data, ecosystem information, geospatial data, or national statistics.
- **How will the data be used?** Think about the end users, such as decision-makers, researchers, or biodiversity managers. Portals should be tailored to provide the tools these users need, such as geospatial analyses or report generation.
- **What level of customization and control do you need?** Determine whether the node requires a flexible infrastructure capable of integrating additional data types, such as geographic, climate, or land-use layers, to conduct more advanced analyses of the biodiversity data hosted. This factor is essential to be able to select between a Living Atlases type portal or a Hosted Portal.
- **What national conservation or biodiversity challenges are you addressing?** Identify the specific challenges where the data portal can have an impact, such as

species monitoring, regional biodiversity analyses, protected area management, building national biodiversity inventories, or simply facilitating data access and serving as the node's website.

Examples of needs:

- Display biodiversity data with graphs and statistics.
- Maintain governance over data and information generated nationally within a portal managed by the node itself.
- Easily share information with decision-makers.
- Combine biodiversity data with other sources (e.g., climatic layers, land use) to address questions like: the state of biodiversity knowledge in a specific area; presence of threatened, exotic, or invasive species, identification of taxonomic, geographic, or temporal data gaps.

Since most scientific or environmental management questions require combining biodiversity data with other sources, the portal should enable users to perform combined analyses and apply simple filters. A portal based on ALA technologies meets these needs. However, it is essential to assess whether some of these requirements are already addressed by another type of portal or platform developed nationally or if these analysis needs are beyond the node's scope. In the latter case, a simpler portal might suffice to provide data access in the context of national, regional, or local environmental systems.

2.2. Resources needed to Install, Manage, and Maintain a Data Portal

After determining needs, evaluating the technical and financial resources required to install, manage, and maintain a biodiversity data portal is crucial:

- **Technological Infrastructure:** Assess whether you have the necessary infrastructure to host the data portal, such as local or cloud servers. Additionally, ensure these servers have sufficient capacity to store the data and the platform itself, projecting its growth over the years. This ensures the scalability of the infrastructure as the data volume increases.
- **Human Resources:** Does the node have trained staff capable of managing and maintaining a portal with complex technical requirements? This is a critical question for determining the type of portal to implement. If your team lacks IT developers, you will need to budget for this personnel over time to provide support and maintain the portal. If you lack the necessary resources or technical team, consider outsourcing this need.
- **Investment:** Financial resources for licenses, maintenance, and continuous upgrades to the portal. These costs vary depending on the chosen technology. More customizable platforms, such as Living Atlases, may require higher initial investment in infrastructure and technical personnel, while Hosted Portals reduce these costs since GBIF manages them. However, investment is still needed for maintenance and upgrades.

Before selecting a technology for your data portal, conduct a comparison between the identified needs and the available technical and financial capacities. Prioritize what can be realistically developed in the short and medium term, considering your node's financial and technical limitations.

The following tables summarize the requirements (Table 1) and approximate costs (Table 2) for both technologies.

Tabla 1. Comparativa de requisitos entre tecnologías *Living Atlases* y *Hosted Portals*

Criterion	ALA	Hosted Portals
Materials - IT Infrastructure	Requires local servers for data storage and to host the personalized analytical tools offered by this type of portal	IT infrastructure managed by the GBIF Secretariat, no local servers required
Staff- Developers	Needs a team of developers for software customization and maintenance	Does not require advanced technical knowledge; content management staff skilled in markup languages (Markdown, HTML, CSS) are sufficient
Personal - Administradores de sistemas	Dedicated system administrators for servers, security, and technical support	Technical support for the platform is centralized in GBIF
Staff - Biodiversity Specialists	Specialists required for biodiversity data indexing, validation, and mobilization	Specialists required for biodiversity data indexing, validation, and mobilization
Investment - Financial Resources	Higher initial investment in infrastructure, staff, and customized software development. Variable depending on the desired modules	No local infrastructure costs, with investment in site customization staff; personnel and time investment vary depending on content and customization needs
Investment - Licenses and Maintenance	Software licenses (databases, analysis) and server maintenance	Licensing and maintenance costs covered as part of the Hosted Portal service
Flexibility for Data Integration	High flexibility and customization for integrating various data types, including advanced geographical layers and cross-analyses	Geographic layers can be integrated for visualization and querying (via WKT files), but advanced analyses or customized geographical area reports are not supported
Flexibility for New Tools	High flexibility and customization for integrating ALA tools and modules (e.g., Spatial Portal)	Independent tools can be embedded using the GBIF API (e.g., https://www.legumedata.org/taxonomy/search)
Scalability	Dependent on local infrastructure; requires planning for data volume growth	Highly scalable without local infrastructure concerns
Long-term Sustainability	Requires ongoing financial resources and dedicated staff for maintenance	Sustainability depends on ongoing GBIF support; easier to maintain

Table 2. Cost Estimation: ALA vs. Hosted Portals

Concept	ALA		Hosted Portals	
	Description	Cost (€)	Description	Cost (€)
Concept				
Servers and storage	Requires significant infrastructure to host data, including servers, databases, and backup systems	10 000 - 50 000	Provided by GBIF. No need for local servers or cloud infrastructure provided by nodes or publishing organizations	0
Software licenses	Open-source software, but some tools and modules may require third-party licenses or additional development.	5 000 - 20 000 *		
Staff				
Developers	Requires skilled developers with experience in Java, Python, web development, and biodiversity data management	12 000 - 100 000 **	—	
System administrators	Dedicated staff needed to maintain servers and manage databases	15 000 - 70 000**	Staff needed for portal content management, depending on the desired level of customization	5 000 - 30 000 ***
Operations				
Ongoing maintenance (annual)	Includes security, software updates, backups, and database management.	3 000-50 000	Maintenance, updates, and infrastructure scaling are fully managed by the GBIF Secretariat.	0
TOTAL €	Installation	15 000 - 100 000 ****	Instalación	3 100 - 5 000 ****
	Annual maintenance	3 000 - 85 000 ****	Mantenimiento anual	5 100 - 30 500 ***

NOTE: The price range for both platforms is broad and depends on the level of customization of each national portal. Initially, greater time investment is required for site structuring, even with a low level of customization. Subsequently, annual costs and time dedication tend to decrease.

* Some ALA portals operate with Google, Amazon, etc.

** Depending on the portal's features, personnel costs could involve a single person with specific knowledge of ALA technology development.

*** Costs depend on the number of personnel, time commitment, professional profile in line with the level of content customization, and the portal's development stage.

**** Approximate cost associated with domain payment and security certificates for hosting the portal.

Decision-Making Questionnaire: Choosing Between ALA and Hosted Portals

This questionnaire aids in deciding between both technologies:

1. **Do you have access to local or cloud IT infrastructure?**
 - **Yes** → Go to Question 2
 - **No** → Hosted Portal is for you.
2. **Does your node have a team of developers capable of installing, managing, and maintaining a complex data portal (requires several servers and custom programming)?**
 - **Yes** → Go to Question 3
 - **No** → Hosted Portal is for you.
3. **Do you seek a ready-to-use solution requiring minimal investment in infrastructure or advanced technical personnel?**
 - **Yes** → Hosted Portal is for you.
 - **No** → Go to Question 4
4. **Do you need to publish data not covered by GBIF.org's central portal?**
 - **And/or** combine biodiversity data with other data types (e.g., environmental, protected areas, geospatial) and perform advanced analyses?
 - **And/or** have a large budget for infrastructure and specialized technical staff?
 - **Yes** → ALA is for you. Estimated costs:
 - Installation: 15 000–100 000 €
 - Maintenance: 3 000–85 000 €/year
 - **No** → Hosted Portal is for you. Estimated costs:
 - Installation: 100–500 €/year (domain and security certificate costs)
 - Maintenance: 5 100–3,500 €/year

3. Challenges and objectives that a national portal must address

National biodiversity portals are key tools to support biodiversity conservation and management efforts at the national level. Developing such a portal within the GBIF framework, either by incorporating a Hosted Portal or building it using ALA technologies, is one of the most effective ways for a country to maximize its return on investment in being part of GBIF. To fully leverage its potential, it is essential to identify specific challenges and define clear objectives to guide the portal's development and usage. Below are some objectives identified by the authors of this guide, which are typically pursued or achieved through portals or technological platforms.

3.1. Identifying data flows and actions to support national biodiversity conservation processes

National nodes must map the necessary data flows to address biodiversity priorities, which include:

- Collecting and consolidating data on species, ecosystems, protected areas, and other environmental variables
- Establishing governance and data validation processes to ensure quality and relevance.

This process not only helps centralize information but also contributes to improving decision-making by providing access to integrated and updated data.

3.2. Engaging key stakeholders and social actors to identify and address conservation issues and challenges in the national and international context

For a portal to be effective, it is essential to collaborate with various social and government actors who can provide relevant information and help identify and prioritize conservation challenges:

- Local and national governments: Provide information on environmental policies and regulations that the portal can support with real data.
- Local and indigenous communities: They contribute traditional knowledge and identify specific challenges in their territories. Portals aim to link their knowledge systems, giving them visibility and recognition.
- Academics: They are the scientific foundation behind much of the data shared through biological collections and reference taxonomic lists
- Non-governmental organizations (NGOs): They often participate in conservation and monitoring activities, enriching the portal's database
- The business sector: They are data users and also generate data and information from Environmental Impact Studies for operating licenses
- Networks or initiatives: A prime example is participatory science communities that contribute significantly to data mobilization driven by their enthusiasm for biodiversity. They see portals as a way to showcase their work and contribute to generating new knowledge
- Environmental authorities: National, regional, or local environmental authorities need efficient ways to access information to make effective decisions, such as managing protected areas, among others.

3.3. Developing strategies to ensure that your node contributes directly to national conservation efforts to fulfill local, regional, and international commitments

National portals can aid in fulfilling international conservation commitments, such as the Kunming-Montreal Global Biodiversity Framework (GBF) or the Sustainable Development Goals (SDGs). To achieve this, the portal should:

- Facilitate tracking and reporting biodiversity indicators at the national level and support the preparation of international reports.
- Integrate data into an accessible format to enable decision-makers to evaluate progress toward conservation goals.

3.4. Communicating the node's achievements to decision-makers

Finally, effectively communicating the node's achievements and progress is essential. This not only enhances national recognition of the node's work but also promotes the portal's use and long-term sustainability. Communication strategies can include:

- Regular reports to decision-makers on the state of national biodiversity.
- Collaborations with media outlets and public events to inform society about the importance of biodiversity data.

3.5. National Challenges addressed by National Portals

Biodiversity data available in national portals are a valuable tool for tackling various conservation and environmental management challenges. Below are challenges addressed by the portals of the project's partner nodes, with detailed examples available in the [Catalogue of Use Cases for National Portals Addressing National Challenges](#) (in spanish).

Challenge: Reports on the state and trend of biodiversity knowledge at the national and regional levels

In several countries, data consolidated in national portals allows the generation of regular reports on the state of biodiversity. These reports include information on taxonomy, threatened species, distribution changes, and invasive exotic species. Such reports are crucial for:

- Public policies: They provide reliable information to support the development of policies that promote the conservation and sustainable use of natural resources.
- Fulfilling international commitments: Data facilitates the monitoring of conservation goals under the Convention on Biological Diversity (CBD).

Lessons learned

- It is imperative to promote the use of GBIF data in national red lists committees.
- Publishing official regional and national red lists in GBIF makes it easier to filter presence records by specific checklists.
- Nodes should participate in national consultations or expert meetings on IUCN taxon assessments to encourage the use and publication of data and complete datasets

Challenge: Building national biodiversity inventories with biological, ecological, and management descriptors

Biodiversity portals allow countries to create and maintain detailed inventories of species and ecosystems at the national level. These inventories are essential for:

- Identifying and protecting endemic and endangered species: Biodiversity data helps catalog present species and monitor their populations.
- Research and education: The availability of national inventories contributes to the development of scientific research and educational programs.

Lessons learned

Additional information is needed on species biology, characteristics, and other details to document species recovery actions. Standards like the Plinian Core can be used to build National Biodiversity Catalogs.

Challenge: Improving and restoring biodiversity status

Biodiversity data helps identify priority areas for restoration and conservation. Using data published on national portals facilitates implementing proactive measures to recover ecological functionality and restore self-sustaining ecosystems

Lessons learned

Data published in national portals is a useful source not only for monitoring biodiversity but also for designing restoration measures.

Challenge: Protected areas planning:

Data on national portals is crucial for the design, management, and monitoring of protected areas. This includes detailed biodiversity and geographic information that supports creating new areas and managing existing ones.

- Protected area effectiveness evaluation: Data allows monitoring biodiversity within protected areas and assessing their effectiveness
- Expanding protected areas: Regions of high ecological value can be identified where conservation zones need to be expanded.

Lessons learned

- Protected area planning is a dynamic process. National portals must be adaptable to incorporate new data and address emerging challenges, such as climate change or land use changes.
- Coordinating with multiple stakeholders, including government agencies, NGOs, and local communities, ensures that the data used in planning is comprehensive and supports shared conservation goals.
- Ensuring the accuracy and timely update of data is crucial for reliable results.

Challenge: Determining areas suitable for productive activities using biodiversity data to support risk analysis

Integrating biodiversity data with other layers of information (such as soils, climate, and land use) supports the development of sustainable productive activities that minimize the impact on the natural environment.

- **Zoning for productive activities:** Areas suitable for agricultural or forestry activities can be identified that do not interfere with biodiversity conservation.
- **Environmental risk assessment:** Biodiversity data, combined with other environmental data, enables risk assessments for productive activities in specific zones.

Lessons learned

- Encourage the publication of data and species listings from productive areas (agriculture, forestry, livestock, aquaculture).
- Promote sustainable productive practices alongside this.

These examples illustrate how biodiversity data, when organized and centralized in national portals, become a strategic resource for addressing national challenges in conservation and sustainable development. Each node can adapt these use cases to its own needs, maximizing the impact of its data and improving biodiversity conservation at national and international levels.

4. Strategic recommendations to strengthen national data portals

National data portals are fundamental tools for addressing national challenges. However, without actions that demonstrate their utility and promote their adoption in decision-making regarding these challenges, their impact will be limited and their justification questioned.

Thus, the most successful national nodes—regardless of the technology used in their portals—have created collaboration spaces and synergies that go beyond technical issues and focus on generating impact in the environmental context. The following are key actions identified in the framework of the project:

- **Training and capacity building:** Targeted at data managers and portal administrators, fostering their ability to manage and leverage available resources.
- **Promoting interinstitutional collaboration:** Creating spaces for collaboration and mutual learning among environmental administrations. A key example is the [Biodiversity and Environmental Administration Information Days](#), organized annually by the GBIF Spain node since 2009.
- **Participating in advisory and management committees:** Participating in advisory and management committees on environmental and biodiversity issues. For example, GBIF Spain is part of the Spanish Inventory of Natural Heritage and Biodiversity Committee under the Ministry of Ecological Transition and

Demographic Challenge. Its mission is to coordinate and oversee the development of the national biodiversity inventory.

- **Articulating with key actors:** Collaborating with various sectors to understand their needs in managing biodiversity data. Together, develop management plans that include the open publication of data via GBIF or OBIS.
- **Engaging with the business and productive sector:** Creating specific training spaces for business and productive sectors to enable them to become both data generators and users for monitoring and measuring environmental compensation activities.
- **Generating strategic information:** Producing updated information on biodiversity that consolidates as a national reference. This strengthens the visibility, relevance, and sustainability of the node, highlighting the value of data platforms. Successful examples of this approach include Biodiversity in Figures, which synthesizes key data for decision-making, and Biodiversity Indicators—BioTablero, which generates specific figures to support conservation strategies. Both cases are detailed in the [Catalogue of Use Cases of National Portals to Address National Challenges](#) (in Spanish).