Global Gateway

EUROCLIMA PROGRAMME

Policy Recommendations on Interoperability for Biodiversity Information Management for Colombia, Ecuador and Peru

Implemented by

aecid Spanish Agency for International Development Cooperation

AFD AGENCE FRANÇAISE DE DÉVELOPPEMENT

UNITED NATIONS ECLAC

EXPERTISE FRANCE GROUPE AFD

FIIAPP

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

UNDP

UN environment programme

Policy Recommendations on Interoperability for Biodiversity Information Management
for Colombia, Ecuador and Peru

Texts:
Jose Luis Capella, Luis Zarí, Angélica Gómez (Peruvian Society for Environmental Law - SPDA)

Technical review:
Valeria Biffi Isla (GIZ/Euroclima)
Roberta Lossio Medeiros (GIZ/Euroclima)

1. EUROCLIMA

Euroclima is the regional cooperation programme that fosters the strategic partnership between the European Union and Latin America and the Caribbean, based on shared values and a commitment to jointly address climate change and biodiversity loss. It is a platform for the exchange of ideas and experiences between countries in the region and with the European Union. It is co-funded by the European Union and the German Federal Government through the Federal Ministry for Economic Cooperation and Development (BMZ). It seeks to contribute to sustainable, resilient and inclusive transition through climate mitigation and adaptation efforts, including protection, restoration, biodiversity conservation and the promotion of the circular economy. Euroclima is part of the renewed Agenda for Relations between the EU and Latin America and the Caribbean and is part of the Global Gateway strategy that promotes investments and financing in relevant sectors, as well as the use of other instruments of the EU and its Member States to achieve more sustainable, just and interconnected societies.

It is implemented under the spirit of Team Europe, through the synergic work of eight agencies: Spanish Agency for International Development Cooperation (AECID), AFD Group: Agence Française de Développement (AFD)/ Expertise France (EF), Economic Commission for Latin America and the Caribbean (ECLAC), Fundación Internacional y para Iberoamérica de Administración y Políticas Públicas (FIIAPP), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the UN Environment Programme (UNEP) and the United Nations Development Programme (UNDP).

Key Messages

- Interoperability, defined as the capacity of two or more systems to interact and share information for common objectives, is an essential tool for the conservation and sustainable use of biodiversity. This capacity facilitates informed public decision-making, promoting more effective resources management.

- Colombia, Ecuador and Peru face significant challenges regarding governance, technical capacities, financing, and information standardization for efficient interoperability. Although all they have national platforms as the Colombian Biodiversity Information System[1] (SIB Colombia) and the Ecuadorian Biodiversity Information System[2] (SIB Ecuador), limitations persist for the standardized exchange of biodiversity data between institutions.

- It is imperative that these countries establish effective mechanisms for information exchange and adopt international standards for biodiversity data management. Additionally, they must guarantee adequate financial resources, and strengthen their teams' technical capacities, promoting a more efficient and sustainable interoperability.

---

[1]   SiB Colombia.
[2]   Sistema de Información de Biodiversidad del Ecuador (SIB) – Ministerio del Ambiente, Agua y Transición Ecológica

2. Introduction

Managing updated information on biodiversity is essential for making informed public policy decisions. This information enables governments, environmental organizations and the scientific community to identify prioritized areas for conservation, and to develop strategies adapted to the ecosystems' specific needs.

The Conference of the Parties to the Convention on Biological Diversity has highlighted the importance of developing relevant databases and interoperable systems, which must be articulated with other international instruments[3]. Likewise, global initiatives such as the Global Biodiversity Information Facility (GBIF) promote free and open access to biodiversity data. However, the biodiversity of sources and standards in data production represent significant challenges for their harmonization and interoperability. Information exchange on biodiversity includes records of observations, collections, ecosystems, flora, fauna, and other biological organisms.

In Colombia, Ecuador, and Peru, interoperability is an essential tool for biodiversity management and decision making. Colombia, through the national Environmental Information System (SIAC) and the Biodiversity Information System (SIB Colombia), has adopted international standards to facilitate data publication and access. Ecuador has the Ecuadorian Biodiversity Information System (SiB-Ecuador) and works on the National Biodiversity Database (BNDB) to centralize information and promote its exchange.

Peru has an enabling legal framework for data exchange, and, in addition, has several institutions, such as the National Forestry and Wildlife Service (SERFOR), the Ministry of Environment and the subnational governments, which manage information on biodiversity.

This document provides policy recommendations for Colombia, Ecuador, and Peru, with the aim of strengthening interoperability between national systems and biodiversity databases. Although all three countries have made progress in public policies, common challenges remain: the need to standardize formats, improve data governance, strengthen the technical capacities of officials who manage information, guarantee sustainable financing for platforms, and promote inter-institutional cooperation. These recommendations are part of the Euroclima program initiative to implement the Leticia Pact Action Plan. This plan provides a framework for action to address the causes of deforestation and forest degradation, promoting the conservation, biodiversity management and sustainable development of the Amazon biome, and the protection of Indigenous people and local communities living in this strategic ecosystem.

---

[3]   Report of the Sixth COP meeting, 2002: https://www.cbd.int/doc/meetings/cop/cop-06/official/cop-06-20-es.pdf And CBD/COP/DEC/XIII/24 decision from December 16, 2016: https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-24-es.pdf

Between 2022 and 2024, Euroclima, through the implementing agencies: Spanish Agency for International Development Cooperation (AECID), in collaboration with the International Union for Conservation of Nature (IUCN); the French Public Agency for Technical Cooperation of the AFD Group (Expertise France) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, supported the implementation of prioritized actions of the Action Plan of the Leticia Pact for the Amazon, in Colombia, Ecuador and Peru, focusing on the following areas:

1. Conservation, sustainable use of forests and biodiversity, restoration and bioeconomy.

2. Information and knowledge management.

3. Empowerment of women and indigenous people.

Within the framework of subject 2, GIZ worked with the Colombian, Ecuadorian, and Peruvian Ministries of Environment to analyze opportunities to improve interoperability between information systems that manage biodiversity data. The following reports were produced as part of this work:

- Interoperability as ecosystem to share biodiversity knowledge in Colombia.
- Actions to strengthen national information systems and databases to achieve interoperability for biodiversity management in Ecuador.
- Connecting data: interoperability for biodiversity in Peru.

This recommendation document is based on the reports mentioned above, as well as on the review of legal frameworks of the three countries regarding interoperability. It also considers opinions of public, private and civil society actors with competences on interoperability, and on the results of the exchange event[4] held for public representatives from the Ministries of Environment.

---

[4] In November 2023, 25 representatives from the Colombian, Ecuadorian, and Peruvian Ministries of Environment met virtually in an experience exchange meeting to share public policy progress and challenges in Colombia, Ecuador, and Peru on interoperability for management of biodiversity information . In addition, they discussed the results of the studies carried out, under GIZ implementation, to improve interoperability for the management of biodiversity information.

3. Interoperability in Colombia, Ecuador and Peru

Interoperability of information systems and databases for biodiversity conservation is globally recognized as a fundamental aspect.

The Kunming-Montreal Global Biodiversity Framework (CBD, 2022) sets the goal of ensuring that the best data, information and knowledge are available to decision-makers, professionals and the public, in order to guide effective and equitable governance, and an integrated and participatory management of biological diversity (Goal 21[5]). Additionally, the European Biodiversity Partnership (Biodiversa[6]) highlights the necessity of data standardization and compliance with the FAIR (Findable, Accessible, Interoperable, and Reusable) principles, maximizing the use of available data and achieving a more comprehensive understanding of biodiversity and its dynamics.

Worldwide, Global Biodiversity Information Facility (GBIF[7]) has consolidated as the main platform for accessing biodiversity data. GBIF promotes open access to biodiversity data, supporting scientific research and evidence-based decision-making. Having a national GBIF node is essential to implement uniform standards and coordinate data management.

For example, SiB is the national node in Colombia. Moreover, the Bari Manifesto *(Hardisty et. Al.,2019)* establishes an interoperability framework for biodiversity change variables, providing solid foundations for measuring and evaluating biodiversity changes and its relationship to national and international policy objectives.

Colombia, Ecuador and Peru have made significant progress in public policies aimed at interoperability, as the creation of National Interoperability Platform in Peru[8], the Biodiversity Information System in Colombia, and the Unified Environmental Information System in Ecuador. Nevertheless, they face common challenges, including the need to standardize formats, strengthen data governance, improve the technical capacities of officials managing the information, ensure sustainable financing, and foster inter-institutional cooperation. The use of international criteria and frameworks, such as those promoted by GBIF, may facilitate standardized information exchange, building solid evidence, supporting political responses and offering comprehensive training to States that adopt these standards.

[5]   15/4. Kunming-Montreal Global Biodiversity Framework
[6]   https://www.biodiversa.eu/
[7]   https://assets.ctfassets.net/uo17ejk9rkwj/4syMySXpjvR7ZABffjJx2g/d6c0e77cc72d7e3429f3c248ec50eef2/gbif-strategic-framework-23-27.pdf
[8]   Plataforma Nacional de Interoperabilidad - Orientación - Presidencia del Consejo de Ministros - Plataforma del Estado Peruano

3.1. Colombia

Colombia has made significant progress in biodiversity data interoperability, driven by the need to make informed decisions regarding natural resources conservation and sustainable use. This progress is reflected in the development of institutional frameworks and the implementation of policies related to governance and digital transformation. Among the main systems, we can mention the Colombian Environmental Information System (SIAC) managed by the Ministry of Environment and Sustainable Development through the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM), and the Biodiversity Information System (SIB Colombia), managed by the Alexander Von Humboldt Institute. Regarding policies, the country has a Digital Government Policy, the Digital Transformation Framework, and the Interoperability Framework. All these policies guide the integration of information systems and data opening. Initiatives as the National Data Infrastructure Plan and the Colombian Spatial Data Infrastructure also support these efforts.

However, challenges limiting the full integration and use of biodiversity information remain. These include deficiencies in technical capacities and infrastructure, weak data governance, and lack of standardization. Additionally, inter-institutional coordination and collaboration between the information systems from responsible agencies such as the Ministry of Environment, the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM, for its acronym in Spanish), the Von Humboldt Institute and data generators, face significant challenges. These limitations complicate efficient data management, highlighting the need to strengthen capacities in information collection, processing and analysis (Devia, 2025).

Although open access to biodiversity information is a priority, data standardization remains a challenge for effective management. Data integration from different sources is hampered by heterogeneity in collection methods, description formats and accessibility levels. To overcome these limitations, it is crucial to adopt international standards such as Darwin Core or EML, widely used in platforms such as Biodiversa. Moreover, data governance requires a coordinated interoperability strategy, with the participation of all institutions involved. This strategy should define roles, responsibilities, agreements, structures and oversight mechanisms, to ensure the quality, security and accessibility of biodiversity information. Effective collaboration between responsible agencies will strengthen data management and enable more informed and sustainable decision-making.
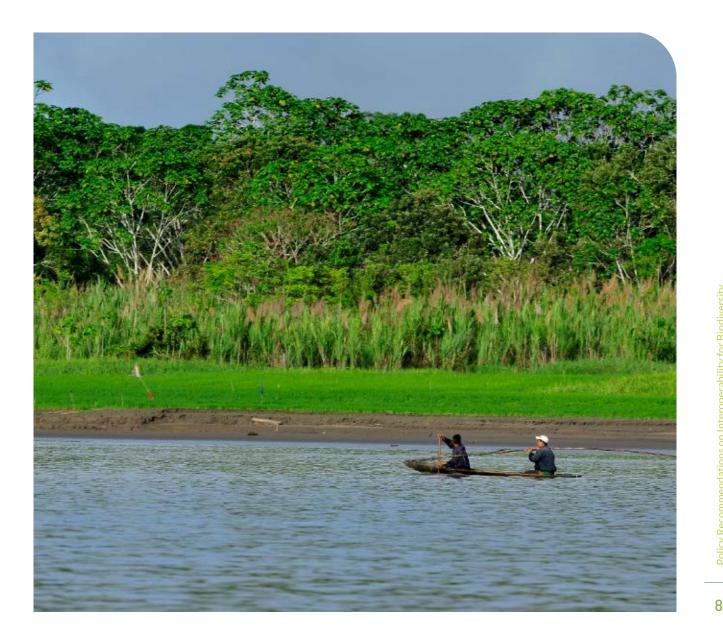
3.2. Ecuador

One of Ecuador's most significant advances in interoperability is the creation of the National Biodiversity Database (BNDB). This initiative, led by the Ministry of Environment, Water, and Ecological Transition (MAATE, for its acronym in Spanish) and managed by the National Institute of Biodiversity (INABIO, for its acronym in Spanish), aims to centralize and facilitate access to biodiversity information in the country. The legal framework supporting information exchange includes Ministerial Agreement No. 36 from September 17, 2021, while institutions such as the National Directorate of Public Records also participate in data regulation and registry.

Although the proposal to create the BNDB is a significant progress, Ecuador faces challenges related to governance, standardization and financing. In terms of governance, MAATE and INABIO have legal frameworks that define their competences; however, they do not have a comprehensive inter-institutional vision for data management, nor agreements for inter-institutional coordination with entities such as the National Customs Service (SENAE) or the Ministry of Agriculture and Livestock (MAG). The need to strengthen technical capacities in standards, software tools, and biodiversity data management among information-generating entities has been identified (Benítez, 2025). In terms of financing, it is important for INABIO to have a specific budget to strengthen governance and a better data management. Benitez (2025) also points out that MAATE could lead projects aimed at financing and supporting data-generating entities with specific budget, based on established policies and results.
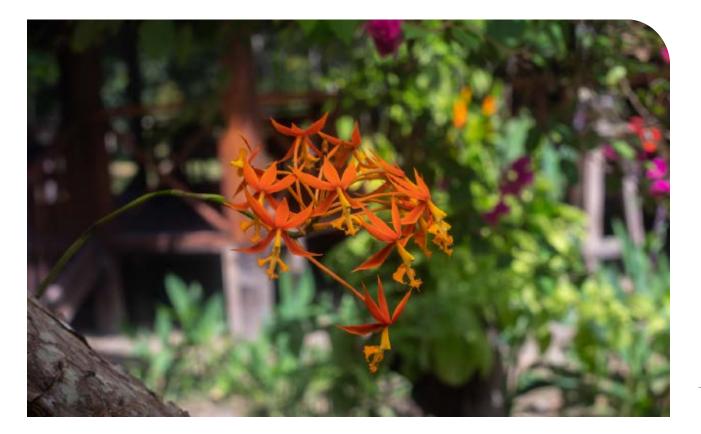
3.3. Peru

In Peru, the Ministry of Environment (MINAM) is responsible for geospatial data interoperability through the General Directorate of Territorial Planning and Integrated Management of Natural Resources. This work is coordinated with the National Environmental Information System and the National Spatial Data Infrastructure, managed by the National Geographic Institute. Through these systems, protocols for information exchange have been developed, establishing agreements with up to eight internal and external institutions. Peruvian legislation promotes interoperability in public administration, with regulations driven by the Digital Government Secretariat of the Presidency of the Council of Ministers. This has enabled the implementation of Spatial Data Infrastructures, and the development of information platforms and systems, such as the Peruvian Amazonia Platform or the Clearing-House Mechanism (CHM) Platform. Despite the robust legal framework, Peru faces challenges in matters of governance, financing, data standardization, and capacity building. According to Valer (2025), articulation among public entities, particularly subnational and local governments, is still limited.

This results in gaps related to lack of harmonization[9], leading to a different categorization, heterogeneous data management, and a need for continuous training due to officials' turnover in regional and local governments. Technical and operative capacities vary significantly across the institutions evaluated. While entities like the National Service of Natural Areas Protected by the State (SERNANP, for its acronym in Spanish) and the National Forestry and Wildlife Service (SERFOR, for its acronym in Spanish) demonstrate a high level of maturity in geospatial data management, others, such as the subnational government of Loreto or the Research Institute of the Peruvian Amazon (IIAP), face limitations in data production and information systems. Finally, insufficient funding also impacts data production and validation in institutions such as MINAM and IIAP. To address these issues, it has become necessary to strengthen data production and validation processes to ensure information quality and reliability. This requires incorporating and establishing regulatory, organizational and procedural guidelines aligned with the digital government policy.

---

[9]   For instance, in wildlife, in geospatial issues, in open data. Each of them has a different standard, and the institutions managing them face gaps related to lack of harmonization.

4. Common and Differentiating Aspects of Interoperability in Colombia, Ecuador, and Peru

The following outlines the common and differentiating aspects in information management and biodiversity data interoperability in Colombia, Ecuador, and Peru.

Common Aspects

Commitment for enhancing interoperability: Colombia, Ecuador and Peru acknowledge the importance of information systems interoperability and biodiversity databases for informed decision-making, scientific research, and natural resources sustainable management. The three countries have initiated actions to improve interoperability, whether through the creation of new platforms, the strengthening of existing ones, or the implementation of digital government policies.

Consolidated but variable legal frameworks: In Colombia, the Digital Government Policy and the Digital Transformation Policy provide a robust framework for interoperability. In Ecuador, the legal framework is still under development. Ministerial Agreement No. 036 (2021) establishes the creation of the National Biodiversity Database (BNDB) and assigns MAATE the responsibility of issuing guidelines for its operation. In Peru, the Digital Government Law lays the foundation for interoperability, digital security and data management. However, the legal framework is still in the process of consolidation.

Strengthening specialized expertise: Capacity building in biodiversity data management for public representatives and strategic stakeholders is essential for achieving effective interoperability. This involves training both the teams managing information systems and the data-generating entities in the use of standards, software tools, and best practices for data documentation, publication, and use. In Colombia, the efforts should focus on the Forest Directorate of the Ministry of Environment. In Ecuador, in MAATE and INABIO. In Peru, MINAM, IIAP, and the Subnational Government of Loreto.

Differential aspects

Institutional maturity: Colombia has a higher level of institutional maturity in biodiversity data management, with well-established systems as SIAC and SIB. Ecuador is on process of consolidating its BNDB, meanwhile Peru faces a fragmented data management, with different institutions, such as IIAP, MINAM and subnational governments, operating separate systems.

Standardization and data quality: Colombia has made significant progress in adopting international standards, such as Darwin Core and EML, facilitating interoperability with global platforms like GBIF. Ecuador, despite having technical capacities and a legal framework through MAATE and INABIO, lacks a unified vision for data management. BNDB consolidation provides an opportunity to standardize criteria. Peru recognizes the importance of standardization through its legal framework. However, the implementation of standards like Darwin Core or EML is not yet evident.

Financing and resources: Colombia has allocated resources for biodiversity data management, as evidenced by their systems' development[10]. Meanwhile, Peru has not demonstrated a concrete budget for the evaluated systems. Ecuador also lacks specific provisions regarding financial allocation for these purposes. Despite these differences, all three countries share a common need for increased funding, both for the institutions managing biodiversity information systems, and those generating the data.

---

[10]   The SIAC's strategic line on "Governance Instruments Management highlight "resources" as a key axis, including financial, human, and technological resources. Information taken from Devia (2025).

5. Recommendations

Training and standardization of formats: Public officials involved in biodiversity data management should upgrade their skills in the usage of international standards, such as Darwin Core or EML, in line with standardized international platforms like GBIF. Training sessions should be practical and adapted to the specific needs of each country or region. Additionally, collaborative and experience-sharing networks between the different actors involved in biodiversity data management of each country should be promoted.

Definition of a clear governance framework: Interinstitutional coordination in biodiversity data management requires a well-defined governance framework. This framework should establish roles, responsibilities and procedures for biodiversity data management in each country. It should also include coordination protocols among the various institutions involved, as well as protocols for decision-making and conflicts resolution.

Strengthening information exchange mechanisms: It is essential to consolidate and support existing platforms for data exchange, such as GBIF, which acts as a central hub at a global level. GBIF national nodes, such as SiB Colombia, should receive technical and financial support to fulfill their roles, including coordinating activities, publishing data, promoting international standards, offering open access to biodiversity information, among others. This strengthening will ensure a more efficient data exchange, and better integration with international platforms.

Promoting open access to data: Open access to biodiversity data should be a priority, using open licenses that allow their reuse for different purposes. This will contribute to democratize knowledge, fostering scientific research, informed decision-making, and citizen participation in biodiversity management.

Financing and sustainability: The sustainability of biodiversity information systems should be ensured by allocating adequate funding for the maintenance of technological infrastructure, the continuous updating of systems, and regular personnel training. This involves designing financial strategies that include the mobilization of national and international resources, as well as the integration of information systems into each country's development and conservation plans.

6. References

Benítez, E. (2025). *Acciones para fortalecer los sistemas de información y bases de datos nacionales para lograr la interoperabilidad para la gestión de la biodiversidad en Ecuador.* Programa Euroclima.

Centro Latinoamericano de Administración para el Desarrollo (CLAD). (2010). *Bases para una Estrategia Iberoamericana de Interoperabilidad.* RetrieveDd from https://www.researchgate.net/publication/289374728_Bases_para_una_Estrategia_Iberoamericana_de_Interoperabilidad#pf5

Convenio de Diversidad Biológica (2022). *Kunming-Montreal Global Biodiversity Framework.* Retrieved from: https://www.cbd.int/doc/c/2c37/244c/133052cdb1ff4d5556ffac94/cop-15-l-25-es.pdf
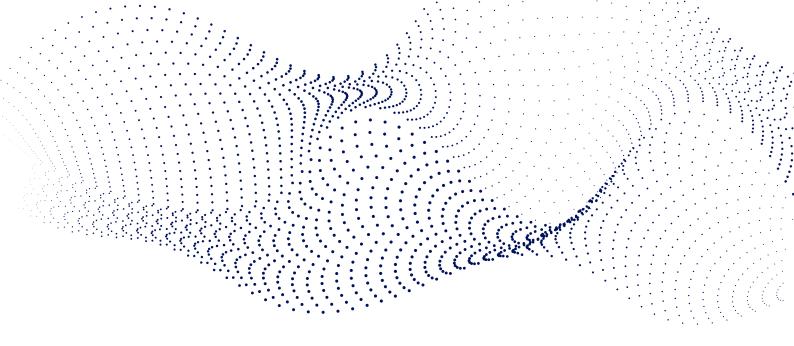
Devia, Y. (2025). *La interoperabilidad como ecosistema para compartir conocimiento sobre biodiversidad en Colombia.* Programa Euroclima.

Global Biodiversity Information Facility (2023). *Strategic Framework 2023-2027.* Retrieved from: https://assets.ctfassets.net/uo17ejk9rkwj/4syMySXpjvR7ZABffjJx2g/d6c0e77cc72d7e3429f3c248ec50eef2/gbif-strategic-framework-23-27.pdf

Hardisty, A.R. *et al.* (2019). The Bari Manifesto: An interoperability framework for essential biodiversity variables. *Ecological Informatics,* 49 (2019), 22-31, ISSN 1574-9541. https://doi.org/10.1016/j.ecoinf.2018.11.003

Universidad Nacional Autónoma de México (UNAM). (s/f). *Interoperabilidad: Dirección General de Repositorios Universitarios.* Retrieved from: https://dgru.unam.mx/index.php/interoperabilidad/

Valer, L. (2025). *Conectando datos: interoperabilidad para la biodiversidad en el Perú.* Programa Euroclima.

Global Gateway

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by

aecid
Spanish Agency
for International
Development
Cooperation

AFD
AGENCE FRANÇAISE
DE DÉVELOPPEMENT

UNITED NATIONS
ECLAC

EXPERTISE
FRANCE
GROUPE AFD

FIIAPP

giz
Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

UNDP

UN environment
programme