

LIFE EL-BIOS:

National Information System for the Biodiversity of Greece

LAYMAN'S REPORT



LIFE EL-BIOS (LIFE20 GIE/GR/001317) received funding from the LIFE Programme of the European Union. EU funding contribution: 1.354.524 € (52.68% of total eligible budget).

COORDINATOR



ASSOCIATED BENEFICIARIES

Project ID

Title: Hellenic Biodiversity Information System – An innovative tool for biodiversity conservation

Acronym: LIFE EL-BIOS

Project code: LIFE20 GIE/GR/001317

Duration: 04 October 2021 – 30 November 2025

Country: Greece

Total eligible budget: 2,571,132 €

EU contribution: 1,354,524 € (≈ 52.68 % of total budget)

Coordinating beneficiary: Green Fund

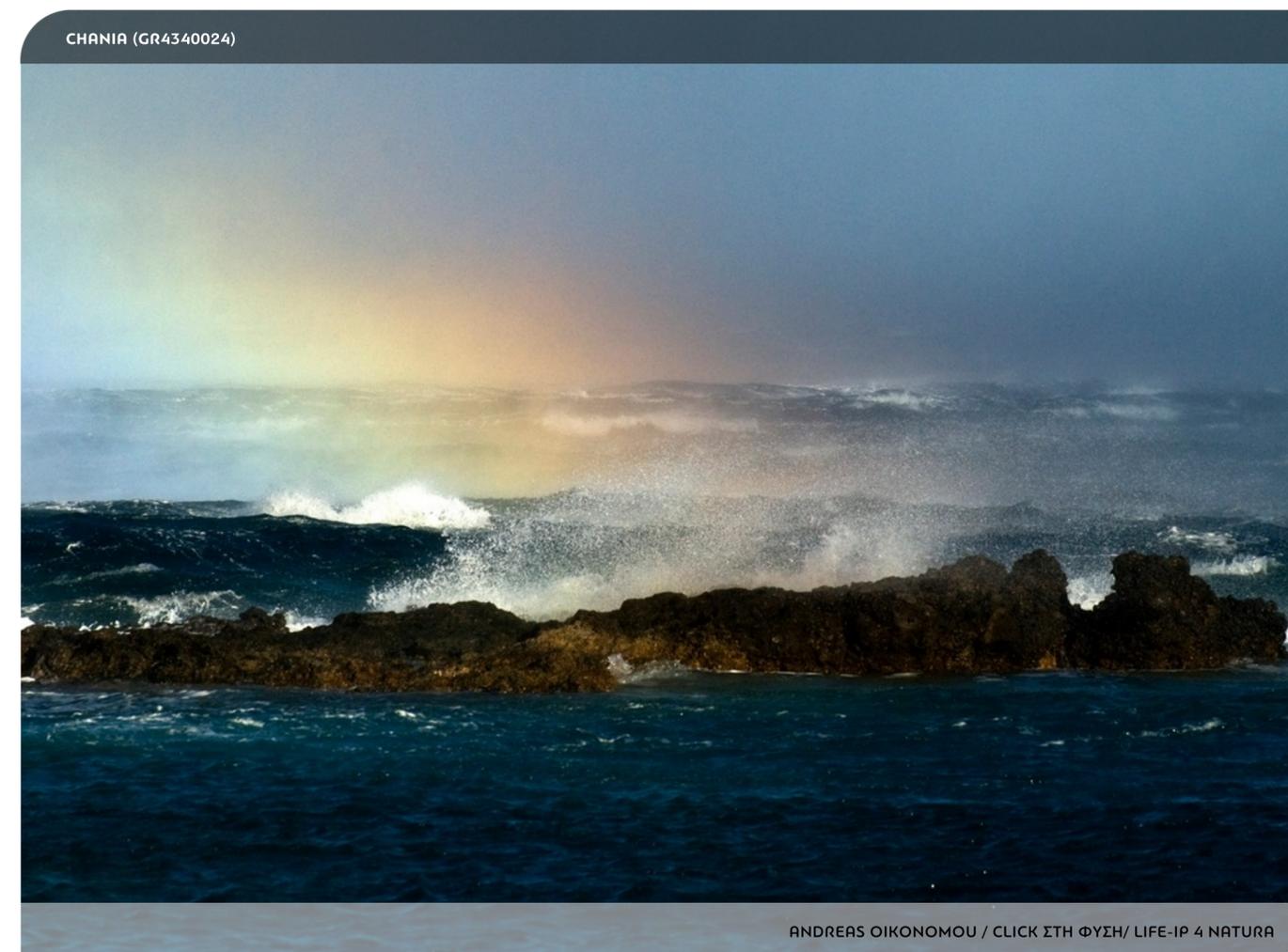
Associated beneficiaries / Partners:

- Natural Environment and Climate Change Agency (NECCA)
- Aristotle University of Thessaloniki – Department of Rural & Surveying Engineering
- Goulandris Natural History Museum – Greek Biotope Wetland Centre (NMNHG-EKBY)
- University of Thessaly – Department of Electrical & Computer Engineering (DECE)
- European Topic Centre – University of Malaga (UMA)
- Olympos Consulting P.C.

Project Website: biodiversity-greece.gr

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National Information System for the Biodiversity of Greece:
biodiversity.necca.gov.gr



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Major challenge: Scattered & inaccessible biodiversity data

Until recently, Greece lacked a national system for collecting, organizing, and sharing biodiversity information. Valuable data on species, habitats, and ecosystems were scattered across institutions, stored in different formats, and often inaccessible even to public authorities.

Universities, research institutes, NGOs, and ministries collected data independently — through projects, environmental impact assessments, and field monitoring — but these were isolated, one-off efforts with no connection to one another.

The national biodiversity data, such as the national reports under Articles 17 and 12 of the Habitats and Birds Directives for the different reporting periods, as well as the Database of the Natura 2000 network sites, were also scattered, often in inaccessible or non-editable formats (e.g., MS Access DB, pdf) and without the ability to compare information from one reporting period to another (to identify changes or trends). This often resulted in significant delays in environmental decision-making and weakened the capacity for effective management of protected areas.

SERRES (GR1260001)



DIMITRIS ARABATZIS / CLICK ΣΤΗ ΦΥΣΗ/ LIFE-IP 4 NATURA

Why it mattered

Without a unified system:

1



Decision-makers lacked timely, reliable, and spatially explicit information.

2



Conservation efforts were less efficient, often resulting in duplicated work and wasted resources.

3



Greece was unable to fully leverage Earth Observation (EO) and digital technologies to monitor biodiversity and climate-related changes.

4



The absence of an open-data culture limited public participation and scientific collaboration.

In short, biodiversity information did exist - but it was scattered, inconsistent, and largely underused.

EVROS (GR1110002)



ATHANASIOS NALBANDIS / CLICK ΣΤΗ ΦΥΣΗ/ LIFE-IP 4 NATURA

The vision behind LIFE EL-BIOS

LIFE EL-BIOS set out to address this major national gap by developing the first Hellenic Biodiversity Information System — a unified, web-based platform designed to integrate, harmonize, and visualize available biodiversity data in Greece.

The system supports:

- ✓ National and EU reporting obligations through standardized, interoperable datasets.
- ✓ Policy development and management planning for protected areas
- ✓ Research, education, and innovation by providing open access to validated, high-quality data.

The project established the foundation for a modern digital ecosystem for environmental information - enabling Greece to move from scattered, inconsistent records to a single, reliable source of biodiversity knowledge.

Our Solution in a Nutshell

To address the fragmentation of biodiversity data in Greece and the difficulty of accessing them, the **LIFE EL-BIOS project**:



Developed a national-scale, comprehensive biodiversity information system.

The project designed and built Greece's first National Biodiversity Information System, consolidating a wide range of data—such as species records, habitats, ecosystems, environmental pressures, and more—into a single unified platform.



Applied modern biodiversity recording methods and developed biodiversity indicators.

The project piloted advanced biodiversity monitoring methods, using drones equipped with 3D scanning sensors, terrestrial laser scanners, and autonomous wireless sensors for remote environmental data collection. The processing of these datasets with specialized algorithms enables the extraction of biodiversity indicators and the assessment of ecosystem health and conservation status.



Connected diverse stakeholders and data sources.

LIFE EL-BIOS strengthened close collaboration among universities, research institutes, NGOs, public authorities, and local agencies, collecting and harmonizing datasets that had previously been scattered, heterogeneous, or isolated.



Supports competent authorities and the scientific community.

The unified, web-based platform aggregates, harmonizes, and visualizes all available biodiversity data, facilitating national and EU reporting obligations. At the same time, it supports policy design and the management of protected areas, while also enhancing research, education, and innovation by providing open access to available datasets.

In short, LIFE EL-BIOS transformed the vision of “one reliable source for biodiversity knowledge in Greece” into reality—turning dispersed information into a cohesive, accessible, and meaningful tool.



Key actions & achievements

Assessment of needs and capacities per stakeholder group

Identification, mapping and grouping of stakeholders and target audiences

Main outcome:

> 2.200

records with contact details of relevant key-persons identified

Assessment of needs and capacities per stakeholder group

A nation-wide research assessed how stakeholders collect, manage, and use biodiversity data.

Qualitative Research (122 participants)



39

semi-structured interviews



11

focus groups

Quantitative Research: 269 on-line questionnaires

Main outcomes

- ✓ **Data categories mostly required:** species, habitat types/vegetation, protected areas, threats and pressures.
- ✓ **Major Challenges:** data fragmentation, low adequacy and availability, usability, validity and reliability, high expenditure of time.



Baseline assessment study on challenges and gaps

Main outcome

Documentation of gaps and challenges in the search and accessibility of biodiversity data at a national level.



Review of existing biodiversity datasets at a national level – Identification of data providers

1

Identification of **502 datasets** & **55 data providers**.

2

The Hellenic Ministry of Environment and Energy authorized the integration of **9 national databases**.

3

NECCA signed Memorandums of Cooperation (MoCs) with **7 data providers for the provision of biodiversity data** and made individual agreements with **5 data providers**.



Main outcome

A solid map of Greece's biodiversity data landscape and a partnership network for data sharing.

State-of-the-art review of national, EU & international biodiversity information systems

Evaluation of **80 national websites** related to biodiversity and **20 EU and international biodiversity information systems**.

Main outcome

Comprehensive overview of the international landscape of biodiversity information systems, along with identification of good practices for the efficient development and operation of an Environmental Information System (EIS) based on a set of defined criteria.



State-of-the-art review of remote sensing, EO, wireless sensors for biodiversity information extraction

Main outcomes



Evaluation of Earth Observation (EO) data portals, remote sensing products and services from Copernicus and other space agencies, and data cube architectures.



State-of-the-art analysis of technologies in the field of wireless and digital communications, as well as of technologies related to forest sound analysis.



Definition of structure, thematic domains & indicators (EO based and traditional) to be included in the Information System

Round-table sessions with 57 representatives from 46 organizations were conducted to discuss and refine the proposed structure, indicators, and use cases. Knowledge and experience exchange with the Spanish Ministry for Ecological Transition on equivalent biodiversity information systems (SIIPNB & EIKOS).

Main outcome

Definition of the primary thematic domains, specification of the functionalities of the LIFE EL-BIOS Information System, and a set of 92 proposed biodiversity indicators.



Design & development of the LIFE EL-BIOS Information System

Designed and developed the following functionalities of the Information System:



Integration of 184 datasets from 49 providers:

Main data provider:
Ministry of Environment & Energy (MEEN)

Agreement-based data providers:

10

Open data sources:

38

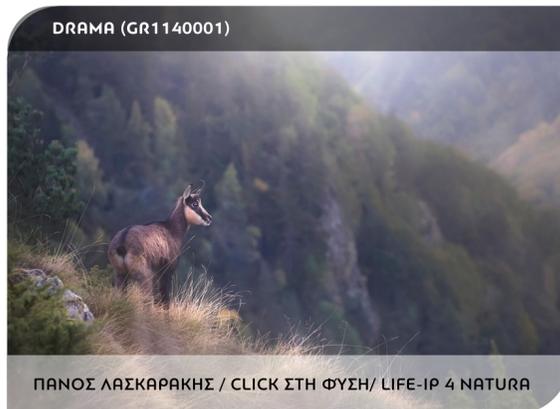
Records: **4,187,708 species records** covering **35.818 taxa**

Main Outcome

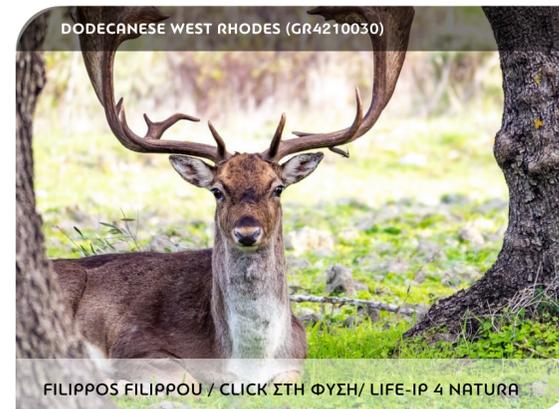
A fully functional National Information System for the Biodiversity of Greece, integrating available Greek biodiversity data into a single system: **biodiversity.necca.gov.gr**

Earth Observation (EO) workflows & biodiversity indicators

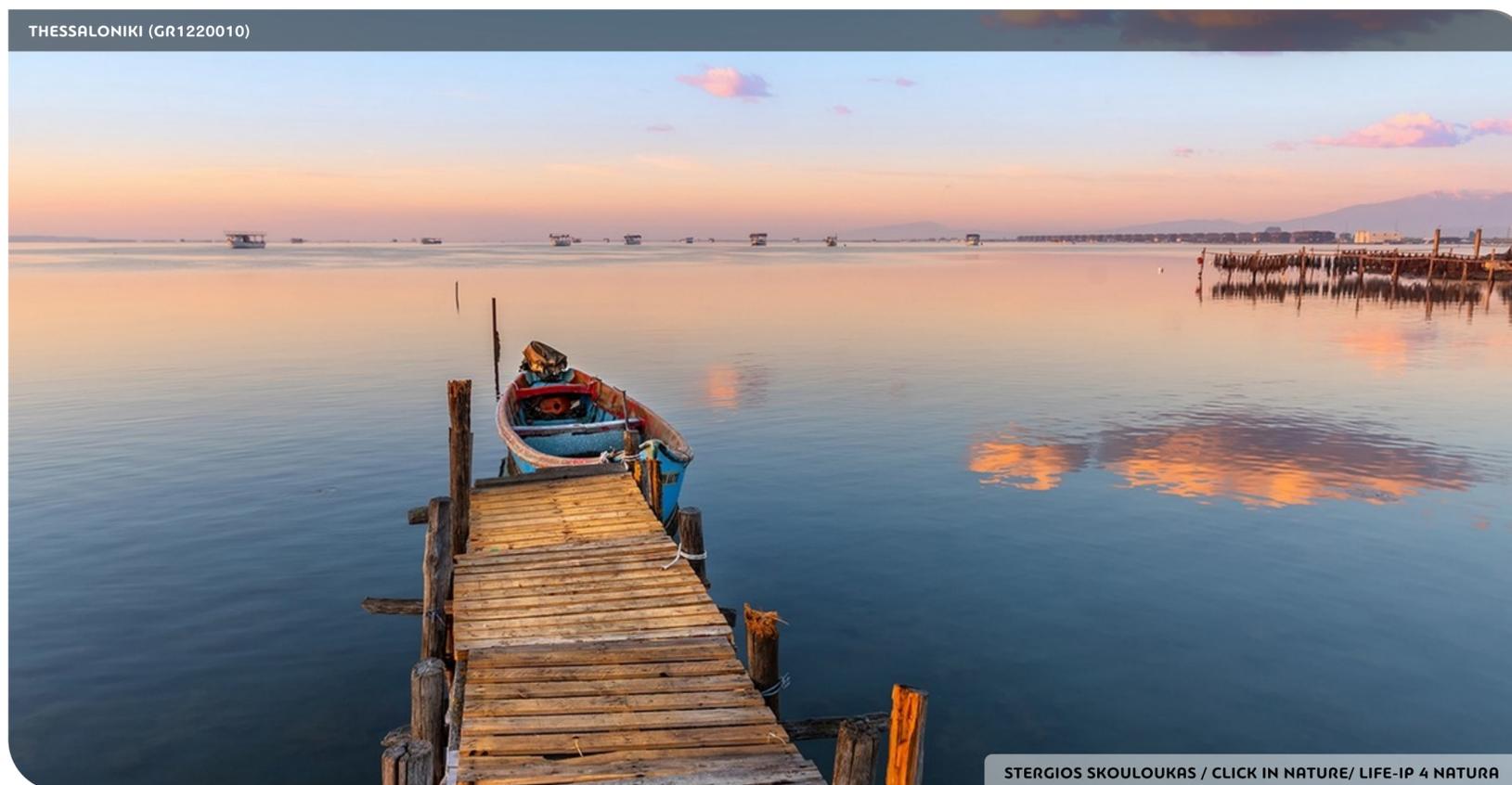
Developed Greece's first Earth Observation based biodiversity monitoring system using Copernicus and high-resolution satellite data.



Tested and validated **74 different models** for calculating biodiversity indicators using Earth Observation data



Ten Earth Observation workflows were developed for the calculation of ten biodiversity indicators at a national scale, covering vegetation structure, productivity, water extent, phenology, and land use/fragmentation.



Main outcomes



A robust workflow library for automated Earth Observation based indicator generation, directly feeding the LIFE EL-BIOS Information System.



Ten biodiversity-relevant indicators derived from Earth Observation data at the national level (over 6.3 terabytes of data).

Innovative technologies & approaches for biodiversity information extraction

Pilot deployment of advanced technologies for biodiversity monitoring was carried out in the Northern Pindos National Park (Valia Kalda) and the Kotychi–Strofylia Wetlands National Park. In total, **36 field plots (6 ha)** were surveyed, with more than 3,170 trees and over **1,040 microhabitats recorded**.



Images and data were recorded through 3D laser scanning using **unmanned aerial systems (UAVs) for mapping**:

Fixed wing with multi-spectral sensor

Quadcopter with LiDAR (Light Detection & Ranging) sensor

Quadcopter with RGB sensor



Different types of terrestrial laser scanners were employed in properly selected sampling plots:

Terrestrial Laser Scanners

GNSS (Global Navigation Satellite System) receivers

SLAM (Simultaneous localization and mapping) systems



The analysis of the data via specialized algorithms, enabled the extraction of biodiversity relevant indicators, along with indicators for ecosystem health and conservation status over the pilot areas:

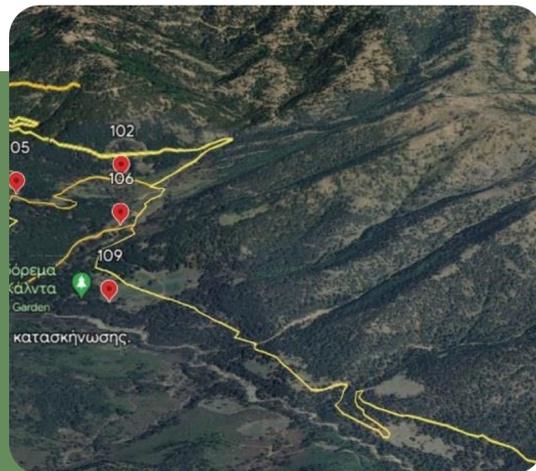
- ✓ Species richness,
- ✓ Density,
- ✓ Micro-habitats,
- ✓ Diversity,
- ✓ Biomass,
- ✓ Height,
- ✓ Canopy density,
- ✓ Deadwood,
- ✓ Diameter at breast height.

Innovative technologies & approaches for biodiversity information extraction

Also, the LIFE EL-BIOS team designed, developed and installed an autonomous network of wireless sensors for the remote collection of biodiversity data in the Northern Pindos National Park.

An autonomous **10-sensor node** was installed in **Valia Kalda** to record the following parameters:

- Humidity,
- Atmospheric pressure,
- Temperature,
- Sounds of animals,
- Sounds of human presence / interference.



An autonomous **9-sensor node** was installed at **Tymfi Dragon Lake** (alpine lake), for the recording of the following water quality parameters:

- pH,
- Dissolved oxygen,
- Water temperature,
- Turbidity,
- Electrical conductivity,
- Chlorophyll,
- Ammonium (ION NH₄⁺),
- Nitrate (ION NO₃⁻).



The biodiversity related data, collected through those autonomous wireless sensors' networks, are subsequently processed and used to feed artificial intelligence algorithms.

Main outcomes



Validated, replicable remote-sensing and 3D modeling methods for large scale biodiversity monitoring in protected areas.



Accurate information for timely and informed decision-making



Biodiversity and policy indicators generated through the LIFE EL-BIOS Information System

5
indicators
of biodiversity
status:



- ✓ Conservation status of habitat types under the EU Habitats Directive
- ✓ Conservation status of species under the EU Habitats Directive
- ✓ Population trends of bird species under the EU Birds Directive
- ✓ Area of Greek wetlands
- ✓ Number of threatened species in the Red List of Greece

7
indicators of
biodiversity pressures
and threats



- ✓ Pressures on habitat types under the EU Habitats Directive
- ✓ Pressures on species under the EU Habitats Directive
- ✓ Pressures on bird species under the EU Birds Directive
- ✓ Land take by urban/artificial areas within the Natura 2000 Network in GREECE
- ✓ Soil imperviousness and changes in imperviousness within the Natura 2000 Network in Greece
- ✓ Landscape fragmentation within the Natura 2000 Network in Greece
- ✓ Changes in land cover/land use within the Natura 2000 Network in Greece

7
indicators for
biodiversity
protection
measures



- ✓ Natura 2000 areas in Greece designated under the EU Habitats and Birds Directives
- ✓ National Protected Areas in Greece
- ✓ Terrestrial protected areas in Greece
- ✓ Marine protected areas in Greece
- ✓ Number and protection status of Greek wetlands
- ✓ Number of approved Special Environmental Studies and Management Plans for Protected Areas
- ✓ Number of approved Action Plans for the conservation of species and habitat types or for the restoration of sensitive ecosystems (either within or outside protected areas)



Capacity Building



A series of training seminars on the use of the National Biodiversity Information System of Greece were delivered to the following groups:

- ✓ Staff of the 'Protected Area Management Units' of NECCA (01/07/2025 & 14/07/2025)
- ✓ Management Unit of Northern Pindos National Park (08/07/2025)
- ✓ Academics, Research Centers/Institutes, NGOs (10/07/2025)
- ✓ Staff of the Ministry of Environment & Energy, Forest Directorates, Forest Services, Regional Authorities (11/07/2025)
- ✓ System Administrators – NECCA staff (24/10/2025)
- ✓ General public (31/10/2025)

In addition, to support users, a training video and a user manual for the National Biodiversity Information System of Greece were created. These are available in the “Information System Use” section (biodiversity.necce.gov.gr).

Main outcome

More than 550 individuals were trained in the use of the National Biodiversity Information System of Greece, through a series of training seminars.

Communication and promotion of the project's activities



A comprehensive set of communication tools — including a website, social media channels, videos, printed materials, and various publicity actions — was used to inform stakeholders about the project and encourage their engagement. During the initial phase, the primary objective was to motivate stakeholders to participate by contributing their biodiversity data.

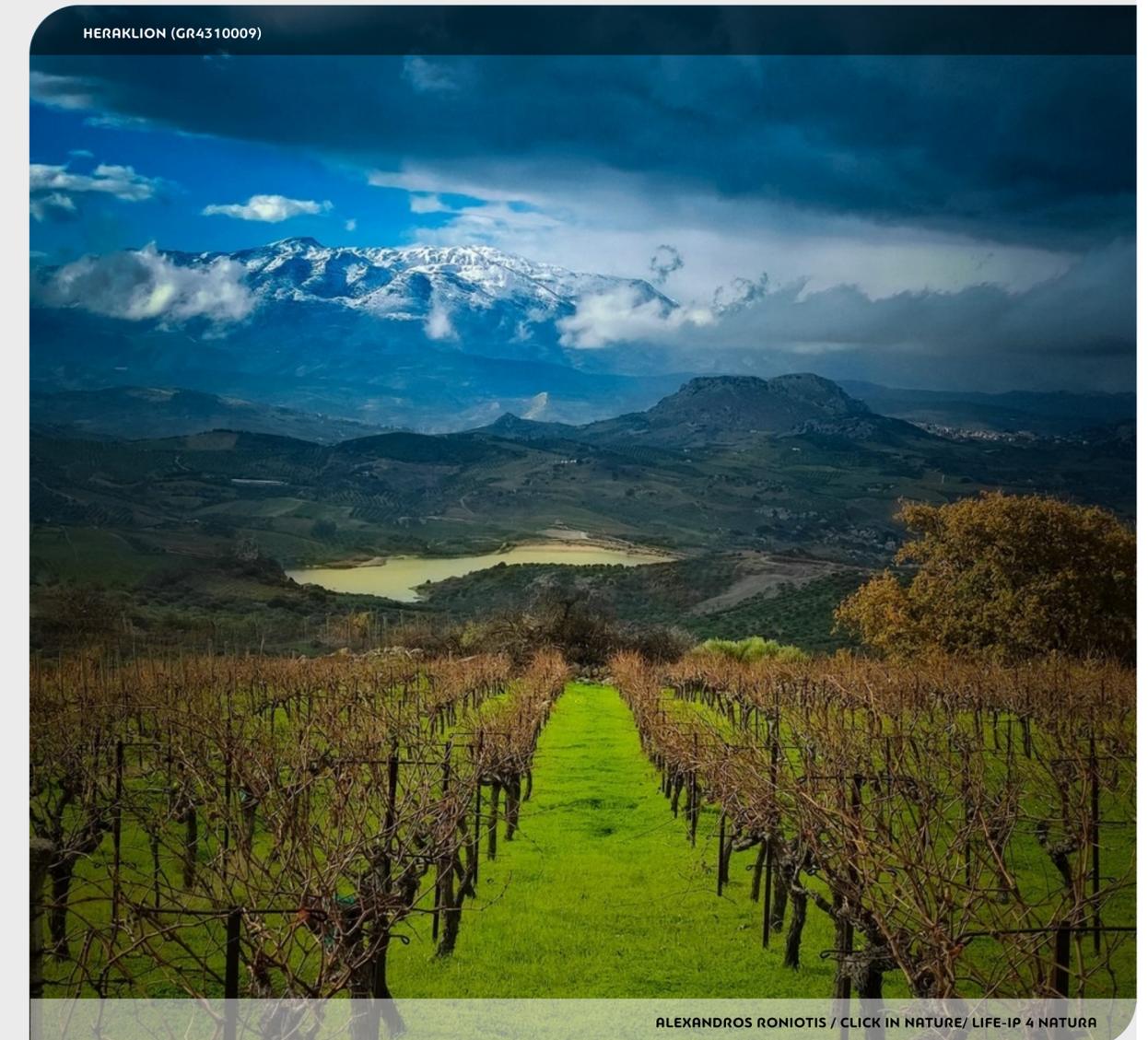
After the development of the National Biodiversity Information System of Greece, the focus shifted toward raising awareness of the system and promoting its use.

Main outcome

The project's communication activities reached an audience of over 150,000 individuals.

Academic publications related to the LIFE EL-BIOS project

- Mallinis, G., Fitoka, E., Chrysafis, I., Fotakidis, V., Chatziordanou, L. and Chatzicharalabous, E., 2024. EO-based indicators for biodiversity monitoring at national scale in Greece: Framework development for the hELlenic BIODiversity Information System (EL-BIOS). Tenth International Conference on Remote Sensing and Geoinformation of Environment, 8–9 April, Cyprus.
- Karolos, I.A., Bellos, K., Alexandridis, V., Chrysafis, I., Georgiadis, H., Pikridas, C., Tsioukas, V., Patias, P. and Mallinis, G., 2024. Advancing forest biodiversity conservation with the EL-BIOS digital twin: An integration of LiDAR and multispectral Earth Observation data. Tenth International Conference on Remote Sensing and Geoinformation of Environment, 8–9 April, Cyprus.
- Fotakidis, V., Roustanis, T., Panayiotou, K., Chrysafis, I., Fitoka, E. and Mallinis, G., 2024. ‘The EL-BIOS Earth Observation Data Cube for Supporting Biodiversity Monitoring in Greece’, Remote Sensing, 16(20), p.3771.
- Verde, N., Patias, P. and Mallinis, G., 2024. Mountain Green Cover Index calculation at a national scale using weak and sparse data. 2024 IEEE International Geoscience and Remote Sensing Symposium (IGARSS): Acting for Sustainability and Resilience, 7–12 July, Athens, Greece.
- Fotakidis, V., Panayiotou, K., Fitoka, E., Roustanis, T., Chrysafis, I., Patias, P., Georgiadis, H., Botzorlos, V. and Mallinis, G., 2024. EL-BIOS Data Cube: National-scale biodiversity monitoring in Greece through EO indicators. 2024 IEEE International Geoscience and Remote Sensing Symposium (IGARSS): Acting for Sustainability and Resilience, 7–12 July, Athens, Greece.
- Fotakidis, V., Roustanis, T., Panayiotou, K., Chrysafis, I., Fitoka, E., Botzorlos, V., Mitsopoulos, I., Kokkoris, I. and Mallinis, G., 2025. LIFE EL-BIOS: The Greek National Earth Observation Data Cube for supporting biodiversity management and conservation. BioSpace25 – Biodiversity Insight from Space, 10–14 February, Frascati (Rome), Italy.
- Alexandridis, V., Karolos, I.A., Bellos, K., Tsioukas, V., Diamantopoulou, M., Chrysafis, I. and Mallinis, G., 2025. Comparative analysis of SLAM and TLS LiDAR technologies for biodiversity-relevant information extraction over two Natura 2000 sites in Greece. The General Assembly 2025 of the European Geosciences Union (EGU), 27 April–2 May, Vienna, Austria.



Socio-Economic impact assessment of the LIFE EL-BIOS Information System

CHANIA (GR4340008)



SOTIRIS ZAPANIOTIS / CLICK IN NATURE/ LIFE-IP 4 NATURA

As part of the project, a socio-economic impact assessment was carried out, aiming to evaluate — in a measurable and operationally meaningful way — the value of the National Biodiversity Information System of Greece.

Overall, the system demonstrates clear socio-economic value. It provides significant time savings (users reported saving an average of 5.2 hours each time they use the database), enhances professional efficiency, and is widely recognized as a reliable data source.

Regarding willingness to pay, although user attitudes are generally positive, the overall willingness remains moderate — a finding linked to the broader societal perception that access to knowledge should be free.

FOKIDA (GR2450002)



CHRISTOS PANTAZIS / CLICK IN NATURE/ LIFE-IP 4 NATURA

IOANNINA (GR2130009)



ELEFThERIA SOUPIADOU / CLICK IN NATURE/ LIFE-IP 4 NATURA

LASITHI (GR4320006)



VAGGELIS MICHELIDAKIS / CLICK IN NATURE/ LIFE-IP 4 NATURA

Transferability & replication potential

KASTORIA (GR1320002)



FOTIS KAFETZIS / CLICK IN NATURE/ LIFE-IP 4 NATURA

The LIFE EL-BIOS approach—with its unified system architecture, combined indicator types, and integration of Earth Observation and field data—provides a model that can be adopted by other countries or regions aiming to modernize their biodiversity information systems.

The pilot technologies (UAVs, LiDAR, EO data-cubes) and associated workflows can be replicated in additional protected areas or ecosystems — terrestrial, wetland, or marine — both within and beyond Greece.

The stakeholder mapping, data-provider agreements, and governance framework developed by the project offer practical tools that other initiatives can leverage to accelerate data consolidation and promote data sharing.

EVROS (GR1110006)



ELENI SAITANIDI / CLICK IN NATURE/ LIFE-IP 4 NATURA

FLORINA (GR1340001)



DIMITRIOS LIOFIS / CLICK IN NATURE/ LIFE-IP 4 NATURA

SERRES (GR1260008)



MICHALIS KONSTANTINIDIS / CLICK IN NATURE/ LIFE-IP 4 NATURA

Continuation of the operation of the National Biodiversity Information System of Greece

The LIFE EL-BIOS project delivered the first National Biodiversity Information System of Greece, and its continuation beyond the LIFE framework is fully secured. NECCA will assume complete responsibility for the system's operation, updates, governance, and long-term maintenance following the project's completion in November 2025.



Institutional integration and management

NECCA will officially host the LIFE EL-BIOS platform within its permanent digital infrastructure (under biodiversity.necca.gov.gr). The system will serve as a core tool for biodiversity monitoring, management, and reporting. A dedicated technical support team will oversee server performance, software updates, and the development of new functionalities.



Data updating & maintenance

The Information System will remain an open, dynamic, and continuously evolving system. Annual data imports will be carried out. Quality assurance and metadata **standards (INSPIRE & GBIF)** will continue to be mandatory for all newly integrated datasets.



Financial continuity

NECCA and Green Fund will jointly ensure financial support for system maintenance, hosting, and staffing through:

- ✓ NECCA's annual operational budget for biodiversity information systems.
- ✓ Green Fund resources through national and European co-financing mechanisms.
- ✓ Targeted EU calls related to digital environment and nature monitoring

What's innovative

1

The project delivered Greece's first national-scale biodiversity information system, integrating data on species, habitats, ecosystems, observations, and monitoring into a single, unified platform.

2

It incorporates both traditional biodiversity indicators and Earth Observation (EO)-based indicators, leveraging remote sensing and data-cube technologies for long-term, scalable monitoring.

EVROS (GR1110006)



DIMITRIS NALBANDIS / CLICK IN NATURE/ LIFE-IP 4 NATURA

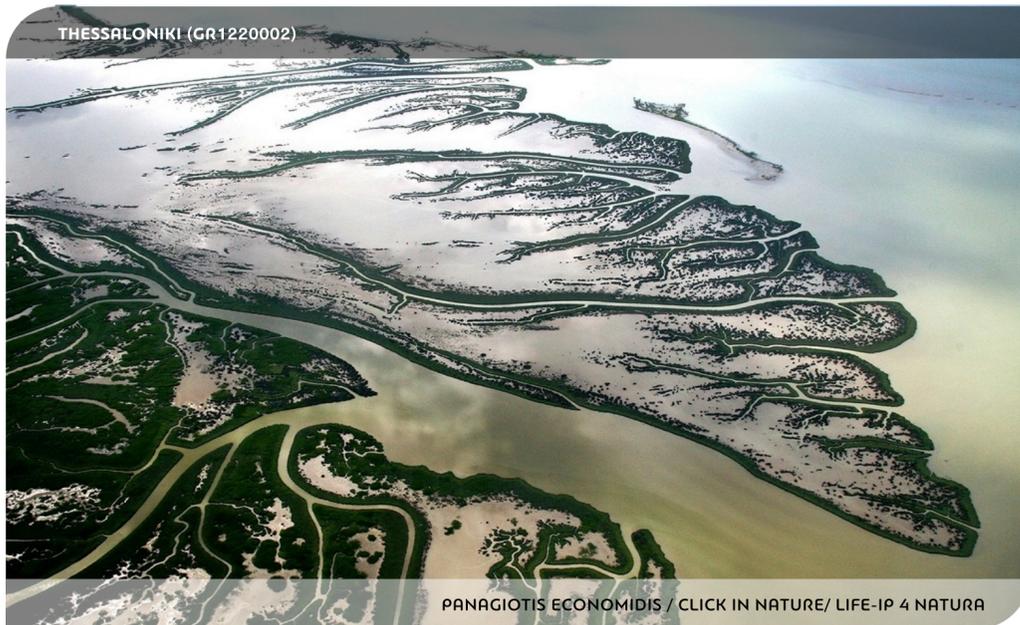
3

It introduced advanced technologies—including UAVs (drones), LiDAR, wireless sensor networks, and EO data-cubes—piloted in Natura 2000 sites to generate multi-scale, multi-source biodiversity information.

4

The system was designed with strong multi-stakeholder integration, involving academia, public authorities, NGOs, and individual biodiversity researchers. This inclusive approach strengthens data uptake, improves quality, and enhances the long-term sustainability of data flows.

THESSALONIKI (GR1220002)



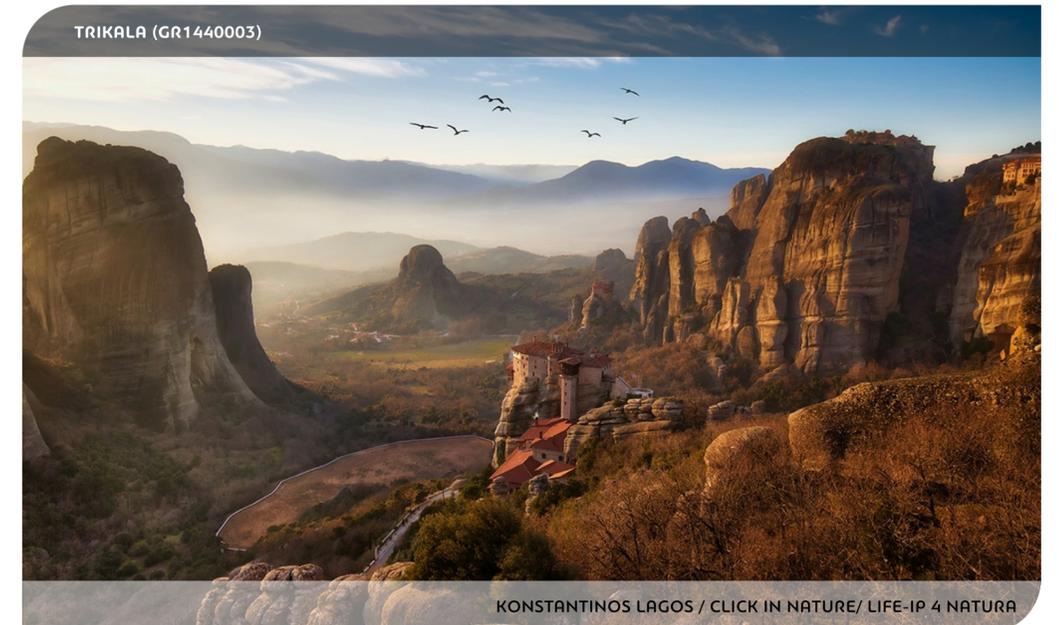
PANAGIOTIS ECONOMIDIS / CLICK IN NATURE/ LIFE-IP 4 NATURA

PIERIA (GR1250001)



ATHANASIOS PALLAS / CLICK IN NATURE/ LIFE-IP 4 NATURA

TRIKALA (GR1440003)

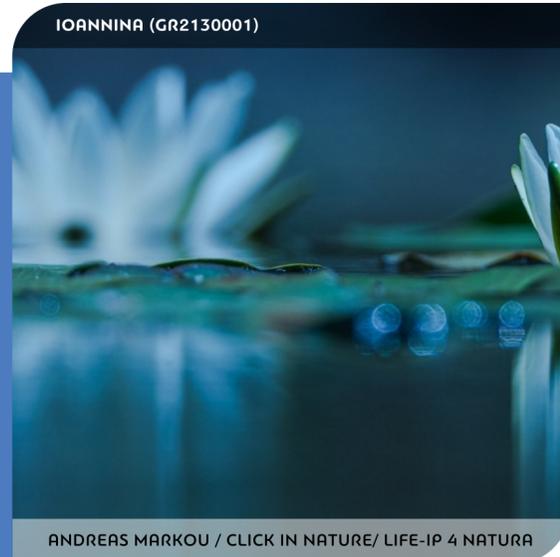


KONSTANTINOS LAGOS / CLICK IN NATURE/ LIFE-IP 4 NATURA

Key lessons learnt

Data fragmentation is a major barrier.

Prior to this project, biodiversity data in Greece were dispersed across multiple unconnected databases, stored in different formats, of varying quality, and often difficult to access. The project highlighted the importance of early partnerships with data providers, formal data-sharing agreements, and harmonised metadata standards.



Technology must be accompanied by strong governance.

Developing the technical infrastructure — software, workflows, sensors — is only one part of the challenge. The project demonstrated the need for clear governance structures, data-access protocols, and procedures for updating and maintaining the system to ensure long-term operability.



Training and capacity building are essential.

Even the most advanced system will underperform unless its users (public agencies, management bodies, scientists) are properly trained, familiar with the tools, and able to understand the indicators and workflows. The project established an important precedent for national-level training (> 550 staff) and user guidance.

Pilot sites provide proof of concept at scale.

Testing innovative technologies in two very different protected areas (mountain vs. wetland/coastal) enabled the project to evaluate method transferability, sensor adaptation, and workflow robustness, and provided critical insights for scaling up to all protected areas.



Accessibility and transparency increase value.

Making data, indicators, and workflows available (with appropriate access levels) enhances the system's usefulness for decision-makers, researchers, and the public. It reduces time and effort for national reporting and improves transparency regarding biodiversity status in Greece.

Project Partners



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COORDINATOR



GREEN FUND

prasinotameio.gr

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LARISSA (GR1420011)



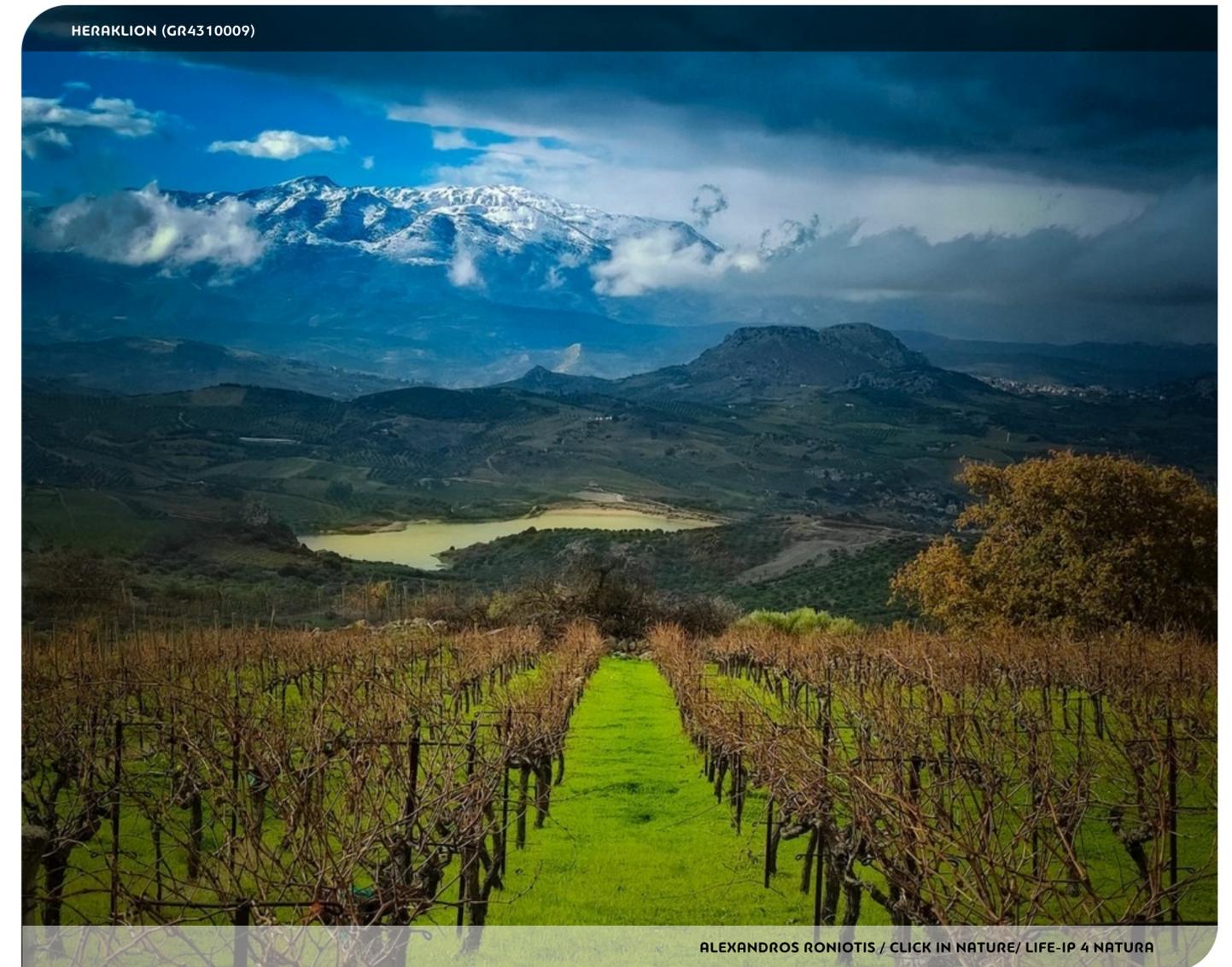
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ekby.gr

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