

2022 ACTIVITIES REPORT

December 2023

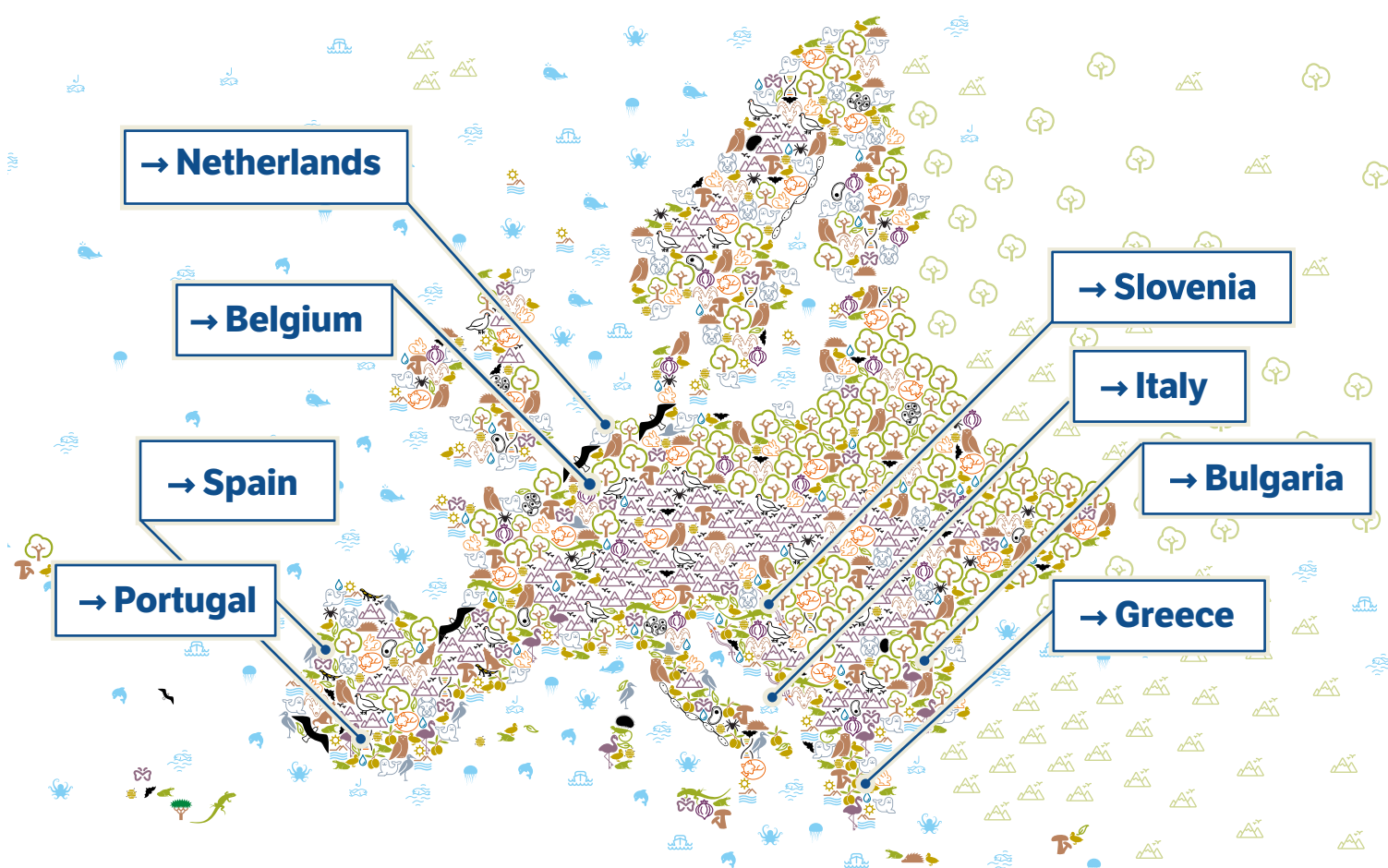


Photo by Giorgos Chatzigeorgiou | LifeWatch Greece

Two morphotypes of protected purple asteria *Ophidiaster ophidianus* in shallow reefs of Preveza

Table of contents

> Foreword	5
> Vision	7
> Mission	7
About LifeWatch ERIC	7
> What We Do	10
> Our History	14
> Our Members	16
> Organisational Chart	20
> Policies	22
> Team	24
The New Strategic Working Plan 2022-2026	32
> The 4 Priorities	36
> Deliverables	39
> Key Performance Indicators	40
Technical and Scientific Progress	46
> Technical and Scientific Progress	48
> Selected Publications	50
> Financial Management	52
> Administrative Management	53
> Collaboration and Networking	54
> Dissemination and Outreach Progress	56
> Training Progress	58
> Engaging our Scientific Community	60
> Projects	62
> Tendered Procurements	66
National Distributed Centres	68
> LifeWatch Belgium	70
> LifeWatch Bulgaria	72
> LifeWatch Greece	74
> LifeWatch Italy	76
> LifeWatch Netherlands	78
> LifeWatch Portugal	80
> LifeWatch Slovenia	82
> LifeWatch Spain	84
Acknowledgments	88
> Annex I: EU Project Descriptions	90
> Annex II: ERDF Project Descriptions	93

LifeWatch ERIC

Statutory Seat
Plaza de España,
SECTOR II-III
41071 Seville (Spain)
Tax Identification Number
N9101001G

> Foreword



Christos Arvanitidis

Chief Executive Officer
of LifeWatch ERIC



The year 2022 was marked by the adoption of the new Strategic Working Plan, which set the new vision and the mission of LifeWatch ERIC for the next five years. This was also an opportunity for the ERIC to make an account of the course taken so far, to learn from its weaknesses and threats, as well as to build on its identified future strengths and opportunities.

During this year, the results of the Internal Joint Initiative (IJI) found their way to publication in peer-reviewed journals along those with the data created during the previous implementation period. LifeWatch ERIC, following the suggestions made by its external *ad-hoc* Evaluation Committee and by its Scientific and Technical Advisory Board, deepened its knowledge on its users' requirements and mapped them against the policy requirements in order to define a plan of implementation. In addition, it updated its former IJI on non-indigenous Invasive Species (NIS) approach, particularly through its involvement in European projects, such as BiCIKL and EOSC Future. Simultaneously, the ERIC harnessed its collaboration with international networks, such as the Marine Biodiversity Observational Network (MBON) and with global aggregators, such as with GBIF, in the context of the United Nations General Assembly (UNGA77).

The year 2022 witnessed the upgrade and addition of many technical components of the LifeWatch ERIC Infrastructure, such as the distributed version of LifeBlock, a unique service in the current landscape of the ERICs and Research Infrastructures, including the Global Aggregators. In addition, the dockerisation of Jupyter notebook and RStudio, as well as the initiation of the plan for the digital industrialisation were developed. One of the highlights of the year was the experimental launching of its nano-satellite for terrestrial observations.

Overall, the community of the common facilities grew by 115% and increased in units from 33 employees to 71. This substantial raise in the personnel units has been caused primarily by the execution of the FEDER projects (ERDF, Andalusia).

The culture principles of LifeWatch ERIC have been identified and placed centrally in its further development and evolution during the new implementation period. From now on, these principles will support the new vision and mission of the ERIC. In parallel, the Gender Equality Plan was developed and initiated.

Progress was also observed in the financial and administrative issues, with the completion of the harmonisation of all accounting principles across the three Common Facilities. The collaborative quality management-oriented platform has been initiated, with a fully integrated document management system, which is based on the requirements from ISO 9001 and FitSM standards. Finally, the management review meetings were established as a monitoring tool to support the suitability, adequacy, effectiveness, and alignment of the management system with the strategic direction of the organisation.

Finally, LifeWatch ERIC had an unprecedented rate in participating to (100) and organising meetings (>300). Similar progress was observed in the activities of dissemination and outreach, training and engaging with the scientific community.

Working hard, collaboratively and under a well-defined Strategic Working Plan raised the brand name of LifeWatch ERIC in 2022, a fact which can be substantiated also by the starting of seven new projects funded by the EU. We're now looking at the future with greater optimism and with the certainty that LifeWatch ERIC can provide the e-Science Infrastructure for Biodiversity and Ecosystem Research to the current and coming generations of scientists and other types of users, including stakeholders.



> Vision



The vision behind LifeWatch ERIC is to become the Research Infrastructure providing access to the world's biodiversity content, services and communities in one click.

> Mission



LifeWatch ERIC aims to accelerate the research efforts of the scientific community by delivering a European state-of-the-art e-Science Research Infrastructure on biodiversity and ecosystem research, a Digital Twin which:

- provides access to, and support for key scientific services by applying cutting-edge ICT technology;
- enables reproducible analytics;
- is co-designed and co-created with the user communities and;
- is tuned with the needs for research that provides key insights for society, in particular science-based policy.

Photo by: Gradimir Gradev | LifeWatch Bulgaria

Lesser kestrel at the Natura2000 Special Protected Area (SPA) Sakar, Bulgaria

About LifeWatch ERIC



> What We Do

LifeWatch ERIC provides **integrated solutions** to current constraints and impediments affecting **biodiversity** and **ecosystem research**, such as the pressing need for increasingly **diverse**, **multi-sourced** and **open data**, **advanced models**, **FAIR compliant data**, **analytical services** and other **research products**, and finally for a **collaborative** and **democratic** research space in the form of **Virtual Research Environments** (VREs). The above elements make it possible to explore new frontiers in biodiversity and ecological science and support society in addressing planetary challenges, such as the impacts of climate change, with science evidence knowledge and advice.



Specialised Knowledge

A varied set of skills is available within LifeWatch ERIC from biological to environmental, earth and agricultural sciences, from biotechnologies to data sciences and ICT, information and communication technologies and computer engineering.



Open and FAIR Data

LifeWatch ERIC fosters the improvement of data, analytical services and other research products' compliance with FAIR data principles to ensure comparable end-to-end scientific approaches, including hypothesis testing.



Semantic Resources and Tools

LifeWatch ERIC has produced its own comprehensive semantic resources and other research products repositories, [Ecoportal](#) and the [Metadata Catalogue](#).



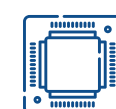
Big Data Analysis

Access to big data and long-tailed data collected at a global level is also provided.



Web Services

Reproducible analytical services, including models, are available through the LifeWatch ERIC Thematic Services [access point](#).



Computational Power

Cloud and computational power, and storage capacity are available to support both individual and collaborative research.



Workflows, VREs and vLabs

The analytical services are often orchestrated in workflows and Virtual Research Environments in order to support an end-to-end scientific approach, including hypothesis testing. They are accessible through the [Catalogue of Virtual Labs](#).



Training Centre

Currently, 23 webinars and workshops, 12 tutorials, 7 schools and courses have been organised to learn how to make better use of the infrastructure resources, tools and services, focusing on both practice and policy aspects. Related training resources are available on the [LifeWatch ERIC training platform](#) and contribute to the [ENVRI Community](#) training offer.



Stakeholder Connection

LifeWatch ERIC serves and interacts with a wide community of stakeholders at all levels, spanning from scientists, researchers and students to environmental managers, policymakers, researchers, civil society and the wider public, in order to provide evidence-based knowledge and advise on biodiversity and ecosystems issues.



Biodiversity Management Support

LifeWatch ERIC contributes to biodiversity and ecosystem management, monitoring and conservation, collectively with its vast network of European and Global Consortia and its strong involvement in the European Research Area (ERA).



Gender equality and inclusiveness

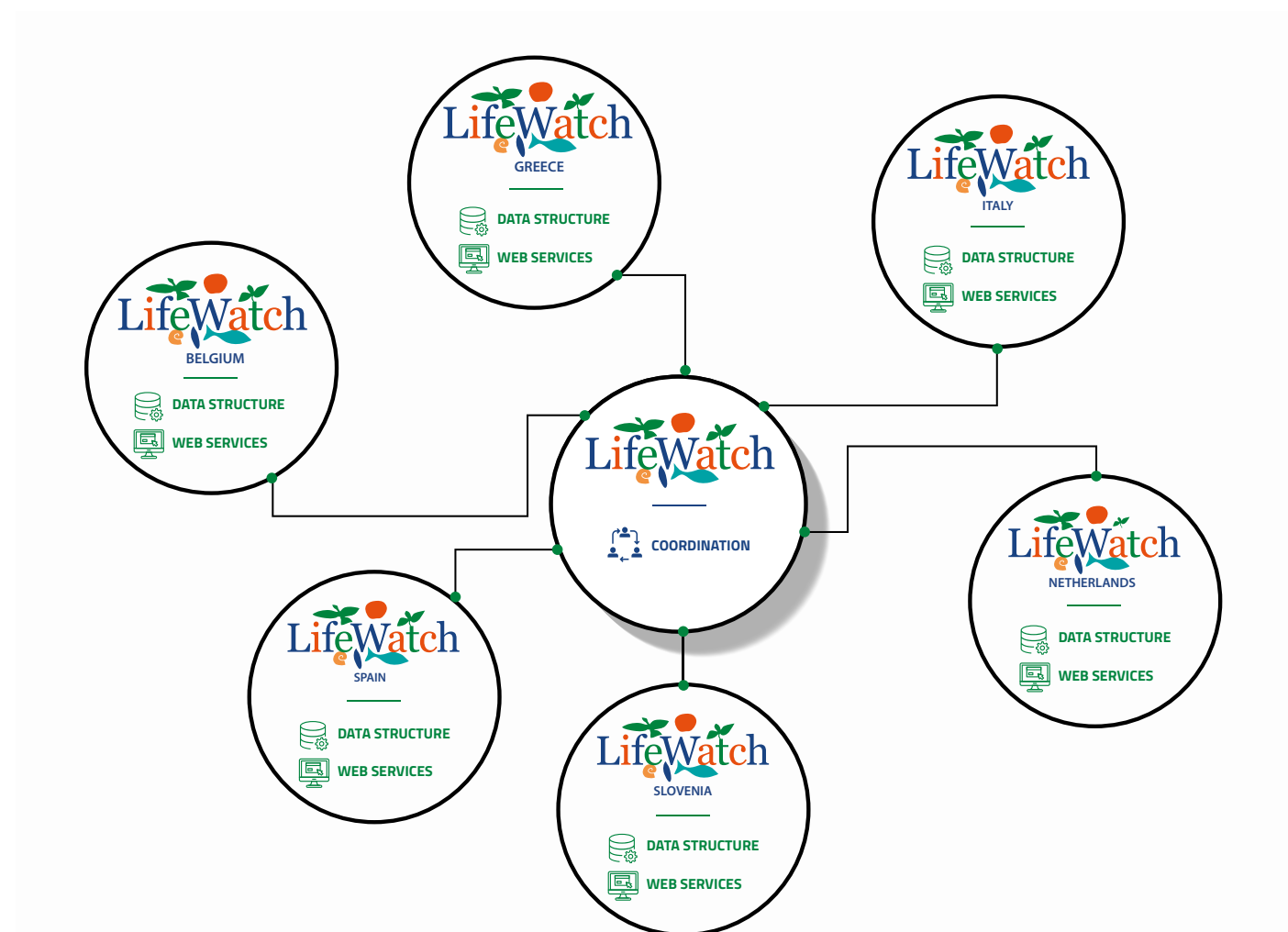
LifeWatch ERIC has developed and is currently implementing a detailed gender equality and inclusiveness plan, based on the United Nations principle that nobody should be left behind in the efforts for sustainable ecosystems. The outline of this plan has been adopted by many other ERICs in the framework of the ERIC Forum project. In addition, the services, serious games and learning platforms supporting citizen science and [education](#), are also part of this plan.



Networking

LifeWatch ERIC is actively involved in a dense grid of networking activities, through which it builds its trading zones with the relevant Research Infrastructures, global aggregators and research networks. This approach leads to the production of new knowledge and innovation and ensures access to multi-disciplinary and cross-domain communities.

> Our History



Preparatory Phase

During its preparatory phase, LifeWatch was designed as a completely new and ambitious Research Infrastructure, opening an innovative approach to scientific research in the field of biodiversity and ecosystems by integrating biological and ecological sciences and technologies, from one side, with information and communication sciences, engineering and technologies, on the other.

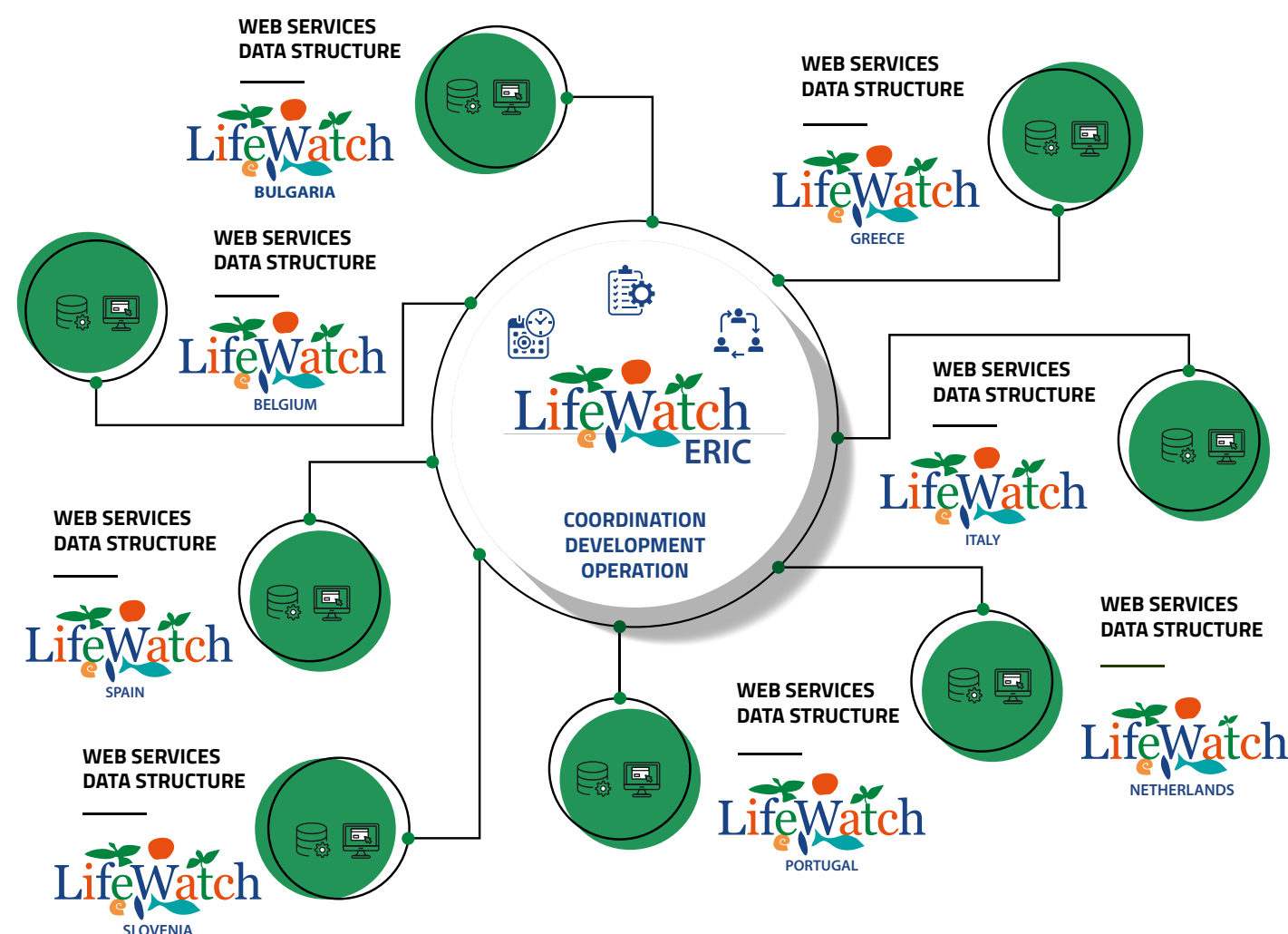
However, in the subsequent longer phase, LifeWatch became a loose ecosystem of nodes, each of which was developing their content and service structure depending on the needs of their scientific communities. During that first period, three of the partnering Member States took the responsibility of hosting LifeWatch Common Facilities: Spain, Italy and The Netherlands. They acted as the central components of the network of national nodes, coordinating activities, serving as a central hub for the national nodes as well as for preparing the material and taking the necessary steps forward becoming an ERIC.

The first implementation period

During the first 5-year implementation period, LifeWatch ERIC was transformed into a real Research Infrastructure, with its Common Facilities, playing an active role in coordinating the many activities and developing and operating its multiple resources in support of the work undertaken in the Distributed Centres.

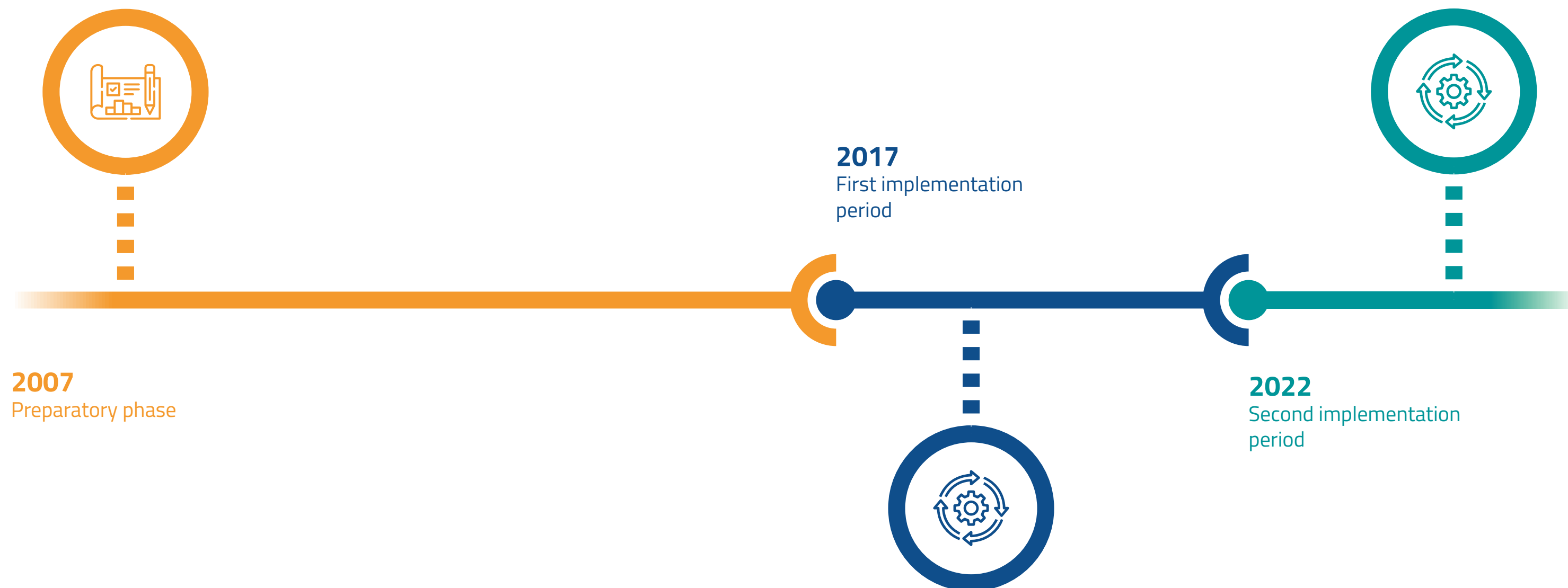
The essential ingredients for LifeWatch ERIC are: (1) Coordination and management of the trustworthy federated distributed e-Infrastructure; (2) Open access (FAIR) data; (3) Reproducible analytics; (4) Mobilised communities. The main challenges identified during this first implementation period were scientific, technical and cultural, the last type being the most difficult to tackle: *"to change scientists' everyday habits, by opening the LifeWatch ERIC Research Infrastructure (RI) web page as they turn on their PCs to use their preferred VREs. This change would direct most of the scientific effort from a single-core brain operation or 'brain-etics', into high-performance brain network synthesis or 'brain-omics'".* This is a cultural change we have to push forward in our community". This cultural change has the potential to bring as much innovation and research growth as those witnessed by jet traveling and internet communicating.

In this way and especially through its flagship project, the Internal Joint Initiative (IJI), LifeWatch ERIC created a prototype of its Infrastructure by developing and operating its key components, in terms of human capital (both scientists and engineers), organisation, services and virtual research environments, as well as integrating previous distributed construction and engaging scientific communities. While starting and boosting construction, LifeWatch ERIC was already operational during its first 5-year implementation phase.



The essential elements of this prototype are:

1. The Catalogue of its Resources (**Metadata Catalogue**);
2. The Repository of its Semantic Resources (e.g., Controlled Vocabularies, Thesauri, and Ontologies: **EcoPortal**);
3. **FAIR compliant datasets** (1,502);
4. **Web services** (113);
5. **Thematic services** (11);
6. **Virtual Research Environments** (VREs; 12);
7. **Workflows** (5);
8. **Training resources** (25);
9. **Research sites** (10);
10. **LifeBlock** (first Research Infrastructure applied Blockchain technology, offering the unique service of accessing multiple datasets both from LifeWatch ERIC and from other major global aggregators (e.g. GBIF and OBIS);
11. **Tesseract** and its **VRE building platform** (including Jupyter Notebook-technical composability layer);
12. **Network of communities engaged**;
13. Access to **next-generation e-Infrastructures** (e.g. EOSC Future).



Finally, the intensive work of the in-kind Contribution Committee resulted in a thorough evaluation on the partial contributions of each of the partnering countries to the development of the Infrastructure over the entire period before LifeWatch received the ERIC status and during this first implementation period (2017-2021). This in-kind contribution, which corresponds to 85% of the total investment made in LifeWatch ERIC, has shaped the main dimensions of the development of the Infrastructure during its first implementation period. This work continues during the second implementation period, starting from a revision of the methods and documents to monitor progress in the in-kind contributions of the partnering countries.

> Our Members

Common Facilities

Distributed Centres

--> Netherlands

The **Virtual Laboratory and Innovations Centre** coordinates and manages the requirements and needs analysis, the design and implementation of the scientific case studies and the products of the LifeWatch ERIC Virtual Laboratories.

--> Belgium

--> Slovenia

--> Italy

The **Service Centre** provides the infrastructure's interface with its user communities, identifying their needs and making available the relevant services. It is also responsible for energising the active involvement of the European scientific community, for training and for LifeWatch ERIC's communication activities.

--> Bulgaria

--> Greece

--> Spain

The **Statutory Seat** and the **ICT e-Infrastructure Technical Offices** jointly assist the functioning of the infrastructure, the former being the coordinator of all legal, administrative and institutional activities, and the latter responsible for managing the distributed ICT e-Infrastructure operations and implementation.

--> Portugal

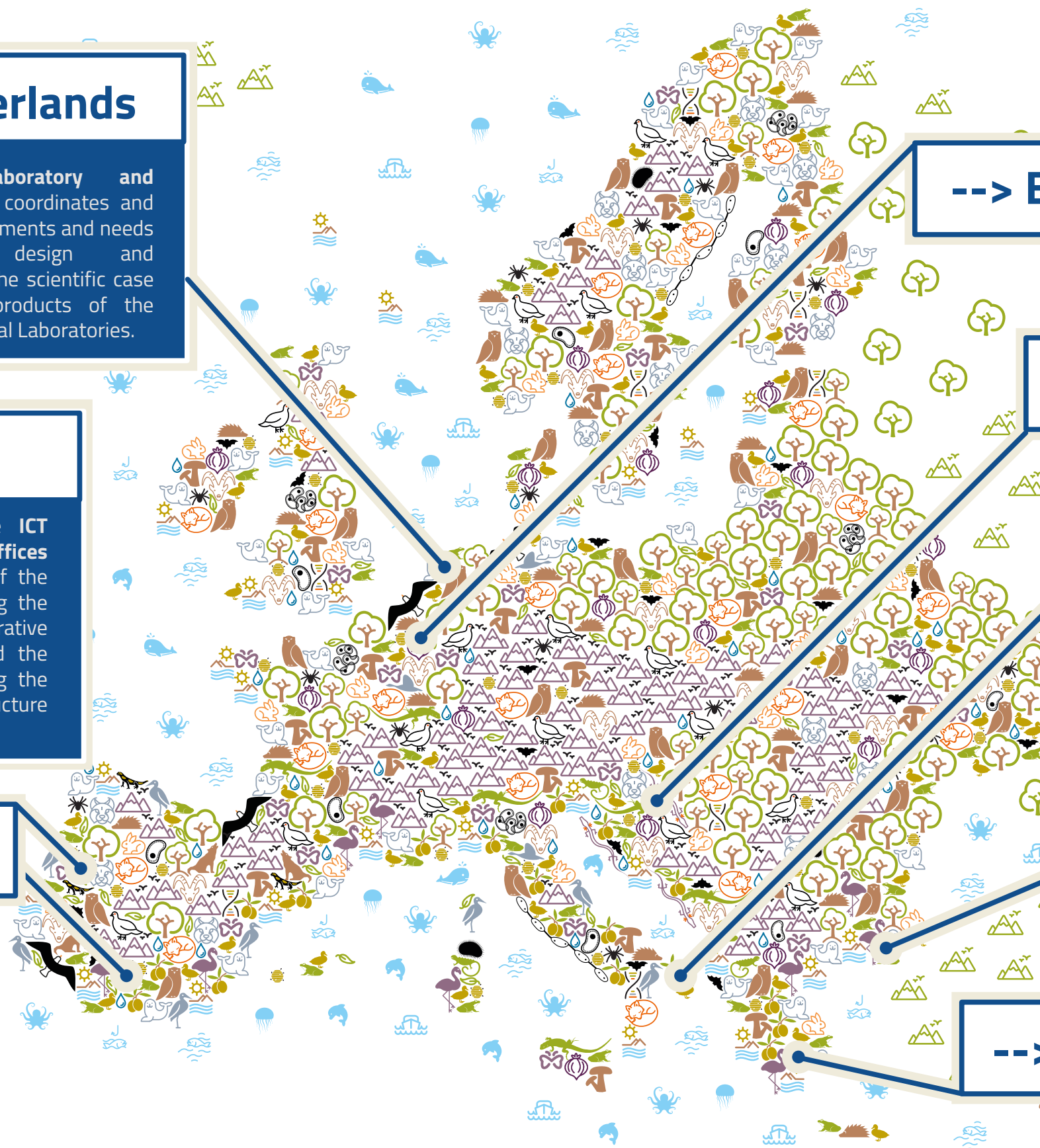
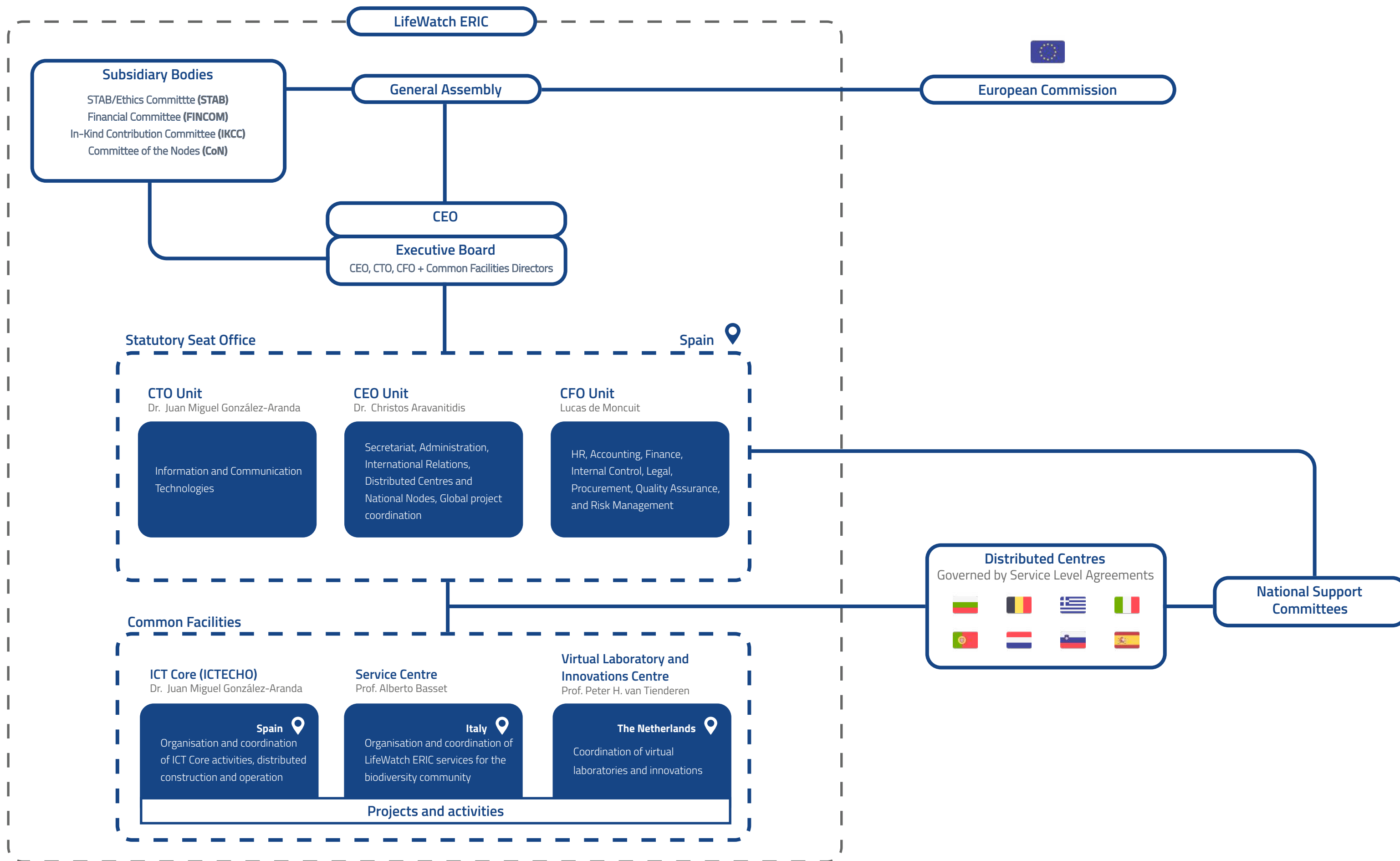


Photo by Annelies Tavernier | VLIZ, LifeWatch Belgium

Collected seashells at the Big Seashell Survey 2023

Organisation & Governance

> Organisational Chart



> Policies

The efforts of LifeWatch ERIC towards the development of the **Data Access and Intellectual Property Policy** deserves a special attention. It is the first version of a more robust policy to be developed next year, based upon general principles condensed in *whenever possible, open source/open access* but always protected and exploited in full recognition of the contributions of individuals, their organisations, and any other parties.

However, among 2022 greatest achievements regarding policies, we are pleased to mention the development of the **Gender Equality Plan (GEP)** and the **LifeWatch ERIC culture principles**.



Gender Equality Plan

Gender Equality benefits R&I, attracts and retains talent, and ensures that everyone can roll down their full potential. There is still significant work to be done in order to bridge the current gaps, but LifeWatch ERIC is strongly committed to establishing this cross-cutting priority that concerns work-life balance and organizational culture, leadership and decision-making, recruitment and career progression, research & training, plus measures against gender-based violence & sexual harassment. Our living **Gender Equality Plan (GEP)** boldly addresses the above areas and is based on continuous data collection, analysis, and monitoring. The GEP also inspires the **Event Code of Conduct**.



Culture Principles

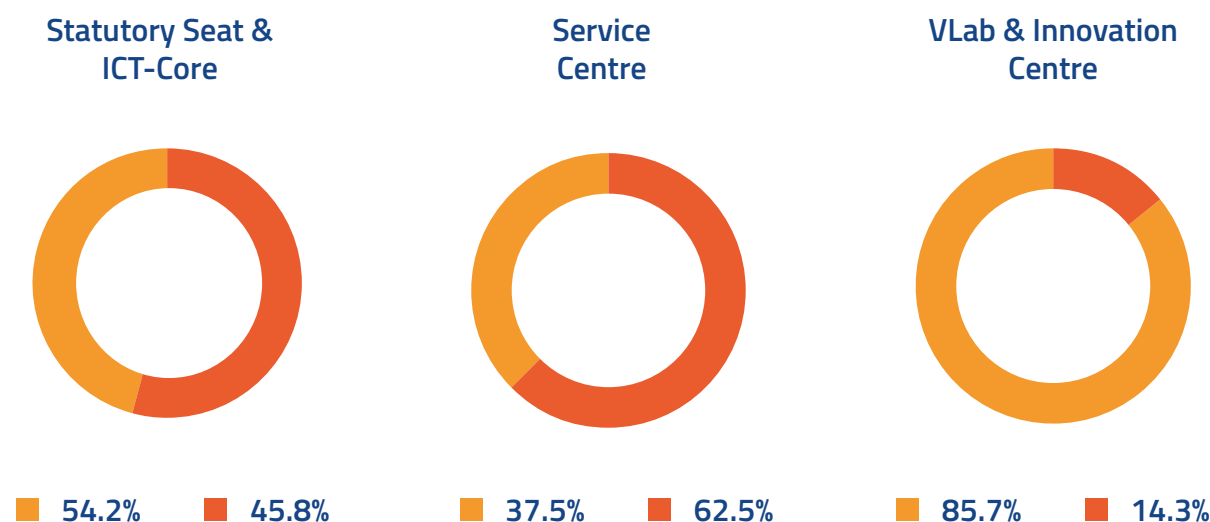
Designed to support LifeWatch ERIC Vision and Mission, and key to achieving them, the **Culture Principles** serve as the foundation for the creation of the positive socio-economic impacts that ERICs are meant to enable, so that staff, researchers, and all partners can be proud to work with us. The pillars of LifeWatch ERIC organisational personality are sevenfold and are illustrated in the figure above.

LifeWatch ERIC builds its success through knowledge, hard work, and by carrying out activities with respect and uncompromising integrity, inclusive of talent across and beyond the organisation.

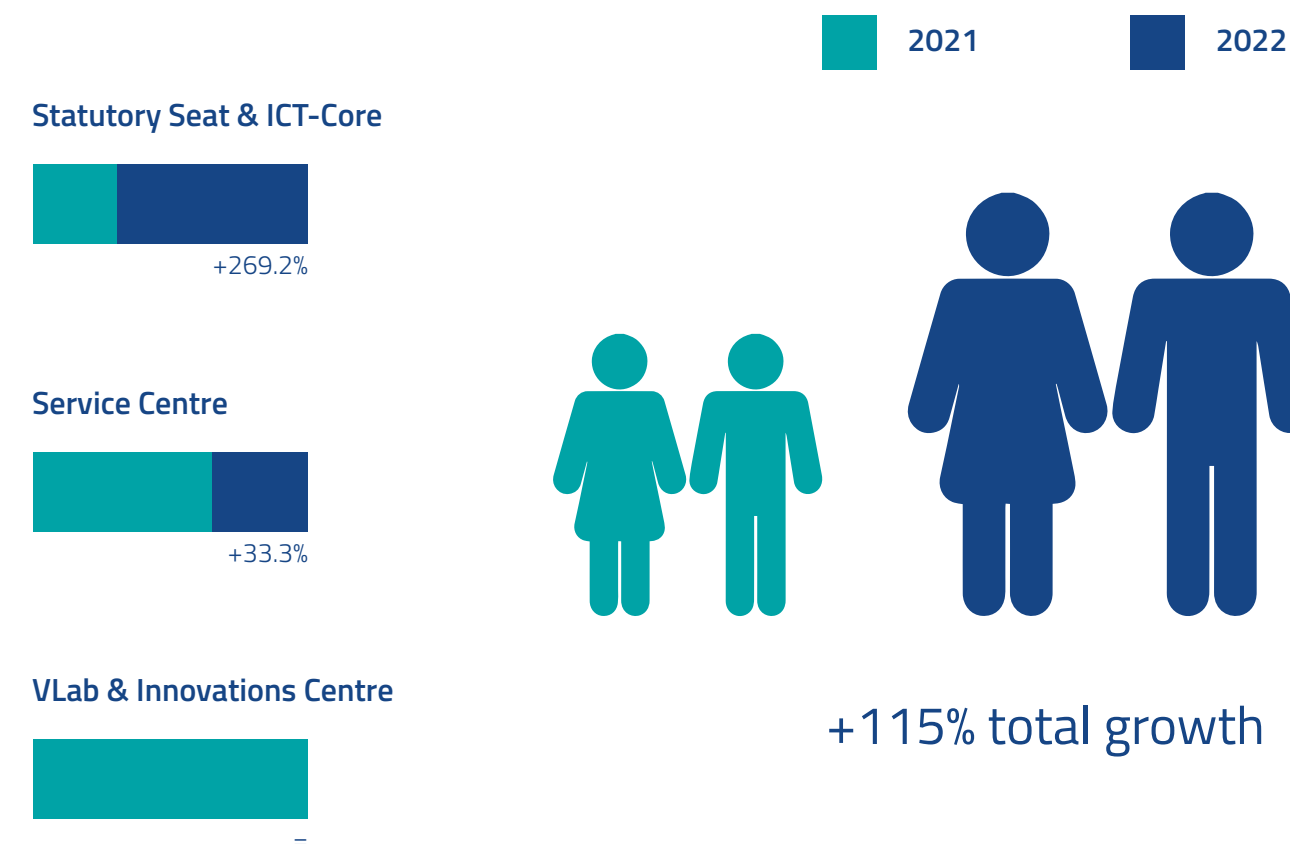
> Team

In 2022, LifeWatch ERIC employee power grew by **115%** from **33 employees** (including Executive Board members) to **71**. The new personnel were hired following a standardised, open and transparent procedure, which is described in the LifeWatch ERIC Employment Policy. Fostering female representation in the infrastructure staff, without compromising qualifications, has been one of the primary objectives. The final achievement was **46.48%** women in the workforce. This overall number however, awaits to be improved in the following years in certain Common Facilities and especially in the higher management positions.

Staff breakdown by gender



Employee growth












Total staff in 2022: 71
















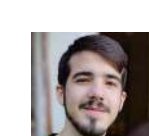







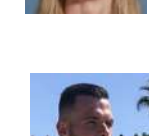
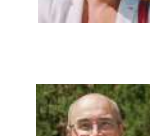

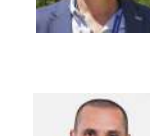
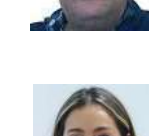

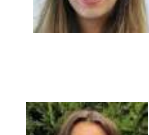


Spain

The Statutory Seat

	Christos Arvanitidis Chief Executive Officer		Lucas de Moncuit Chief Financial Officer
	Africa Zanella International Gender Officer		Ana Cristina Bajandas Boronat EU Project Manager
	Giovanna Caputi Iambrenghi National Nodes Operations Manager		Cristina Huertas-Olivares International Initiatives & Projects Manager
	Rocío Mantero Cejudo Quality & Project Assistant		Hooi Sung Lim Quality Assurance & Risk Management Officer
	Javier Sáenz Reina Finance Officer		

The ICT e-Infrastructure Technical Office

	Juan Miguel González-Aranda Chief Technology Officer		José Manuel Ávila-Castuera Agroecology Coordinator
	Javier López-Torres Procurement & Institutional Relationship Officer		Antonio José Sáenz Albanés e-Infrastructure Operations Coordinator
	Francisco Manuel Sánchez Cano e-Infrastructure Resource Integration Coordinator		Inmaculada Alados Linares Bioinformatics Processes Assistant
	Yassir Benhammou Data Science & Artificial Intelligence Assistant		Kety Cáceres Falcón Project Manager & Fundraising Assistant

	Alberto Cantarero Reina Soil Sampling Technician		Daniel Caro Gomez Agroecology Services Integration Assistant
	Ricardo Esteban Carrillo Marfil Project Executive Coordinator		Juan Manuel Cintas Arid Areas Expert
	Jorge Cobos Technical Assistant for eDNA Metabarcoding & Bioinformatics		Jose Cruz Camacho Database & Back-End Developer
	Diego De Los Santos Parejo Andalusia ERDF Scientific Content Assistant		Ana Del Aguila Data Science Artificial Intelligence Assistant
	Emilio Del Leon Cardenas Distributed e-infrastructure Control & Network Systems Manager		Jaime Lobo Domínguez-Roquetao Satellite & HAPS Operations Manager
	Julia Espinosa Soil Sampling Technician		Aitana Forcén-Vázquez Oceanography Support Assistant
	Arantza Gallardo Lopez Legal & Capacity building framework assistant for Ecosystems		Antonio Garcia Ramos DataBase and Backend Developer Assistant, ENVRI-FAIR
	Ruperto González Gordo Office Processes Manager		Pablo David Guerrero Alonso Remote Sensing, Sensor Networks & Edge Computing Officer
	Emilio Luis Jara Fontacaba Distributed e-Infrastructure Control & Network Systems Manager		Rohaifa Khaldi Data Science Artificial Intelligence Assistant
	Joaquín López Lerida Data e-Science Management Plan & BlockChain Officer		Carola Marín Font Trademark Legal Project Management Assistant
	Ana Mellado García Project Executive Coordinator		Rocío Moreno Domínguez Project Executive Coordinator



Elisa Moron Lopez
Project Manager



Inmaculada Ponce Moreno
Operational Support Assistant for ICT Office



José Rodríguez Ortega
Data Science Artificial Intelligence Assistant



Javier Saura Rascon
Project Executive Assistant



Maria Luz Vazquez Santana
Technical Assistant & QARM FITsM Officer



Carlos Pallero Lázaro
Project Executive Coordinator



Gabriela Represa de la Lastra
Project Manager International Initiatives Assistant



Estíbaliz Sáenz Albanés
Technical Assistant for Construction Projects



Iria Soto Embodas
Agroecology Project Manager

Italy

The Service Centre



Nicola Fiore
Service Centre ICT Coordinator



Sara Montinaro
Chief Communication Officer



Eleonora Romano
Administrative Officer



Elizabeth Bamford
Communication Officer



Laura Caciagli
Science Communication Specialist



Xeni Kechagioglou
Ontology Developer



Julian Kenny
Communication Officer



Maria Teresa Manca
Training & Capacity Building Officer



Eleonora Parisi
ENVRI-FAIR & EOSC Future Training Officer



Margherita Stefanini
EU Project Manager



Massimo Toma
Agroecology Technical Officer



Giuseppe Turrisi
Web Portal Developer



Lucia Vaira
Web Portal Officer



Cosimo Vallo
Training Officer

The Netherlands

The Virtual Laboratory & Innovations Centre



W. Daniel Kissling
Scientific Coordinator



Jacco Konijn
Project Manager



Zhiming Zhao
Technical Manager



Riccardo Bianchi
**Developer for Cloud-based
Virtual Research Environments**



Spiros Koulouzis
VRE Developer



Joris Timmermans
**Scientific Developer for
Essential Biodiversity Variables
Workflows**



Yifang Shi
**Scientific Developer for
Ecological Applications of
LiDAR Remote Sensing**

Photo by Rui Morgado | LifeWatch Portugal

Estrilda astrild in Alcochete, Portugal

The New Strategic Working Plan 2022-2026



Executive Summary

LifeWatch ERIC is following a clear path of consolidation, overcoming the obstacles encountered on its way and meeting to a great extent its objectives. The year 2022 saw LifeWatch ERIC as an accredited player in the European Research Area, capable of involving its partnering countries and participating to several partnerships in European and international projects. This path of consolidation is thus dependent on the ability to deliver concrete results and also begins to reveal the greater complexity of a growing collective e-Science infrastructure. A challenge that LifeWatch ERIC is well aware of and is ready to tackle in its second implementation period thanks to a flexible management structure, a sound operational plan, and tools for its monitoring and evaluation.

Strategic Objectives and Priorities

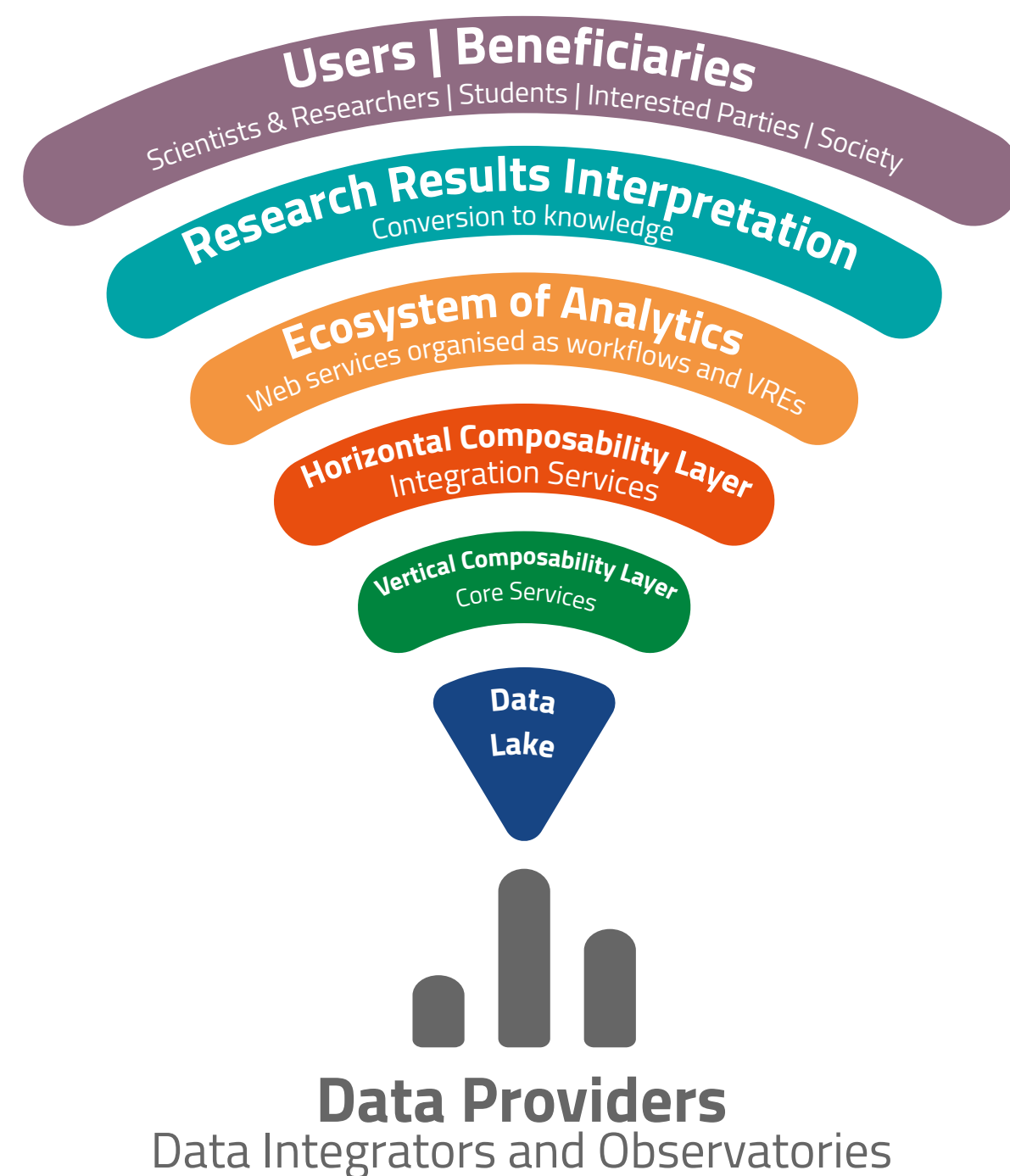
Scientific objectives and priorities are well-defined at different levels of organisation and operational activities.

The knowledge transfer and innovation sections are those where LifeWatch ERIC will invest the most over the next five years. The Strategic Working Plan (SWP) of LifeWatch ERIC provides the essential elements for the next five years of its implementation period, 2022-2026. This new SWP sets LifeWatch ERIC firmly on the cruising altitude, toward the integration of all its facilities (in both Common Facilities and Distributed Centres), components of the Infrastructure, and most importantly, the mobilisation of its communities and relevant stakeholders towards the co-design and co-development of the Infrastructure, including its interaction with the public and private sectors and industry. It is the product of a long consultation period with the LifeWatch ERIC Advisory Bodies, that is the Scientific and Technical Advisory Board and the external *ad-hoc* Evaluation Committee, whose comments and suggestions on the main objectives, directions and ways of achieving the expected results were instrumental in shaping this new SWP. As a result, the new SWP went through several rounds of revision until it was finally accepted by the General Assembly of the ERIC. This new SWP constitutes the heart of LifeWatch ERIC strategic objectives, responding to the four priorities underlying LifeWatch ERIC implementation plan for the next five years.

Expected Impacts

The new implementation period will convert the current LifeWatch ERIC Infrastructure into a hub for biodiversity and ecosystem research making in the current landscape through the innovation and its use by the communities. A very ambitious challenge whose impacts are at the same time of a scientific, technical, social and cultural nature. The **breakthrough innovations** that will be brought by will make the **infrastructure** a **game changer** in the **making** of **modern science** and in the **production** of **knowledge**. Under a socio-economic perspective, LifeWatch ERIC will **push** the current **knowledge limits** and **bring down barriers** between communities, leading to the development of **synthetic knowledge**. This is a key prerequisite in providing **reliable, evidence-based scientific knowledge** for the **management** and **sustainable exploitation** of **biodiversity** and **ecosystem resources**, and a **tool** for relevant **policy-making**. Through the **industrialisation** process and the participation to several EU funded projects, LifeWatch ERIC will foster **technology transfer**, directly and indirectly contributing to the creation of **green jobs**. Lastly, LifeWatch ERIC is working to achieve a cultural impact, **promoting multi-disciplinary** and **cross-domain research**, allowing different communities to work in the same **collaborative** and **democratic environment**.

Broad-based engagement is the fundamental methodology behind this co-design and co-development of the infrastructure with all the interested parties and networks. Measurable and adapted Key Performance Indicators (KPIs) were identified to allow the yearly monitoring of LifeWatch ERIC activities and results.



> The 4 priorities

LifeWatch ERIC as an Organisation:

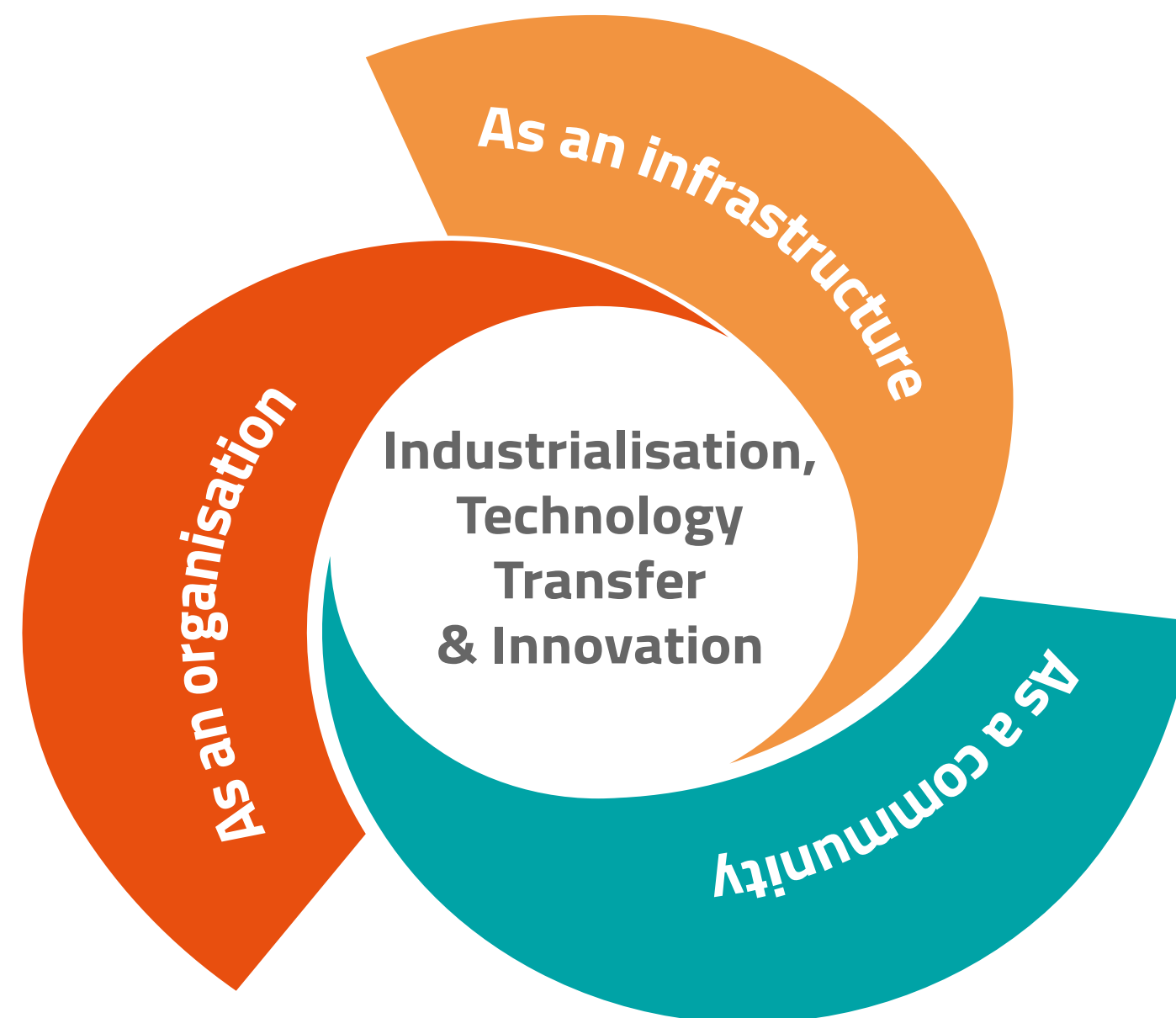
it sets out the steps needed to be taken at the administrative and organisational levels, including the financial, for LifeWatch ERIC to take advantage of the lessons learned during the first period and optimise both its structure and function as an Organisation.

LifeWatch ERIC as an Infrastructure:

the process of turning the current prototype of the Infrastructure developed, currently at the Technical Readiness Level of 6 (TRL6), to the next-generation Infrastructure on Biodiversity and Ecosystem Research (next-gen IBER), at the TRL9.

LifeWatch ERIC as a Community: the development of the trading zones of LifeWatch ERIC with the scientific communities and other stakeholders, other ERICs, Research Infrastructures (RIs) and global actors, comes as the top Priority in this period. It engages them through the co-design and co-development of the Infrastructure with all the interested parties, including networks, and the upgrading of the current approach on communication and networking, engagement and outreach and finally training and education.

Industrialisation, Technology Transfer and Innovation: this Priority includes activities designed to achieve the consolidation of business processes and services to enable the industrialisation of the LifeWatch ERIC prototype, to disseminate the results stemming from scientific and technological research to the market place and wider society, to increase the visibility of LifeWatch ERIC and strengthen the position of its members (and Europe) as strong R&D actors and finally to scale up the socioeconomic impact of LifeWatch ERIC.



> Deliverables

Priority	Task	Deliverable	Type*	Date
LifeWatch ERIC as an Organisation	Task 1.1. Upgrade of the Management System	Actionable Roadmap of LifeWatch ERIC	DEM	M08
LifeWatch ERIC as an Organisation	Task 1.1. Upgrade of the Management System	Strategic Working Plan Repository	DEM	M08
LifeWatch ERIC as an Organisation	Task 1.1. Upgrade of the Management System	Risk Registry of LifeWatch ERIC Strategic Working Plan implementation in operation	DEM	M08
LifeWatch ERIC as an Organisation	Task 1.1. Upgrade of the Management System	Communication Strategy	R	M06
LifeWatch ERIC as an Organisation	Task 1.2. Upgrade of the Management System	User Strategy (first version, entitled: “Users and policy requirements: plan and process for its implementation)	R	M12
Industrialisation, Technology Transfer and Innovation	Task 4.1. Industrialisation planning of the LifeWatch ERIC prototype	Industrialisation Plan (IP) describing the actions to be implemented to support the industrialisation of prototype	R	M08

R: Document, report (excluding the periodic and final reports)
DEM: Demonstrator, pilot, prototype, plan designs
DEC: Websites, patents filing, press & media actions, videos, etc.
OTHER: Software, technical diagram, etc.

> Key Performance Indicators

Strategic Objectives	KPI	Description	Indicators
Strategic Objective 1 To industrialise and support the knowledge & technology transfer mechanisms of the existing prototype LifeWatch ERIC Research Infrastructure at all levels: scientific, technical, communication, innovation, administrative and financial -from current Technology Readiness Level (TRL 6) to TRL 9).	KPI 1.a: Number of users per VRE	Number of downloads/studies or provisions of service. <i>Expected performance: On average, 30- 50 users per year per VRE.</i>	<ul style="list-style-type: none">Workflows executed (IJI VRE): 319Users executing workflows: 36
	KPI 1.b: Number of user requests for access	Requests for access as a function of new resources published and operated by LifeWatch ERIC per year. <i>Expected performance: Hundreds of users requesting access to 30-50 new resources per year.</i>	<ul style="list-style-type: none">In 2022: 5,093 new users requested access to new resources (119 services, 5 workflows, 357 new datasets, etc.), over 6,811 sessions Registered users <ul style="list-style-type: none">Total (since 2021): 287 In 2022: 74 Registered UsersTotal (since 2021): 8,167 In 2022: 5,450 UsersTotal (since 2021): 8,517 In 2022: 6,811 Sessions
	KPI 1.c: Number of new projects and private sector partners involved in co-construction processes and percentage of revenues from contracts, economic activities in the annual accounts	Any kind of economic activities: Projects, Private Sector and Industry related services provision, common capital ventures, etc. <i>Expected performance: As much as 20% of the total in-cash investment on a yearly basis, with an average of 2 new activities and 5 new partners per year.</i>	In 2022 <ul style="list-style-type: none">Budget from incoming projects 28.9% of the in-cash investment. Collaboration with 6 private companies in project activities (co-development).1,178 new partners, collaborating with LifeWatch ERIC in the framework of projects.
Strategic Objective 2 To consolidate and broaden LifeWatch ERIC e-Infrastructure towards the integration of all contents, services and other assets (e.g. installations, hardware, software, observatories), currently existing in the member states and the new ones, into a single RI offering users an open, creative and democratic space.	KPI 2.a: Number of resources managed and operated by LifeWatch ERIC (installations, hardware, software, observatories)	Web services available on LifeWatch ERIC web portal, which are fully operational. <i>Expected performance: On average, 30-50 new services per year, accessed by hundreds of users.</i>	<ul style="list-style-type: none">Total (since 2021): 124 web services.In 2022: 119 new web services, accessed by 1,270 users.
	KPI 2.b: Number of publicly available datasets (% of FAIR-compliant data)	Number of FAIR datasets produced as a percentage of the total number of datasets produced. <i>Expected performance: On a yearly basis, 30-50 new datasets accessed by hundreds of users.</i>	<ul style="list-style-type: none">Total (since 2021): 1,498 datasets, 99% of them are FAIR compliant.In 2022: 357 new datasets accessed by 5,093 new users

Strategic Objectives	KPI	Description	Indicators
Strategic Objective 3 To advance scientific and technological innovation, based on the continuous improvement in the performance of the VREs, by investing in emerging technologies with profound application in Biodiversity and Ecosystem Research (BER), towards the next generation Infrastructure on Biodiversity and Ecosystem Research (next-gen IBER).	KPI 3: Publications	<p>Number of publications based on the research performed using concepts/facilities/resources, etc. of LifeWatch ERIC.</p> <p><i>Expected performance: 30-50 new publications per year.</i></p>	<ul style="list-style-type: none">Total number of publications in 2022: 81 out of which, 38 authored by LifeWatch ERIC affiliated researchers
	KPI4.a Engagement achieved by direct contact (e.g. events, booths, etc.)	<p>Outreach by public relations/direct contact with specific target groups: organisation of (e.g. summer schools, etc.) or participation to events organised by third parties.</p> <p><i>Expected performance: On average, 100-200 persons per year engaged through the above events.</i></p>	<p>In 2022: Totally, 952 persons engaged</p> <ul style="list-style-type: none">638 persons engaged in LifeWatch ERIC own events314 persons engaged in events organised by others
Strategic Objective 4 To deepen the engagement of the scientific communities (with attention to inclusivity and equity), biodiversity and ecological observatories, stakeholders and citizens, at global scale.	KPI 4.b Outreach through media and LifeWatch ERIC own web and social media activities	<p>Impact of press and communication actions in raising awareness of LifeWatch ERIC mission, activities and societal relevance of results:</p> <ol style="list-style-type: none">Mentions on mediaWebsite analyticsSocial media analyticsNewsletter analytics. <p><i>Expected performance: Thousands of people reached through the above activities, yearly.</i></p>	<p>In 2022:</p> <ol style="list-style-type: none">Media mentions: 142www.lifewatch.eu<ul style="list-style-type: none">Users: 29,633Page views: 105,799Social media<ol style="list-style-type: none">Twitter<ul style="list-style-type: none">Followers: 2,031Reach: 197,227LinkedIn<ul style="list-style-type: none">Followers: 1,095Reach: 61,618Facebook<ul style="list-style-type: none">Followers: 428Reach: 13,607Newsletter<ul style="list-style-type: none">Total numbers of subscribers: 529New subscribers in 2022: 100Open rate: 31,8%

Strategic Objectives	KPI	Description	Indicators
<p>Strategic Objective 4</p> <p>To deepen the engagement of the scientific communities (with attention to inclusivity and equity), biodiversity and ecological observatories, stakeholders and citizens, at the global scale.</p>	<p>KPI 4.c Participation to policy related events</p>	<p>Number of participation cases in policy related events, working groups, committees & advisory boards.</p> <p><i>Expected performance: On average, participation of LifeWatch ERIC in at least 10 such events per year.</i></p>	<ul style="list-style-type: none">In 2022: 45 events
<p>Strategic Objective 5</p> <p>To forge collaboration with the public and private sector and industry to guarantee sustainability of the innovation produced and to address aspects of the EU Green Deal, EU Biodiversity 2030 Strategy and EU Digitation and Innovation plans.</p>	<p>KPI 5 Projects (EU, national and regional) that LifeWatch ERIC collaborates with</p>	<p>Number of projects funded by means external to LifeWatch ERIC and total budget as project income for LifeWatch ERIC.</p> <p><i>Expected performance: On average, participation in 2 new projects per year with a total sum for LifeWatch ERIC of 150,000 €.</i></p>	<p>In 2022:</p> <ul style="list-style-type: none">6 new European projects; 114,742 € budget income1 new ERDF project, 481,426 € budget income

Photo by Gregor Aljančič | LifeWatch Slovenia

Proteus anguinus at the Tular Cave Laboratory, Slovenia.

Technical and Scientific Progress



> Technical & Scientific Progress

Scientific advancements

- Upgrade of the **Scientific Working Plan for 2022-2026**;
- Analysis of **users' requirements** (taxonomy, ecology, etc.), particularly in connection with the BiCIKL project;
- Update of the **Internal Joint Initiative on Non-Indigenous Invasive Species** approach, in connection with the EOSC Future project;
- Engagement with the **Marine Biodiversity Observation Network** (MBON, LifeBlock);
- Engagement with the **Global Biodiversity Information Facility** (GBIF, UNGA77).

Technical advancements

- **LifeBlock** distributed architecture version to address simultaneous access to multiple sources of information and data (taxonomies and phylogenies, museum specimens and collections, sequences, species occurrences and distribution, taxonomic literature treatments). LifeBlock, based on the BlockChain technology, forms a cross-cutting layer (horizontal) for the entire LifeWatch ERIC Infrastructure. It offers a unique service capability that provides the structure needed for the FAIR-ification of the data, services and any other research products. It also provides core services to the infrastructure such as accounting, monitoring and evaluation. LifeWatch is the only ERIC which has deployed so far BlockChain technology. During 2022, new capabilities were added to LifeBlock, like the structured search, allowing searching for datasets or other research products through predefined terms.
- Development of the dockerisation of tools such as **Jupyter Notebook** and **RStudio tested** (IJ). Dockerisation forms another cross-cutting layer for the Infrastructure;
- Documentation, integration, testing, and improvement of different existing components developed and applied (Industrialisation of the technical platform);
- Plan for **Industrialisation and Digital Transformation** initiated (Knowledge and Technology Transfer according to FitSM principles);
- Initiative to launch the **first nano-satellite for terrestrial observation** started (collaboration with AGAPA);
- Refining of webportal applied, new plan of webportal initiated.

All of the above developments, enhance vital processes in the infrastructure of LifeWatch ERIC, such as the onboarding and integration of its resources, most of which have been produced by the partnering countries. They enhance the connectivity of these resources and they provide them with the added value of being discovered and used in combination.



> Selected publications

Adame JA, Gutierrez-Alvarez I, Cristofanelli P, Notario A, Bogeat JA, Lopez A, Gómez A, Bolivar JP, Yela M (2022) Surface ozone trends over a 21-year period at El Arenosillo observatory (Southwestern Europe). *Atmospheric Research* 269: 106–148. **DOI: 10.1016/j.atmosres.2022.106048**

Benhammou Y, Alcaraz-Segura D, Guirado E, Khaldi R, Achchab B, Herrera F, Tabik S (2022) Sentinel2GlobalLULC: A Sentinel-2 RGB image tile dataset for global land use/cover mapping with deep learning. *Scientific Data*, 9: 1–20. **DOI: 10.1038/s41597-022-01775-8**

Chen Q, Timmermans J, Wen W, van Bodegom PM (2022) A multi-metric assessment of drought vulnerability across different vegetation types using high resolution remote sensing. *Science of the Total Environment*, 832:154970. **DOI: 10.1016/j.scitotenv.2022.154970**

Chen P, Liu H, Xin R, Carval T, Zhao J, Xia Y, Zhao Z (2022) Effectively Detecting Operational Anomalies In Large-Scale IoT Data Infrastructures By Using A GAN-Based Predictive Model. *The Computer Journal*, 65, 2909–2925. **DOI: 10.1093/comjnl/bxac085**

Di Muri C, Alcorlo P, Bardelli R, Catalan J, Gacia E, Guerra MT, Rosati I, Soto DX, Vizzini S, Mancinelli G (2022) Individual and population-scale carbon and nitrogen isotopic values of *Procambarus clarkii* in invaded freshwater ecosystems. *Biodiversity Data Journal*, 10: e94411. **DOI: 10.3897/BDJ.10.e94411**

Di Muri C, Rosati I, Bardelli R, Cilenti L, Li Veli D, Falco S, Vizzini S, Katselis GN, Kevrekidis K, Glamuzina L, Mancinelli G (2022) An individual-based dataset of carbon and nitrogen isotopic data of *Callinectes sapidus* in invaded Mediterranean waters. *Biodiversity Data Journal*, 10: e77516. **DOI: 10.3897/BDJ.10.e77516**

Digenis M, Arvanitidis C, Dailianis T, Gerovasileiou V. (2022) Comparative Study of Marine Cave Communities in a Protected Area of the South-Eastern Aegean Sea, Greece. *Journal of Marine Science and Engineering*, 10(5):660. **DOI: 10.3390/jmse10050660**

Ibáñez-Jiménez Á, Jiménez-Olivencia Y, Mesa-Pedrazas Á, Porcel-Rodríguez L, Zimmerer K (2022) A Systematic Review of EU-Funded Innovative Agri-Food Projects: Potential for Transfer between Territories. *Land*, 11: 519. **DOI: 10.3390/land11040519**

Khaldi R, Alcaraz-Segura D, Guirado E, Benhammou Y, El Afia A, Herrera F, Tabik S (2022) TimeSpec4LULC: a global multispectral time series database for training LULC mapping models with machine learning. *Earth System Science Data*, 14: 1377–1411. **DOI: 10.5194/essd-14-1377-2022**

Kissling WD, Shi Y, Koma Z, Meijer C, Ku O, Nattino F, Seijmonsbergen AC, Grootes MW (2022) Laserfarm – A high-throughput workflow for generating geospatial data products of ecosystem structure from airborne laser scanning point clouds. *Ecological Informatics*, 72: 101836. **DOI: 10.1016/j.ecoinf.2022.101836**

Moya-García AA, González-Jiménez A, Moreno F, Stephens C, Lucena MI, Ranea JAG (2022) Identification of New Toxicity Mechanisms in Drug-Induced Liver Injury through Systems Pharmacology. *Genes*, 13(7):1292. **DOI: 10.3390/genes13071292**

Papazoglou AS, Karagiannidis E, Liatsos A, Bompoti A, Moysidis DV, Arvanitidis C, Tsolaki F, Tsagkaropoulos S, Theocharis S, Tagarakis G, Michaelson JS, Herrmann MD (2022) Volumetric Tissue Imaging of Surgical Tissue Specimens Using Micro–Computed Tomography. *American Journal of Clinical Pathology*, 159 (3): 242–254. **DOI: 10.1093/ajcp/aqac143**

Paragkamian S, Sarafidou G, Mavraki D, Pavloudi C, Beja J, Eliezer M, Lipizer M, Boicenco L, Vandepitte L, Perez-Perez R, Zafeiropoulos H, Arvanitidis C, Pafilis E, Gerovasileiou V (2022) Automating the Curation Process of Historical Literature on Marine Biodiversity Using Text Mining: The DECO Workflow. *Frontiers of Marine Science*, 9:940844. **DOI: 10.3389/fmars.2022.940844**

Shi Z, de Laat C, Grosso P, Zhao Z (2022) Integration of Blockchain and Auction Models: A Survey, Some Applications, and Challenges. *IEEE Communications Surveys & Tutorials*, 25 (1): 497–537. **DOI: 10.1109/COMST.2022.3222403**

Shi Z, Ivankovic V, Farshidi S, Surbiryala J, Zhou H, Zhao Z (2022) AWESOME: an auction and witness enhanced SLA model for decentralised cloud marketplaces. *Journal of Cloud Computing*, 11 (27). **DOI: 10.1186/s13677-022-00292-8**

Shi Z, Zhou H, de Laat C, Zhao Z (2022) A Bayesian game-enhanced auction model for federated cloud services using blockchain. *Future Generation Computer Systems*, 136: 49–66. **DOI: 10.1016/j.future.2022.05.017**

Smith VS, French L, Vincent S, Woodburn M, Addink W, Arvanitidis C, Bánki O, Casino A, Dusoulier F, Glöckler F, Hobern D, Kalfatovic MR, Koureas D, Mergen P, Miller J, Schulman L, Juslén A (2022) Research Infrastructure Contact Zones: a framework and dataset to characterise the activities of major biodiversity informatics initiatives. *Biodiversity Data Journal*, 10: e82953;1–24. **DOI: 10.3897/BDJ.10.e82953**

Wen W, Timmermans J, Chen Q, van Bodegom PM (2022) Monitoring the combined effects of drought and salinity stress on crops using remote sensing in the Netherlands. **Hydrology and Earth System Sciences**, 26 (17): 4537–52. **DOI: 10.5194/hess-26-4537-2022**

Zhao Z, Koulouzis S, Bianchi R, Farshidi S, Shi Z, Xin R, Wang Y, Li N, Shi Y, Timmermans J, Kissling WD (2022) Notebook as a VRE (NaaVRE): From private notebooks to a collaborative cloud virtual research environment. *Software: Practice and Experience*, 52 (9): 1947–66. **DOI: 10.1002/spe.3098**

> Financial Management

In 2022, the Statutory Seat successfully completed the harmonisation of all accounting principles across the three Common Facilities. This development has significantly accelerated the transfer of reliable financial data between the Common Facilities and the Statutory Seat allowing tighter monitoring of the financial situation and more efficient preparation of related reports.

The upgrade of LifeWatch ERIC financial management system was complemented with the hiring of a new administrative team specifically dedicated to the control and management of the largest externally funded activities of LifeWatch ERIC so far involving multiple beneficiaries across 6 projects and funded through the Spanish European Regional Development Fund for a total of 21,5M €.



> Administrative Management

This implementation period triggers a new maturation stage which, in turn, requires new progress in advanced policies to govern the life of the organisation. In 2022, any previously adopted policies, procedures, and rules - such as the [Employment Policy](#), [Procurement Rules](#), or various financial management & accounting processes - were refined and released into improved new versions under the new quality management framework.

Success in designing the collaborative quality management-oriented platform has been remarkable, with a fully integrated [Document management system](#) based on the requirements from ISO 9001 and FitSM standards, whose full deployment is planned for 2023.

As a monitoring tool, LifeWatch ERIC has set up the [Management Review Meetings](#) (MRM), a review forum established with the objective of ensuring management system development, continued suitability, adequacy, effectiveness, and alignment with the strategic direction of the organisation. The objective of each MRM is to identify the set of activities that will lead to organisational and performance improvements.



> Collaborations and Networking

LifeWatch ERIC is building on the good background achieved in previous years, reinforcing its positioning within the European Research Area, towards engaging policy-makers and industry representatives. A big effort was spent in forging new collaborations and strengthening those already established. Overall, LifeWatch ERIC **participated** in more than **100 meetings** and **organised** about **300** during 2022, between online and in-person gatherings.

- Other **European research infrastructures** and **international initiatives** within the biodiversity and ecosystem research areas are one of the main targets of LifeWatch ERIC networking activities. In this framework, LifeWatch ERIC's active involvement in the **ERIC Forum** is of particular note, marked by its contribution to the Annual Meeting and to the environmental sustainability session organised as part the **EuroScience Open Forum (ESOF2022)**. At the same time, direct relations with other ERICs and ERICs-to-be were fostered to develop new synergies, as occurred with **EU-SOLARIS** and **MIRRI ERIC**. In parallel, LifeWatch ERIC tightened its bonds with **Biodiversa+**, the European Biodiversity Partnership supporting excellent research on biodiversity that impacts on society and policy. LifeWatch ERIC also demonstrated its potential in supporting the **EOSC Interoperability Framework** in technical, semantic, organisational and legal terms, explaining the (meta)data structure and workflows made available by LifeWatch ERIC, along with the status and main challenges of interoperability within the Infrastructure.

- Policy-makers**, be they international, European or national, play a critical role when it comes not only to research funding but also to issues pertaining to biodiversity and ecosystem functioning, conservation and restoration. In LifeWatch ERIC's vision, policy-makers and the research infrastructure have to work in constant and mutual synergies to tackle the challenges posed by climate change and biodiversity loss. Over 2022, LifeWatch ERIC developed relations with many international organisations playing pivotal roles in international fora like the **COP15** in Canada, the **United Nations General Assembly 77 Science Summit**, the **EU, Latin American, Caribbean and Ibero-American Community Meeting on Sustainable Ecosystem Management**, **El-Hiwar Euro-Arab Policy Dialogue on Challenges**, and the **Sahel Coalition**. On the European Union front, similar progress was made with LifeWatch ERIC increasing its presence in the most relevant platforms, like the **1st European Innovation Area Summit**,

the **Women for the Mediterranean Conference** and the **AERAP Africa-Europe Science Collaboration Platform and Opportunities for Women Economic Empowerment in Times of Climate Change**, and the **Smart Agrifood Summit**. Engagement with the new Horizon Europe projects launched this year - **BioDT**, **Marine SABRES**, **MARBEFES**, **FAIR-IMPACT**, **OPEN-EARTH-MONITOR** and **MARCO-BOLO**- and those continuing from the previous years - **EOSC FUTURE**, **BiCIKL**, **ALL READY**, **RITrain Plus**, **ERIC FORUM**, **ENVRI-FAIR** and **EU-CELAC ResInfra** - demonstrates how LifeWatch ERIC is consolidating its place as one of the most significant players in the sector.

- In line with the new LifeWatch ERIC Strategic Working Plan, relations with representatives of the **private sector** were further strengthened through the active involvement in events like Transfiere, the biggest professional and multi-sectoral forum for knowledge and technology transfer in Spain, the **International Conference on Service-Oriented Computing**, the **Association of Science and Technology Parks of Spain (APTE)**, and the **DISRUPTIVE** platform.

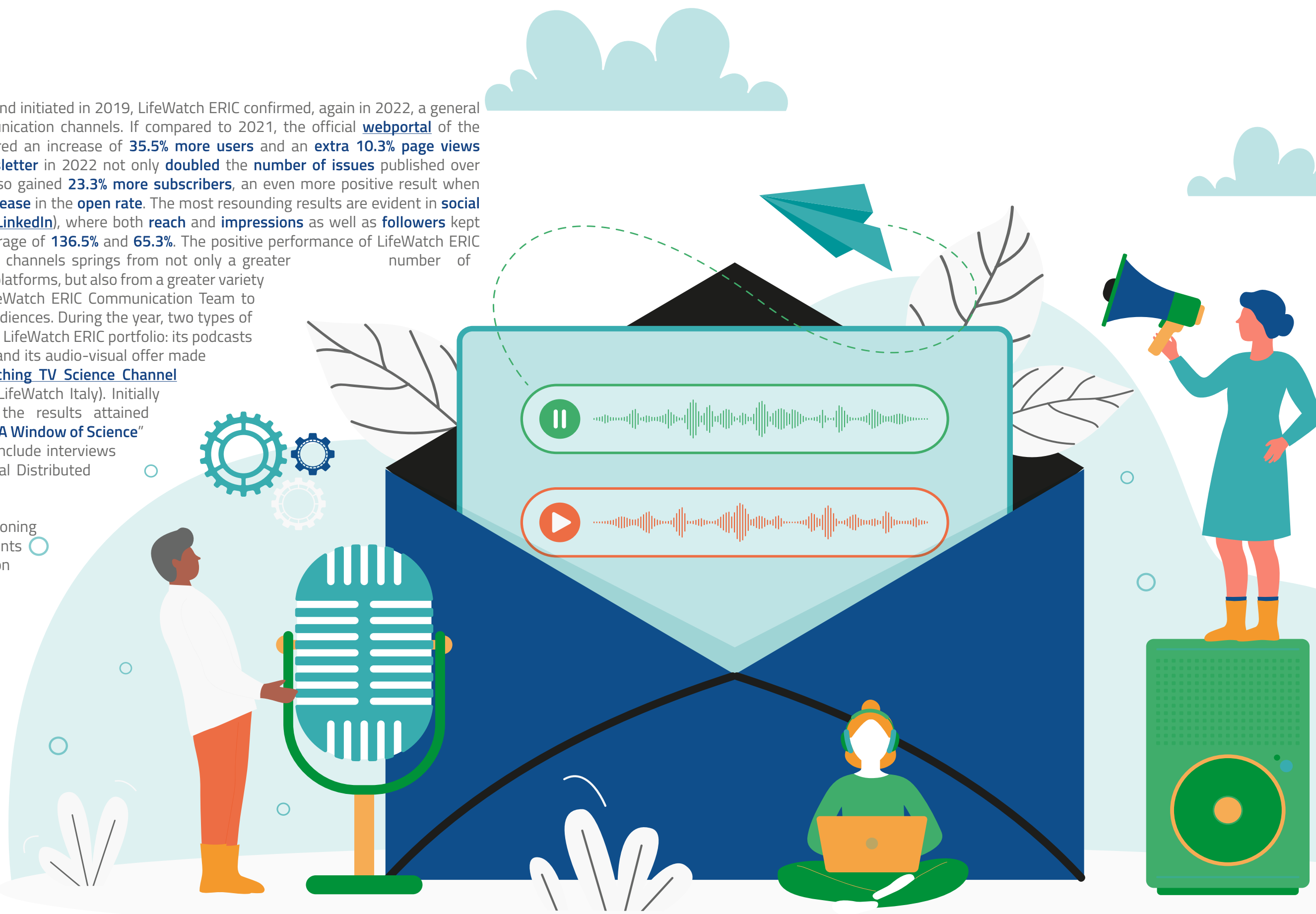


> Dissemination & Outreach Progress

Following up on the positive trend initiated in 2019, LifeWatch ERIC confirmed, again in 2022, a general growth in all its online communication channels. If compared to 2021, the official [webportal](#) of the research infrastructure registered an increase of **35.5% more users** and an **extra 10.3% page views** throughout the year. The [newsletter](#) in 2022 not only **doubled the number of issues** published over the year (from 5 to 10), but also gained **23.3% more subscribers**, an even more positive result when read together with the **18% increase** in the **open rate**. The most resounding results are evident in **social media** ([Facebook](#), [Twitter](#) and [LinkedIn](#)), where both **reach** and **impressions** as well as **followers** kept on growing at a respective average of **136.5%** and **65.3%**. The positive performance of LifeWatch ERIC in all its online communication channels springs from not only a greater number of posts published on the various platforms, but also from a greater variety of contents created by the LifeWatch ERIC Communication Team to retain and further engage its audiences. During the year, two types of contents were introduced in the LifeWatch ERIC portfolio: its podcasts series "[A Window on Science](#)" and its audio-visual offer made available through the [LifeWatching TV Science Channel](#) (thanks to the contribution of LifeWatch Italy). Initially created to further promote the results attained through the LifeWatch ERIC IJI, "[A Window of Science](#)" quickly expanded its scope to include interviews with researchers in the National Distributed Centres.

Finally, it is worth mentioning the two most relevant events organised with the contribution of the Communication Team for the scientific public: a) the **ENVRI Community International Summer School "Road to a FAIR ENVRI-Hub: Designing and Developing Data Services for End Users"** and, b) the participation of LifeWatch ERIC in the **International Conference on Ecological Science (SFE², GFO & EEF)**. In this event, LifeWatch ERIC coordinated and

animated a single booth that brought together several Research Infrastructures active in the field of Biodiversity and Ecosystem Research. In addition, LifeWatch ERIC organised a **Workshop**, in the context of the same event, on the use of e-tools and resources to address key ecological issues on Non-indigenous Invasive Species, and a **Symposium** on European Research Infrastructures (RIs).



> Training Progress

Training, education, and capacity building are key areas for the acceleration of LifeWatch ERIC over the implementation period 2022 - 2026.

Under the priority **Community**, in 2022 LifeWatch ERIC has expanded its role of training provider and increased opportunities of collaboration and co-construction with the ERIC staff and national members, as well as with other scientific communities and research infrastructures. All the important steps taken forward during this year laid the foundations of a long-term training provision aiming at offering to stakeholders the necessary knowledge and skills to contribute effectively to the mission of LifeWatch ERIC.

The most notable advances and achievements in the area of training for 2022 are:

- **Continuous improvement** of the “look and feel” of the training catalogue and platform and strengthening of the LifeWatch ERIC training offer. During 2022, new training contents were onboarded and existing ones duly updated and curated. The **Training Catalogue** and the **Training Platform** were populated with products delivered by both Common Facilities and National Distributed Centres. In 2022, new sections of the training platform were designed and developed, as subsections specifically dedicated to European projects, with the aim of becoming the access point of project-related training materials.



- **Consolidation** of the **Training Working Group (TWG)** as the designated platform for coordination and internal communication among the Common Facilities and the National Distributed Centres. Over the year, the training focal points of the Distributed Centres met regularly once a month to share and exchange experiences and learn from each other; optimise resources and plan together several initiatives towards common goals; adopt agreed procedures, quality standards, and guidelines. At the same time, the Training Team, in coordination with the TWG and other LifeWatch ERIC members and staff members, started to design a number of coordination and information sharing tools aimed at maximising the visibility of the LifeWatch ERIC training offer.

- **Plan and development** of the **LifeWatch ERIC training strategy**. The purpose of the training strategy is to address at best the needs of all LifeWatch ERIC’s diverse groups of stakeholders, refine the scope of training and education tasks across the ERIC, and plan for training provision in the long term.

- **Enhancement** of the **LifeWatch ERIC’s contribution to training WPs of various European projects and launch of new partnerships**: after the experience in the training and skills work package of **ENVRI-FAIR** and **EOSC Future**, LifeWatch ERIC started its work in the training work package of projects such as **BioDT** and **SUBMERSE**, bringing in its technical know-how regarding the design and development of training platforms and FAIR training materials, consolidating its position as a point of reference for this specific expertise. Similarly, the year 2022 registered the participation of the Training Team of LifeWatch ERIC at events, conferences and workshops, like the EOSC Symposium and others.

- **Strengthen** the **collaboration** with the **ENVRI Community** and the **Research Data Alliance** through the joint organisation and delivery of online and onsite training events, including a webinar series on the **I-ADOPT Framework for FAIR variables and metadata description**, and the **ENVRI Community International Summer School 2022**, which was introduced by a **preparatory webinar series** about data service validation, evaluation, documentation and end-user support.

- **Continuous support** of the **M.Sc. curriculum on e-Biodiversity and Ecosystem Sciences (EBES)** and renovated efforts aimed at the internationalisation of the Master programme. In 2022, initiatives carried on were: agreement document with the Ionian University (under finalisation), drafting new agreement document with the Murcia University, and exploring possibilities for collaboration with the Nova Gorica University and the Plovdiv University.

- **Promotion** of the **capacity development of the LifeWatch ERIC internal staff** in Common Facilities and National Distributed Centres supporting the design, development and delivery of induction training for newcomers, and training initiatives regarding gender equality and integration of gender analysis into research.

> Engaging our Scientific Community



Mapping and matching the user community requirements with the infrastructure components has been one of the strategic objectives of the first five years LifeWatch ERIC Strategic Working Plan (SWP). The attention on matching users and policy requirements becomes even more critical in the 2022-2026 LifeWatch ERIC SWP, which has raised 'LifeWatch ERIC as a Community' or simply 'Community' as one of its Strategic Priorities.

LifeWatch ERIC as a Community focuses on the expansion of the current Infrastructure through the collaboration with the scientific communities, other ERICs, Research Infrastructures and global actors. It includes co-design and co-construction processes with all the interested parties and the respective communication, networking and, where possible, capacity building.

This approach has been put into action already in 2022, inspiring all LifeWatch ERIC's scientific networking activities. **Two major trajectories** have been pursued: **i. enforcing the collaboration with the scientific communities, other ERICs and RIs and global actors**; and, **ii. fostering the development of the scientific communities of practice** in connection to the main releases of operational VREs and the strategic co-development of services within Horizon 2020, Horizon Europe, and major International Initiatives.

In all of the activities described on the following page, LifeWatch ERIC interviewed the users on their experience on the use of the research products and their requirements. Subsequently, an attempt has been made to map these requirements against those of the relevant policies. Finally, a plan for improving the mapping and matching users and policy requirements has been produced. The material generated from the mentioned activities has been edited as the first version of the Users' Requirements, entitled: "Users and policy requirements: plan and process for its implementation".

Enforcing collaborations

During 2022 the collaboration with other ERICs, RIs, global actors and their related scientific communities has been strongly enforced also thanks to the important roles played by LifeWatch ERIC in cluster projects as **ENVRI-FAIR** and **EOSC Future**.

In this framework, every year since 2019 LifeWatch ERIC has been co-organising, with other RIs and Research Institutions, a Summer or Winter School in Lecce on the most advanced aspects of data, and other digital objects, FAIRness, curation and services. The latest edition was the **ENVRI Community International Summer School "Road to a FAIR ENVRI-Hub: Designing and Developing Data Services for End Users"**, held in Lecce in July 2022, and co-organised by ENVRI-FAIR and LifeWatch ERIC. The event attracted a diverse group of participants, including IT architects, RI service developers, user support staff, and RI personnel involved in user interaction and community/network building.

In 2022, LifeWatch ERIC's collaboration with key international actors in the Biodiversity and Ecosystem Landscape has been enlarged with the involvement of the Biodiversa+ partnership on the issue of dataset harmonisation and data interoperability. This collaboration has been developed in the framework of the Biodiversity Monitoring component of the Biodiversa+ workplan, as well as a reinforcement of the collaboration between the RIs in the Environmental ESFRI Domain and the EU related Partnerships. In this context, LifeWatch ERIC has organised the symposium **"Advanced facilities for ecological research: the European Research Infrastructures"** at the European Ecological Federation Conference in Metz together with ICOS ERIC, eLTER RI, DiSSCo, Danubius-RI, EMBRC ERIC, EMSO ERIC, Jerico-RI and Biodiversa+. The expert panel triggered a fruitful discussion and presented the integrated facilities and funding programmes that the European Research Infrastructures and Biodiversa+ are making available to enhance the competitiveness of the European Research Area on the grand challenges dealing with conservation of biodiversity, its organisation and related ecosystem functions and services in the face of climate change and other concurring threats.

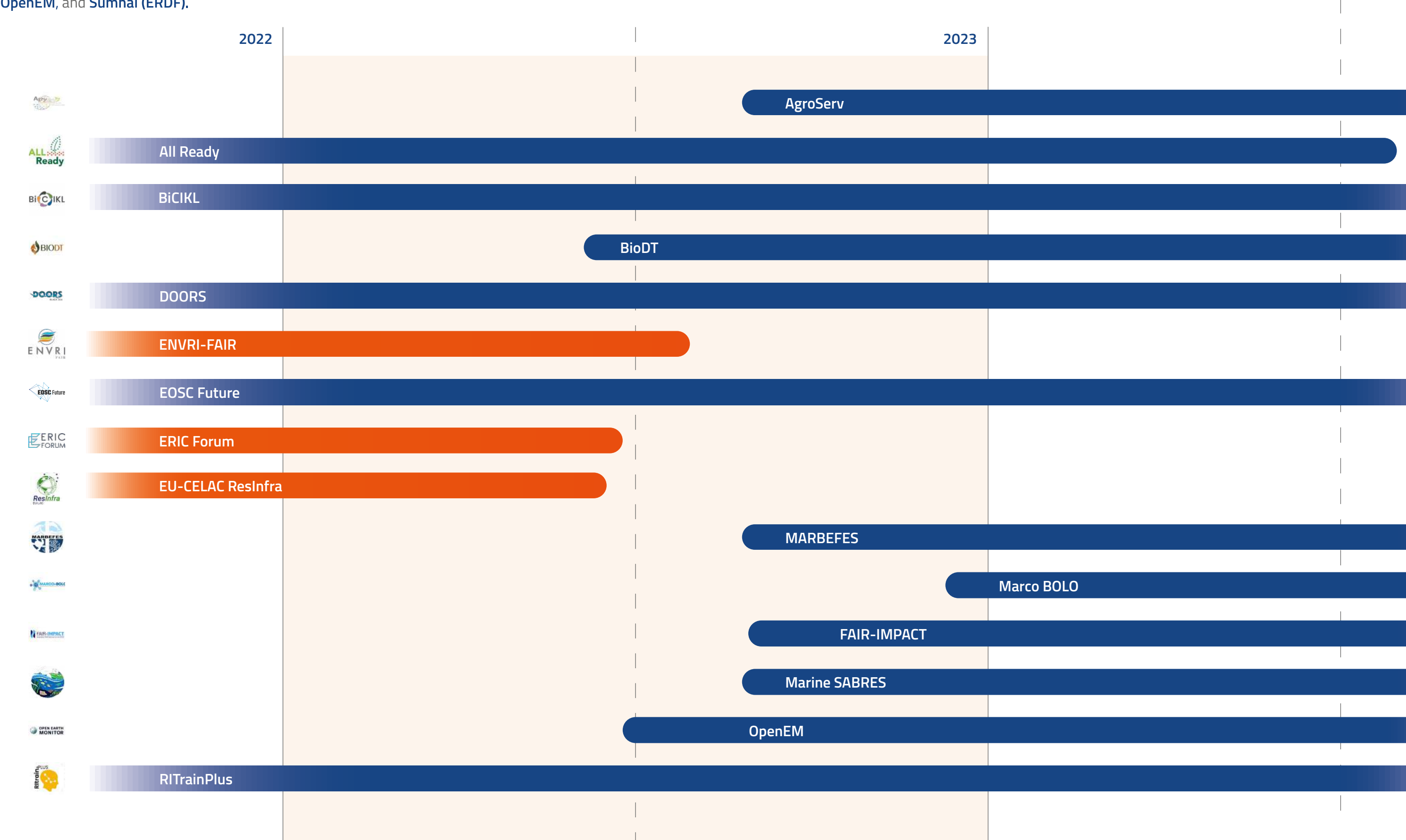
Building communities of practice

LifeWatch ERIC's efforts focused on further strengthening the engagement of the invasive alien species scientific community of practice in the use and development of the LifeWatch ERIC Virtual Research Environments. The networking activities have made valuable progress: i. in promoting and coordinating a series of papers on the key results of the research activities done on the five Virtual Research Environments made operational in the LifeWatch ERIC webplatform; ii. in further co-developing and extending some of the invasive alien species Virtual Research Environments with the respective scientific community of practice; iii. in organising a hands-on workshop **"e-Tools and resources to address key ecological questions on Non-indigenous and Invasive Species"** at the 2022 European Ecological Federation's Conference in Metz.

Moreover, the development of the scientific communities of practice in connection to the main releases of operational VREs and the strategic co-development of services successfully benefitted from the participation of LifeWatch ERIC in Cluster Projects and Initiatives, as **ENVRI-FAIR**, **EOSC Future** and the **OntoPortal Alliance**, as well as to relevant scientific gatherings like the **59th Estuarine Coastal Sciences Association Conference**.

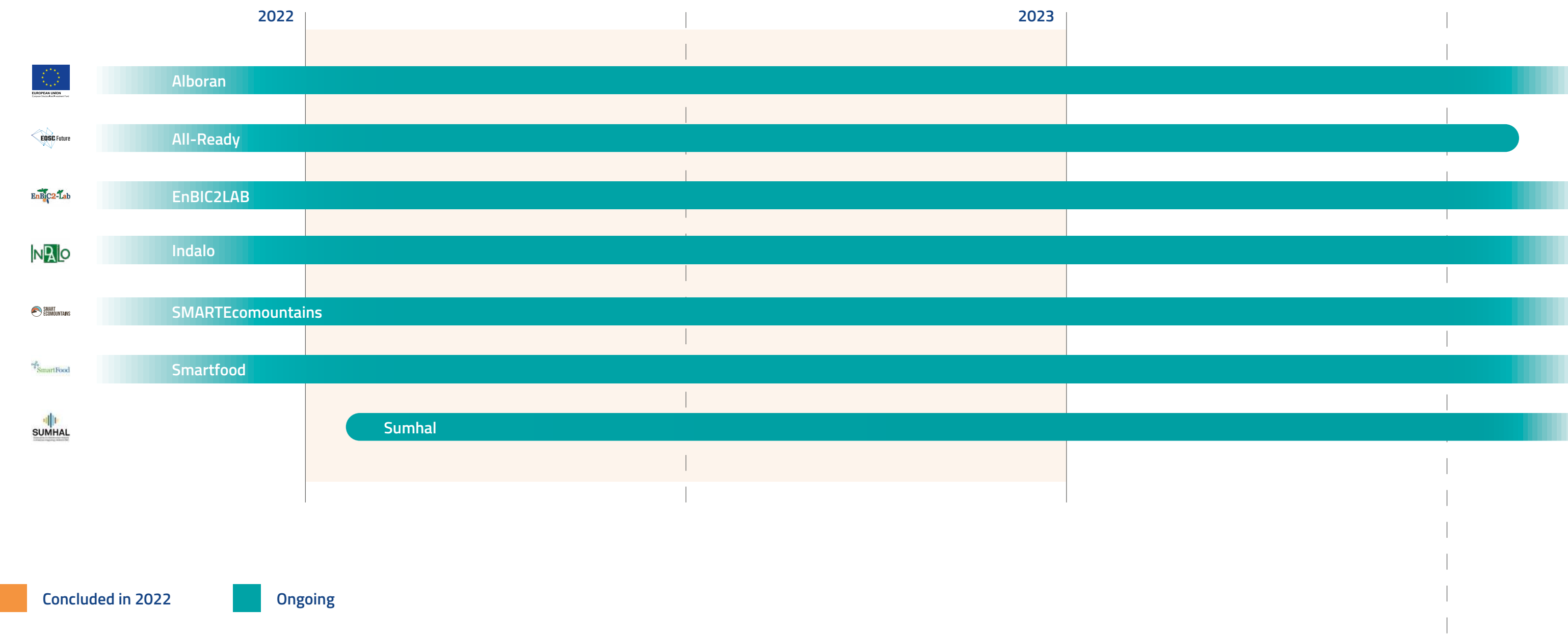
> Projects

In 2022, LifeWatch ERIC actively participated in and contributed to **21** projects, **15** being funded by **Horizon 2020** and **Horizon Europe** programmes and **6** by **ERDF** fundings. Among those **8** projects beginning this year: **AgroS erv**, **BioDT**, **FAIR-IMPACT**, **MARBEFES**, **MARCO-BOLO**, **Marine SABRES**, **OpenEM**, and **Sumhal** (ERDF).



European Projects

ERDF Projects



> Tendered Procurements

LifeWatch ERIC, as an International Organisation and having regard to article 9.1 b) of the Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement, has its own Procurement Rules to promote, among others, the principles of transparency, non-discrimination and competition that inspire European sectoral legislation. Moreover, tenders, at the time of submitting the offer and during the performance of the contract, if

awarded, must comply with applicable environmental, social, and labour law obligations established by the European Union and member legislation, collective agreements or the international environmental, social security and labour conventions. Tenders are expected to contribute in boosting jobs, growth, and investments, and to create an economy that is more innovative, resource and energy efficient, and socially-inclusive, sharing the European Institutions principles. The Procurement rules are available to the public on the bidding platform: www.lifewatch.eu/procurements, through which 16 public offers were published in 2022. Their details are available in the table below.

*ITT: Invitation to tender (For tenders from 10.000€ to 50.000€)
PN: Procurement Notice (Opened tender), published also in the Official Journal of the European Union

Project	Procurement	Type*	Publication Date	Bidder
INDALO (ERDF)	Preliminary project for subsequent tendering and construction work at the Pablo de Olavide University	ITT	24/02/22	BATCH Arquitectura SLP
ALBORÁN (ERDF)	External technical assistance for the control, monitoring and economic/financial reporting of the expenses of the LifeWatch Alborán project awarded to the City Council of Malaga/OMAU	ITT	26/07/22	BIC Euronova
ALBORÁN (ERDF)	Service for integral management of communication tasks, audiovisual contents for the dissemination of the project	ITT	26/07/22	Doctor Watson
ALBORÁN (ERDF)	Technical assistance for the drafting, control and monitoring of the LifeWatch Alborán project tenders awarded to the City Council of Malaga/OMAU	ITT	26/07/22	26/07/22
ALL ERDF Projects	Service for integral management of communication tasks, audiovisual contents and dissemination of ERDF Projects	PN	26/07/22	Publicaciones del Sur
INDALO (ERDF)	Drafting of the basic and execution project, project management (construction management, execution management) and Health and Safety coordination and execution of construction works of the research building at Pablo de Olavide University in Sevilla	PN	28/07/22	DECLARED VOID
INDALO (ERDF)	Computer switching equipment	ITT	29/07/22	GESE RISK Centro de la Seguridad y el Riesgo Cibernetico, S.L.
ALL ERDF Projects	Green devices for standardised environmental monitoring with direct and real-time integration of data into the LifeWatch ERIC's datalake	PN	28/07/22	IERTEC SMART TECHNOLOGIES S.L.U.
ECOMOUNTAINS (ERDF)	AI and deep learning machine for LifeWacth ERIC to boost artificial intelligence and machine learning research projects through the supply of hardware for high performance computing	PN	10/10/22	PROXYA SERVICIOS TECNOLOGICOS, S.L.U.
ALL ERDF Projects	Services for the development of semantic information classification and search systems for the LifeWatch ERIC data management system	PN	10/10/22	Joint Venture Advance Services PC & Netmechanics Ltd
ALL ERDF Projects	Fiware infrastructure for LifeWatch ERIC	PN	10/10/22	PROXYA SERVICIOS TECNOLOGICOS, S.L.U.
INDALO (ERDF)	Specialised Service for the provision of Administration and Operation of the Red Hat OpenStack-based platform; Red Hat OpenStack based platform technology engineering; and IT infrastructure development consultancy and IT catalogue	PN	10/10/22	SISTEMAS DE COMPUTACIÓN Y AUTOMÁTICA GENERAL SA
INDALO (ERDF)	Deployment of wireless networks for environmental monitoring of sensor data from the INDALO Cultivated Biodiversity Observatories and integration of data into the LifeWatch ERIC infrastructure	PN	10/10/22	IERTEC SMART TECHNOLOGIES S.L.U.
ALL ERDF Projects	Collaboration and internationalisation platform for LifeWatch ERIC	ITT	10/10/22	Collabwith Group B.V.
ALL ERDF Projects	Acquisition, support, monitoring and maintenance of the security infrastructure of the ZTNA communications network and provision of SOC (cyber security operations centre) service for LifeWatch ERIC	PN	25/10/22	GESE RISK Centro de la Seguridad y el Riesgo Cibernetico, S.L.
ALL ERDF Projects	Acquisition of servers, communications, electronics and cabinets for the distributed infrastructure for LifeWatch ERIC	PN	10/11/22	APLICACIONES Y PROYECTOS TIC, S.L. (APTICA)

Photo by Massimiliano Manno | LifeWatch Italy

Libellula depressa in Torre Guaceto, Italy

National Distributed Centres



> LifeWatch Belgium

Year of affiliation: 2017




National Coordinator Klaas Deneudt

 www.lifewatch.be

 LifeWatchBE

 info@lifewatch.be

 Flanders Marine Institute (VLIZ),
InnovOcean site, Wandelaarkaai 7,
8400 Ostend

Belgium joined LifeWatch ERIC in 2017 and it contributes to LifeWatch ERIC through its National Distributed Centre. Notwithstanding its relatively small territory, Belgium has a remarkable diversity of habitats and species, and has a rich tradition of biodiversity and ecosystem research, both within and outside of its borders. Since the start of LifeWatch, Belgium has actively contributed through a number of long-term projects managed by different research centres and universities across the country and supported by the respective political authorities.

The Belgian Node has continued the development and operation of:

- **Species information Backbone** for LifeWatch ERIC (VLIZ);
- Regional node: **Marine, terrestrial and freshwater biodiversity observatories** (VLIZ&INBO);
- Virtual labs: **LifeWatch data cloud, LifeWatch e-lab, Rshiny data explorer, ETN virtual Lab, Agouti virtual lab** (VLIZ& INBO);
- Facility for **thematic biodiversity and habitat mapping** from remote sensing and species distribution modelling (UCLouvain & ULiège);
- Facility for **SCAR Antarctic Biodiversity Portal** (RBINS).

The Belgian Node has supported LifeWatch ERIC through the:

- Further development of specific **workflows**, part of the **LifeWatch ERIC Internal Joint Initiative** on invasive species;
- Provision of the **metadata** of the Belgian Node to the LifeWatch ERIC Metadata Catalogue;
- Provision of information for the **Strategic Working Plan**;
- Participation and contribution to **LifeWatch ERIC communication and dissemination activities** (e.g. podcasts, news and newsletters, LifeWatching TV Science Channel, etc.);
- Participation to the **National Support Committee meetings, LifeWatch ERIC Common Facilities & Distributed Centres meetings, Training Working Group meetings, Communicators Working Group meetings, Agroecology Working Group meeting**, etc.

The Belgian Node has engaged in other important activities:

- Participation and contribution to various **Mission Ocean** and **UN Ocean Decade** related activities (Sodecade.org, Marine Life 2030 (WoRMS, OTN, OBON, EMO BON, etc.), **World Ocean Assessment III workshop, OSPAR and ICES working groups, EuropaBON** conference, **TDWG** international conference, TDWG machine observations interest group, etc.);
- Local **outreach** and **training** through various events and communication initiatives (Biodiversity conference, Biodiversity Day, Science day, citizen science events, Empowering Biodiversity Research (EBR), etc.);
- Collaboration with LifeWatch ERIC in several **EU projects** (ENVRI-FAIR, EOSC Future, MARBEFES, MARCO-BOLO, Marine SABRES, ANERIS, etc.).

For the Belgian Node and funding for the next years, the Flanders Research Foundation (FWO) has, after a thorough evaluation procedure run by the Department of Economy, Science & Innovation (EWI), decided to continue the funding of the Flemish in-kind contribution for the next 2 years (2023-2024) under the FWO IRI call. Also, the Fédération Wallonie Bruxelles has announced to continue the funding of the Walloon contribution until March 2024.




> LifeWatch Bulgaria


Year of affiliation: 2022



National Coordinator Dafinka Grozdanova

 www.lifewatch.eu/organisation-governance/bulgaria

 lifewatch.bulgaria@lifewatch.eu

 Agricultural University-Plovdiv
12 Mendeleev Blvd.
Plovdiv 4000

Bulgaria joined LifeWatch ERIC in 2022 and contributes to LifeWatch ERIC thanks to a consortium of 14 Bulgarian Scientific and Educational Institutions in the field of Biodiversity and Agroecology. The Agricultural University-Plovdiv is the official national scientific organisation that represents Bulgaria within LifeWatch ERIC.

LifeWatch Bulgaria can perform activities in the following thematic areas:

- **Plant Health** Infrastructure activities;
- Research, involving **laboratory** and **field testing and assessment**;
- Analysis and assessment of the **impact of agricultural practices on biodiversity**;
- Analysis of **ecosystem services and agroecology**;
- Advanced **agrobiodiversity monitoring**;
- Analysis and assessment of **environmental pressures**;
- Implementation of the '**multi-actor approach**' engaging key stakeholders and experts for an open-source collaboration.

During 2022, the Bulgarian Node has supported LifeWatch ERIC through:

- Contribution to the LifeWatch ERIC's European Project **BiCIKL** through its Consortium Partner – Pensoft, leader of the project;
- Participation in different ongoing **workshops, meetings and events** organised by LifeWatch ERIC;
- Participation and contribution to LifeWatch ERIC **communication and dissemination activities** (e.g. podcasts, news and newsletters, LifeWatching TV Science Channel, etc.);
- Participation in the **National Support Committee meetings, LifeWatch ERIC Common Facilities & Distributed Centres meetings, Training Working Group meetings, Communicator Working Group meetings, Agroecology and Intellectual Property Rights Policy Working Group meeting**, etc.;



> LifeWatch Greece

Year of affiliation: 2017




National Coordinator Eva Chatzinikolaou

 www.lifewatchgreece.eu

 LifeWatchGreece

 LifeWatchGreece

 info@lifewatchgreece.eu

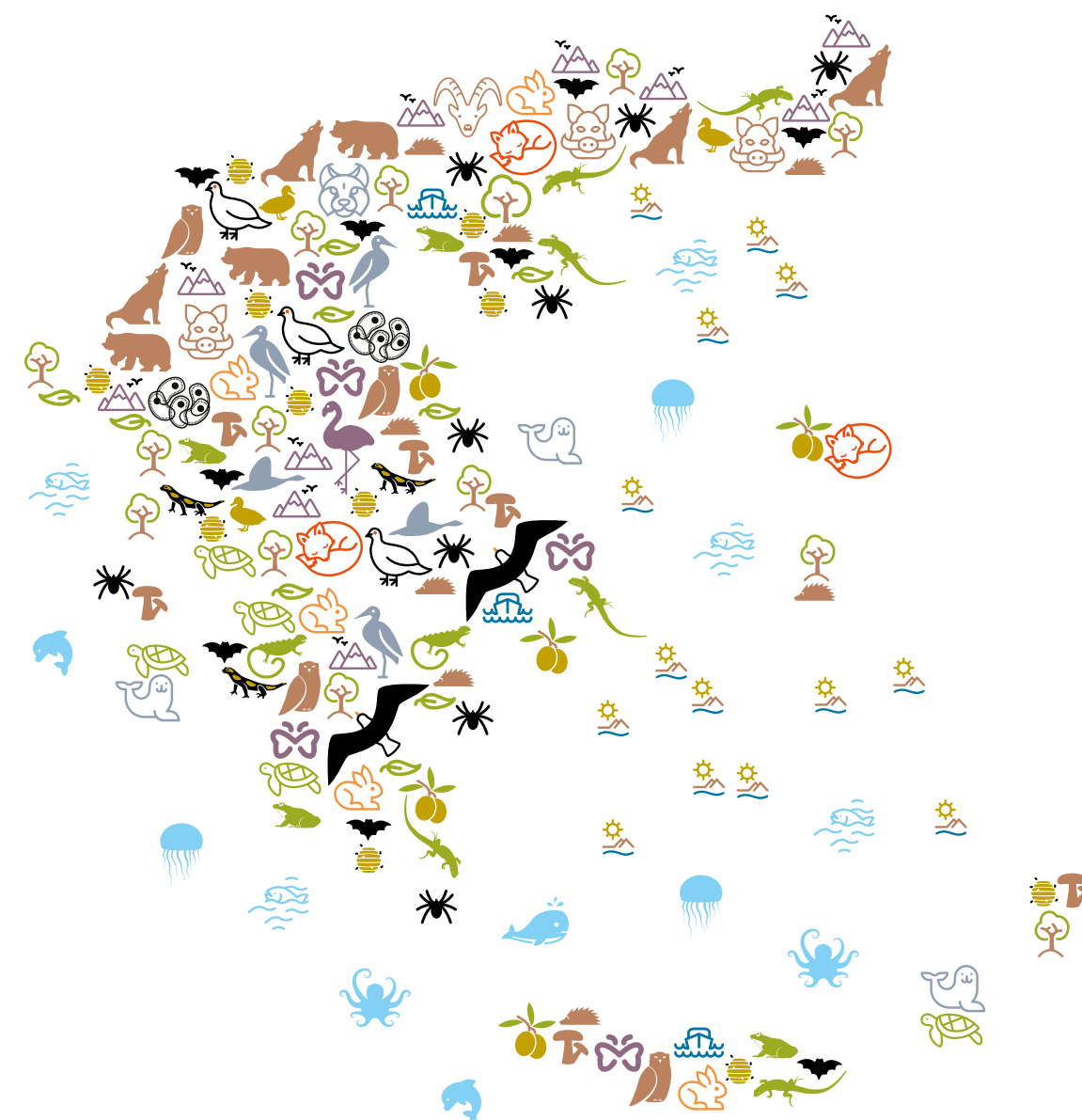
 Institute of Marine Biology, Biotechnology & Aquaculture,
Hellenic Centre for Marine Research,
Thalassokosmos,
Former US Base at Gournes, 71003, Crete

Greece joined LifeWatch ERIC in 2017 and fulfils the vision to establish the Biodiversity Centre of Excellence for South-eastern Europe, by: (a) Allying all the Greek scientific human potential working on biodiversity data and data observatories; (b) Paving the way for the development of complex virtual domains through a number of background e-Services; (c) Developing a number of virtual labs (vLabs) as a contribution to LifeWatch ERIC; (d) Building capacity at the national level through a network of activities; (e) Disseminating information, scientific knowledge and expertise to the public.

The Greek Node has supported LifeWatch ERIC through:

- **Advancement of the microCT vLab**, including the development of an Application Programming Interface (REST API) to access and create new content (within the framework of the ELIXIR-GR project), the ability to download the original microCT datasets (within the framework of BIOIMAGING-GR project), to upload 12 more microCT datasets (several HCMR projects) and biomedical microCT datasets (within the framework of BIOIMAGING-GR project), inclusion of the biomedicine category (within the framework of BIOIMAGING-GR project), creation of a Metadata catalogue to dynamically display the complete metadata available for each dataset published in the micro-CT vLab (within the framework of SYNTHESYS+ project), and the upgrade of MicroCTvLab to Drupal v.9 (within the framework of the ELIXIR-GR project);
- **Improvement of MedOBIS vLab** with 7 new and updated datasets available in MedOBIS Integrated Publishing Toolkit (ipt), including historical ones (within the framework of EMODnet Biology project and several HCMR projects), service update, which mainly provides an efficient way of querying semantic networks and searching for MedOBIS datasets is now available online ([Data Services](#)) (within the framework of the ENVRI-FAIR project);

- **Operational update of R vLab** functions and creation of pptainer (former Singularity) container for the integration of functions in ARMS;
- **Upgrade of the Data Services for MicroCT and MedOBIS vLabs** (within the framework of ENVRI-FAIR project) regarding the design and implementation of facilities for harvesting data, data modelling and semantic data transformation activities, updates and enhancements of the Data Services of the LifeWatch Greece infrastructure;
- **Alignment with the LifeWatch ERIC Metadata Catalogue** so that the updated contents and Data Services can be efficiently demonstrated, support the evolution of related datasets, with the addition of analytics monitoring script to track user statistics;
- **Communication activities**, among which: the participation in the International Ocean Data Conference-I and to the 15th International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions, the finalisation of a citizen science project in [Zooniverse platform](#) (in the framework of the EMODnet Biology project), the publication of a new article in the framework of the EMODnet Biology project ([doi:10.3389/fmars.2022.940844](https://doi.org/10.3389/fmars.2022.940844)), continuous updates of [LifeWatchGreece website](#) and social media (Facebook & Twitter). Similar activities were also disseminated through the network and media of the Mobilise project;
- Participation and contribution to **LifeWatch ERIC communication and dissemination activities** (e.g. podcasts, news and newsletters, LifeWatching TV Science Channel, etc.).



> LifeWatch Italy

Year of affiliation: 2017




National Coordinator Antonello Provenzale

 www.lifewatchitaly.eu

 LifeWatchIT

 LifeWatch.Italia

 lifewatchitaly@gmail.com

 University of Salento
via prov. Lecce Monteroni sn,
73100 Lecce

Italy joined LifeWatch ERIC in 2017 and hosts its Service Centre. LifeWatch ERIC has always been strongly supported by the national scientific community, as well as regional and national institutions, as Italy is a biodiversity hotspot in Europe, with over 57,400 animal and 6,500 plant species. Italian landscapes and protected areas are natural laboratories for biodiversity and ecosystem research. The LifeWatch Italy web portal provides a networking interface for the biodiversity and ecosystem community, offers learning and training opportunities, semantic resources and data, ICT services & VREs, supporting research activities and science-based policymaking.

During 2022, the National Distributed Centres of LifeWatch ERIC significantly improved the LifeWatch Italy web portal, developing and publishing new platforms and services, while others will be released in 2023.

- The [helpdesk](#) has been integrated into the LifeWatch Italy web portal as a basic service to the whole community of users. Three new platforms have been integrated and existing services/platforms have been renewed;
- The '[Community Platform](#)' offers the whole LifeWatch Italy community of practice a view on the open positions, on a number of employment opportunities from external sources, on the most significant LifeWatch Italy Conferences and Workshops, on the Community members and their scientific skills, and on the possibility to create Working Groups in the Community Platform. The Working Groups represent an opportunity offered to science networks, initiatives, project teams, research units and other groups of interest to develop a working space and allow users to customise the area with collaborative services;
- The [Citizen Science Platform](#) serves different categories of citizen scientists, from project partners in Citizen Science initiatives, to school students and citizen at large;
- The [Semantic Platform](#) has been designed for searching and accessing the LifeWatch Italy resources with the help of semantically enriched queries. The Semantic Platform is based on a semantic model which combines different ontologies, with additional custom semantic relationships, created to improve efficiency;
- A second release of [EcoPortal](#), the repository of semantic resources for ecology and related domains, has been deployed and funded by the LifeWatchPLUS infrastructure project;

- The [Training Platform](#) of LifeWatch Italy was renewed and enriched with additional materials from national educational programmes targeting the new generations of Italian and European citizens;
- The [Phytoplankton Virtual Research Environment](#) was completely revised, integrating new web services and improving existing ones, and is currently undergoing further development;
- The realisation of a [Multimedia Production Centre](#) at the University of Salento, serving the whole LifeWatch ERIC organisation, including both the Common Facilities and the National Distributed Centres. The Multimedia Production Centre has worked, together with the communication team of LifeWatch ERIC and the performing arts course of the University of Salento, to launch the [LifeWatching TV Science Channel](#). The Multimedia Production Centre entered the Prix Italia 2022, and won an award for the video on the invasive blue crab *Callinectes sapidus*.

Other relevant activities carried out in 2022 include the development of a number of services accessible through the LifeWatch ERIC Metadata Catalogue.

An important networking activity was conducted by the whole LifeWatch Italy Joint Research Unit, under the coordination of the National Research Council, to ensure the participation of LifeWatch Italy in both the National Biodiversity Future Centre and in the proposal of the Environmental Research Infrastructures to the National Recovery and Resilience Plan calls. Both projects were awarded with funding.

Additional platforms/services, such as [DataLabs](#), the collaborative coding platform for Biodiversity and Ecosystem Research, the [Virtual Museum](#), the [Metadata Catalogue](#) and [Data Portal](#) started their development phase in 2022 and will be released on the LifeWatch Italy web portal in 2023. Moreover, the first elements of the [Distributed Data Centre of the National Hub of biodiversity and ecosystem research](#) products were launched in 2022. Most components are available, while the remaining ones of the ReCaS data centre, hosted by the University of Salento, will be released next year.




> LifeWatch Netherlands

Year of affiliation: 2017



National Coordinator Peter van Tienderen

 www.lifewatch.eu/organisation-governance/netherlands

 j.l.konijn@uva.nl

 University of Amsterdam,
Faculty of Science Science Park 904
1098 XH Amsterdam

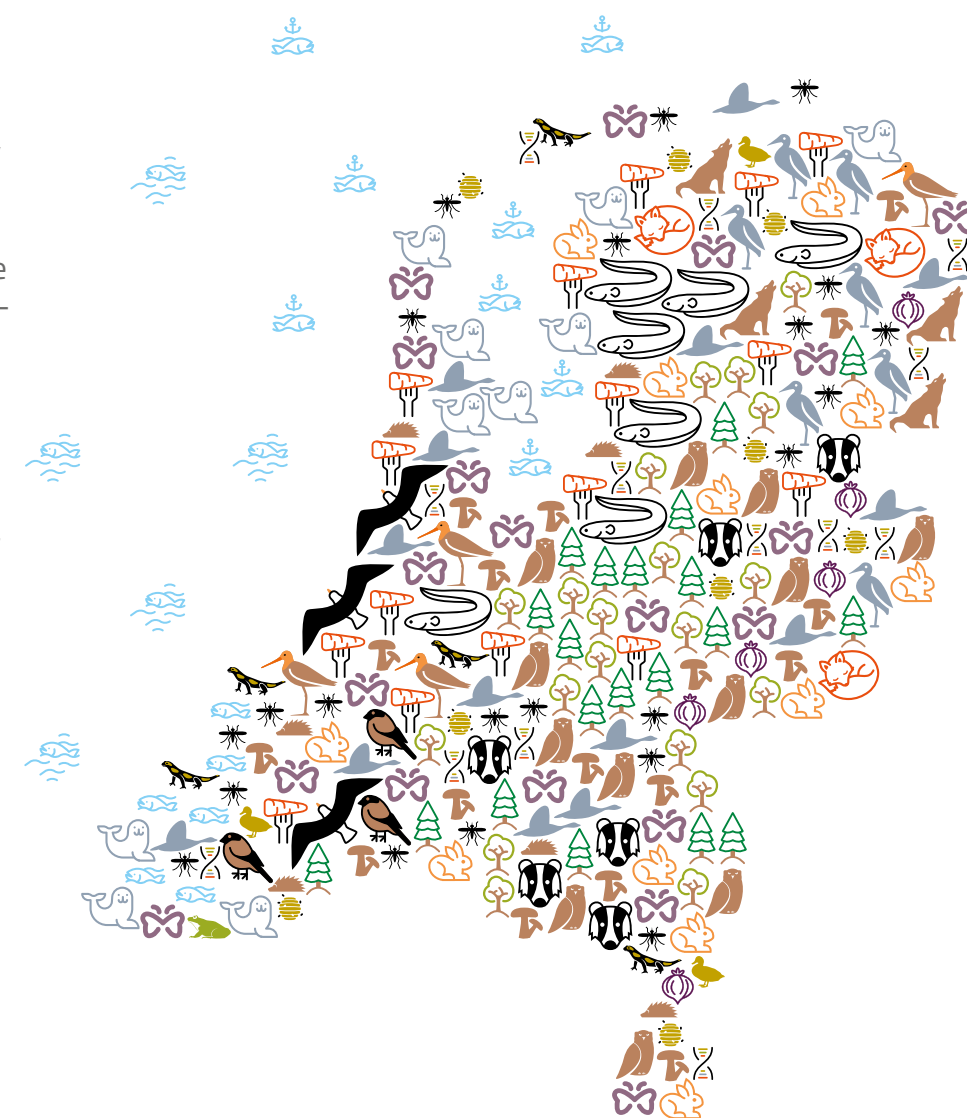
The Netherlands joined LifeWatch ERIC in 2017 and hosts its Virtual Laboratories and Innovations Centre (VLIC). The University of Amsterdam (UvA), the largest and one of the oldest universities in the country, is the leading institution of the Dutch National Distributed Centre. The LifeWatch Netherlands Distributed Centre is hosted by the Faculty of Science, which covers all Natural Sciences, Information Technology and Mathematics. It has over 6,000 students and 1,300 staff members.

During 2022, LifeWatch Netherlands, in strong cooperation with VLIC, attained the following achievements:

- **ILTER Life proposal awarded:** The Dutch LifeWatch community worked on the development of the successful Infrastructure project proposal LTER-Life, where digital twins will be created for two major Dutch natural areas. They will bring a wealth of data and ecology specialists will team up with ICT developers to build virtual research environments supported by LifeWatch ERIC which, when fully functional, can be deployed in similar areas across Europe. The 10 year LTER-Life project will take off in 2023;
- **Notebooks as a Virtual Research Environment (NaaVRE) developments:** A VRE Platform as a Service (VREPaaS) architecture was proposed in 2021 based on requirements collected and analysed in the early phases. This architecture was implemented to include functional components to allow Virtual Lab (vLab) administrators to create and delete vLabs based on the needs of scientific communities. Each vLab can monitor the state of its workflow executions. The VREPaaS is available as a Kubernetes application, so it can be deployed on any Kubernetes cluster;
- **VREPaas and NaaVRE integration with a single LifeWatch ERIC sign-on (SSO):** This allows users with LifeWatch ERIC accounts to use the VRE. Moreover, LifeWatch ERIC offers identity providers from ORCID, Google, and EGI-EOSC. The API of a customised notebook search engine was integrated with the NaaVRE enabling users to search for notebooks and select the most relevant one based on the notebook's description summary. The NaaVRE users may also download the notebooks in their user space, as well as send feedback on the search results: an ETL pipeline converts all LifeWatch Italy resources into RDF triples what the model is able to exploit;
- **Knowledge base/Search engine:** Activities related to the knowledge base and search engine were centred around academic research by the University of Amsterdam, which have a direct impact on the

services provided by VLIC. An indexing pipeline prototype was developed, which can index scientific datasets and computational notebooks. This pipeline is used in the [ENVRI knowledge base](#), also developed by VLIC. In addition, new developments were carried out on the ENVRI knowledge base. The backend engine that stores indexed documents and returns search results was replaced with Elasticsearch, which provides better scalability in cloud environments, better documentation and community support. The interface of the [ENVRI knowledge base search engine](#) was entirely rewritten using the Django Python framework. Among other functionalities, this allows users to better visualise search results into categories, and refine their queries;

- **Support for Radar Aeroecology VL:** LifeWatch ERIC VLIC in collaboration with the University of Amsterdam has started the support for a radar aeroecology virtual research environment, based on the NaaVRE technology. The virtual research environment has a workflow engine accompanied by the FAIR-Cells tool. FAIR-Cells allow users to encapsulate Jupyter-notebook cells and export them as a workflow component. This allows any user to write, re-use, produce and share workflow components. The vLab infrastructure executes these FAIR-cells on the cloud, greatly reducing the threshold for using large-scale computing resources;
- **LiDAR Lab:** In collaboration with the University of Amsterdam, VLIC has supported the development of the 'LiDAR-lab' (Light Detection And Ranging). A virtual research environment containing workflow builders to analyse vegetation structure from LiDAR images. Light Detection And Ranging enables the mapping of vegetation structure with unprecedented detail. However, considerable effort and advanced technical skills are required for researchers to process massive amounts of LiDAR data, entailing the challenges of handling big data and high computational costs;
- **SOPPHY lab:** In collaboration with the University of Amsterdam, VLIC has supported the Satellite Observations of Plant PHYSiology (SOPPHY) virtual laboratory, in response to a user-requirement analysis, providing Essential Biodiversity Variables (EBV) workflows for estimating plant species traits from satellite observations. The vLab, integrated into Notebook-as-a-Virtual- Research-Environment (NaaVRE) consists of several workflow components for processing and combining information from high resolution and multi-spectral satellite imagery to monitor plant functional traits such as leaf area index and foliar chlorophyll and carotenoids.



> LifeWatch Portugal

Year of affiliation: 2019




National Coordinator Pedro Beja

 www.porbiota.pt

 Porbiota

 Porbiota

 pbeja@cibio.up.pt

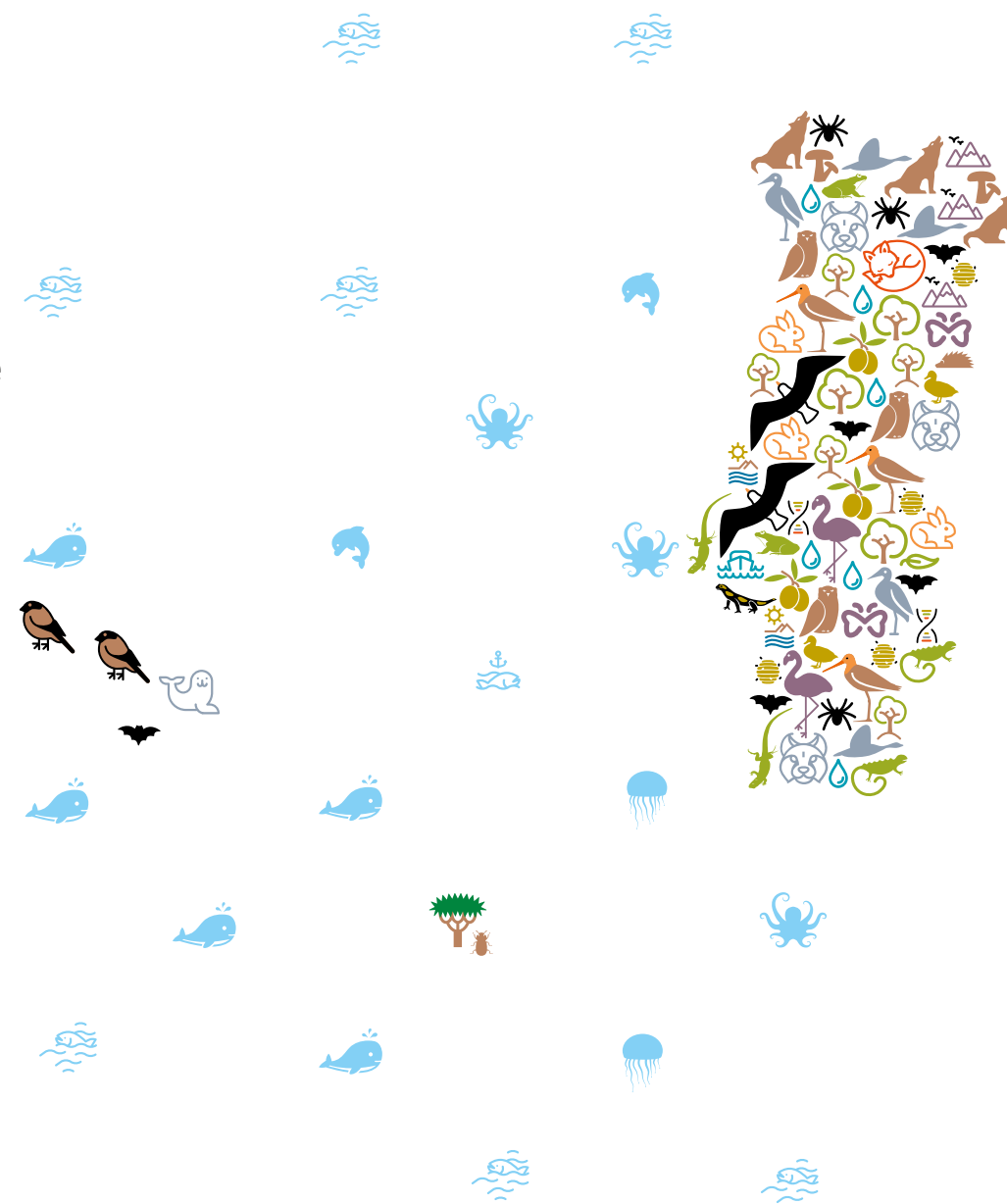
 BIOPOLIS/CIBIO-InBIO
Research Centre in Biodiversity and
Genetic Resources,
University of Porto, Campus de Vairão,
Rua Padre Armando Quintas, n.º 7,
4485-661 Vairão, Vila do Conde

LifeWatch Portugal joined LifeWatch ERIC in 2019 and contributes to LifeWatch ERIC through its National Distributed Centre. LifeWatch Portugal is managed by PORBIOTA, the Portuguese e-Infrastructure for Information and Research on Biodiversity, which connects the main Portuguese research institutions working in biodiversity, ecosystem functions, and services, storing and managing biodiversity data. PORBIOTA was included in the first Portuguese Roadmap for Research Infrastructures of strategic relevance (RNIE) in 2014. PORBIOTA stores, organises and disseminates biodiversity and ecosystem data, making it available to the scientific community and society, and contributes to promoting integrative taxonomy and building up knowledge on national biodiversity. It encourages progress in highly competitive cutting-edge areas, such as metabarcoding and environmental metagenomics. PORBIOTA contributes significantly to the advancement of scientific knowledge in biodiversity, ecosystem functions, and ecosystem services by supporting the digitisation, aggregation, and dissemination of data on biodiversity and Portuguese ecosystems, as well as increasing the international impact of Portuguese research in these fields. LifeWatch Portugal, through PORBIOTA, provides access to a wide range of biodiversity-related services, including biodiversity and environmental data resources, as well as computational and analytical tools for study, policy implementation, and assessment.

During 2022, the LifeWatch Portugal Node attained the following accomplishments:

- **Datasets access:** Datasets from biodiversity and ecosystem subdomains from Portuguese data providers were combined. Species occurrence/abundance and DNA barcodes, abiotic variables and species trophic interactions and dietary metabarcoding datasets are now available on the LifeWatch ERIC Metadata Catalogue;

- **Species Identification:** Taxonomic identification services for a variety of taxa, with validation using DNA barcodes (COI and other markers);
- **Data processing:** New analytic pipelines are being developed to improve the automation of biodiversity data collection and processing, including semi-automatic pipelines for processing eDNA bio-monitoring data; endangered species using portable DNA sequencers and pipelines for extracting and analysing data on biodiversity and human-nature interactions from social media and file sharing platforms (iEcology and Conservation Culturomics);
- **Training workshops:** Training in biodiversity informatics was organised, covering the management of biological collections, biodiversity data cleaning and quality, geo-referencing of biodiversity databases, and biodiversity data publication through GBIF;
- **Services:** The BIOPOLIS/CIBIO startups MoveTech and ElectricBlue developed novel hardware and analytics services for bio-logging and animal tracking, including the use of sensors to be put in monitored animals (e.g., video cameras, temperature and oxygen meters);
- LifeWatch Portugal supported the organisation of the **14th General Assembly of LifeWatch ERIC** (21-22 June 2022), at CIBIO headquarters, LifeWatch ERIC participation in IBERGRID 2022 and Science Summit at UNGA77;
- LifeWatch Portugal through the University of Aveiro **hosted a 12-month fellowship** on “Scientific developments in monitoring the distribution, spread, and impact of Non-indigenous Invasive species (NIS) in aquatic and terrestrial ecosystems: The case studies of the LifeWatch ERIC Internal Joint Initiative (IJI)”;
- The **BIOPOLIS/CIBIO** development team, as Linked Third Party in the ANERIS and ENVRI-FAIR projects, proceeded to test the retrieval of functional traits from SOPPHY over the Oostvaardersplassen Dutch Natura 2000 nature reserve from 2016 to 2022.



> LifeWatch Slovenia

Year of affiliation: 2017




National Coordinator Tanja Pipan

 www.lifewatch.si

 LifeWatch_SI

 info.lifewatch@zrc-sazu.si

 Karst Research Institute at Research Centre of the Slovenian Academy of Sciences and Arts – ZRC SAZU
Titov trg 2, 6230 Postojna

LifeWatch Slovenia is one of the National Distributed Centres composing LifeWatch ERIC, and is also included in the Slovenian National Roadmap and in the Strategy for Smart Specialisation (S4) and Horizon 2020, focusing on the development of technological solutions in the field of biodiversity and socio-ecosystem research. Since 2015, the Slovenian Consortium, LifeWatch-SI, has been promoting the importance of integrating and networking information & data in order to coordinate biodiversity research in marine, freshwater and terrestrial ecosystems, plan common access to a vast array of data from various databases and observatories, predict computing capabilities with analytical and modelling tools in virtual laboratories and, support training and educational programmes that will enable a proper understanding of biodiversity. The LifeWatch-SI consortium consists of 10 partners from nationally and internationally recognised scientific institutions, universities, a regional park, a national museum, and an NGO, all active in the field of biodiversity and ecosystem research, with ZRC SAZU serving as the national coordinator and headquarters of LifeWatch-SI.

During 2022, LifeWatch Slovenia consortium actively contributed with ecological research measurements and observations which are integrated into dedicated data and services for different ecosystem domains:

- **Terrestrial ecosystem:** The Database of Slovenian Bird Ringing Centre (BRDbase) is an application that enables bird ringers operating in the Slovenian Bird Ringing Centre of the Slovenian Museum of Natural History and through the LifeWatch Slovenia Data Centre at the ZRC SAZU (the Research Centre of the Slovenian Academy) to store and process data on ringed birds and birds found with the ring (recoveries);
- **Marine ecosystem:** the Marine Biology Station Piran of National Institute of Biology keeps a large number of data from the marine environment that are available to researchers and decision makers for marine environmental research (Buoy VIDA, vector data service). The development of genomic techniques also opens up new ways of monitoring biodiversity through metabarcoding and the use of passive samplers, or by sampling seawater as part of a network of genomic observatories which are also being used in the Slovenian sea. Services are provided through the LifeWatch ERIC Metadata Catalogue, Gulf of Trieste HF radar node and Oceanographic buoy VIDA, and several datasets have been

shared within the LifeWatch ERIC Metadata Catalogue;


- **Forest ecosystem:** The FOR-PLAT LifeWatch RI-SI data platform of the Slovenian Forestry Institute represents the first step towards the establishment of a Data Centre for observation, modelling and analysis of biodiversity in forest ecosystems in Slovenia, in the context of the LifeWatch Slovenia consortium. The development and preparation of the information system of the Slovenian Forestry Institute, up to the present FOR-PLAT format, took place over a long period and in several stages;
- **Estimation of the Leaf Area Index (LAI) by the means of remote sensing:** LAI is one of the key variables for understanding the physical processes of gas and water exchanges from the atmosphere to soil and transpiration through vegetation. Recently, a variety of automated approaches based on remote sensing for the estimation of LAI have been proposed. Up-scaling the LAI measurements on a regional scale for karst landscapes, for example, works where the terrain shows significant elevation and vegetation variability. On the other hand, aquifers typically exhibit rapid variations in water storage, and are considerably more challenging. The aim of this study is to validate and assess the applicability of remote sensing based methods for estimating the LAI in the Slovenian karst region based on *in situ* measurements;
- **Aquatic ecosystem:** the development of two virtual labs, the ProteusWatch vLab and the Karst Groundwater Habitats vLab, was initiated in 2022 to assess and monitor the inaccessible and unique karst groundwater in semi-natural conditions of the Tular Cave Laboratory, using neural network models on IR imagery which have shown their potential to track *Proteus* even in low visibility. With a sustainable support from the LifeWatch ERIC community, the project plans to go beyond state of the art in both sensor technologies and computational and simulation strategies to overcome associated challenges of relocation *in situ*, into the subterranean aquatic habitats;
- **The 4th International Meeting SOS *Proteus*:** this addressed the conservation of *Proteus* and its habitat which is facing climate change challenges. The meeting was organised in collaboration with LifeWatch ERIC and hosted a round-table session on "e-Science and Open Science to address challenges in conservation of *Proteus*";
- **The IZRK Metadata Portal:** This has been developed by the Data Centre of the Karst Research Institute ZRC SAZU since 2021 and was finally released in October 2022. It uses the GeoNetwork platform to build a system management and user interface for multidisciplinary environmental data mining and access to data products. The architecture of the new metadata portal is compliant with FAIR data principles and data lifecycle, and collects and maps various datasets, databases, research sites and instruments, virtual laboratories, workflows, and codes. The portal offers data for the multidisciplinary KARST database and for multidisciplinary research covering all domains and functionalities of a karst landscape. Moreover, the portal is designed to provide a temporal and spatial link between specific sites and their data, partially also as the outcomes of RI-SI-LifeWatch project.



> LifeWatch Spain

Year of affiliation: 2017



 www.lifewatch.eu/organisation-governance/spain

 LifeWatchSpain

 director.cflwes@lifewatch.eu

 Plaza España SN, SECTOR II-III 41071
Seville (Spain)

Spain joined LifeWatch ERIC in 2017 and hosts the Statutory Seat and the ICT e-Infrastructure Technical Offices, assisting in the day-to-day coordination and management of LifeWatch ERIC.

The LifeWatch Spain Distributed Centre is supported by the Ministry of Science, Innovation and Universities, the Regional Government of Andalusia and the Guadalquivir River Basin Authority (Ministry for Ecological Transition-MITECO).

With its large territory, between the Mediterranean Sea and the Atlantic coast, Spain has a remarkable diversity of habitats and species, with some of the most interesting natural reserves and parks in Europe (Doñana, Monfrague, Timanfaya), from the white mountains in Sierra Nevada and the Pirineos to the volcanos in Tenerife.

In 2022, the Spanish Distributed Centre continued the implementation of the following activities:

- Development and operation of the **ERDF Projects Andalusia**: SmartFood, SUMHAL, Indalo, SmartEcoMountains, EnBic2Lab and Alboran;
- Contribution to the **COP15 US-AFRICA** in Washington;
- Participation in the **UN COP15 Biodiversity Conference** in Montreal;
- Development and operation of the **AgroServ, Resinfra and ALL-Ready Projects**, focusing on Agroecology;
- Participation in the **European Conference on Ecological Sciences in Metz**;
- Contribution to **IBERGRID 2022** (Portuguese-Spanish Cooperation on Technology Research);
- Participation in the **SmartAgrifood Summit**;
- Organisation of a plenary session on biodiversity during the **77th United Nations General Assembly Science Summit**, participation in a session on Green Medicines;
- Participation in **TRANSFIERE**, the Forum of Transference of Technology of Southern Europe.

LifeWatch ERIC led the ERDF Andalusia Projects (European Regional Development Fund), operational Framework 2014-2020 POPE, for the activities related to the LifeWatch ERIC e-infrastructure located in the Autonomous Community of Andalusia, and the cooperation developed between LifeWatch ERIC and the Spanish Ministry of Science and Innovation. These activities focused on ecological transition as the strategic axis of the Recovery and Resilience Plan, which the EU prescribed as an exit strategy from the crisis generated by COVID19 for its member states, as well as on maintaining and improving the cohesion, biodiversity, and eco-sustainability of territories and natural areas. Within this framework, a number of working areas were identified in the agricultural, livestock, and fisheries sectors, for which it is first necessary to develop an assessment of their current state, in order to subsequently implement digitisation approaches that will enable the desired improvement objectives to be achieved.



Photo by Nico van Kappel (www.buiten-beeld.nl) | LifeWatch Netherlands

Birch trees in heathland, Veluwe natural park, The Netherlands



> Acknowledgements

LifeWatch ERIC is grateful to its members and representing entities for their support of its operations and achievements:

 Flanders State of the Art	 belspo	 FÉDÉRATION WALLONIE-BRUXELLES	
 hcmr ΕΛΚΕΘΕ	 GERT GENERAL SECRETARIAT FOR RESEARCH AND TECHNOLOGY	 Ministero dell'Università e della Ricerca	 Consiglio Nazionale delle Ricerche
 UNIVERSITÀ DEL SALENTO	 fct Fundação para a Ciência e a Tecnologia	 INSTITUTO SUPERIOR D AGRONOMIA <i>Universidade de Lisboa</i>	 CIBIO
 REPUBLIC OF SLOVENIA MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION	 Junta de Andalucía Consejería de Agricultura, Pesca, Ganadería y Desarrollo Sostenible Consejería de Transformación Económica, Industria, Conocimiento y Universidades		
 GOBIERNO DE ESPAÑA	 Naturalis Biodiversity Center	 NWO	 UNIVERSITY OF AMSTERDAM

> Annex I: EU Project Descriptions

Seven European projects started this year: **AgroServ**, **BioDT**, **FAIR-IMPACT**, **MARBEFES**, **MARCO-BOLO**, **Marine SABRES** and **OpenEM**.

Integrated SERVICES supporting a sustainable AGROecological transition (AgroServ)

AgroServ will facilitate a systemic and holistic approach to understand the threats and challenges agriculture is facing, and work towards the implementation of a resilient and sustainable agrifood system. A trans-disciplinary offer of services is proposed, integrating representatives of the agriculture system, first and foremost farmers, in the research process, through a broad range of living labs across Europe. A wider catalogue of integrated and customised services will also be developed, thanks to a specific service pipeline approach, designed from a gap analysis of stakeholder and user needs. A strong community-building and training programme for access managers and users will be implemented to facilitate multi- and trans-disciplinary research with all relevant parties. Results from the research conducted in AgroServ will be synthesised to be used in the arena of evidence-based policymaking. Data from AgroServ will be open and compliant with FAIR practices, made available in the long term to the communities, and be linked with the main European initiatives, such as the EOSC. Strong links will be established with existing or future programs under H2020 and Horizon Europe. With the planet facing an increasing reduction in biodiversity, it is of the utmost importance to understand the way climate, humans, pollution, and other factors affect biodiversity. Furthermore, there is increasing evidence that a lack of contact with natural biodiversity impacts human health through negative effects on the microbiome and immune system. Understanding the forces shaping biodiversity is the basis for any rational management of natural resources and will be a key enabler of the EU Biodiversity Strategy 2030. In particular, it is necessary to be able to predict global biodiversity dynamics better.

BioDT

The **Biodiversity Digital Twin (BioDT) project** is developing a Digital Twin that will provide advanced modelling, simulation, and prediction capabilities. Scientists at Research Infrastructures will be able to use **BioDT** to: 1) better observe changes in biodiversity, 2) relate these changes to possible causes, and, 3) better predict the effects of changes caused by climate or human interventions. The BioDT consortium brings together a dynamic team of experts in biodiversity, high-performance computing, artificial intelligence and FAIR data to make the first biodiversity Digital Twin prototype a reality.

FAIR-IMPACT

FAIR-IMPACT focuses on expanding FAIR solutions across the EOSC. It aims to implement an EOSC component of FAIR data and services. FAIR-IMPACT will identify proven domain solutions and facilitate the interoperable uptake of these solutions across scientific domains and for different types of research output. The ambition of FAIR-IMPACT is to build a web of FAIR data and related services in collaboration with the scientific community and relevant stakeholder groups, and to take steps towards bringing to life the holy grail of a web of Open Science. It will contribute to transforming the way researchers share and exploit research products within and across disciplines and domains, and to facilitating scientific multi-disciplinary cooperation. With its focus on increasing FAIRness levels, FAIR-IMPACT will contribute to improving public trust and reproducibility in science.

MARBEFES

The overall aim of MARBEFES is to determine the links between biodiversity and the functioning of coastal and marine ecosystems, the resulting ecosystem services and societal goods and benefits. In this, it will achieve ecological and socio-economic evaluations through a validated set of innovative tools in a distributed toolbox (TRL 6) to enhance policy and governance to secure benefits for current and future generations. Progress is being sought substantially beyond the current state-of-the-art understanding of the causes and consequences of the maintenance, loss, and gain of biodiversity and ecological and economic value and the repercussions of this for the management and governance of European seas, from the Arctic to semi-tropical areas, comprising their dominant habitats and iconic species.

MARCO-BOLO

MARCO-BOLO (MARine Coastal BiODiversity Long-term Observations) presents as overall aim to enable a digital framework for biodiversity data streams and data access, building on international standards and approaches to establish the biological component of the coastal and marine Earth observation Infrastructure in Europe. This project will address the present challenges in coastal and marine biodiversity observations by advancing our observational capacity and ensuring better coordination, shared vision and strategies, and delivering data responding to societal needs by linking products to explicit management needs. These challenges are the focus of the four distinct themes: Digitisation, Data access, Technology and Assessment, and People and Trust. LifeWatch ERIC contribution consists in the provision of an analytical methods to explore multidisciplinary data on non-indigenous invasive species, and in the development of the VRE and workflows.

Marine SABRES

Marine Biodiversity is continuing to decline despite current conservation efforts. Marine SABRES will co-design a Simple Socio-Ecological System approach (the Simple SES) to rapidly enable and upscale Ecosystem Based Management across Europe and abroad. Marine SABRES will set European marine management on a course to reverse biodiversity decline, and will conserve and protect biodiversity by integrating sustainable ecosystems and a resilient blue economy. It will enable managers to make sustainable decisions, empower citizens to engage with marine biodiversity conservation; promote sustainable development in coastal and marine sectors across Europe, focusing on the demonstration of practical management efforts in three Demonstration Areas (Tuscan Archipelago, the Arctic North-East Atlantic, and Macaronesia) before upscaling throughout Europe and beyond.

Open-Earth-Monitor

The Open-Earth-Monitor project will increase European capability to generate timely, accurate, disaggregated, people-centred, accessible (GSM-compatible), and user-friendly environmental information based on Earth Observation data by building a cyber infrastructure anchored in FAIR data principles, leveraging and improving our existing platform. Specific targets include: contributing to operational planning for planting 3 billion trees over the EU by 2030; achieving climate neutrality by 2035 in the land sector; building back a net-zero greenhouse gas emission economy by 2050; achieving the United Nation's Sustainable Development Goals; monitoring essential biodiversity indicators; compiling natural capital accounts for private/public sectors; enabling businesses to leverage competitive advantage through the EU Green Deal; and increasing the quality of life for European citizens. Innovations will comprise: 1) the implementation of original cloud-based solutions to seamlessly integrate *in-situ* (point, site) & Earth Observation data so that we can produce environmental information at analysis- and decision-ready levels; 2) implementation of fully-scalable Automated Mapping/AutoML frameworks; 3) user experience designed data provision and Apps possibly capable of reaching millions of users across Europe and globally; and 4) financial assessment tools that allow users to directly quantify ecosystem services (SEEA methodology), to identify optimal environmental and climate solutions, and to build business solutions.

> Annex II: ERDF Project Descriptions

Six the projects currently ongoing are funded by ERDF Spain, Andalusia, one of them, Sumhal (ERDF), started this year.

ALBORAN

The ALBORAN project aims to promote the sustainable use of the endogenous resources of the city of Malaga, by facilitating the management of terrestrial and marine biodiversity as well as by increasing scientific awareness among citizens in this matter. The project has a particular focus on conservation of territorial capital and conservation of cultural heritage.

EnBiC2-Lab

EnBiC2-Lab aims to develop a Virtual Research Environment which will offer a multiperspective view of the impacts of climate change. It will be based on the integration of databases and services of areas such as water, soil, air, fauna and flora with innovative tools such as Supercomputing and Big Data.

INDALO

INDALO studies biodiversity in the various representative ecosystems of Andalusia, and analyses their evolution to detect and understand the consequences of Global Change. It will orient the future of Andalusian R&D&I in terms of biodiversity and ecosystems towards the use of the LifeWatch ERIC e-infrastructure, as well as stimulate the link between Andalusian R&D&I and the EU, in addition to attracting the private sector.

SMARTECOMOUNTAINS

The SMARTECOMOUNTAINS project aims at the creation of a Thematic Centre to expand our knowledge on the functioning of the Sierra Nevada ecosystems in global change scenarios, as well as designing management procedures for the adaptation of the Sierra Nevada ecosystems to global changes.

SMARTFOOD

SMARTFOOD focuses on the monitoring of the impact of agricultural and fisheries systems on biodiversity and ecosystems, contributing to three main social challenges: (1) Food safety and quality, agriculture sustainable production, sustainability of natural resources, marine and maritime research; (2) Climate change and resources and raw material efficiency; and (3) Digital economy and society.

SUMHAL

The SUMHAL project implements a strategy for the conservation of biodiversity in sustainable natural systems of the western Mediterranean area. Its main objective is to combine the results of the fieldwork with Virtual Research Environments for the storage, management, analysis and dissemination of the conservation status of Andalusian biosystems.

LifeWatch ERIC

Statutory Seat

Plaza de España,
SECTOR II-III
41071 Seville (Spain)

Tax Identification Number
N9101001G

This report was approved by the LifeWatch ERIC General Assembly in 2023 and is available on the LifeWatch ERIC website in the Documents section www.lifewatch.eu/official-documents. The limited number of hard copy versions of the 2022 Activities Report is printed on 100% recycled paper.



www.lifewatch.eu



[@LifeWatchERIC](https://twitter.com/LifeWatchERIC)



[ERICLifeWatch](https://www.facebook.com/ERICLifeWatch)



[LifeWatch ERIC](https://www.linkedin.com/company/lifewatch-eric)



[LifeWatch ERIC](https://www.youtube.com/LifeWatchERIC)



info@lifewatch.eu