LifeWatch ERIC

2020 ACTIVITIES REPORT

August 2021

Photo by CSIC-LW.ES

Fractal harmony of Doñana and the marshland, Spain

LifeWatch ERIC

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> Foreword

Gert Verreet

Chair of the
LifeWatch ERIC
General Assembly

LifeWatch, in its third year as an ERIC (a particular species[1] of legal entity), clearly accelerated its performance during 2020. This report is a very meticulous record, a map of what is becoming a real beehive.

Ex ante, "2020": much was expected to be achieved by this particular year, as if it were a sign for a better future. Hence the year was to play a pivotal role as a milestone in many policy initiatives, also for biodiversity.

But, oh boy!, was the real 2020 tough. For one thing, it saw us all shifting much of our social and professional lives online. Luckily, for an e-infrastructure, that wasn't too much of a test!

But something that was really tough to digest in 2020 were the findings that humanity underperformed in terms of its self-declared objectives, such as the Aichi Targets.

Let's hope that Kunming, as a process until 2022, will bring about a robust perspective for global biodiversity policy with a strong role for biodiversity science, which often does not get the recognition that it deserves. Critically, Environmental Research Infrastructures, such as LifeWatch ERIC, should allow scientists to embed their endeavours in a systems perspective.

As a society, we broadly grasp that the Earth system is undergoing rapid, mostly human-driven, changes. Carbon (can I call it the life-giving chemical element? Let's not make it our nemesis), is still being remobilised from within the Earth at unprecedented speed, despite all we know. Humans occupy ever more space with their activities, and whatever else was or is on offer becomes a commodified resource. The dynamic processes in the biosphere, atmosphere, hydrosphere and even geosphere are all affected. What will all this mean for the Earth as our habitat in practice?

We need tools such as those provided by LifeWatch ERIC to understand how life adapts (or struggles to adapt) to these changes.

I want to thank all the staff, technical and scientific collaborators who have contributed to the achievements reported here. Your results are real enablers! Be proud of your achievements and keep engaging with users.

Enjoy the report!

[1] An allusion to "Erik of het klein insectenboek" (1941) by Godfried Bomans, a playful book in the Dutch literary firmament, cannot plausibly be denied.

Christos Arvanitidis

Chief Executive Officer of LifeWatch ERIC

LifeWatch ERIC has completed another year of its development. The year 2020 was a different one: not only was it the year of implementation for the development of the prototype of its platform, but this effort was challenged by the COVID-19 pandemic, which radically changed the modes of operation in LifeWatch ERIC.

However, the fact that it is by nature a distributed and an e-Infrastructure provided LifeWatch ERIC with the resilience and the collaborative environment to continue its operations remotely at all levels: scientific, technical, administrative and financial.

The year 2020 witnessed LifeWatch ERIC increasing its human potential, bringing the Technology Readiness Level (TRL) of the prototype of its Infrastructure up to 5, delivering tangible scientific and technical results, engaging in a number of top-level events, enhancing dialogue with ERICs, RIs and International Organisations and Networks, supporting the first M.Sc. curriculum on e-Biodiversity and Ecosystem Services (EBES), expanding its training activity, adopting several important policies for its operations, launching the activity of its Advisory Boards and actively participating in several projects and proposals.

Overall, LifeWatch ERIC continued to invest in disruptive technologies for the integration of its assets in breaking current barriers between the different communities in terms of language and in ways of thinking and acting, and tried to tackle its most difficult challenge: the cultural one.

I feel very much indebted to the most valuable ingredient of LifeWatch ERIC: its fantastic personnel, who achieved so much, with intelligence, talent and faith, in such a difficult year. This gives me great hope that the Infrastructure will be entirely developed, tested and delivered as fully operational in the year to come.

On behalf of the LifeWatch ERIC Executive Board

> Executive Summary

The year 2020 was the year of implementation. Despite the challenges of the COVID-19 pandemic, LifeWatch ERIC managed to:

- **Grow** by **29.4%** and assemble a total human potential of **22 employees**

- **Extend** and **intensify** the **collaboration** between the scientific and technical teams in order to further develop the **scientific hypotheses** to be tested and to address the needs of its **Internal Joint Initiative (IJI)** in **data** and **analytics** through **workflows** and **VREs**, under development

- Bring the **prototype** of the Infrastructure up to **Technology Readiness Level (TRL) 5** and deliver **3 workflows** at an experimentally tested stage, while another 3 were at their **final stage** of development and testing

- Officially **admit Portugal** as the **seventh** EU **Member State** of **LifeWatch ERIC** by amending its **Statutes**

- Make progress on administrative and financial operations, to **adopt** its **Procurement** and **Employment Policies**, initiate the work of its **In-Kind Contribution Committee (IKCC)** and launch the **Scientific and Technical Advisory Body (STAB)**

Implementation year beyond the challenges posed by the pandemic

- Deliver the **IJI Communication Strategy**, draft the **Communication Policy**, actively engage in a number of high-level **virtual events**, such as the **World Conference on Marine Biodiversity**, and organise the **United Nations General Assembly (UNGA) 75** Anniversary event: "*LifeWatch ERIC in support of the SDG 2030 accomplishment*"

- **Increase** its **online presence**, a fact demonstrated by **56%** more **users** of its **website**

- Actively support the **launch** of the first **M.Sc.** curriculum **"e-Biodiversity and Ecosystem Services (EBES)"**, organise the **ENVRI Community International Winter School DATA FAIRness** and improve its **Training Platform**

- **Expand dialogue** and define its **trading zones** with **ERICs**, **RIs** and **International Organisations and Networks**

- **Continue** its active **participation** in ongoing **projects** and in the preparation of many **proposals**

- **Adapt** its **management** and **operation** activities during these **first waves** of the **COVID-19 pandemic** and prove its **resilience** through **adaptations** reflecting its nature of a **distributed** and **e-Infrastructure**

Photo by Massimiliano Manno

Pink Flamingoes in Margherita di Savoia, Italy

> LifeWatch ERIC Team, 2020

The LifeWatch ERIC family expands

In 2020, LifeWatch ERIC grew by **29.41%**, going from 17 employees (including Executive Board members) to **22**. The new personnel were hired following a standard, open and transparent procedure, which is now described in the LifeWatch ERIC Employment Policy.

- Riccardo Bianchi, Developer for Cloud-based Virtual Research Environments, VLab & Innovations Centre;
- Monique Bossi, ENVRI-FAIR Project Manager, Service Centre;
- Maria Teresa Manca, Training and Capacity Building Officer, Service Centre;
- Joris Timmermans, Scientific developer for Essential Biodiversity Variables workflows, VLab & Innovations Centre;
- Yifang Shi, Scientific developer for ecological applications of LiDAR Remote Sensing, VLab & Innovations Centre.

The Executive Board

Christos Arvanitidis
Chief Executive Officer

Juan Miguel González-Aranda
Chief Technology Officer

Lucas de Moncuit
Chief Financial Officer

Alberto Basset
Director of Service Centre

Peter H. Van Tienderen
Director of VLab & Innovations Centre

The Statutory Seat

Giovanna Caputi
National Nodes Operations Manager

Cristina Huertas-Olivares
International Initiatives & Projects Manager

The ICT e-Infrastructure Technical Office

Antonio José Sáenz Albanés
e-infrastructure Operation Coordinator

Francisco Manuel Sánchez Cano
e-infrastructure Resource Integration Coordinator

Service Centre

Nicola Fiore
Service Centre ICT Coordinator

Sara Montinaro
Chief Communication Officer

Monique Bossi
ENVRI-FAIR Project Manager

Julian Kenny
Communication Officer

Bénédicte Madon
Scientific Community Networking Officer

Maria Teresa Manca
Training and Capacity Building Officer

Patricia Szép
Fundraising & Administrative Assistant

Lucia Vaira
Web Portal Officer

VLab & Innovations Centre

Jacco Konijn
Project Manager VLab & Innovations Centre

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

> LifeWatch ERIC Structure

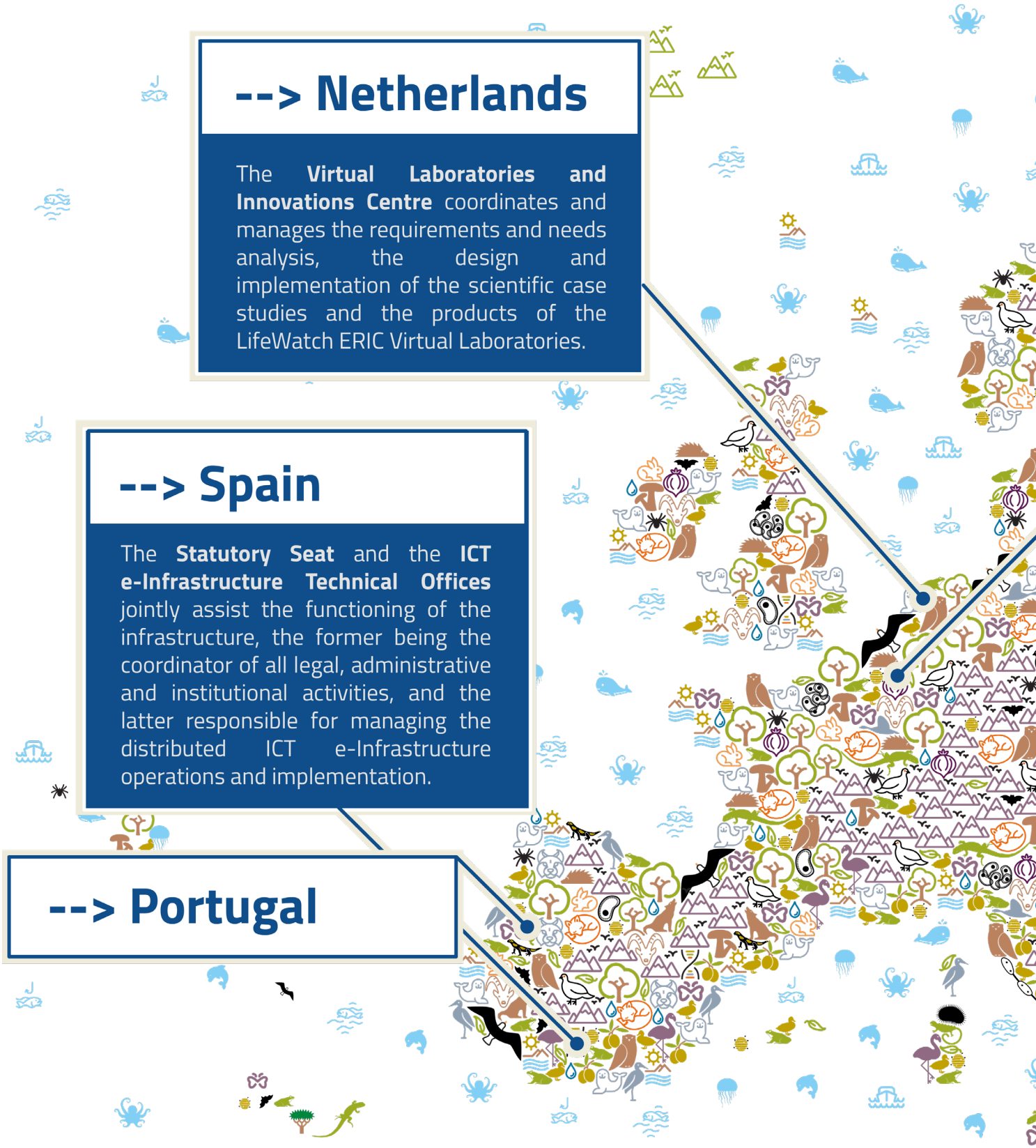
--> Netherlands

The **Virtual Laboratories 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.

--> Spain

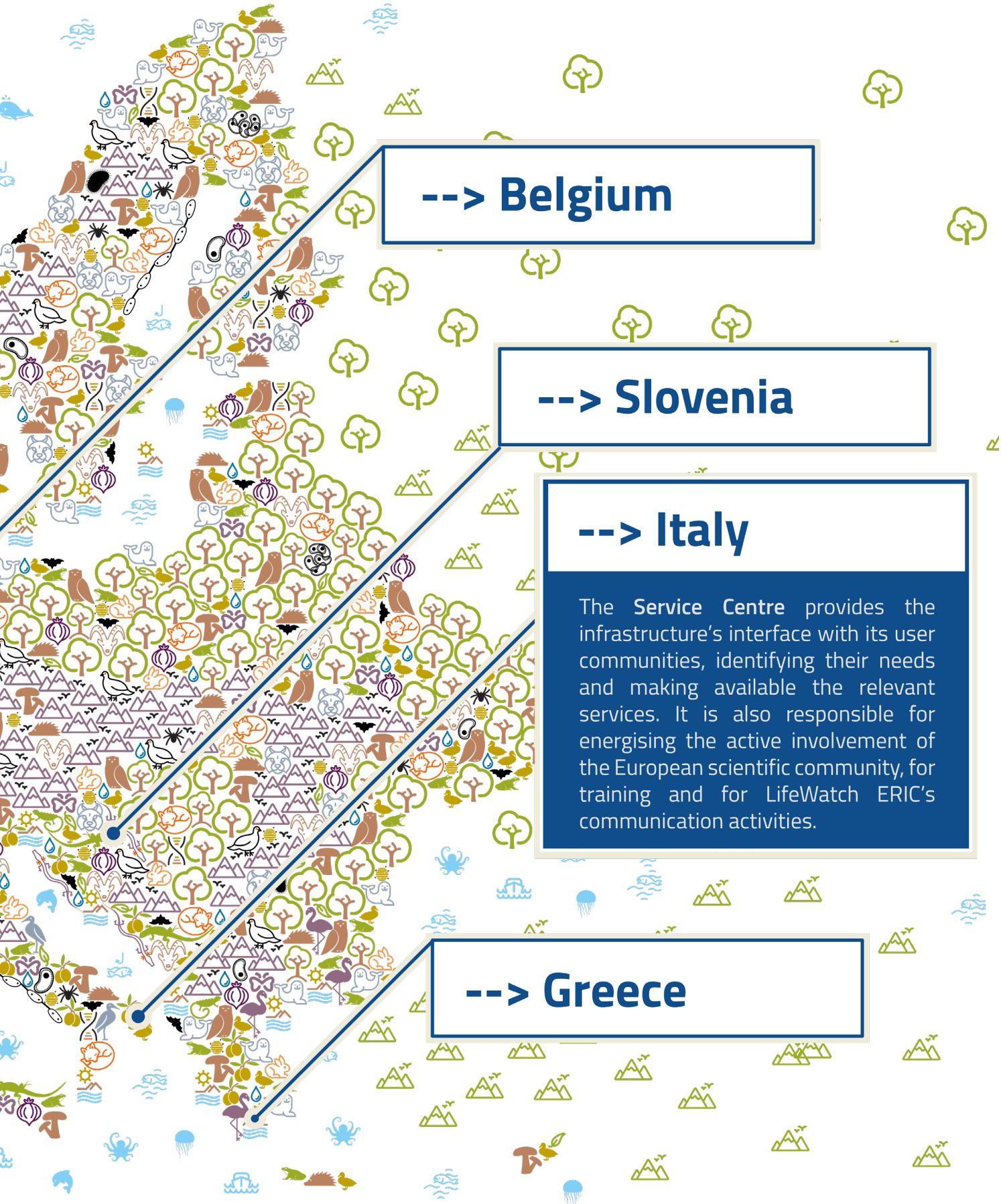
The **Statutory Seat** and the **ICT e-Infrastructure Technical Offices** jointly assist the functioning of the infrastructure, the former being the coordinator of all legal, administrative and institutional activities, and the latter responsible for managing the distributed ICT e-Infrastructure operations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

--> Portugal



Common Facilities

Distributed Centres



--> 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.

--> Greece

> Scientific Progress

Bringing the scientific community closer to the Infrastructure

The LifeWatch ERIC flagship project, the **Internal Joint Initiative (IJI)**, which facilitates the assessment of the impact of **non-indigenous invasive species (NIS)** on European **biodiversity** –that is, on **genes**, **species** and **habitats** (**ecosystems**)– was the primary scientific activity of the ERIC over the entire year.

The scientific community continued its cooperation with the scientific and technical teams of LifeWatch ERIC in order to further develop the scientific hypotheses to be tested and to address its data and analytical needs through workflows and VREs under development. The major achievement here was that the initial language barriers were removed and both teams adopted a mutually accepted language. During 2020, the major scientific outcome of this process has been summarised in the "*Scientific document with the technical specifications of the LW ERIC VRE on NIS*".

At the end of July 2020, six validation cases led to the development of clear research questions and, accordingly, to scientific **workflows**: ***Ailanthus*, ARMS, Biotope, Crustaceans, *Phytophthora cinnamomi*** and **Metabarcoding**. Several documents were developed collaboratively by scientists and ICT engineers in order to communicate to the ICT team the various requirements of each of the validation cases: a **standardised workflow**, a **tutorial** describing the workflow in detail, and a **document listing all the services** involved in each workflow, including their current stage of development, were all produced for each of the above workflows.

The **workflows** were designed by the scientists following a standardised workflow template provided by the ICT team and enriched by a **step-by-step tutorial** describing each step of the workflow in detail. Each **step** described in the tutorial is a single analysis operation within the workflow, later categorised as a "**service**", that requires input files and produces output files. The scientists provided, for each step of their **workflow**, details about the input and output files (i.e., description, format, source, structure) and, subsequently, when data were in the form of a table, a screenshot of the first few lines of the table. The scientists provided all necessary details about the service operating at each step, i.e., description, type (e.g. Python script, R script, etc.), availability (i.e., terms of use of service), development type and literature reference.

In 2020, scientific activities exceeded expectations. Apart from consolidating the synergies between the LifeWatch ERIC community and those of other ERICs and RIs in the context of **ENVRI-FAIR** and the **ERIC FORUM** and guiding the FAIRness implementation of the ERICs and RIs in the ESFRI landscape of the biodiversity and ecosystem subdomain, LifeWatch ERIC was invited to lead a work package in a proposal on the development of the next generation of the **European Open Science Cloud (EOSC)** platform, **EOSC Future**. The proposal activity coordinated by LifeWatch ERIC in the EOSC Future proposal deals with the involvement of the scientific communities in EOSC towards the expansion of its services and the audience to use them. For this reason, two types of activities were employed in order to widen the use of EOSC services and content: (a) Scientific Projects (SPs) submitted by the Science Clusters; (b) Test Cases submitted by the broader scientific communities. LifeWatch ERIC achieved a balance between the participating **e-Infrastructures** and **Research Infrastructures (RIs)** and made sure that they understood each other's language: once again, a **cultural challenge**.

The above activities will be expanded as part of the scientific engagement of LifeWatch ERIC with Latin American and Caribbean Communities of practice through the projects **EU-LAC ResInfra** and **ALL-Ready** (The European Agroecology Living Lab and Research Infrastructure Network: Preparation phase).

> Technological Progress

Meeting the great challenges

The technical platform of LifeWatch ERIC, with its main components, **LifeBlock**, **Tesseract** (**the technical composability layer and VRE**), **Systematisation** of its **Resources** and **EcoPortal**, reached an overall **Technology Readiness Layer (TRL)** of **3** (Experimental proof of concept) in 2019 and evolved during 2020 to a **TRL** of **5** (Technology validated in relevant environment).

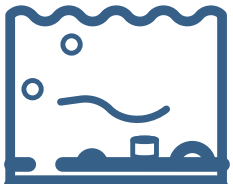
The support of the operation and upgrading at all possible levels of LifeWatch ERIC Research Infrastructure and scales of integration has been continued throughout the reporting period. ICT technical stuff operativity, as allocated to task-dedicated Working Groups during 2019, continued in 2020 and all issues have finally been addressed through this approach.

During 2020, there were significant advances on the coordination and management of distributed ICT e-Infrastructure construction and operations. Progress was achieved on the co-design and implementation of the procedures for: **resource integration** and **engagement**, the **composability layer** (metadata, e-Services), and **traceability** and **provenance** (including cybersecurity aspects).

The following paragraphs detail the net outcome of this approach.

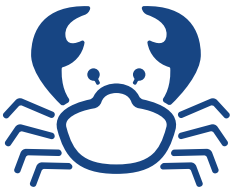
> Fully developed workflows (experimental stage)

ARMS Workflow



This **complex workflow** is a data chaining pipeline that uses both **community composition** and **community metabarcoding** data produced by a network of **Autonomous Reef Monitoring Structures (ARMS)** and it is developed in collaboration with **EMBRC ERIC**, in the context of the EU project **ASSEMBLE+**. The ARMS are placed in the vicinity of marine stations and **Long-term Ecological Research sites (LTER)** in order to assess the status of and changes in hard bottom communities of near-coastal environments, using both standard (conventional) community and metabarcoding (genetic) approaches. Therefore, this **workflow** includes two different **analytical pipelines**, the results of which can be compared to each other at the end. The scientists provided a complete step-by-step tutorial with a description of the inputs and outputs, the dependencies, and the codes, in each step of the ARMS **workflow**. They further provided a described mock-up.

Crustaceans Workflow



This **validation case** operates as an **analysis pipeline** for **isotopic** data aiming at predicting the **distribution of an invasive crustacean species**. A step-by-step tutorial has been provided, describing all input and output files and the rational for each analytical step. This **workflow** can be fully run manually with all input and output files provided, and relies on R scripts that have been provided for each step. A scientific paper is under development.

Metabarcoding Workflow

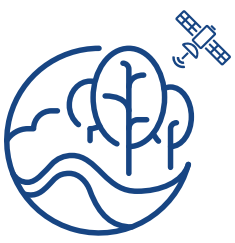
This **validation case** aims at developing an **analytical pipeline** to detect **NIS** in **freshwater** samples using **metabarcoding** techniques. The scientific team provided a standardised **workflow**, a step-by-step tutorial describing input and output files. R scripts were provided to run all the steps of the analysis.

> Workflows under development (experimental stage)

Ailanthus Workflow

This **complex validation case** focuses on providing and integrating **modelling** and **remote sensing techniques** to monitor and control the spread of the **invasive species *Ailanthus altissima***. The scientific team provided a complete step-by-step tutorial along with the **workflow** that operates in two modules. This work is building on a previous remote-sensing-oriented project, which is part of the H2020 project **EcoPotential**. This **workflow** relies partly on R scripts and partly on proprietary software (e.g. Ecognition Developer 8.7). All input and output files have been provided. A scientific paper on the results achieved in the **EcoPotential** project has been already submitted by the authors to Science Advances.

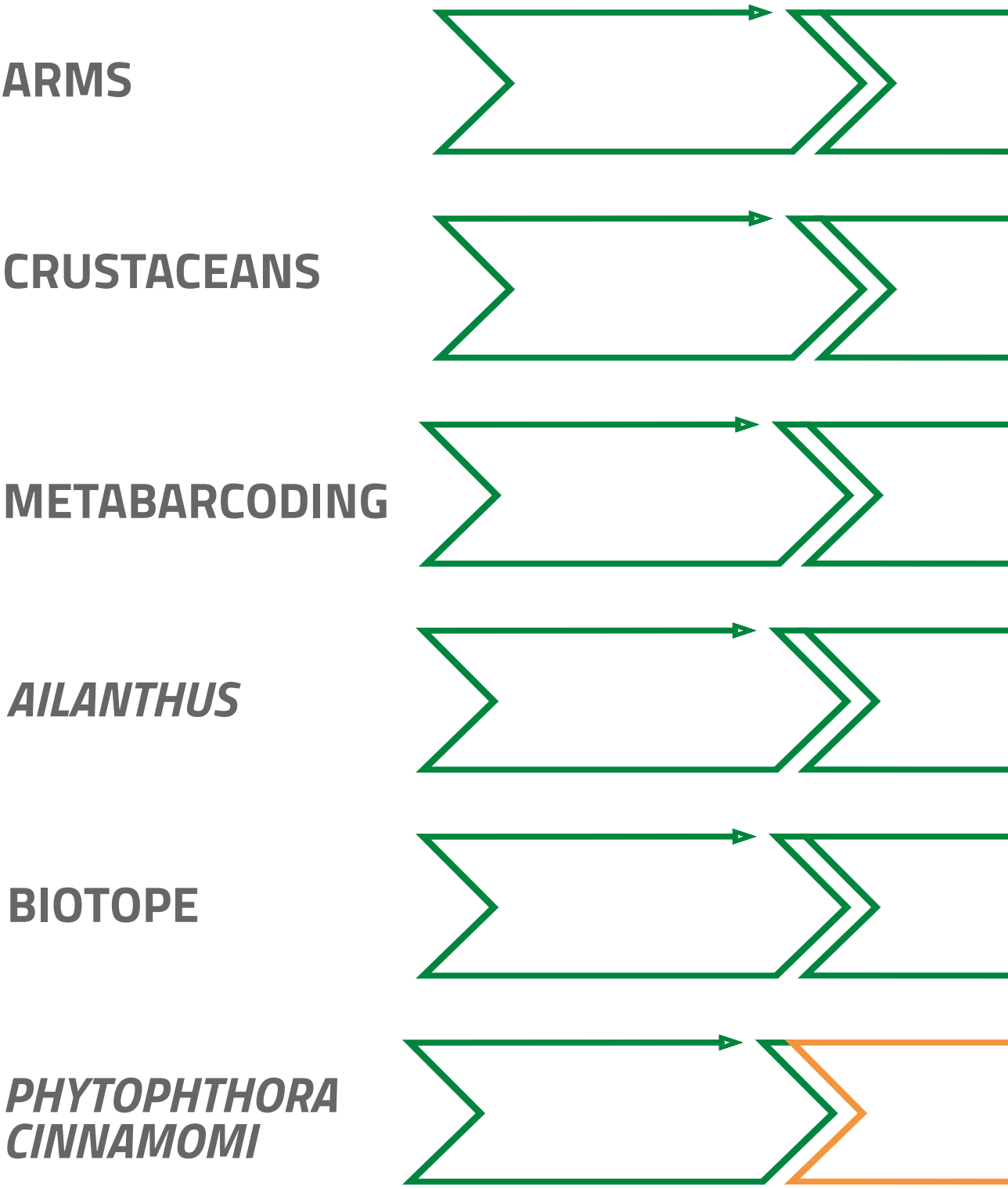
Biotope Workflow



This **European-wide validation case** aims at highlighting where the **incidence of invasive alien species** is the strongest and which areas (or habitats when possible) are the most vulnerable to the negative impacts of invasive alien species. A step-by-step tutorial has been provided for Belgium and Italy. Data from both local and remote resources can be retrieved through various means, such as **queries to remote/local databases**, or web service invocations. Currently, the species occurrence files are GBIF extractions with provided references. Scientists propose to have the study case fully operational according to the **workflow**, addressing scientific questions.

Phytophthora cinnamomi Workflow*

This **validation case** aims at understanding the **factors triggering mortality and health status** in **Mediterranean oak forests**. It is of utmost importance to ensure their sustainability and multifunctional character in the ecosystem. It will focus on Mediterranean agro-silvopastoral systems with open oak forests under the scope of **Ecosystem Services**. For this purpose, a working plan has been defined and approved. The working plan is composed of 4 WPs: Management and coordination; Data acquisition and monitoring in the Mediterranean oak forest; Mediterranean oak forest decline modelling; Ecosystem services.



*** The Macro-algae validation case was discarded for the intial deployment of the platform and replaced by the *Phytophthora cinnamomi* one.**

Table 1 - Overview of the stage of completion of the different scientific tasks per validation case at December 2020: Green = completed, light orange = partially completed, dark orange = not provided.

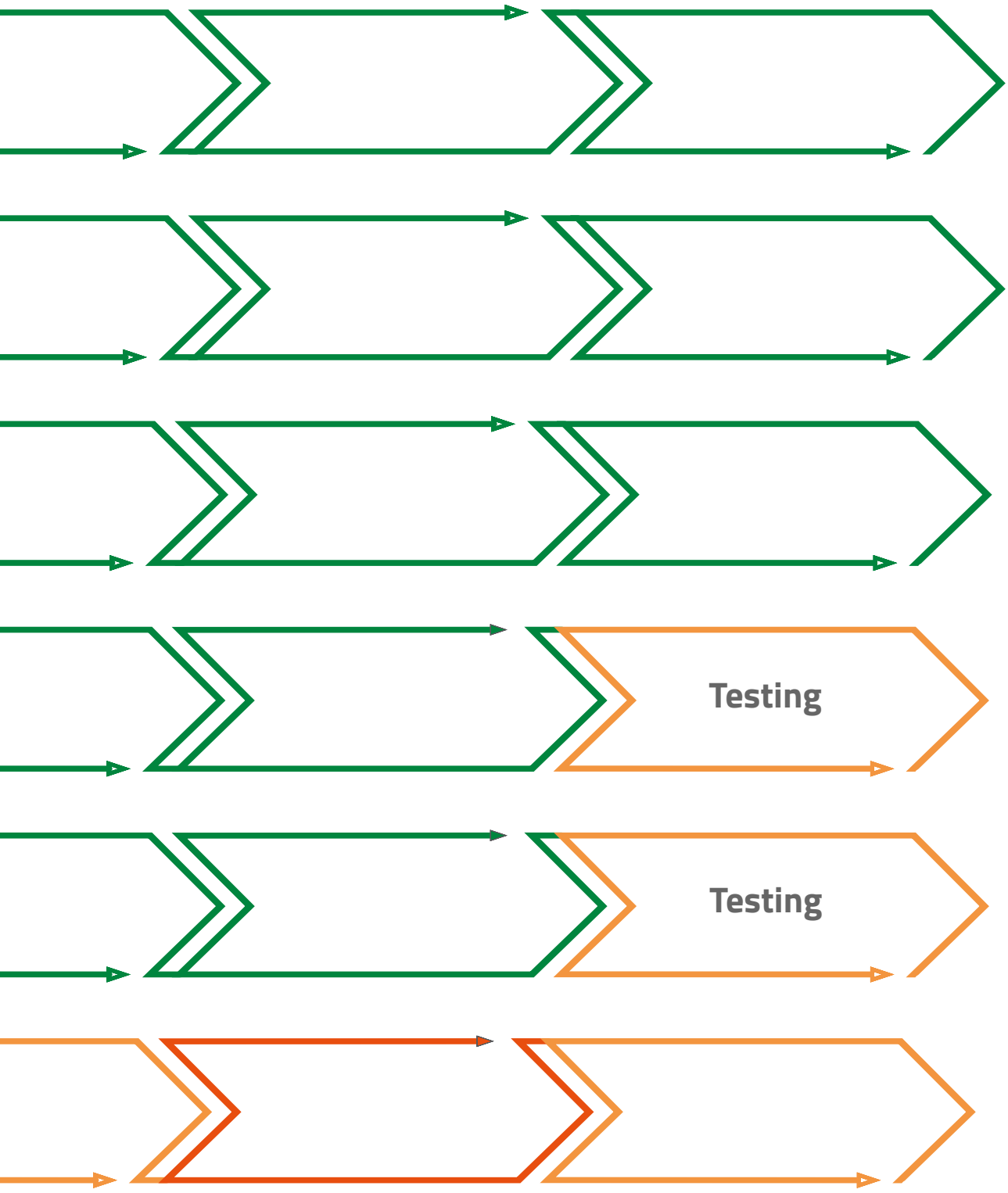


Photo by CSIC-LW.ES

Pine forest and dunes landscape in Doñana, Spain

> Operational Progress

Setting LifeWatch ERIC in motion

Key developments in the area of financial management:

- The 2019 audited Financial Statements were formally adopted through a written procedure along with the Annual Report on 15 July 2020.

- The SWP Budget for the 2020-2021 period was updated based on the latest developments and adopted by the 7th General Assembly (20 October 2020).

- The Financial Committee (FINCOM) was launched.

- The Financial Rules were adopted by the 7th General Assembly (20 October 2020).

- New accounting procedures were introduced, which will help ensure sound bookkeeping practices, the tracking of budgets and the production of project financial reports and the yearly financial statements.

- The first project (H2020) financial statements were submitted, covering the first reporting period of the ENVRI-FAIR and ERIC Forum projects (reporting period from 01 January 2019 to 30 June 2020).

Key administrative developments:

- The LifeWatch ERIC Statutes were amended in order to include Portugal as the 7th EU Member State joining the ERIC as a new Member.

- The Chief Financial Officer was hired in February 2020 to consolidate LifeWatch ERIC financial management capacity.

- The Scientific and Technical Advisory Board (STAB) was launched.

- The LifeWatch IJI Communication Strategy was adopted by the 6th General Assembly (26 May 2020).

- The Procurement Policy was adopted by the 7th General Assembly (20 October 2020).

- The Employment Policy was adopted by the 7th General Assembly (20 October 2020).

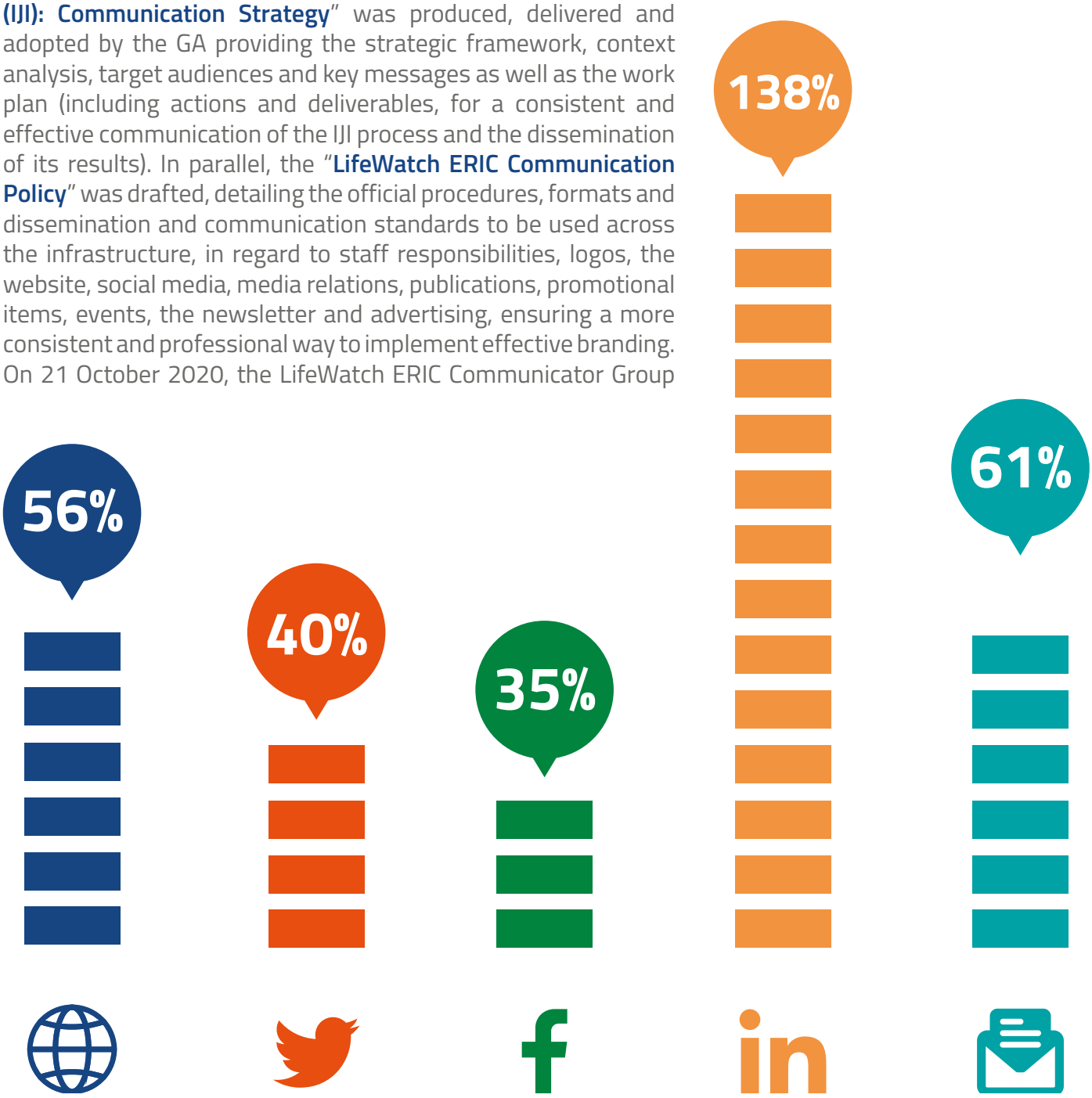
- The In-Kind Contribution Committee (IKCC) was launched and started the assessment of the in-kind contributions of the members.

> Dissemination & Outreach Progress

Approaching a broad audience

Dissemination and communication activities were divided into two main sections for the year 2020: 1) strategy and planning; and 2) implementation.

1) In the first section, the "**LifeWatch ERIC Internal Joint Initiative (IJI): Communication Strategy**" was produced, delivered and adopted by the GA providing the strategic framework, context analysis, target audiences and key messages as well as the work plan (including actions and deliverables, for a consistent and effective communication of the IJI process and the dissemination of its results). In parallel, the "**LifeWatch ERIC Communication Policy**" was drafted, detailing the official procedures, formats and dissemination and communication standards to be used across the infrastructure, in regard to staff responsibilities, logos, the website, social media, media relations, publications, promotional items, events, the newsletter and advertising, ensuring a more consistent and professional way to implement effective branding. On 21 October 2020, the LifeWatch ERIC Communicator Group



started an in-depth analysis and brainstorming on its stakeholders (**Operation Stakeholders**) resulting in the mapping and categorisation of seven major groups, segmentation within each group and assignment of priorities. This activity will be continued into 2021 to define the purpose of communication, key tools and messages for each group and the delineation of personae. Last but definitely not least, in the last quarter of the year, the Communication team started working on the new LifeWatch ERIC website, in particular on its graphical concept and organisation. The new website is expected to be released publicly in the course of 2021.

2) Implementation of communication activities will be presented under three different categories:

(a) The first relates to **engagement through events**, which suffered significantly from the restrictions related to the COVID-19 pandemic and the resultant cancellation of events, including those organised by LifeWatch ERIC, such as the **Biodiversity and Ecosystem e-Science (BEeS) Conference**, originally scheduled for 27-29 May 2020 in Ljubljana, Slovenia. The largest event of the year was the **Fifth World Conference on Marine Biodiversity**, with LifeWatch ERIC as one of its platinum sponsors. Moreover, LifeWatch ERIC participated with booths and demonstration sessions at the **9th EUROLAG Conference** (Venice, Italy) and **Transfiere 2020** (Málaga, Spain). Overall, however, LifeWatch ERIC reached, between physical and online meetings, **2,200** people over **96** hours of presence at booths and conferences.

(b) Secondly, a variety of communication materials were designed and produced over the year. The release of the new **motion graphic video** to represent the infrastructure, followed by work done with the national communicators, in which a set of **visual materials** was designed based on the national icon-maps and leaflets for the distributed centres, to improve the consistency of communication and the recognition of the LifeWatch brand at all levels.

(c) Finally, the online presence of LifeWatch ERIC showed a considerable improvement compared to the previous year, with **56%** more users on the **website** and **29%** more sessions opened. The same success was witnessed on the LifeWatch ERIC social media channels, with a **40%** growth in **Twitter** followers, **35%** on **Facebook** and **138%** on **LinkedIn**. A **61%** increase was observed on the **newsletters** delivered over the year, followed by an increase in subscribers of **26%**.

> Training Progress

Changing the game

Progress made in 2020 in terms of training can be analysed from three different perspectives: (a) the launch of the M.Sc. curriculum on e-Biodiversity and Ecosystem Sciences, (b) progress in terms of technological improvement of the platforms which provide and support the training activities, and (c) the training events jointly organised by ENVRI-FAIR and LifeWatch ERIC.

The training events organised within the ENVRI-FAIR project are:

▪ **M.Sc. e-Biodiversity and Ecosystem Sciences (EBES)**. In the academic year 2020-2021, LifeWatch ERIC entered into a strategic partnership with the University of Salento in order to create a new curriculum (120 ECTS) for the Master's degree in Coastal and Marine Biodiversity and Ecology, designed to provide trans-disciplinary knowledge and skill sets for a new generation of ecologists proficient in data science, modelling and eco-informatics. The course is entirely taught in English and will soon also offer a Joint Degree with the Ionian University in Corfu, Greece. Students will have the unique opportunity to carry out exchange periods abroad. Taking advantage of dedicated LifeWatch ERIC fellowships or those of the

ERASMUS+ programme, they will be welcomed into the LifeWatch ERIC Partner Institution Network, offered access to infrastructure facilities and Virtual Research Environments, and LifeWatch ERIC will also facilitate student access to other Research Infrastructures focusing on Biodiversity and Ecosystems or e-Science.

▪ **Terminologies for ENVRIs: why, what and how**, a training course held in-person in Dresden, Germany, on 5 February 2020 as part of ENVRI Week 2020. The course was aimed at data centre staff and provided a strong introduction into ontologies and how these can help "putting the I into FAIR". Participants became familiar with the key concepts of the Semantic Web and several knowledge representation techniques and saw different examples of ontology and vocabulary portals. Participants were given a quick overview of the improved user interface of the ENVRI-FAIR Training Catalogue filled with training resources and materials related to FAIR Data Principles and Research Data Management. Further information is available on the ENVRI-FAIR training catalogue and on the ENVRI training platform.

▪ **Towards ENVRI Community International Winter School DATA FAIRness**, a webinar series organised in preparation for the ENVRI Community International Summer School on Data FAIRness that, for two years, has been assembling in Lecce in the middle of summer. Due to the COVID-19 restrictions, the school was postponed to the beginning of 2021, and this delay created the opportunity to enrich the training offered, with a series of online webinars dedicated to data management, paving the way '*Towards the ENVRI Community Winter School*'. In particular, three webinars, jointly organised by ENVRI-FAIR and LifeWatch ERIC, were held from July to September 2020, with a focus on helping end users –particularly ENVRI-FAIR project partners and data centre staff– to make the best use of their data. The webinars introduced the main topics of the Winter School: an introduction to Cloud Computing, Workflow Orchestration and Execution and an Introduction to Jupyter. More information can be found on the ENVRI-FAIR Training Catalogue and on the ENVRI Training Platform.

▪ To support both remote and on-site training activities, LifeWatch ERIC managed and continuously improved the **LifeWatch ERIC Training Platform** on Moodle, which allows for the provision of user guidelines, tutorials, webinars, and other kinds of training resources in order to ensure user-friendly access to data, tools, services and Virtual Research Environments. In order to catalogue, integrate and index all the available training materials and therefore make the knowledge developed among the different research groups accessible, LifeWatch ERIC developed the LifeWatch ERIC Training Catalogue, which has been designed and developed according to the "reuse" perspective, including accurate and descriptive metadata for each training resource that allows the user to filter for the most appropriate and well-suited educational resources. The Training Platform and the Training Catalogue are integrated and interconnected. It is therefore possible to access LifeWatch ERIC training materials directly from the metadata record that is listed on the LifeWatch ERIC Training Catalogue (by means of a "Start the course" button).

> Dialogue with other ERICs, RIs and International Organisations

Defining our "trading zones"

In 2020, LifeWatch ERIC went on a marathon in order to develop dialogue with other ERICs, Research Infrastructures and International Organisations and Networks. The main activities carried out are summarised below in chronological order:

- Presentation of LifeWatch ERIC during the General Assembly of the **EUROMARINE Network** and interaction with its members (15-16 January 2020, Piran, Slovenia)

- Direct interaction with all ERICs during the **ERIC FORUM** Annual Assembly (5-6 February 2020, Brussels,

Belgium), including in parallel interactions with stakeholders from the European Parliament

- Active participation and interaction with ERICs and RIs working in the marine domain during the **EMSO ERIC** Workshop "*Preparing for UN Decade of Ocean Science*" (12-14 February 2020, Athens, Greece)

- Initiation of high-level talks between LifeWatch ERIC and **GBIF** executives (20 February 2020, Madrid, Spain)

- Continuation of the dialogue between LifeWatch ERIC and **EMBRC ERIC** in the framework of the **ASSEMBLE+** project (21 February, 7 April and 4 May 2020, online)

- Contribution of LifeWatch ERIC to the event of the Croatian Presidency on the **EU Green Deal** and the collaboration of **ESFRIs**: "*European Research Infrastructures for a smarter future*" (15 May 2020, online)

- Initiation of the dialogue between LifeWatch ERIC and the **Marine Biodiversity Observation Network** (**MBON, GEO**) (22 May 2020, online)

- Initiation of the dialogue between LifeWatch ERIC and **EuroBioImaging_GR** RI (28 May 2020, online)

- Continuation of the high-level talks between LifeWatch ERIC and **eLTER** executives (12, 22, 30 June 2020, online)

- Participation of LifeWatch ERIC in the **EMODnet Biology** annual meeting (12 September 2020, online)

- Organisation of the side event at the **United Nations General Assembly** (**UNGA**) **75** Anniversary: "*LifeWatch ERIC in support of the SDG 2030 accomplishment*" (28 September 2020, online)

- Participation of LifeWatch ERIC in the Second **ESFRI** RIs – EOSC Workshop: "*Research Infrastructures shaping EOSC: present and future*", as part of ENVRI-FAIR Science Cluster (6-7 October 2020, online)

- Participation of LifeWatch ERIC in the 7th **European Marine Board** (**EMB**) Forum: "*Big Data in Marine Science*" (23 October 2020, online)

- Participation of LifeWatch ERIC in the **EU-LAC RI Cooperation Workshop** "*Biodiversity and Climate Change*" (29 October 2020, online)

- Participation of LifeWatch ERIC in the **European Ocean Observing System** (**EOOS**) Operations Committee meeting (24 November 2020, online)

- Initiation of the dialogue between LifeWatch ERIC and **ELIXIR** (30 November 2020, online)

- Initiation of the dialogue between LifeWatch ERIC and **Catalogue of Life** (**CoL**) (2 December 2020, online)

- Participation of LifeWatch ERIC in the **International FAIR Convergence Symposium** 2020: CODATA - GO FAIR (4 December 2020, online)

- Participation of LifeWatch ERIC in the **EOSC Association** Constitutional General Assembly (17 December 2020, online)

> Projects

Embedding LifeWatch ERIC in the current landscape

This was a very important year for the involvement of LifeWatch ERIC not only in EU funded projects (see below), but also in the Consortia preparing proposals for various calls. The most important among them were **RiTrainPlus** (Research Infrastructure Training Plus), **DOORS** (Developing Optimal and Open Research Support for the Black Sea), **BiCIKL** (Biodiversity Community Integrated Knowledge Library) and **EOSC Future**. The last proposal was on the design and development of the next-generation EOSC platform, where LifeWatch ERIC has been tasked with the coordination of WP6, dealing with the engagement of scientific communities through cross-domain science projects.

ERIC FORUM Implementation project (ERIC FORUM)

This project brings together 20 established European Research Infrastructure Consortia (ERICs) and 3 ERICs still in the preparatory phase, to strengthen their coordination and enhance their collaboration. The strategic approach of the ERIC Forum will contribute to addressing critical challenges and developing best practices.

ResInfra EU-LAC

Towards a new EU-LAC partnership in Research Infrastructures (ResInfra EU-LAC), this project aims to promote collaboration among Research Infrastructures from the EU and countries from Latin America and the Caribbean.

ENVRI-FAIR

The overarching goal of the ENVRI-FAIR project is to connect the Environmental Research Infrastructure (ENVRI) community to the European Open Science Cloud (EOSC). Participating research infrastructures (RIs) of the environmental domain cover the subdomains of Atmosphere, Marine, Solid Earth and Biodiversity/ Ecosystems and thus address the Earth system in its full complexity. LifeWatch ERIC chairs the Biodiversity and Ecosystem subdomain WP and co-chairs the WP on Training.

ALL-Ready

The European Agroecology Living Lab and Research Infrastructure Network aims to strengthen European agroecological research and the innovation ecosystem.

> COVID-19 Pandemic Impact

Meeting the great challenges

Early in 2020, the COVID-19 pandemic broke out violently all over the European continent. The initial travelling restrictions and subsequent lockdowns replaced the **in-person working meetings**, such as Conferences, Workshops and project meetings, with virtual ones, in the form of **web conferences** and **online meetings**. Consequently, LifeWatch ERIC had to adapt its management and operation activities during these first waves of the COVID-19 pandemic.

LifeWatch ERIC has proved to be resilient and has developed adaptations which reflect the fact that it is a distributed and an e-Infrastructure:

- **95%** of the **management activity** has already been carried out online (e.g. administrative, financial, legal, etc.) in its **LwOS** (**LifeWatch ERIC Organisational System**) inter-communication and content management platform, based on the proprietary suite of the software **Zoho**.

- **99%** of the **operations** have been performed **online** (e.g. meetings, workshops, conferences, training, education).

- In the cases in which a **response to emergencies** was needed, a **workflow** was designed and implemented, which was initiated by incoming information in the form of phone calls, mobile app texting or email messages. This incoming information triggered an initial dialogue between the interested parties, which, in turn, resulted in setting up emergency meetings in the cases in which the initial dialogue was not sufficient to solve the emergency case. These meetings were held in specified GoToMeetings rooms, where response actions and/or online execution were performed (e.g. decision making, payments, signing and sealing of papers, etc.).

LifeWatch ERIC Organisational System (**LwOS**) proved to be an efficient and reliable platform for the online performance of the ERIC. The way it has been designed and developed showed many advantages, such as the fact that: (a) it provides a truly **collaborative environment** in which multiple actors can work at the same time on the same documents, designs, databases, projects, etc.; (b) it is a **secure platform**, accessed only by certified users; (c) it ensures **accuracy** in all operations by allowing certain actions through workflows tailored to the specific needs of the ERIC's online operations; (d) it provides **transparency** in all actions since every action by any of the actors is visible to all of them; (e) it provides **versioning** on its content so that the user can access its development at any time; (f) workflows are designed to offer

continuity to the operations of the ERIC, that is, they allow recent operations to be based on or to use the content of older ones.

In addition, LifeWatch ERIC was efficient in running its in-house flagship project, the **Internal Joint Initiative** (**IJI**) and allowing fast-track access for high priority research in the times of the COVID-19 pandemic. The **LwOS collaborative environment** allowed for the continuation of the tasks and interaction between the scientific community and ICT personnel, divided into **11 Working Groups** (e.g. WG-D) in order to develop the **workflows** needed for the testing of the primary hypotheses formed.

LifeWatch ERIC was also efficient in accelerating the diffusion of research results and data primarily through its website and its participation in virtual events, organised either in-house or by key players from all around the world.

Finally, LifeWatch ERIC effectively mobilised its **primary ingredients** (**FAIR data, reproducible analytics** and **mobilised communities**) towards the co-design and co-development of the virtual environment for the collaboration of ERICs and RIs:

- In the context of the EOSC Future proposal towards the design and development of an **EU platform for cross-domain research**

- Through its **collaboration with the Science Clusters**, such as ENVRI-FAIR, EOSC Life, SSHOC, PANOSC and ESCAPE

- By building on ERIC and RI commonalities, and by looking for **effective funding models** to promote the sustainability of their operation, in the context of the ERIC Forum project

- By looking for funding opportunities in order to develop its **trading zones** with ERICS and RIs through the calls of the **European Green Deal**, the lobbying for the design of the **Missions**, etc.

> Financial Statements

Setting LifeWatch ERIC in motion

The abridged balance sheet and profit and loss accounts as of December 2020 are available below.

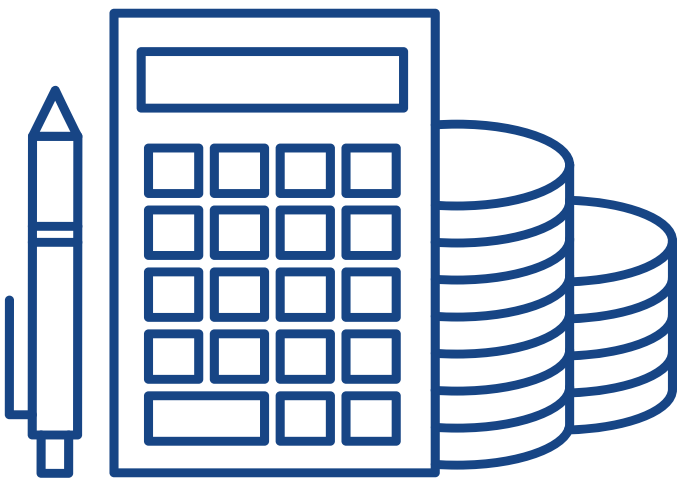
Abridged Balance Sheet as of 31 December 2020

Assets	2020	2019
Non-current assets	**51.120,56**	**58.621,36**
Intangible assets	555,07	13.859,96
Tangible assets	50.565,49	44.761,40
Current assets	**4.954.903,67**	**4.400.312,89**
Inventories	**237.676,25**	**-**
Advance to suppliers	237.676,25	-
Accounts receivable	**435.035,49**	**351.003,00**
Users and others accounts receivables for the Association's own activity	351.504,00	351.003,00
Other receivables	83.531,49	-
Current investments	**270,19**	**244,19**
Prepayments for current assets	**97.830,71**	**5.773,08**
Cash and cash equivalents	**4.184.091,03**	**4.043.292,62**
Total Assets	**5.006.024,23**	**4.458.934,25**

Equity & Liabilities	2020	2019
Equity	**3.731.702,39**	**3.862.445,16**
Profit/(Losses) from previous years and other	3.739.570,04	2.833.710,74
Profit/(loss) for the period	(7.867,65)	1.028.734,42
Total equity	**3.731.702,39**	**3.862.445,16**
Non current liabilities	**1.076.381,71**	**508.012,09**
Provisions	33.166,27	-
Other long-term debts	1.043.215,44	508.012,09
Current liabilities	**197.940,12**	**88.477,00**
Trade and other payables	197.940,12	88.477,00
Other trade payables	105.161,16	19.568,36
Personnel (salaries payable)	6.388,68	2.840,25
Accounts payable to Public Administrations	86.390,28	66.068,39
Total Equity & Liabilities	**5.006.024,23**	**4.458.934,25**

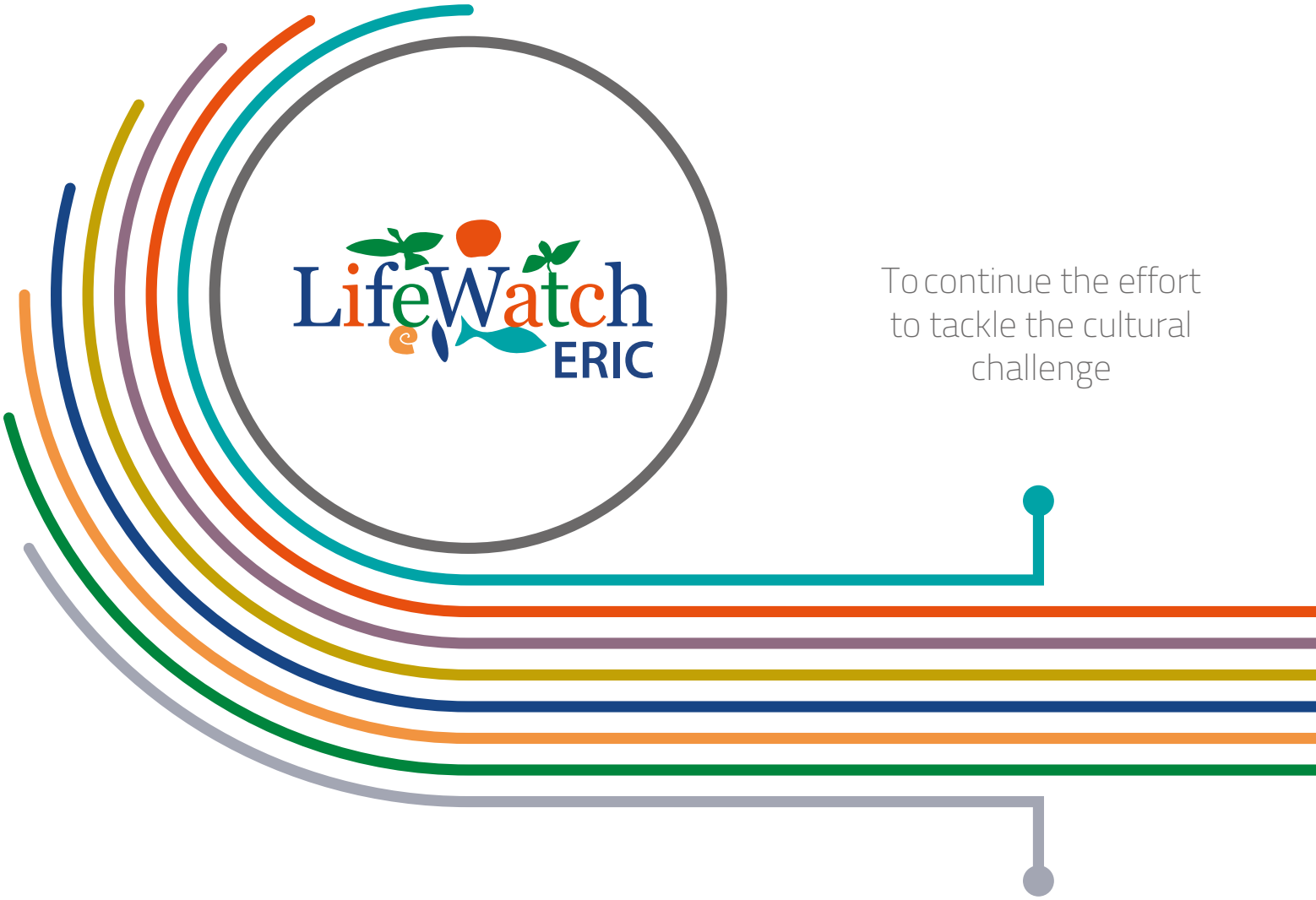
Abridged Profit and Loss Account as of 31 December 2020

Operating Profit/(loss)	2020	2019
Association's own activity income	2.256.648,13	2.411.313,33
Operating grants taken to income	2.256.648,13	2.411.313,33
Operating expenses	(1.263.824,70)	(1.380.714,72)
Personnel expenses	(1.200.062,92)	(865.440,03)
Depreciation and amortisation	(34.441,18)	(22.968,08)
Other operating expenses	(1.029.320,60)	(492.306,61)
Other results	(197,76)	(1.864,19)
Operating Profit/(loss)	**(7.374,34)**	**1.028.734,42**
Finance income	3,35	-
Finance costs	(496,66)	-
Net Finance Cost	**(493,31)**	**-**
Consolidated Profit/(loss) before taxes	**(7.867,65)**	**1.028.734,42**
Income tax	-	-
Profit/(loss) for the period	**(7.867,65)**	**1.028.734,42**



> LifeWatch ERIC Looking Ahead

Meeting the great challenges



To continue the effort to tackle the cultural challenge

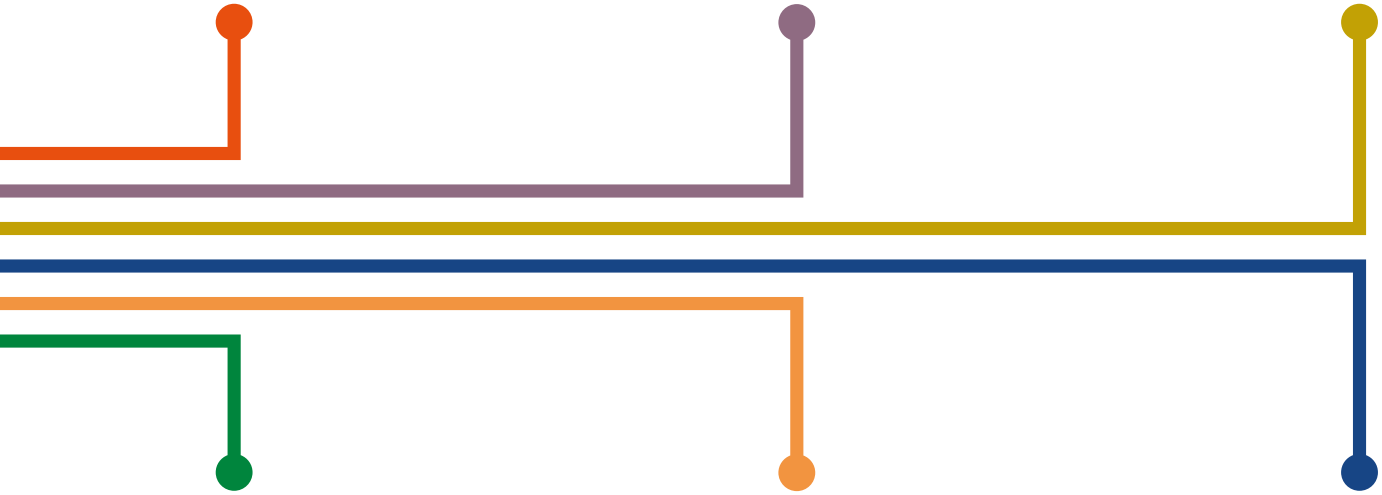
To enhance LifeWatch ERIC's position inside the current European and international landscape

The next steps to take in order for LifeWatch ERIC to complete its first five-year implementation period and for the collaborative environment it offers to achieve a **Technology Readiness Layer** (**TRL**) of **7** (System prototype demonstration in operational environment) are:

To complete the activities of the Internal Joint Initiative (IJI)

To deliver the scientific products of the IJI

To release the operating version of its collaborative environment and its principal components, LifeBlock, Tesseract (technical composability layer and VRE), Systematisation of its Resources and Ecoportal, **online**



To expand dialogue and foster collaboration with ERICs, RIs, International Organisations and Networks, and Stakeholders

To expand LifeWatch ERIC Partnership

To initiate the preparations for the next five-year implementation period

Photo by Thanos Dailianis, HCMR - LifeWatch Greece

Extended formation of the sponge *Aplysina aerophoba* along a typical shallow rocky coast of the North Aegean Sea, Greece

> Acknowledgements

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

LifeWatch ERIC

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This report was approved by the LifeWatch ERIC General Assembly in August 2021 and is available on the LifeWatch ERIC website in the Documents section **www.lifewatch.eu/documents**.

LifeWatch ERIC


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