**e-Infrastructure for Biodiversity and Ecosystem Research**
**LifeWatch**

| | |
|---|---|
| **Scientific area:** | Life Sciences (Biodiversity) |
| **Host country:** | Spain |
| **Infarstrcture type:** | Distributed |
| **Dutch node or similar:** | LifeWatch Netherlands |
| **Legal entity** | ERIC |
| **Established:** | 2017 |
| **The Netherlands member since:** | 2017 |
| **Phase:** | Operational |

**Duration of agreement**
Ongoing

**Terms of withdrawal**
Any new member of LifeWatch ERIC may not withdraw for at least for the remaining time of the five-year period in force in the moment of its accession. A member may withdraw at the end of the third year of a five-year period if it gives notice of its intention to withdraw before the end of the second year of the five-year period

**Access to facilities**
On application

**Access to data**
Open access unless otherwise agree with owner of data

**User definition**
As user we mean the total users of the LifeWatch ERIC website.

**Description**
LifeWatch ERIC seeks to address the global factors (climate, demographic pressure, pollution, soil consumption, etc.) responsible for ongoing loss of biological diversity and ecosystem functioning, which have a direct impact on the well-being and development of today's society. LifeWatch aims to provide information and services for the biodiversity research community by offering opportunities for large-scale scientific development, enabling accelerated data capture with innovative new technologies, supporting knowledge-based decision-making for biodiversity and ecosystem management, and providing training, dissemination and awareness programmes. LifeWatch consists of eight member states that operate from national nodes. Three common facilities exist in Spain, Italy and the Netherlands.

**Financial details**
**Mean Dutch membership over 5 year period (k€):**           2072*
**Mean Dutch share of contribution over 5 year period (%):**   14,33
*Contribution may be provided in cash or in kind, as long as 15% of the total contribution is provided in cash. Numbers provided refer to the sum of the agreed upon in cash and in kind contributions.*

| Year | NL membership (k€) | NL Contribution (% of total*) | Total membership (k€) | Total expenditure (k€) | Turn-over (k€) |
|---|---|---|---|---|---|
| *2017* | *2072* | *14.3* | *14461* | *0* | *1521* |
| *2018* | *2072* | *14.3* | *14461* | *433* | *1736* |
| *2019* | *2072* | *14.3* | *14461* | *1381* | *2072* |
| *2020* | *2072* | *14.3* | *14461* | *1264* | *2072* |

**Employee statistics**

| | Female | Male | Other | Total |
|---|---|---|---|---|
| **Total*** | 10 | 20 | | 30 |
| **Of which Dutch**** | 1 | 3 | | 4 |

*(2019, FTE – Full Time Equivalents)*
*\*This personnel numbers refers only to those working on the core business of LifeWatch ERIC, not those working exclusively in the funded projects.\*\*Numbers are for 2021. In 2019 LifeWatch Netherlands was not operational yet.*

**Use of the infrastructure**
**User information**

| Year | Number of users | | Dutch share of users |
|---|---|---|---|
| | **NL** | **Other Countries** | |
| ***2016*** | n/a | n/a | n/a |
| ***2017*** | n/a | n/a | n/a |
| ***2018*** | 217 | 3861 | 3.2 |
| ***2019*** | 471 | 15013 | 3.0 |

**Type of users**
n/a

*Comments by the RI*
The LifeWatch ERIC website tracks users as from March 2018.
Factors affecting number of users: The main factor affecting the total number of users is that LifeWatch ERIC was established in March 2017 and in the reporting period was in a start-up phase.

**Application information**
n/a

*Comments by the RI*
LifeWatch ERIC is a virtual research infrastructure that applies open access policy.

**Sample request information**
n/a

*Comments by the RI*
LifeWatch ERIC is a virtual research infrastructure that does not provide access to physical samples.

**Data request information**
*n/a*

*Comments by the RI*
The LifeWatch ERIC Metadata Catalogue was published in early 2020. LifeWatch Netherlands was not operational yet in 2019, providing data sets is not a key task of LifeWatch Netherlands.

**Contributions provided by organisations or companies in the participating countries**
*n/a*

ERIC established in 2017. Annual breakdown not available as In-kind contributions for the 2017-21 period are being assessed and approved as a package for the whole 2017-2021 period. As of 31.12.2021 a total of €22,208,000.00 have been approved as in-kind contributions for the construction of the RI for the 2017-2021 period for 5 out of 7 members. In-kind contribution reports of the 2 remaining members are currently being assessed by the In-Kind Contribution Committee (IKCC). In kind contributions to LifeWatch were established and reported to the General Assembly. For The Netherlands this amounted to around 9M euro, but difficult to specify in much more detail.

**Total sum spent on other deliveries such as equipment, services and consumables**
n/a

**Dutch percentage out of total sum spent on other deliveries such as equipment, services and consumables**:
n/a

**Comments RI (2020):** No purchase in 2017. During the year 2018 and 2019 main additions correspond to diverse furniture and Information Technology Equipment. LifeWatch Netherlands was not operational in the mentioned years.

**Income from user fees**
n/a

*Comments by the RI*
LifeWatch ERIC does not charge on use because all of its resources and products are paid by tax payers in the participating countries.

**Additional questions to the RI**
**What is the Dutch contribution to the RI?**
The Dutch in-kind contributions to LifeWatch amounted to around 9M euro, coming mainly from project activities at the University of Amsterdam, infrastructure support by SURF and the e-Science Center. This has all been reported to the LifeWatch In Kind Contributions Committee.

**Currently, are there any RI´s that provide similar kinds of research infrastructure and services as yours in the world?**
Biodiversity and ecology are two disciplines which include all the levels of the biological organization, that is, from genes to ecosystems and scales of observations, such as from local to global, functional etc. Therefore, there is no way that a single Research Infrastructure can offer all the services services that needed for the in vivo, in vitro and in silico data collection, management, analysis, interpretation of results into knowledge and communication and dissemination of the results. There are specific Infrastructures, such as the global aggregators (GBIF) which provide data primarily at the species level, ELIXIR which provides data and services primarily on the molecular (genetic) level, DiSCCo which provides data on the collections speciments, EMODnet, which provides data on marine species and habitats, eLTER which provides long-term data and some services on mostly terrestrial data, etc. Part of LifeWatch ERIC is OBIS (Ocean Biogeographic Information System), which is also global and offers species distribution and abundance data. LifeWatch ERIC provides FAIR (by 95%) data and reproducible analytical services to all levels of the biological organization.

**What are the overlaps and what are the main differences? To which extent do you cooperate or compete?**
LifeWatch ERIC is systematically building on the collaborative interfaces of all the similar and also some different Infrastructures. It has a strategy how to proceed on this kind of interfaces and work on them to both or multiple Research Infrastructures can all benefit from them. We call these collaborative zones as trading zones. Therefore, LifeWatch ERIC chooses on mutual collaboration and not on competition. This has became a very interesting exercise in the case of the project EOSC Future, where LifeWatch not only collaborates with RIs from the same Science Cluster but also from different ones that is from different domains. In addition, LifeWatch ERIC has

already showed proof of concept of its research products being used by many disciplines, such as the virtual laboratory on the micro-CT, which has been used by biologists, natural scientists, veterinarians, researchers from the material science and, more recently, by cardiologists.

Finally, LifeWatch ERIC has created its own horizontal composability layer with unique services, such as the Tesseract (which includes Jupyter Notebooks, and NaaVRE technology for operating VRE's in the cloud, developed by LifeWatch in collaboration with the University of Amsterdam) and LifeBlock (based on blockchain technology). These are research services which for the time being have no competitors in other Research Infrastructures. They both secure the use of multiple research products (e.g. data, services) in any possible combination and also the adequate monitoring of their usage and attribution to their owners. This way, LifeWatch ERIC is able to provide an Infrastructure which follows all the levels of the scientific process, that is from the conception and formulation of a hypothesis to the testing to the data and their interpretation into knowledge. Another unique attribute these technologies bring is that the main approach LW ERIC adopted right from the start of its first implementation period: a systemic solution, which means to provide technologies which unite all the components developed at national level. This means that each of the components of its Infrastructure would benefit from the attributes of the technologies provided and also that they would become part of the broader LW ERIC Infrastructure. This systemic solution is indicative of the holistic approach LW ERIC implements to solve technological and scientific issues and it brings a breakthrough change when compared to the piecemeal approach followed by several key players in the landscape. Their practice so far developed and followed has been to respond to the demands of their communities by delivering one piece of software at a time, depending on their problems and needs. This practice has led to the adoption of the patchwork solution which practically means that the components of an Infrastructure are not organically linked to each other and therefore they cannot form any type of workflow. An indicative attribute of this approach is the fact that the components in many RIs are provided to the user only one at a time, that is, the user can use only one component, then the next and so on. Also, each of these components have their own specifications and application rules.

LW ERIC brings an innovative solution on the above issue, that is, its integration services (e.g., Tesseract and its VRE building platform (including Jupyter Notebooks/NaaVRE), LifeBlock, Ecoportal) are capable of connecting and integrating both the content and services developed by the national operators. The latter means that both content and services can be used individually but they can be also be used in combination, in any doable way subject to the principle that the output of one service can be used as an input from the subsequent one and so on. Another important advantage of this technology is that the resources created by the investment of the member countries and which make part of the LW ERIC Infrastructure are continuously under upgrading and therefore their value increases with time. The option to be used in combination with others provides them with the potential to attract more users than they currently do. An additional advantage of LW ERIC infrastructure is that the services (software) it develops are discipline and domain agnostic and therefore may be used by multiple disciplines and domains. This means that both the content and services defined by LW ERIC can benefit additional users from multiple disciplines and domains. Therefore, this accessibility clearly provides added value to the content and services developed at the national scale. By following the holistic approach, the LW ERIC Infrastructure has been developed to offer unique attributes, such as:

- Access to multiple data and service resources in one click, for example access to biological and environmental data at the same time;
- Provision of workflows dedicated to specific lines of research with customised data and services;
- Enabling the user to develop her/his own workflow, depending on the working hypotheses and the content and services available, on the fly;
- Serving the individual researchers or their communities from multiple disciplines (/domains) by providing multiple workflows that can test the same hypothesis in parallel and then compare the results.

The above attributes have already brought important implications to the way scientific research is being pursued, which will be further enhanced in the next implementation period. The most serious implications are that LW ERIC contributes to:

- The application and further development of disruptive technology which takes the transparency and repeatability of doing research to a much higher level than it is currently at;
- Promotion of multi-disciplinary and cross-domain research, which brings down the existing barriers between them and encourages the communities to work on the same collaborative environment;
- Collaboration with EOSC next-generation e-Infrastructure.

All of the above contributes to synthetic knowledge, that is, testing the same hypothesis with content and services from a plethora of disciplines/domains and comparing the results to achieve a knowledge basis much broader than it is today. This way the new scientific knowledge will have a much stronger convincing power.

Finally, the above implications assist the current ERICs, RIs and international organizations to find their trading zones and to invest together with them to further scientific and technological innovation. This approach will continue from the mapping exercise already in progress with many of the ERICs and RIs towards the development of common and inter-dependent resources (hardware, data, services, common projects, etc.). These attributes bring another, equally important, implication for LW ERIC: they provide the potential for the Infrastructure to act as a marketplace for both content and services on biodiversity and ecosystem research. This will have the potential to attract major actors in the public, private sector and the industry to join and invest in common with LW ERIC.

**What are the RI's major educational and outreach acticities?**

Data are available as from 2019:

- 5 events organised by the RI with a total number of 946 participants (1 international summer school);
- 7 events organised by other organisations to which LifeWatch ERIC participated with an outreach of 18,967 persons.