



# Juan Miguel González-Aranda

Responsable técnico del desarrollo de LifeWatch ERIC

# Cambio Climático, servicios ecosistémicos y TIC disruptivas

Salón de Actos, Edificio Biblioteca de Ciencias. Universidad de Navarra.

**Pamplona-Iruña, 12 noviembre 2021**



# Hilo argumental

**PARTE I.** Una aproximación al paradigma de Servicios Ecosistémicos en un contexto de Cambio Climático

**PARTE II.** e-Infraestructuras Distribuídas de Investigación paneuropeas para fortalecer las comunidades científicas, tecnológicas y de innovación

**PARTE III.** “Let’s be FAIR”: Abordando los desafíos de heterogeneidad y factores de escala en la e-Biodiversidad y provisión sostenible de Servicios Ecosistémicos mediante el uso de TIC disruptivas

**PARTE IV.** Tesseract VRE y LifeBlock

**PARTE V.** Algunas Conclusiones

# **PARTE I. Una aproximación al paradigma de Servicios Ecosistémicos en un contexto de Cambio Climático**



# OBJETIVOS DE DESARROLLO SOSTENIBLE



**Objetivo 15:** Gestionar sosteniblemente los bosques, luchar contra la desertificación, detener e invertir la degradación de las tierras y detener la pérdida de **biodiversidad**

## CRECIMIENTO SOSTENIBLE:



*doing what IPCC did for Climate Change for biodiversity*

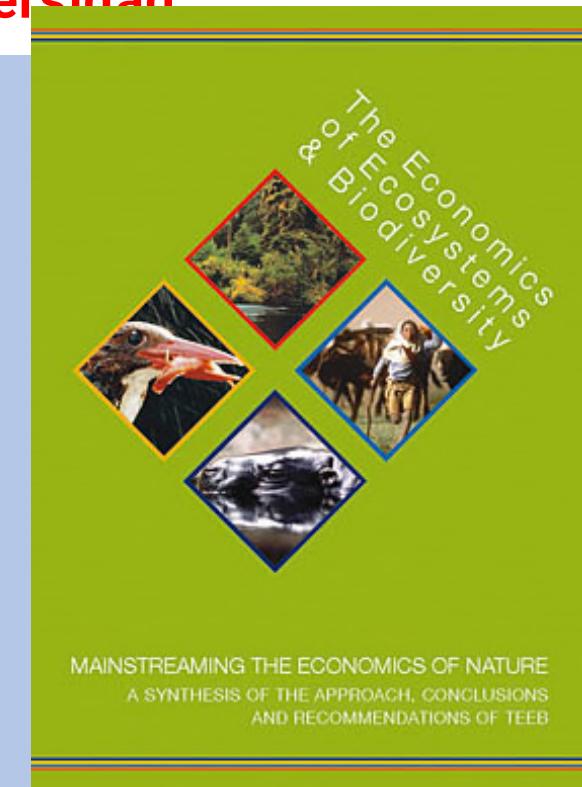
Nagoya – 2010 – CBD targets

The mission of the Strategic Plan is to “take effective and urgent action to **halt the loss of biodiversity** in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, ...”

Se necesita  
**ENTENDER:**

- Los límites/umbrales críticos medioambientales y **“resiliencia”** de los ecosistemas

**Relación entre  
BIODIVERSIDAD &  
SERVICIOS  
ECOSISTÉMICOS  
ESENCIALES**



## Los ecosistemas proporcionan cuatro tipos de servicios al mundo:



Servicios de abastecimiento son los **beneficios materiales** que las personas obtienen de los ecosistemas, por ejemplo, el suministro de alimentos, agua, fibras, madera y combustibles.



Servicios de regulación son los beneficios obtenidos de la regulación de los procesos ecosistémicos, por ejemplo, la regulación de la **calidad del aire** y la **fertilidad** de los suelos, el control de las inundaciones y las enfermedades y la polinización de los cultivos.



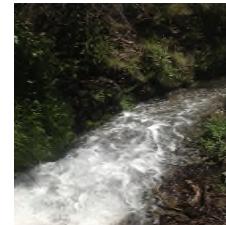
Servicios de apoyo son necesarios para la producción de todos los demás servicios ecosistémicos, por ejemplo, ofreciendo espacios en los que viven las plantas y los animales, permitiendo la diversidad de especies y manteniendo la diversidad genética.



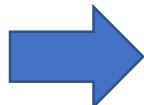
Servicios culturales son los **beneficios inmateriales** que las personas obtienen de los ecosistemas, por ejemplo, la fuente de inspiración para las manifestaciones estéticas y las obras de ingeniería, la identidad cultural y el bienestar espiritual.



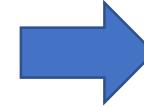
Biodiversidad y procesos ecológicos



**FUNCIONES**  
ecosistémicas

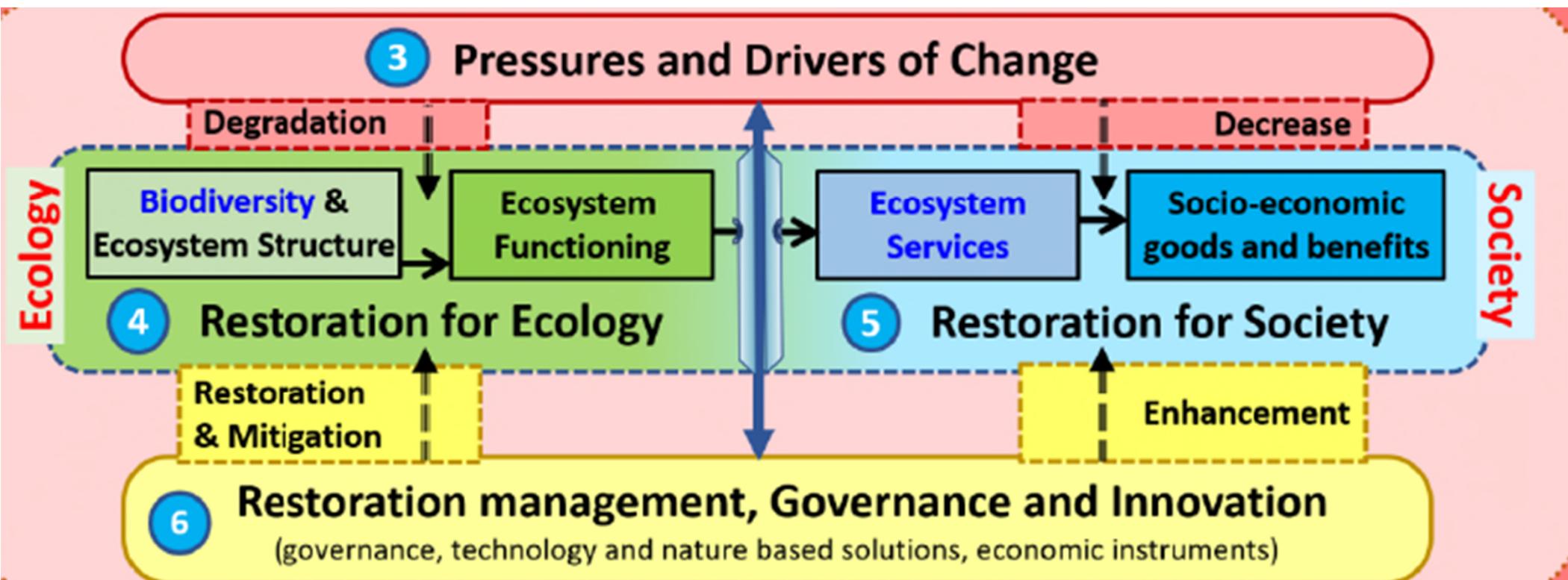


**SERVICIOS**  
ecosistémicos



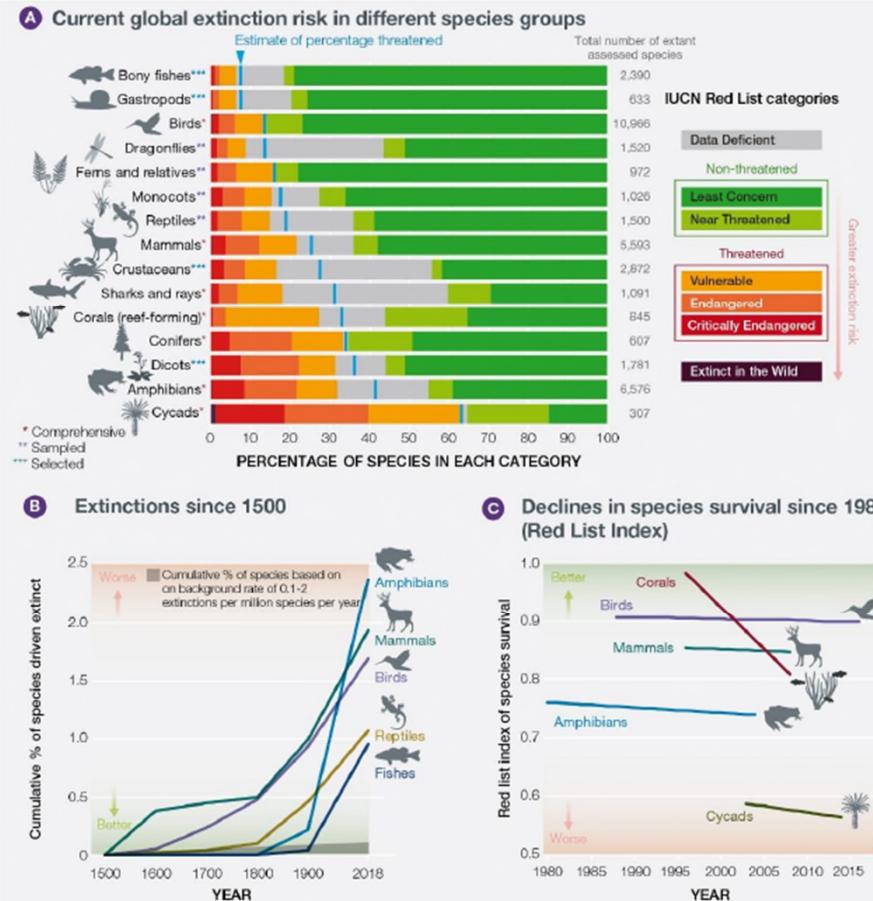
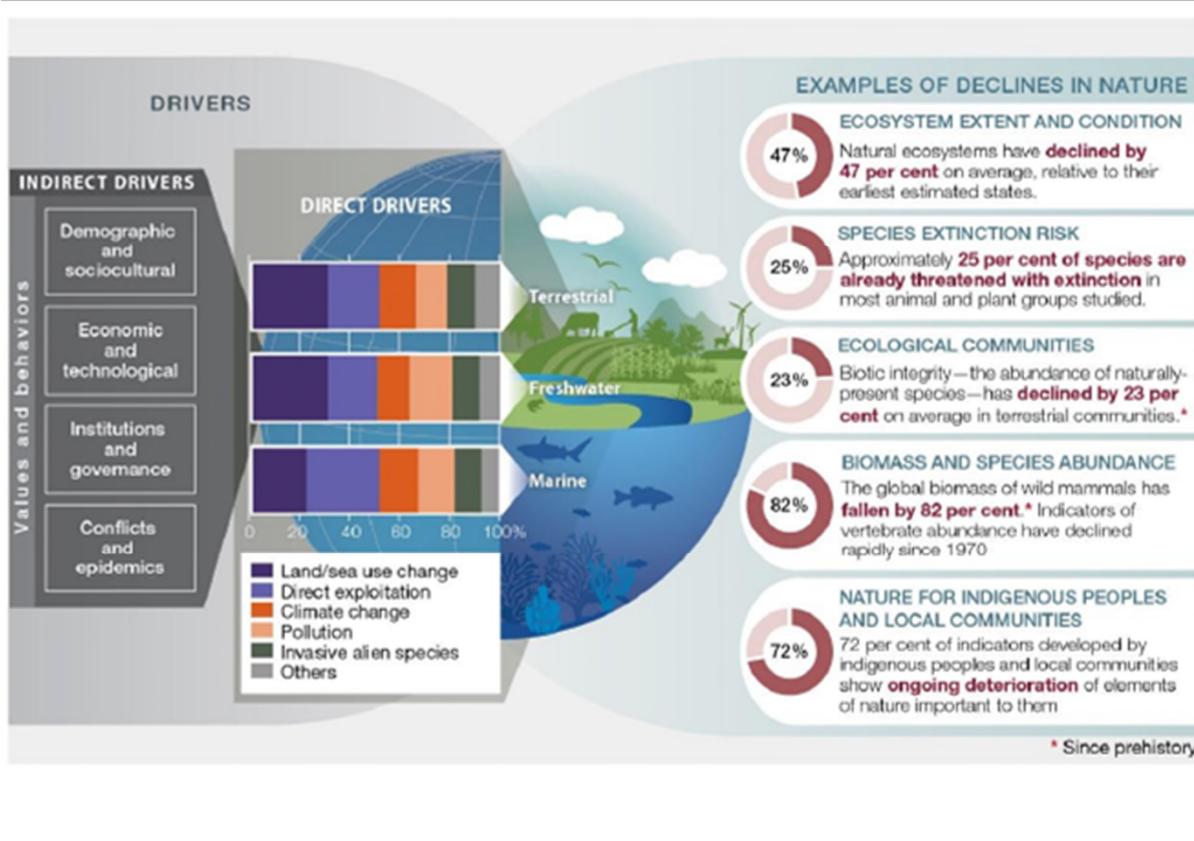
**BENEFICIOS** para los humanos

# Biodiversidad y Servicios Ecosistémicos: Marco Científico

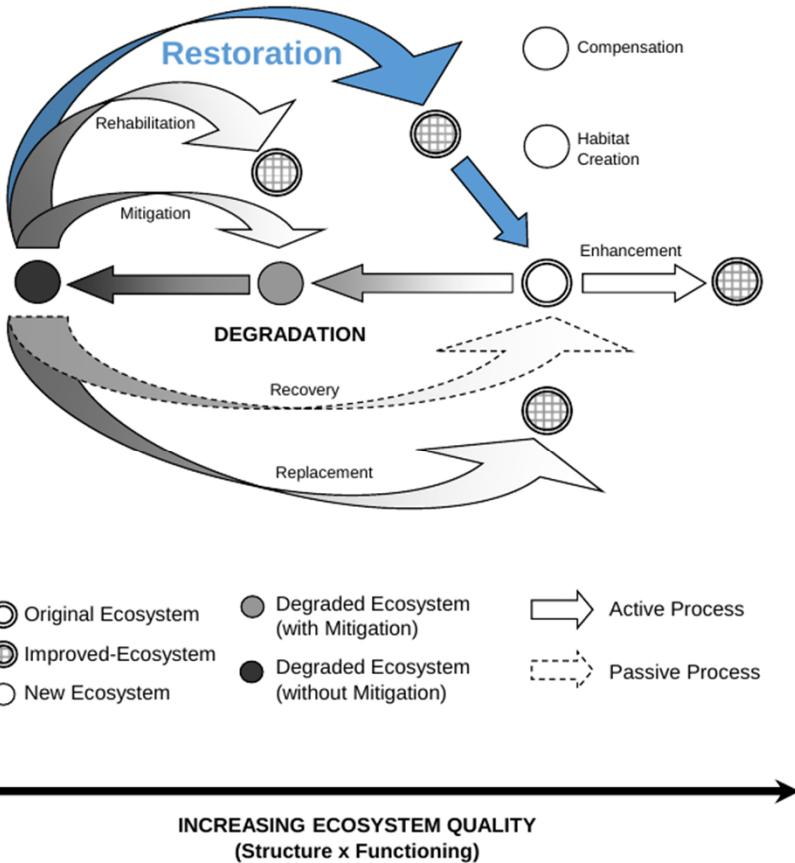


# ¿ Hacia la sexta gran extinción ?

IPBES/7/10/Add.1



# Biodiversidad y Servicios Ecosistémicos: Marco Científico



## Box 2.1. The OECD Well-being Framework

The main features of the OECD Well-being Framework are that it:

- Focuses on people, rather than on the economic system;
- Concentrates on outcomes, rather than inputs and outputs;
- Looks at the distribution of well-being across a population, rather than only country-averages;
- Considers both objective and subjective aspects of well-being; and
- Considers sustainability from a cross-cutting perspective, to assess how humanity's imprint today on a range of assets will impact well-being in the future.



Source: OECD (2020[6]) How's Life? 2020 <https://dx.doi.org/10.1787/9870c393-en>.

Figure 1.3: Active and passive responses to ecosystem degradation (from Elliott et al., 2007)

# Biodiversidad y Servicios Ecosistémicos: Marco Político

## Estrategia de la UE sobre Biodiversidad para 2030

### **EU Nature Restoration Plan: key commitments by 2030**

1. Legally binding EU nature restoration targets to be proposed in 2021, subject to an impact assessment. By 2030, significant areas of degraded and carbon-rich ecosystems are restored; habitats and species show no deterioration in conservation trends and status; and at least 30% reach favourable conservation status or at least show a positive trend.
2. The decline in pollinators is reversed.
3. The risk and use of chemical pesticides is reduced by 50% and the use of more hazardous pesticides is reduced by 50%.
4. At least 10% of agricultural area is under high-diversity landscape features.
5. At least 25% of agricultural land is under organic farming management, and the uptake of agro-ecological practices is significantly increased.
6. Three billion new trees are planted in the EU, in full respect of ecological principles.
7. Significant progress has been made in the remediation of contaminated soil sites.
8. At least 25,000 km of free-flowing rivers are restored.
9. There is a 50% reduction in the number of Red List species threatened by invasive alien species.
10. The losses of nutrients from fertilisers are reduced by 50%, resulting in the reduction of the use of fertilisers by at least 20%.
11. Cities with at least 20,000 inhabitants have an ambitious Urban Greening Plan.
12. No chemical pesticides are used in sensitive areas such as EU urban green areas.
13. The negative impacts on sensitive species and habitats, including on the seabed through fishing and extraction activities, are substantially reduced to achieve good environmental status.
14. The by-catch of species is eliminated or reduced to a level that allows species recovery and conservation.

## Pacto Verde de la UE y Biodiversidad



Ecosystems provide food, fresh water, clean air, and shelter. They mitigate natural disasters, pests and diseases and help regulate the climate.

- The Commission will present a **Biodiversity Strategy** by March 2020 
- The EU will work towards an ambitious new global framework to protect biodiversity at the UN Biodiversity Conference in October 2020. 
- The Commission will make proposals to **green European cities** and increase biodiversity in urban spaces. 
- The **farm to fork strategy** will work to reduce the use of pesticides and fertilisers in agriculture. 

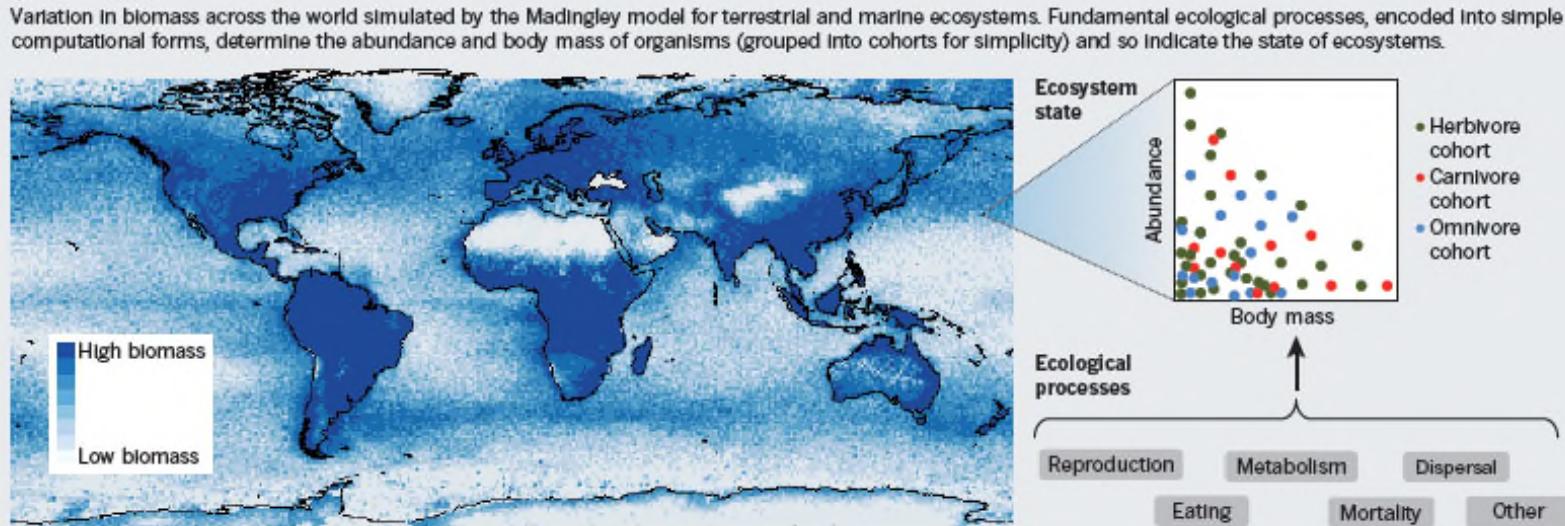
# Biodiversidad y Servicios Ecosistémicos en un escenario de Clima cambiante

*Necesidad de construir una base de conocimiento sobre la estructura futura de las funciones y provisión sostenible de servicios ecosistémicos*

## Time to model all life on Earth

### MODEL LIFE

To help transform our understanding of the biosphere, ecologists – like climate scientists – should simulate whole ecosystems, argue **Drew Purves** and colleagues.



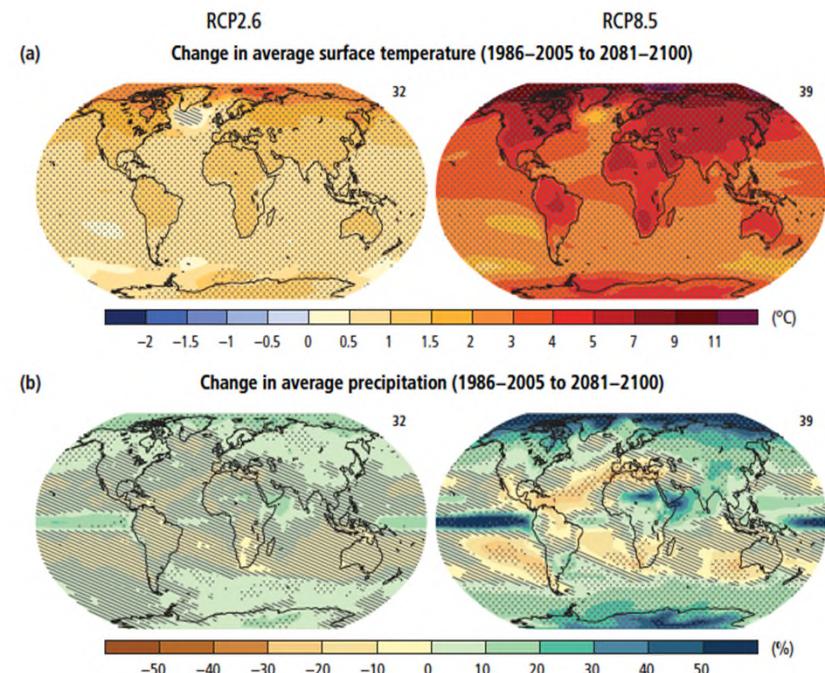
# Servicios Ecosistémicos y Biodiversidad en un escenario de clima cambiante

**Estructura, funcionamiento y prestación de servicios ecosistémicos:**

*Respuesta de ecosistemas y biodiversidad ante los cambios de nicho a nivel global:*

- 1. El área de distribución de ecosistemas y especies está cambiando.*
- 2. La respuesta de las especies ante el cambio climático afecta el equilibrio ecológico de los ecosistemas.*

*Crear conocimiento de la respuesta del metabolismo individual e implicaciones en la distribución global de biomasa en la biosfera y prestación de servicios.*



# Servicios Ecosistémicos y Biodiversidad en un escenario de Clima cambiante

Estructura, funcionamiento y prestación de servicios ecosistémicos en el futuro:

*Respuesta de los ecosistemas y biodiversidad  
ante los cambios de nicho a nivel global:*

**1. Taxonomía de los ecosistemas.**

**2. Dimensiones de los ecosistemas y especies**

SCIENTIFIC DATA  
OPEN Data Descriptor: GlobTherm, a  
global database on thermal  
tolerances for aquatic and  
terrestrial organisms

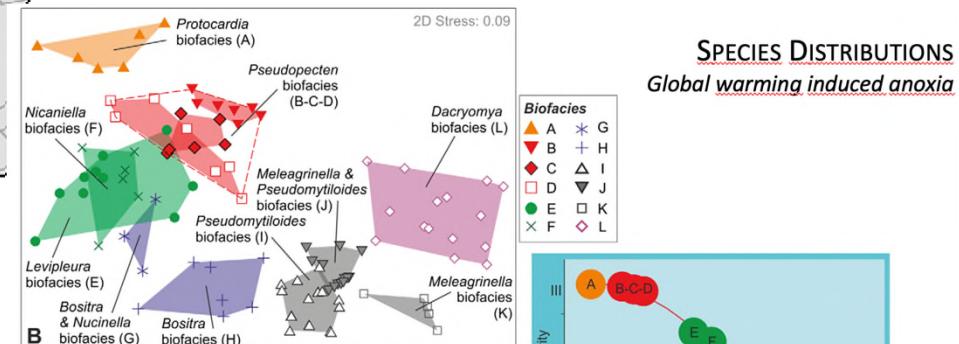
Received: 1 March 2017  
Accepted: 8 December 2017  
Published: 13 March 2018

Joanne M. Bennett et al.\*



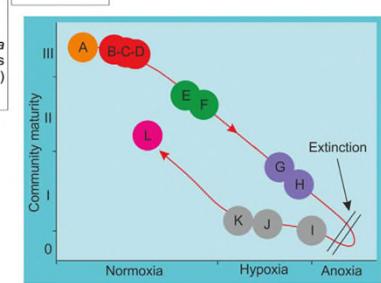
# Servicios Ecosistémicos y Biodiversidad en un escenario de Clima cambiante

Estructura, funcionamiento y prestación de servicios ecosistémicos en el futuro:



Para construir un escenario fiable de la biodiversidad y el funcionamiento de los ecosistemas del futuro es necesario conocer las dimensiones de los nichos que limitan la distribución de las especies y los ecosistemas.

- ① Past climate change shows anoxia effects in deep marine ecosystems;
- ② Ecosystem shift in abiotic filters results in species distribution shift



# Servicios Ecosistémicos y Biodiversidad en un escenario de Clima cambiante

## Respuesta del metabolismo individual y provisión de servicios:

Se espera menor biomasa viva a escala mundial:

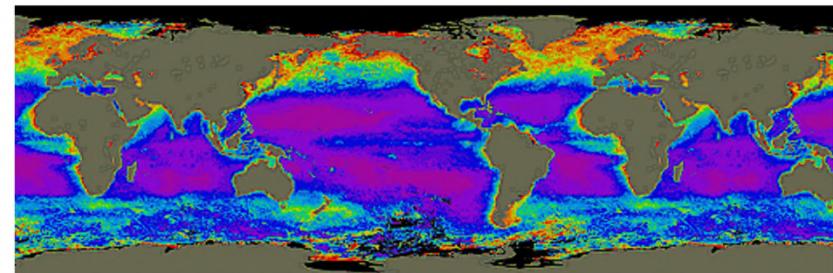
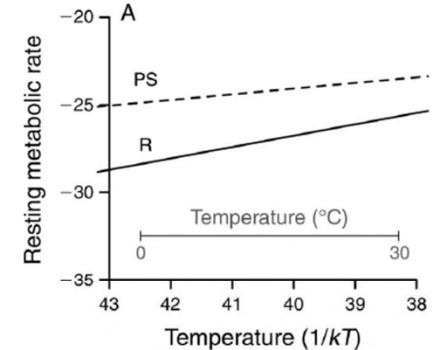
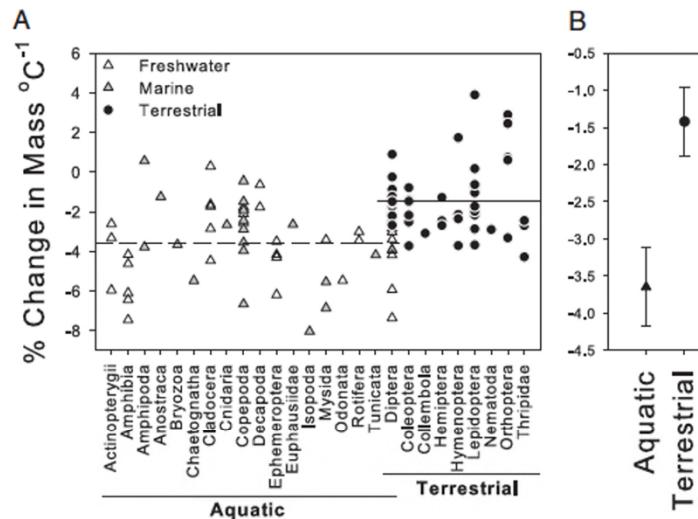
Ecosistemas acuáticos...

Muy probablemente con individuos pequeños

Ecosistemas terrestres...

Muy probablemente con menos individuos y menor biodiversidad

Y los futuros servicios ecosistémicos?



# Servicios Ecosistémicos y Biodiversidad en un escenario de Clima cambiante

Estructura, funcionamiento y prestación de servicios ecosistémicos en el futuro:

*Respuesta de ecosistemas y biodiversidad ante el cambio climático:*

- 1. Inspirar y apoyar nuevos desarrollos teóricos en biodiversidad y ecosistemas.*
- 2. Optimizar la eficiencia en el uso de la información existente,*

F indable A ccessible I nteroperable R eusable



CIENTIFIC DATA

Received: 1 March 2017  
Accepted: 8 December 2017  
Published: 13 March 2018

OPEN Data Descriptor: GlobTherm, a global database on thermal tolerances for aquatic and terrestrial organisms

Joanne M. Bennett et al.<sup>\*</sup>



## **PARTE II.**

**e-Infraestructuras Distribuídas de Investigación  
paneuropeas para fortalecer las comunidades  
científicas, tecnológicas y de innovación**

# \_What are Research Infrastructures?

**Research infrastructures** are organisations that **enable** the **research community** to **use** specific **facilities, resources** and **services** in order **to accelerate scientific achievements** and **promote sustainable research**.



## \_Research Infrastructures

MAKE SCIENCE HAPPEN & DELIVER BIG RESULTS



SHARE KNOWLEDGE & RESOURCES



PROVIDE OPPORTUNITIES & PROMOTE INNOVATION



PROMOTE SUSTAINABILITY



TACKLE SOCIETAL CHALLENGES



BREAK BARRIERS



## \_Types of Research Infrastructures

Different types of Research Infrastructures:



SINGLE SITED  
RESEARCH  
INFRASTRUCTURES



DISTRIBUTED  
RESEARCH  
INFRASTRUCTURES



E-SCIENCE  
RESEARCH  
INFRASTRUCTURES

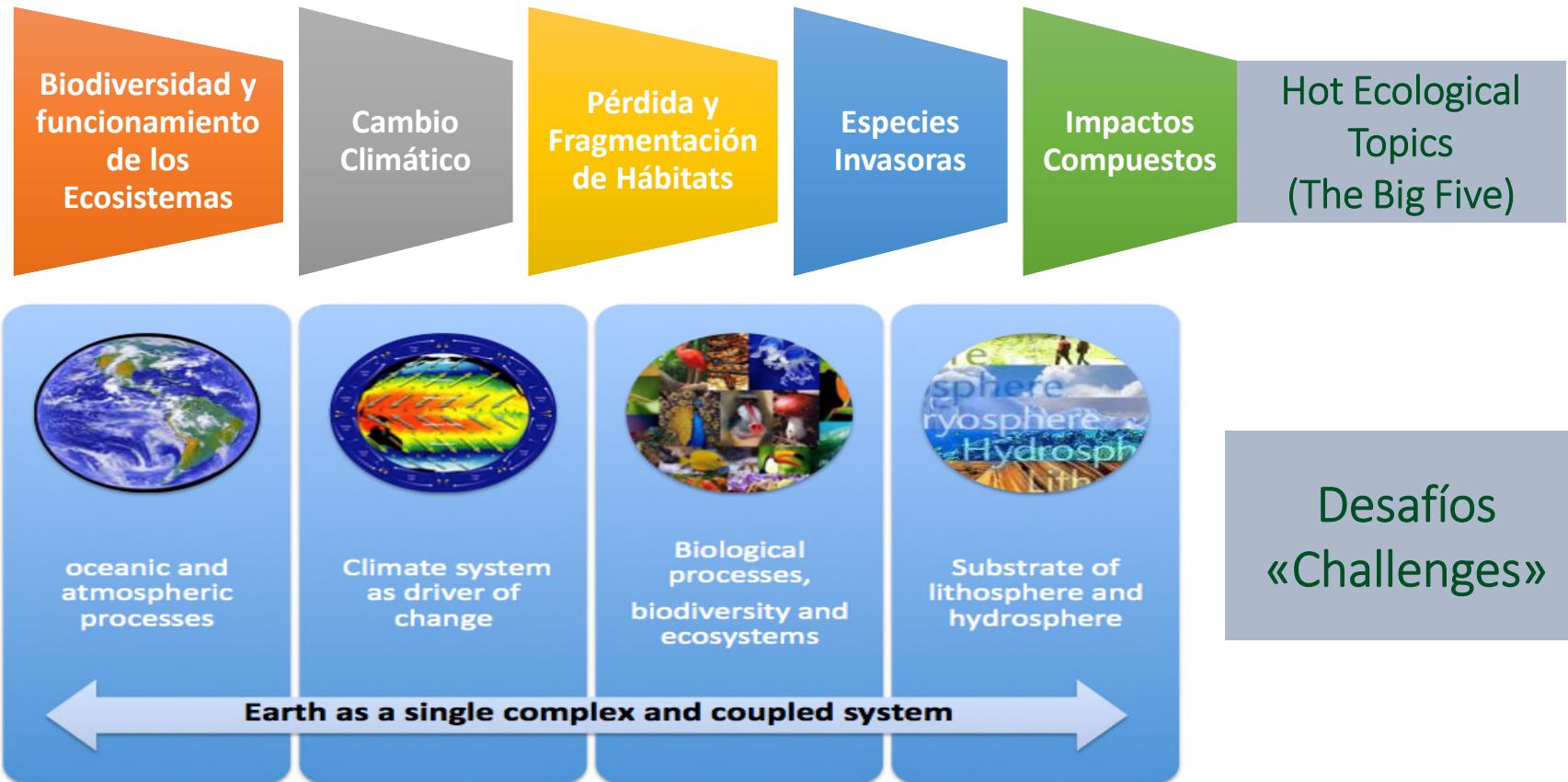
**EL FORO: ESFRI, el Foro Estratégico Europeo sobre Infraestructuras de Investigación**, es un instrumento estratégico para desarrollar la integración científica de Europa y fortalecer su alcance internacional. El acceso competitivo y abierto a infraestructuras de investigación de alta calidad respalda y evalúa la calidad de las actividades de los científicos europeos y atrae a los mejores investigadores de todo el mundo. **ESFRI** opera a la vanguardia de la política científica europea y mundial y contribuye a su desarrollo traduciendo los objetivos políticos en consejos concretos para RI en Europa.

### GRUPOS DE TRABAJO ESTRATÉGICOS:

- Infraestructuras de datos, informática e investigación digital
- Energía
- Salud y alimentación
- **Medioambiente**
- Innovación cultural y social
- Ciencias Físicas e Ingeniería

<b>Infraestructuras ENVRI</b>	EURO-ARGO ERIC European contribution to the international Argo Programme 	ICOS ERIC Integrated Carbon Observation System 
EMSO ERIC European Multidisciplinary Seafloor and water-column Observatory 	LifeWatch ERIC E-Science European Infrastructure for Biodiversity and Ecosystem Research 	EPOS ERIC European Plate Observing System 
EISCAT_3D Next generation European Incoherent Scatter radar system 	IAGOS In-service Aircraft for a Global Observing System 	DANUBIUS-RI International Centre for Advanced Studies on River-Sea Systems 
ACTRIS Aerosols, Clouds and Trace gases RI 	DiSSCo Distributed System of Scientific Collection 	eLTER Long-Term Ecosystem Research in Europe 

**LifeWatch ERIC** aborda los grandes desafíos ambientales y apoya las soluciones estratégicas basadas en el conocimiento para la preservación del medio ambiente, en su papel de e-Infraestructura distribuida de e-Ciencia Europea focalizada en medir el impacto del Cambio Climático en la Biodiversidad y Gestión Sostenible de los Ecosistemas.



# e-Science European Infrastructure for Biodiversity and Ecosystem Research

<https://www.lifewatch.eu>



Congratulations to @ll LifeWatch Community !

Last May 23rd, 2017 European Commission Director-General for Research & Innovation, Robert Jan-Smit, awarded LifeWatch ERIC Plus to the Spanish Ministry of State for Research, Development & Innovation, Carmen Vela, who received it on behalf of the entire LifeWatch community, also represented there by some of our colleagues and friends (see Family Photo), who were accompanied by 120 attendees representing other regional, national and international stakeholders. (+info)

Since March 2017 LifeWatch is considered (the 14<sup>th</sup>) ERIC



8.8.2009

EN

Official Journal of the European Union

L 206/1

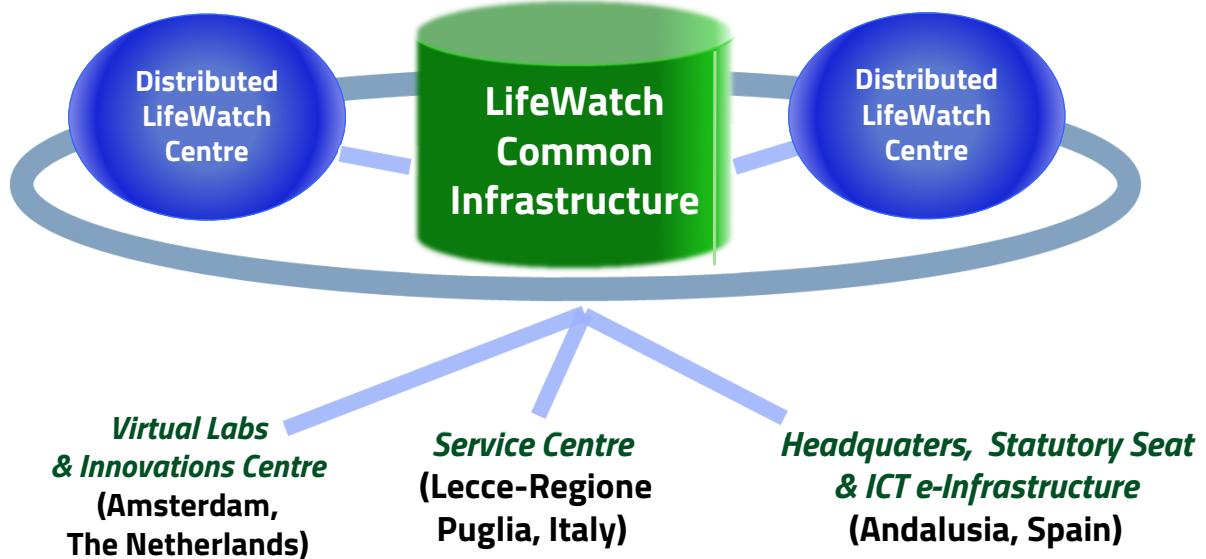
COUNCIL REGULATION (EC) No 723/2009

of 25 June 2009

on the Community legal framework for a European Research Infrastructure Consortium (ERIC)

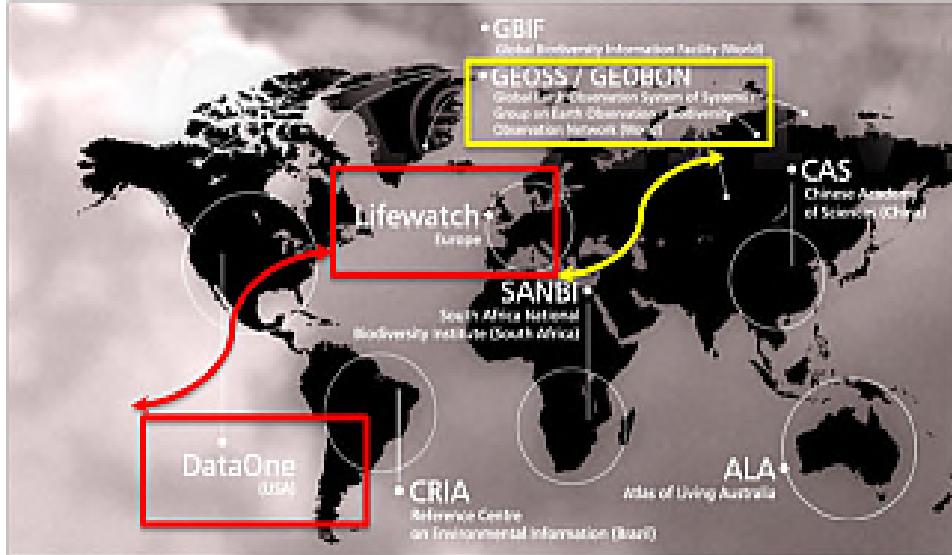
<https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1574712556704&uri=CELEX:32009R0723>

# LifeWatch e-Science European Infrastructure for Biodiversity and Ecosystem Research



**COORDINATING COUNTRY: ES**  
**MEMBER COUNTRIES: BE, BG, EL, ES, IT, NL, PT, SI**  
**OBSERVER COUNTRIES: CY, IE, IL, SK, UA,**  
**REQUESTED ADMISSION: RO**

**Thematic Centres** are in member countries (**and REGIONS**) and develop components of the **e-Science** facilities



*And not only!*



H2020-INFRASSUP-  
RESINFRA



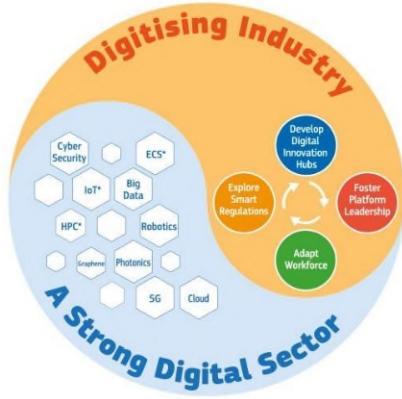
European Open Science Cloud



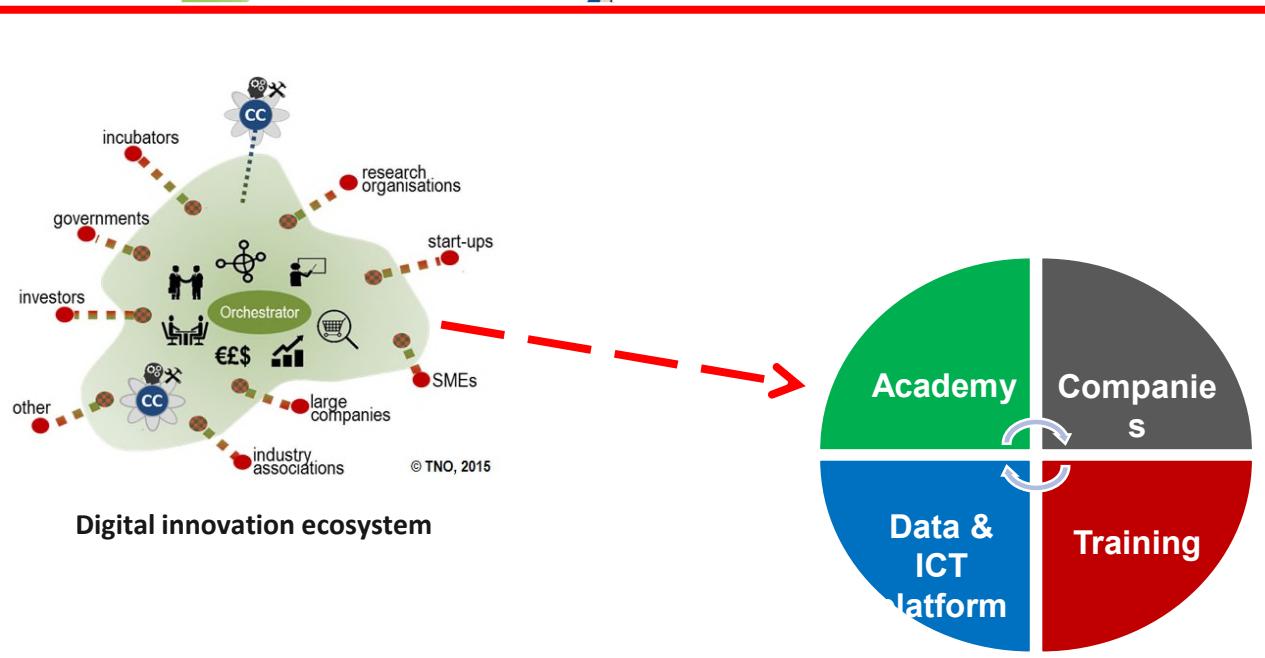


## Digitising European Industry (Industry 4.0 -> 5.0 evolution )

COM(2016) 180 final



DIIs Regulation Platforms Skills



**■ Research Infrastructures (RIs) are at the center of the quadruple helix (Pór, 2005), where research, academy, private companies (including SMEs), civil society organizations and public administration meet by applying an incremental and iterative process for creating new knowledge (González-Aranda et al., 2010-2021).**

**LifeWatch ERIC was ranked in First Position of Interest among rest of Research Infrastructures after the 1st meeting of the EU-Latin America and the Caribbean (EU-LAC) Working Group on Research Infrastructures followed by the Senior Officials Meeting (SOM) Joint Initiative on Research and Innovation (JIRI) held at Brussels- Belgium on 14<sup>th</sup> March 2017; followed by working meetings & fields visits to Seville & Doñana (Andalusia-Spain), and San José (Costa Rica) during 2019.**



[https://www.lifewatch.eu/all-news/-/asset\\_publisher/BU9HdfPGXPaK/content/eu-celac-working-party/10181](https://www.lifewatch.eu/all-news/-/asset_publisher/BU9HdfPGXPaK/content/eu-celac-working-party/10181)

# The CONTEXT



HIGH REPRESENTATIVE  
OF THE UNION FOR  
FOREIGN AFFAIRS AND  
SECURITY POLICY

## AERAP SUBGROUP: GREEN DEAL

### EXPLORING EXTENSIVE SYNERGIES BETWEEN AFRICA AND EUROPE SCIENCE, TECHNOLOGY & INNOVATION COLLABORATION

Brussels, 9.3.2020

JOIN(2020) 4 final

AERAP Green Deal Subgroup co-chairs:

Dr. Juan Miguel González-Aranda, LifeWatch ERIC Chief Technology Officer & ERIC

FORUM Executive Board Member.

Georgina Ryan, Deputy Director for Green Economy-Department of Science and  
Innovation-Republic of South Africa Government.

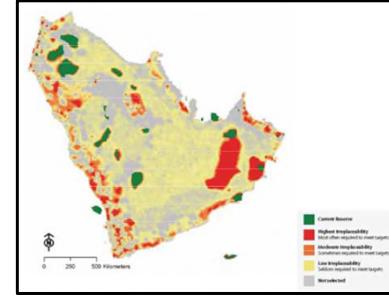
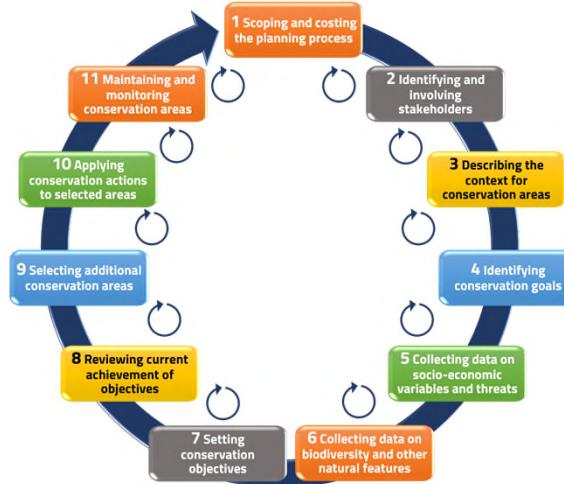
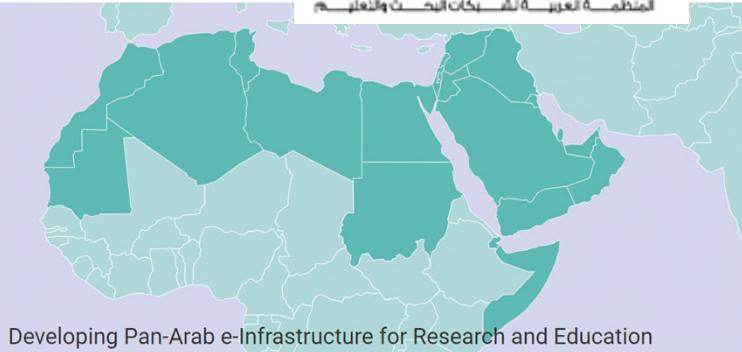
### JOINT COMMUNICATION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

#### Towards a comprehensive Strategy with Africa

In fact, the G-7 agenda conclusions, and the forthcoming COP27 illustrate the biodiversity as a vital and critical component of the European Union public policy agenda in Europe and globally, team Europe, for the future.

To strengthen the EU's strategic alliance with Africa, the European Commission and the High Representative of the Union are proposing to engage discussions with African partners in view of jointly defining at the upcoming EU-AU Summit a new comprehensive EU strategy with Africa that could be built on five partnerships:

- 1. A partnership for green transition and energy access;**
- 2. A partnership for digital transformation;**
- 3. A partnership for sustainable growth and jobs;**
- 4. A partnership for peace and governance; and**
- 5. A partnership on migration and mobility.**



\* Towards a systematic conservation plan for the Arabian Peninsula. Stephen Holness, et al.

## Indigenous Knowledge Research Infrastructure (IKRI) To Support the Implementation of UN Food System Summit

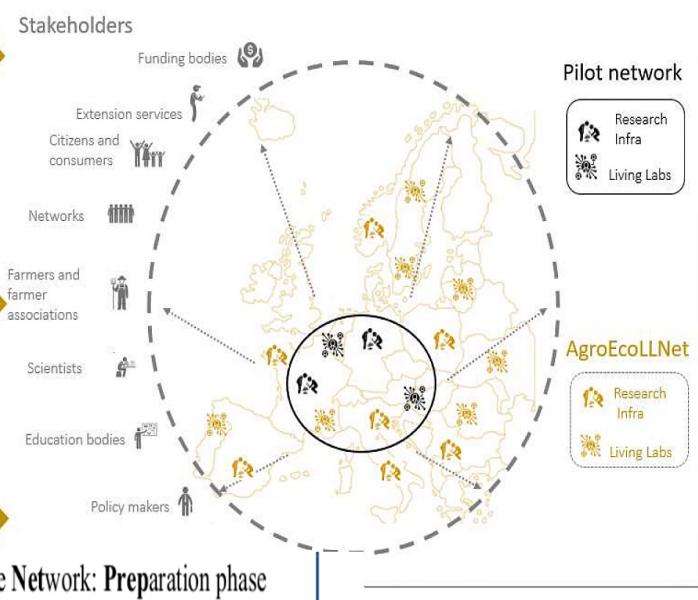
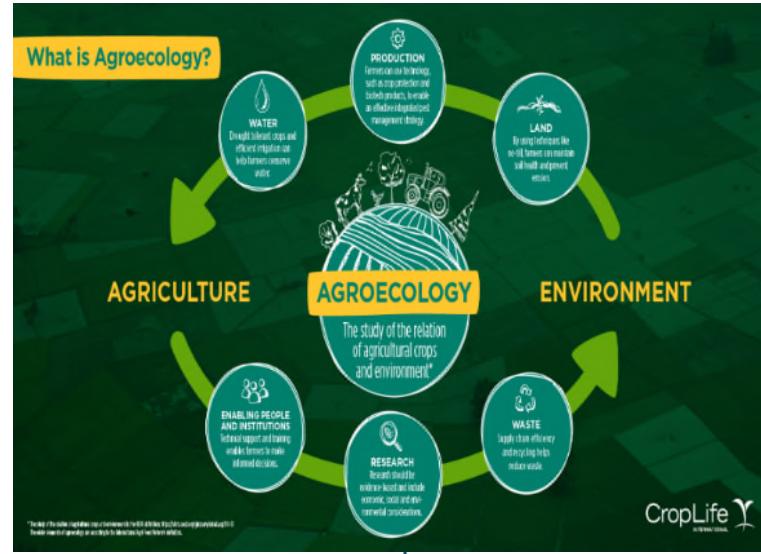


UNITED NATIONS  
Office for Outer Space Affairs



AERAP SCIENCE  
Africa-Europe Science and Innovation Platform  
[www.aerapscience.org](http://www.aerapscience.org)





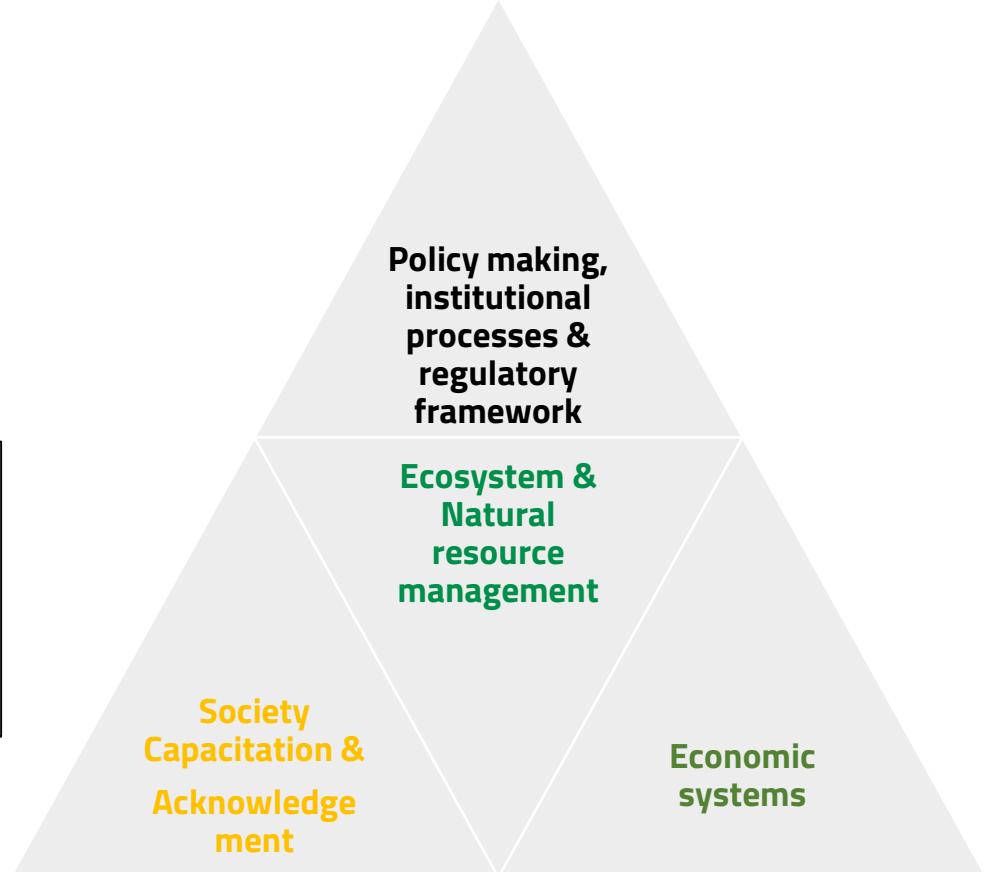
## The European Agroecology Living Lab and Research Infrastructure Network: Preparation phase

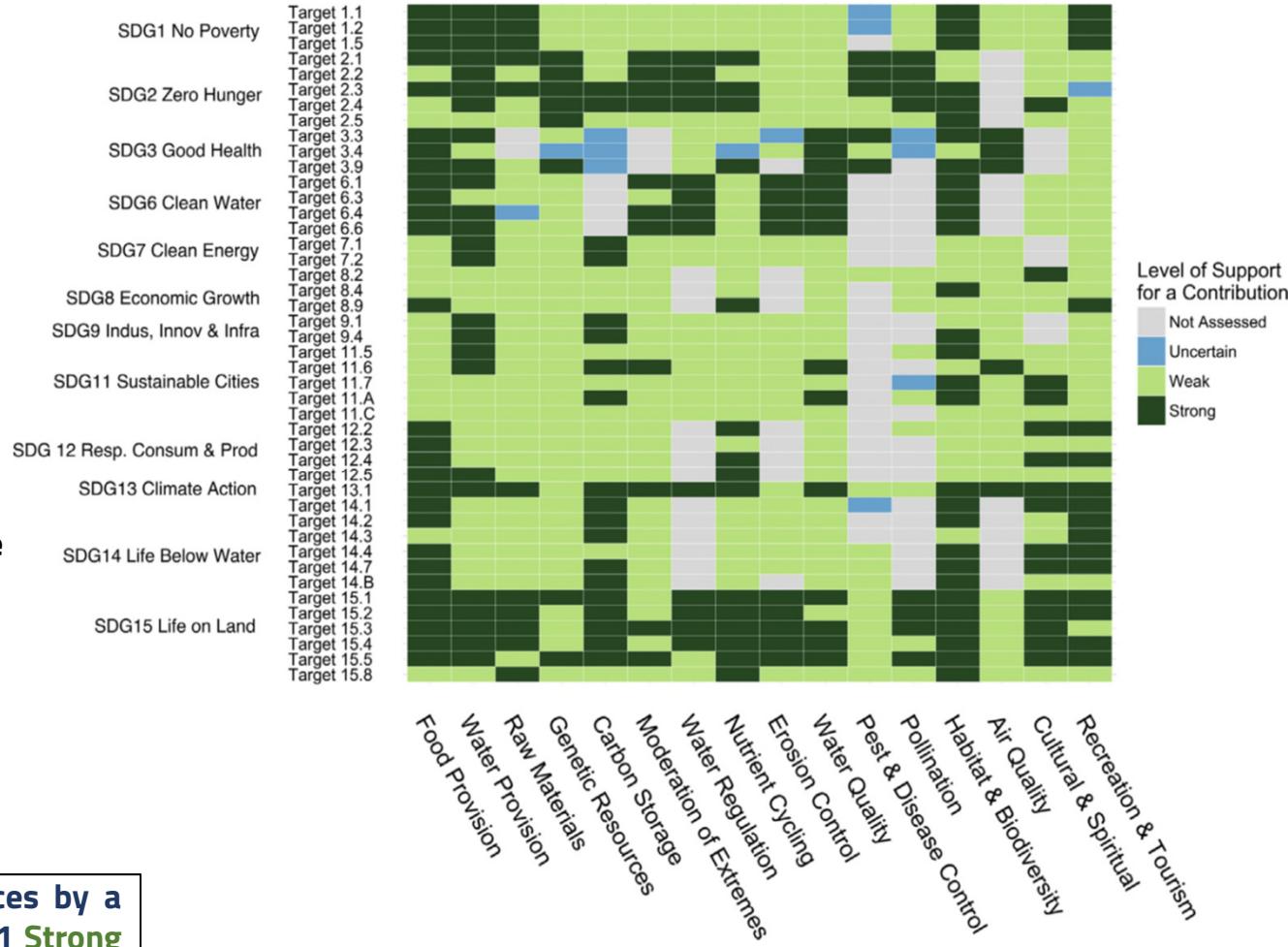
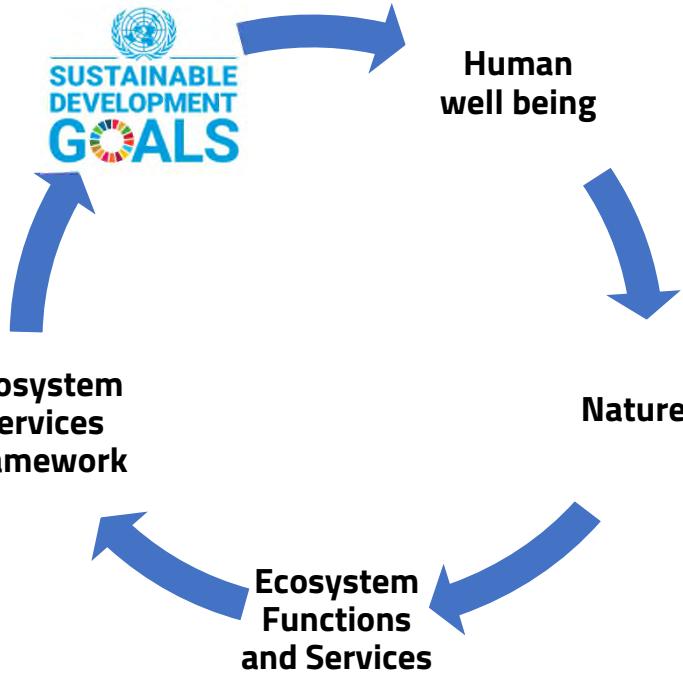
Nº	Participant organisation name (Acronym)	Country
1	Institut national de recherche pour l'Agriculture, l'Alimentation et l'Environnement (INRAE)	France
2	Aarhus Universitet (AU)	Denmark
3	Ökológiai Mezőgazdasági Kutatóintézet Közhasznú Nonprofit Kft (OMKI)	Hungary
4	Johann Heinrich Von Thuenen-Institut, Bundesforschungsinstitut Fuer Laendliche Raeume, Wald Und Fischerei (TI)	Germany
5	European Network Of Living Labs Ivzw (EnoLL)	Belgium
6	Biosense Institute - Research And Development Institute For Information Technologies In Biosystems (BIOS)	Serbia
7	FiBL Europe - Forschungsinstitut fur Biologischen Landbau In Europa (FiBL Europe)	Belgium
8	Ecologic Institut gemeinnützige GmbH (Ecologic)	Germany
9	European Landowners Organization (ELO)	Belgium
10	Agriculture And Agri-Food Canada (AAFC)	Canada
11	Eigen Vermogen Van Het Instituut Voor Landbouw- En Leefstijlonderzoek (EVIL VO)	Belgium
12	E-Science European Infrastructure For Biodiversity And Ecosystem Research (LifeWatch ERIC)	Spain
13	The University of Sheffield (ISF)	United Kingdom



LifeWatch ERIC – Distributed E-Science European Infrastructure on Biodiversity and Ecosystems Research will provide science based management framework, tools and mechanisms to facilitate intervention at the following levels:

**Ecosystem-based approaches** are critical in designing the mechanisms and processes to achieve the SDG's. Through urgent and concerted efforts fostering transformative change.





The assessment of 12 key Ecosystem Services by a survey of experts identified a minimum of 231 Strong dependencies of SDG's targets on multiple Ecosystem Services

S.L.R. Wood et al. / Ecosystem Services 29 (2018) 70–82

**PARTE III. “Let’s be FAIR”:**

**Abordando los desafíos de heterogeneidad y factores de escala en la e-Biodiversidad y provisión sostenible de Servicios Ecosistémicos mediante el uso de TIC disruptivas**

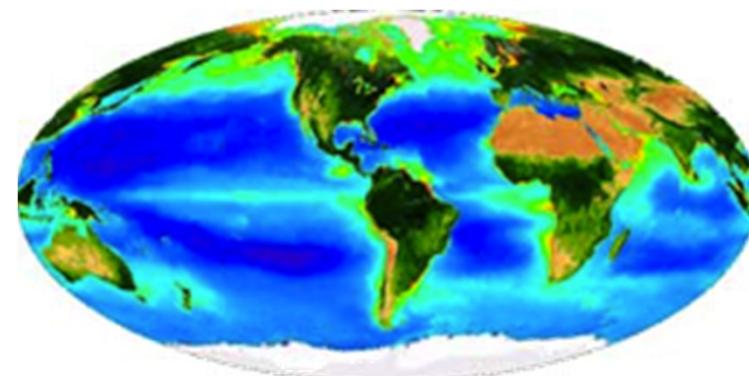
## From ICT perspective solutions...

How can LifeWatch ERIC assess & monitor at the global scale **biodiversity** and **ecosystem functions and services**, taking into account the (**micro-, meso-, macro- SCALE**) & **HETEROGENEITY NATURE** of **data resources involved** ?

With environmental  
observatory networks  
of field samples



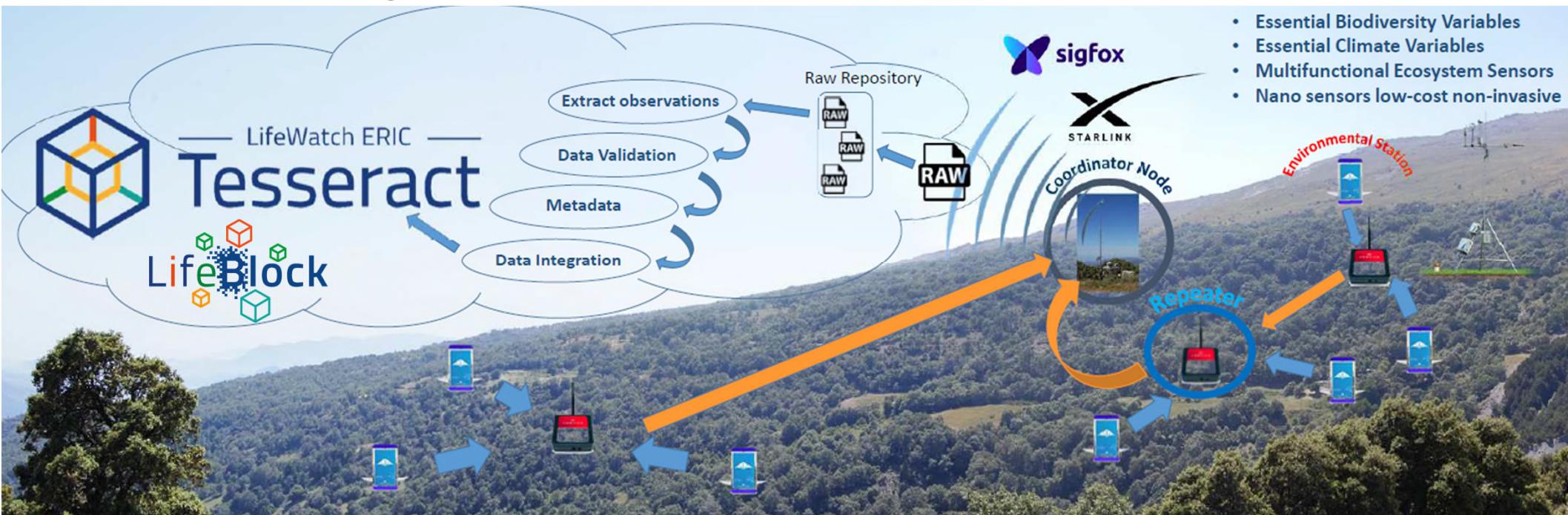
With remote sensing



# Climate Change Monitoring: Environmental Observatory Networks

**Co-designing and co-developing** a global capacity from **Europe plans (i.e., Green Deal, AgroEcology)** linked to other worldwide areas, in particular **Latinamerica & Caribbean (EU-LAC)** and **AFRICA (EU-LAC)** by integrating:

- **Low-cost** sensors for collecting and using biotic & abiotic observations for conservation and ecosystem-based sustainable management. Also mapping and monitor natural and protected areas.
- **Promoting the provision of e-Tools & e-Services to foster Sustainable Development mechanisms related to circular economy ("green" & "blue") initiatives**

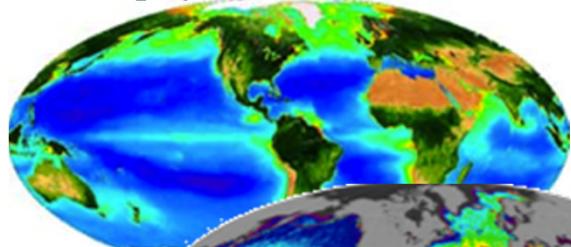


# Remote sensing & Earth Observation: Oceans, Land, Air

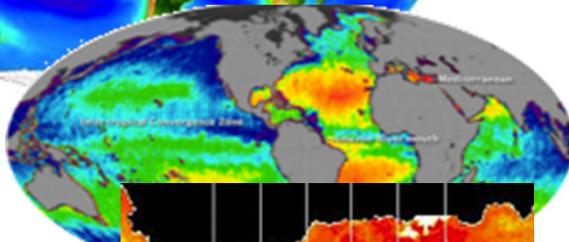
## Sensing in a global scale.

Oceans

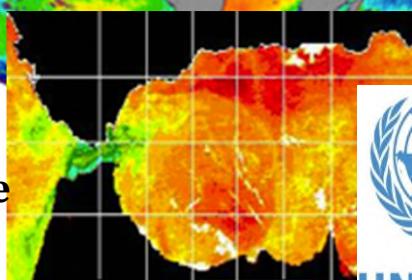
Chlorophyll



Salinity

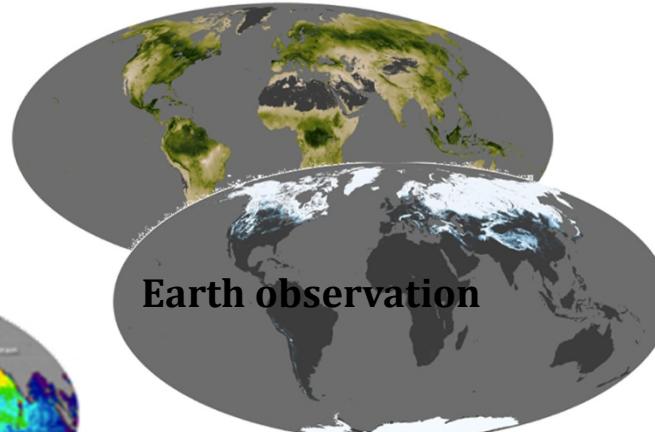


Surface temperature

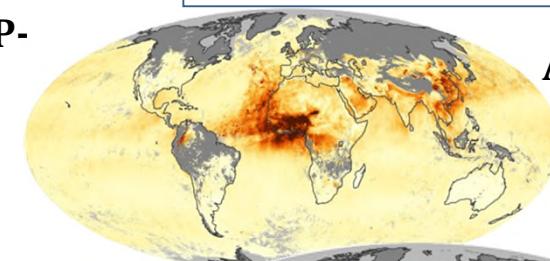


Land

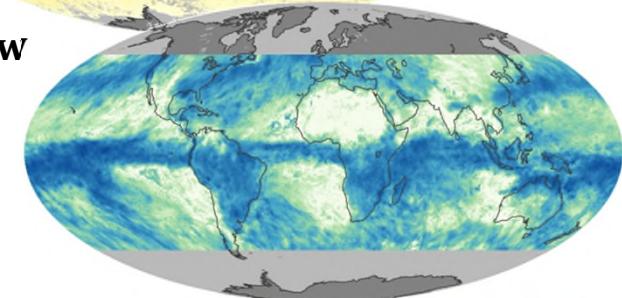
Net Primary Productivity -NPP-



Air



Snow



Aerosols

Rainfall

Night lights

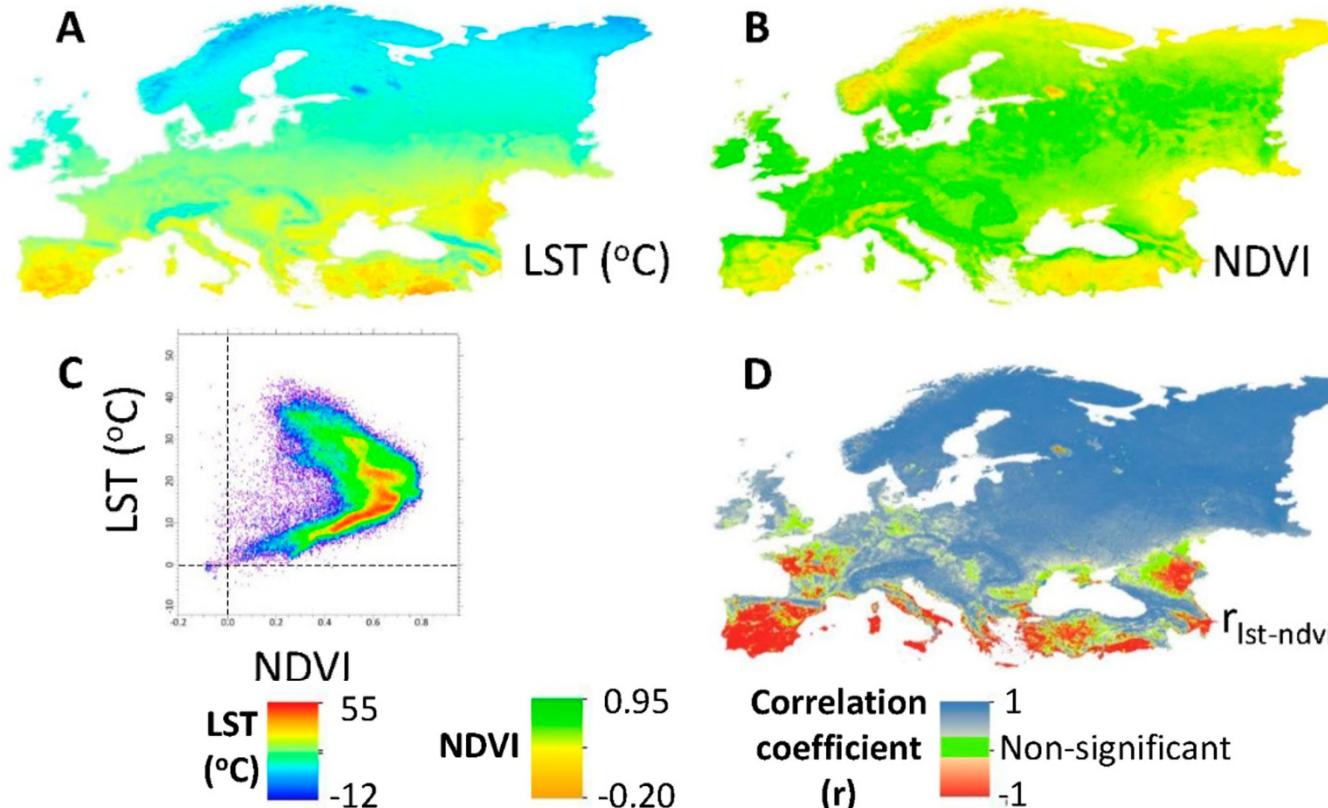


SPACE4SDGS



# Relationships between Land Surface Temperature –LST– and Normalized Difference Vegetation Index –NDVI–

MARCH-AUGUST



## Spatial and Seasonal Patterns in Vegetation Growth-Limiting Factors over Europe



Arnon Karnieli <sup>1,\*</sup> , Noa Ohana-Levi <sup>1,2</sup>, Micha Silver <sup>1</sup> , Tarin Paz-Kagan <sup>3</sup>, Natalya Panov <sup>1</sup>, Dani Varghese <sup>1</sup>, Nektarios Chrysoulakis <sup>4</sup> and Antonello Provenzale <sup>5</sup>

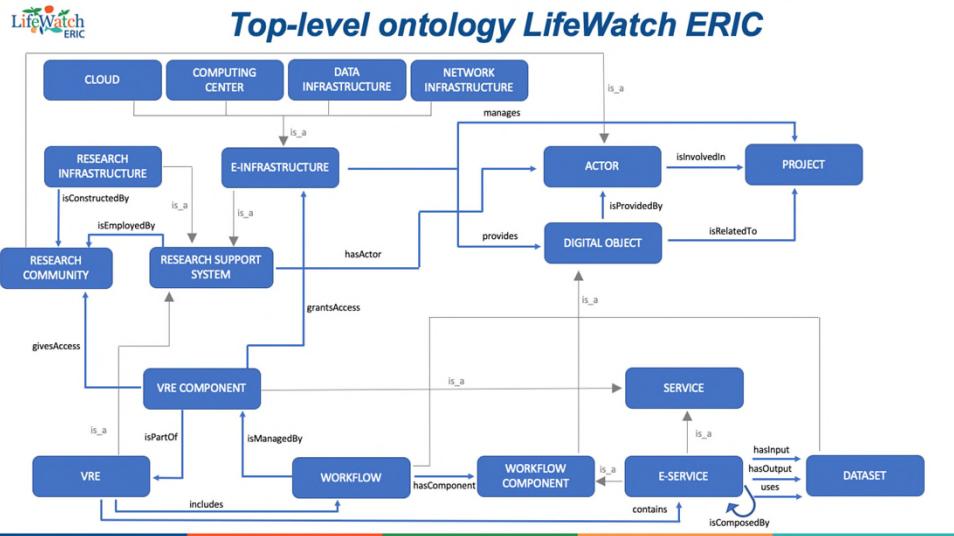
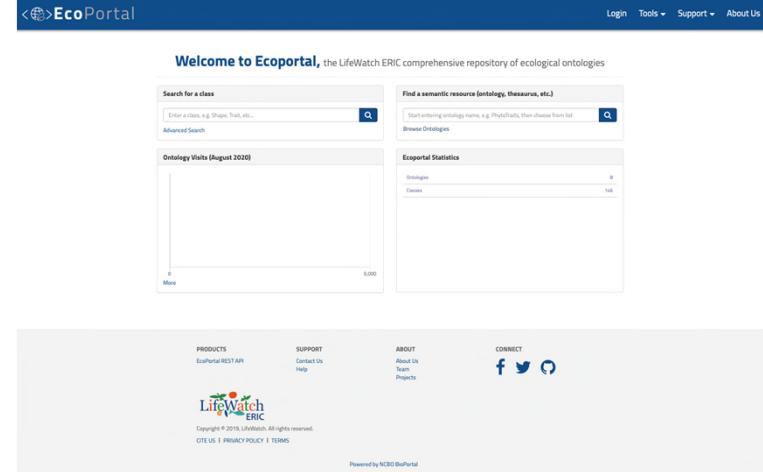
# Importance of (meta-)data Catalogues & Semantic Approach

## EcoPortal

The LifeWatch ERIC online space designed to collect semantic resources and provide the necessary services for enabling discovery and interoperability in the biodiversity and environmental domain.



DOI-PID assignment

Welcome to EcoPortal, the LifeWatch ERIC comprehensive repository of ecological ontologies

Search for a class: Enter a class, e.g. Shape, Tool, etc... Advanced Search

Find a semantic resource (ontology, thesaurus, etc.) Start entering ontology name, e.g. Phytotaxa, then choose from list. Browse Ontologies

Ecoportal Statistics

Ontology Visits (August 2020)

PRODUCTS EcoPortal REST API

SUPPORT Contact Us Help

ABOUT About Us Team Projects

CONNECT [f](#) [t](#) [o](#)

Powered by NCBO BioPortal

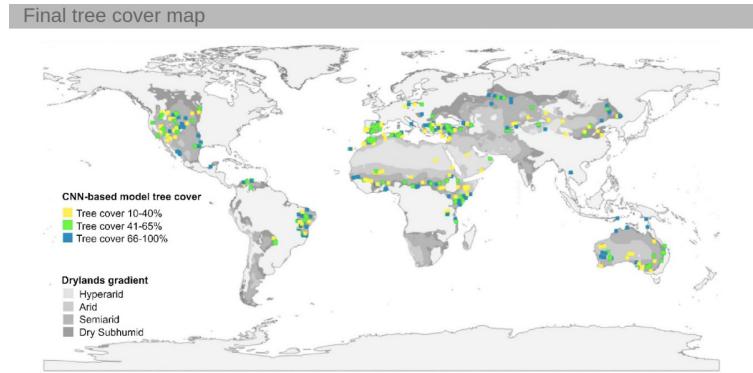
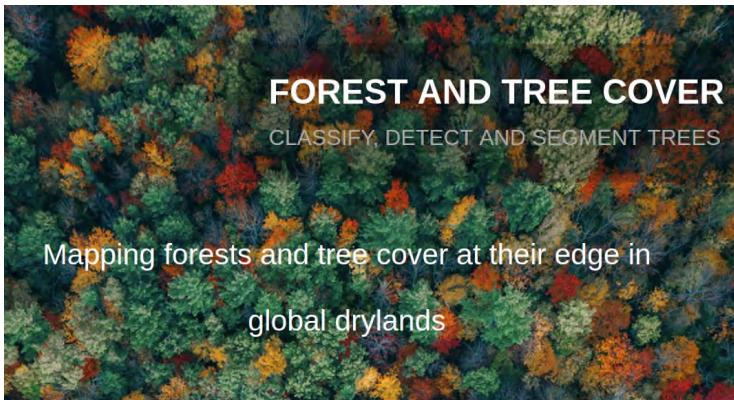
## Top-Level Ontology LifeWatch ERIC

To model the Research Infrastructure world: actors, digital objects, services, workflows and projects



# Artificial Intelligence & Big Data

Why AI and Big Data on top of Remote Sensing & environmental observatory networks of field samples?



1. The CNN-based **classification** model detected whale presence with an accuracy (F1) of 84%

2. The CNN-based **detection** model counted whales with an accuracy (F1) of 97%

# Remote Sensing & Earth Observation disruptive technologies to operationally support AgroEcology

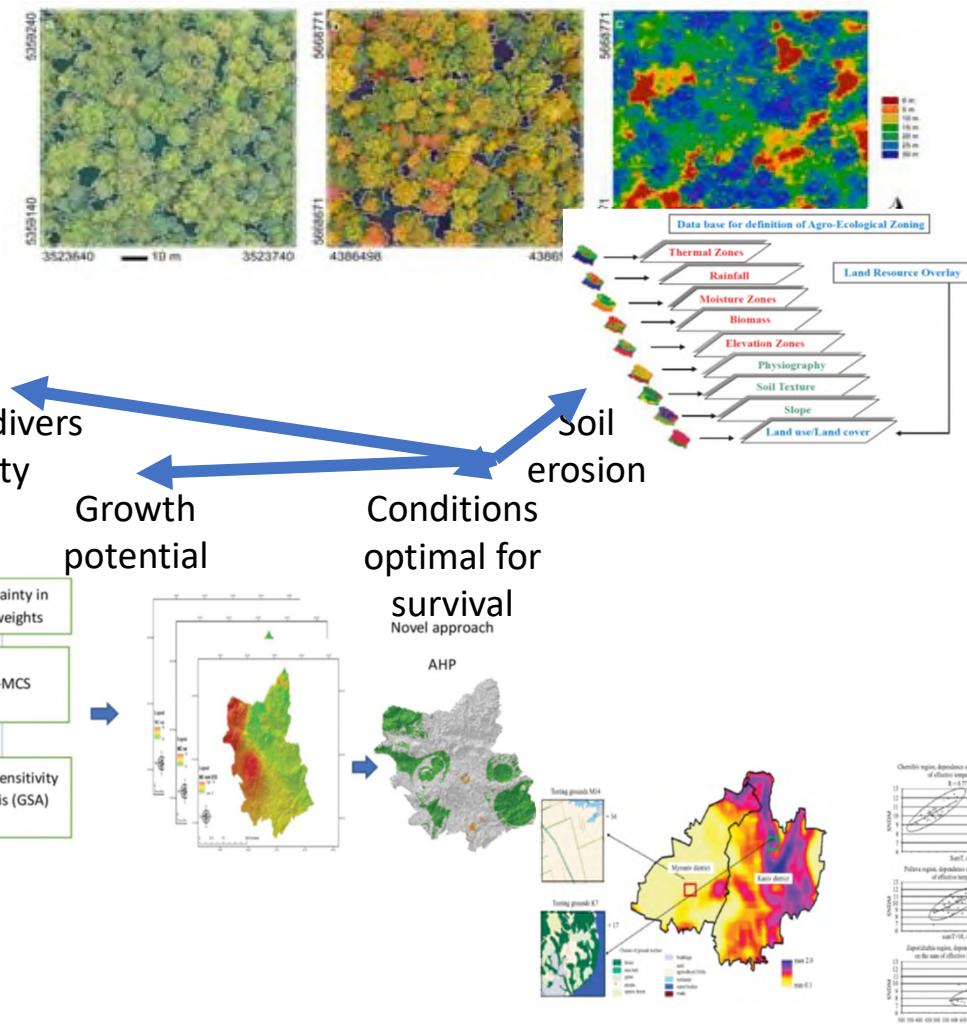
Agroecological transition is an ambitious challenge.

Innovative digital technologies and remote sensing can be very helpful in this transition.

Briney, A, ThoughtCo.; Bellon-Maurel, V. & Huyghe,C, OCL, 2017

**USE CASE 1:** identification of agro-ecological zones for agricultural developmental planning to identify survival and failure of particular land use or farming system.

**USE CASE 2:** Satellite data were used to determine critical zones of erosion degradation of arable lands, requiring preservation and their inclusion to the natural fields, which had a positive impact on the optimization of agrolandscape diversity.

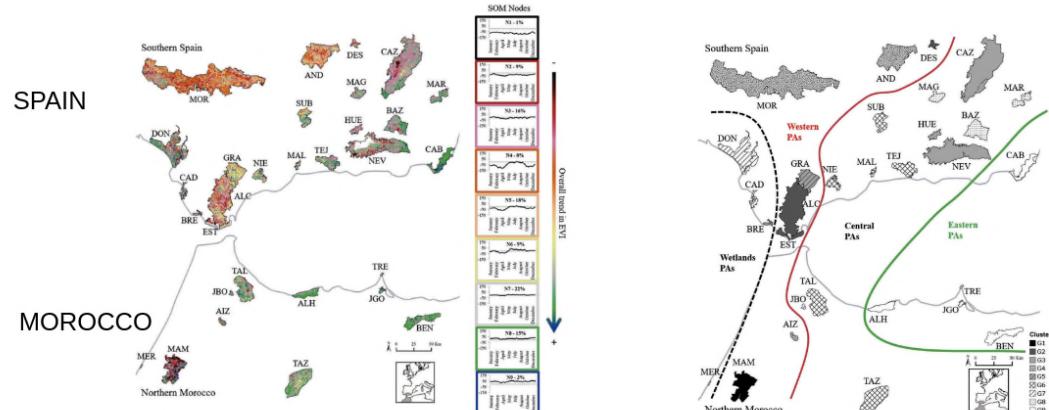


# Artificial Intelligence & Big Data

Why AI and Big Data on top of Remote Sensing & environmental observatory networks of field samples?

## Geopolitical Scope:

- Allows to **compare different geopolitical scenarios** in different parts of the world
- Facilitates the development of Europe to collaborate with other countries



A Safe operation Space  
for Humanity

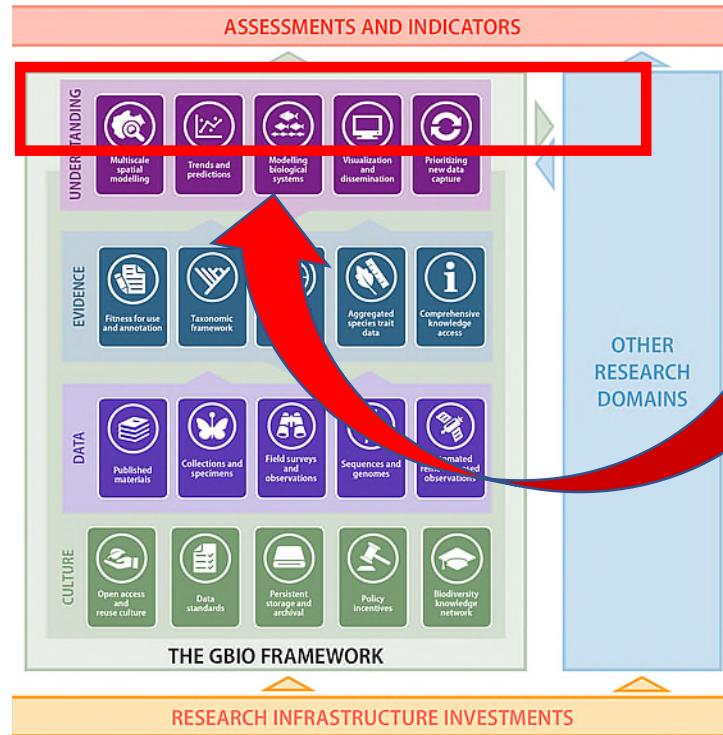
*"We must challenge  
climate-change skeptics  
who deny the facts"*



## **PARTE IV. Tesseract VRE y LifeBlock**

Esta misión se consigue proveyendo acceso a multitud de conjuntos de datos, servicios, herramientas e instrumental (hardware, software) distribuídos, que faciliten la construcción y operación de **Entornos Virtuales de Investigación** haciendo uso de lo mejor (“state-of-art”) de las TIC: **Big Data, AI-Deep Learning, HPC-Supercomputing, Grid-Cloud Computing, Blockchain, ...**

«The Global Biodiversity Informatics Outlook (GBIO) Framework» (Hobern et al. 2012) identifica 20 componentes esenciales de la biodiversidad organizados en 4 capas: **Cultura, Datos, Evidencia y Comprensión.**



**COMPRENSIÓN “Understanding”:** Construyendo representaciones modeladas de patrones y propiedades de la biodiversidad, basadas en cualquier posible **EVIDENCIA**, basada en los siguientes componentes:

- Modelado multiescalar de especies;**
- Tendencias y predicciones;**
- Modelado de sistemas biológicos;**
- Visualización y divulgación;**
- Priorizar nuevas capturas de datos.**



## Facing e-Biodiversity challenges together: GBIO framework-based synergies between DiSSCo and LifeWatch ERIC

González-Aranda, Juan Miguel<sup>1</sup>; Koureas, Dimitris<sup>2</sup>; Addink, Wouter<sup>2</sup>; Hirsch, Tim<sup>3</sup>; Arvanitidis, Christos<sup>1</sup>;  
Sáenz-Albánés, Antonio-José<sup>1</sup>; Schalk, Peter<sup>2</sup>.

Oral presentation during the session "SI22-DiSSCo as a model for regional development of collections infrastructure" in the Infrastructure track at the forthcoming joint Biodiversity Next conference in Leiden, The Netherlands, October 20-25, 2019.



A joint conference by

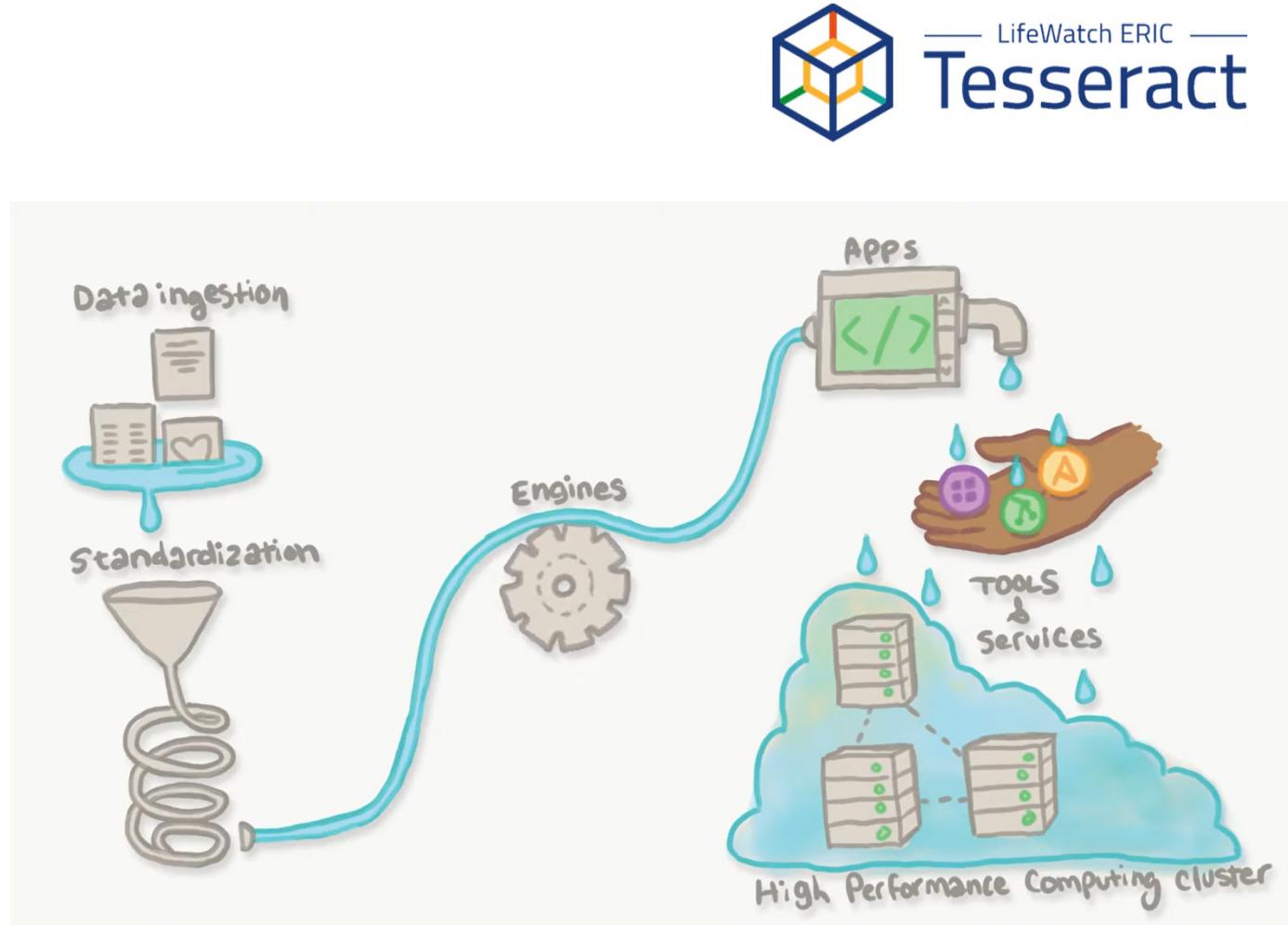


Biodiversity  
Information  
Standards  
TDWG



# What is a VRE?

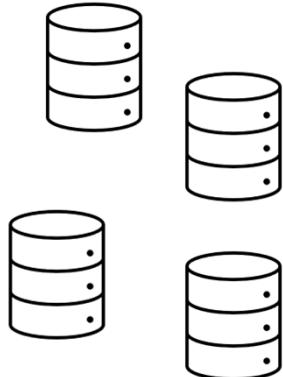
- A Virtual Research Environment is a web-based workspace providing seamless access to all services a data-user needs to do data-related work and collaborate with the community to create new knowledge.
- A VRE facilitate working with data in a more efficient way and improve collaboration between different users (LLs, RIs, end-users, policy-makers, citizens, etc.)
- Usually includes:
  - Data sources (own data, third-parties' data sources)
  - Centralized access to data
  - Data processing (development environment)
  - Visualization of data
  - Sharing of results with others
  - Other e-services
  - ...
- The VRE can be used to answer scientific and managerial questions, in this case, applied to agroecology



# What is a VRE?



LLs & RIs...



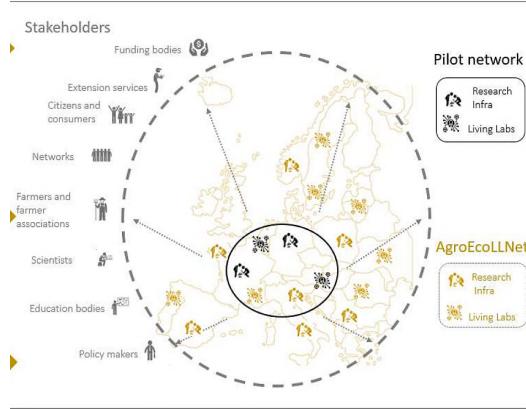
... &  
other  
data  
sources



**ALL Ready**  
Agroecology VRE

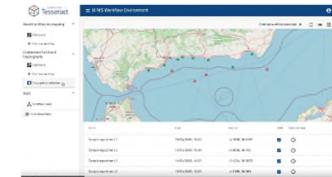


...analyse data to  
provide advice about  
agroecology  
practices...



... the scientists, policy-makers, advisors collaboratively...

... contributing to a transition towards agroecology in Europe through collaboration between LLs and RIs.



**ALL Ready**

# What is a VRE?

With a VRE data are:

- ✓ OPEN
- ✓ EASY TO LOCATE
- ✓ WELL DESCRIBED
- ✓ EASY TO USE
- ✓ TRANSPARENT
- ✓ REPRODUCIBLE
- ✓ INTEROPERABLE

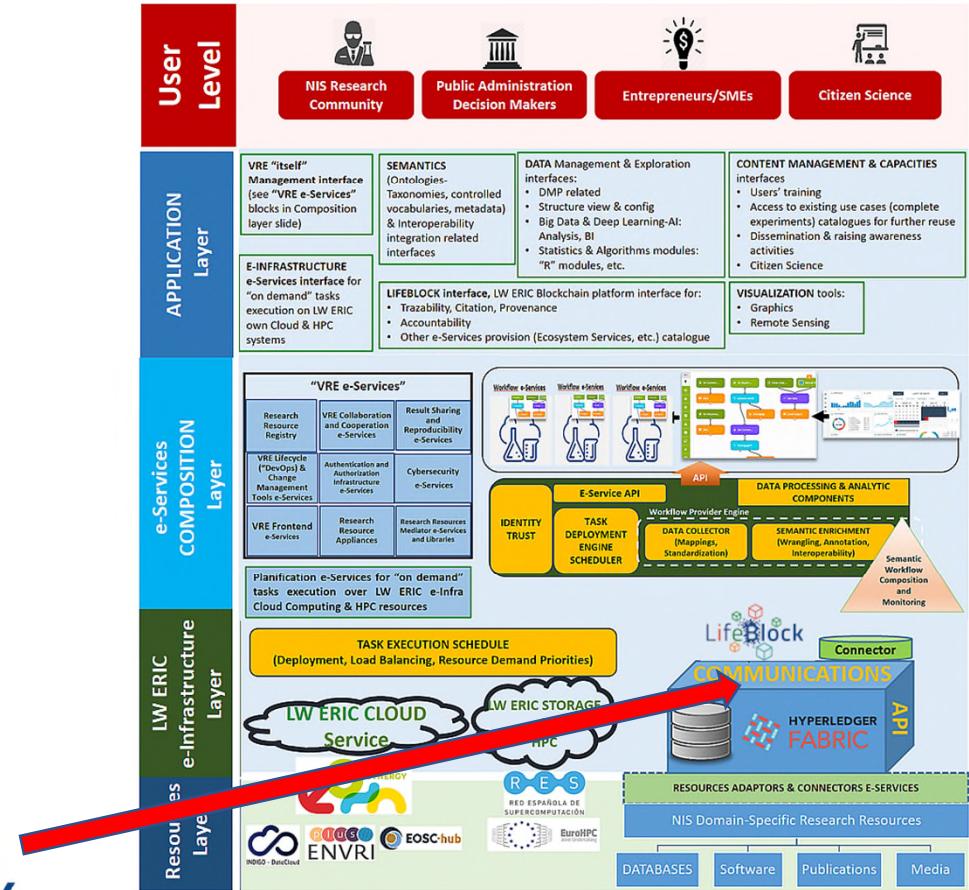
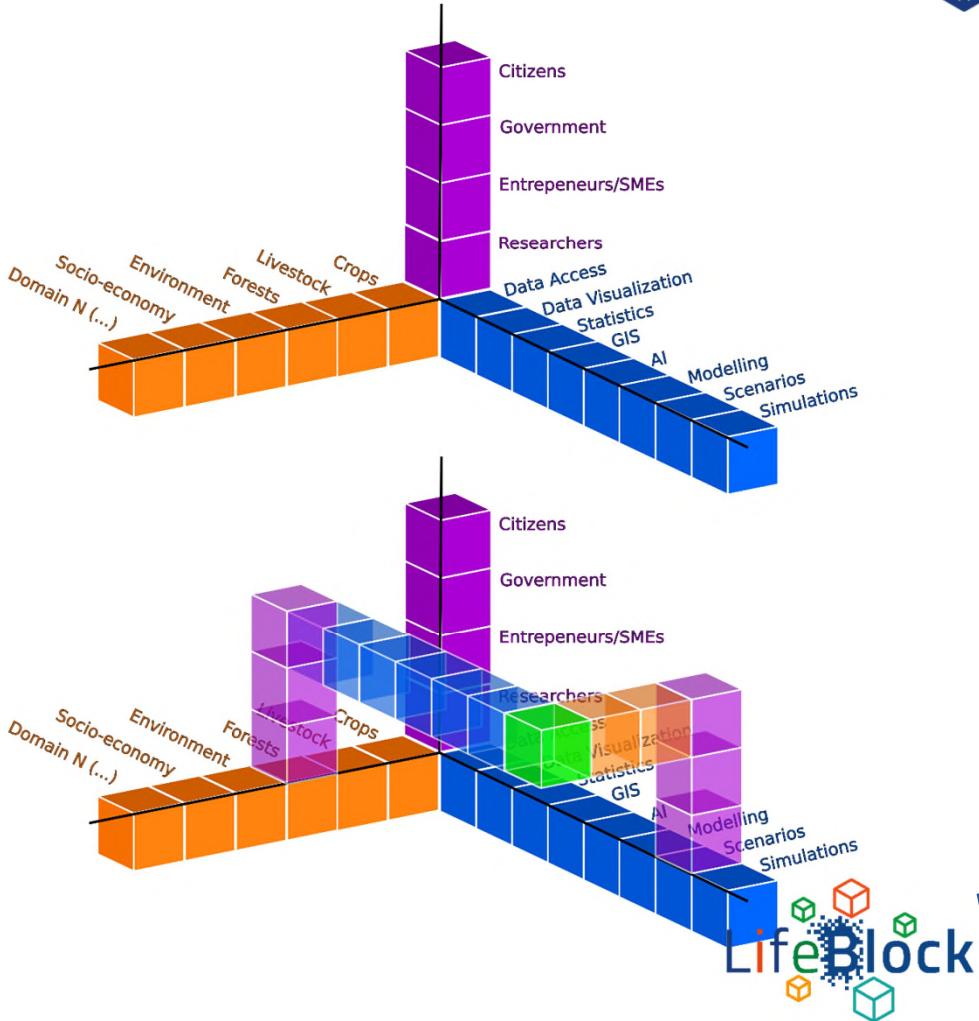


# What is a VRE?



LifeWatch ERIC  
Tesseract

LifeWatch  
ERIC





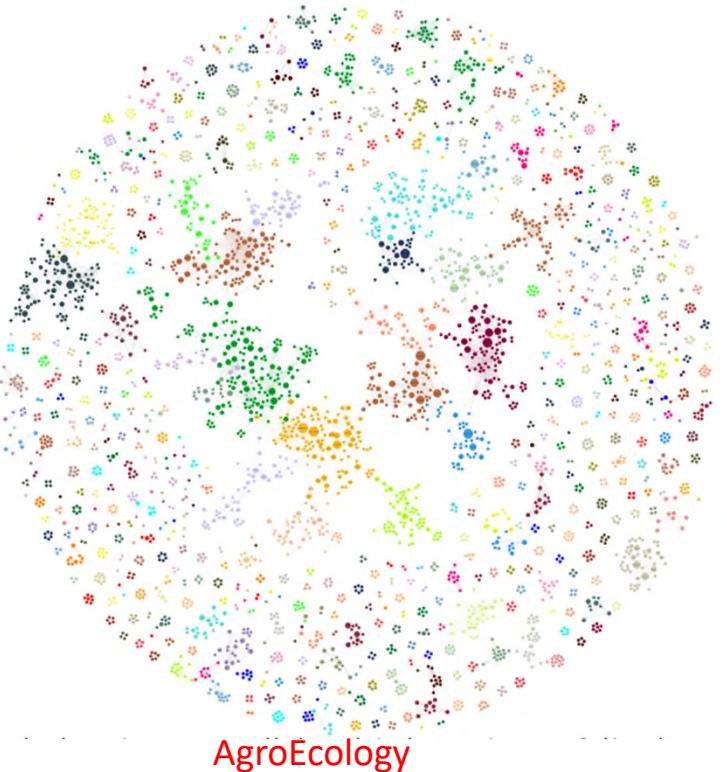
# Combining Blockchain & AI-Deep Learning techniques



Data from Web of Science, use only the papers published on reviews with non zero impact on JCR The period is all data present in WOS up to 5/12/2020, keywords "AgroEcology" and "Living Labs"

AgroEcology papers: 1227 authors: 4181

Living Labs papers: 131 authors: 461

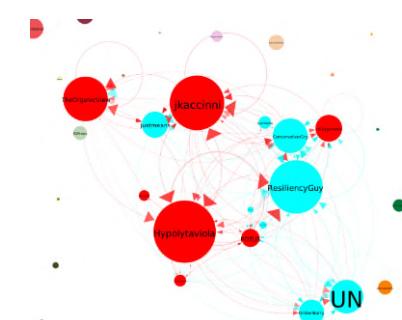
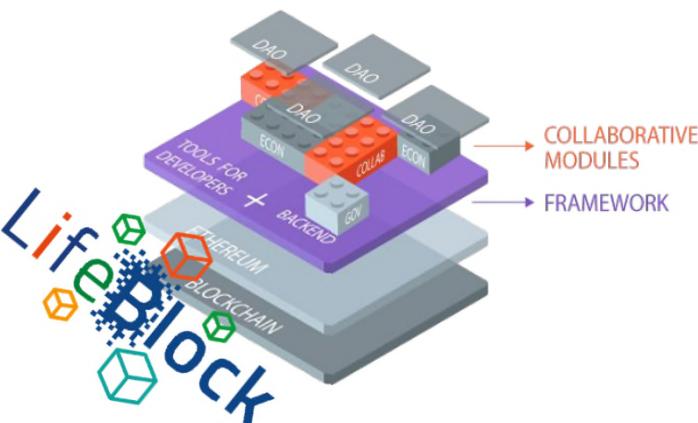
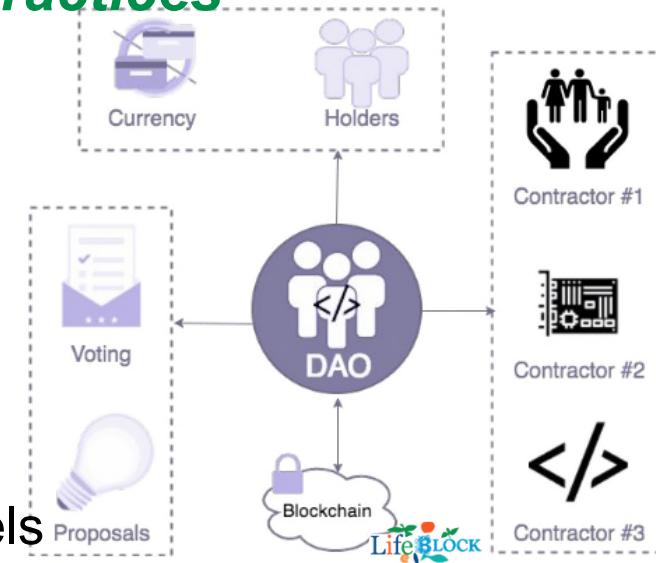


# *Users' Biodiversity & Ecosystem Sustainable Management Communities of Practices*

## Distributed Autonomous Organisations (DAO)

- Self-governed organisation controlled by rules implemented in smart contracts
- Analogy with legal organisation
  - Legal documents (bylaws), define rules of interaction amongst members
  - DAO members' interactions are mediated by rules embedded in DAO code

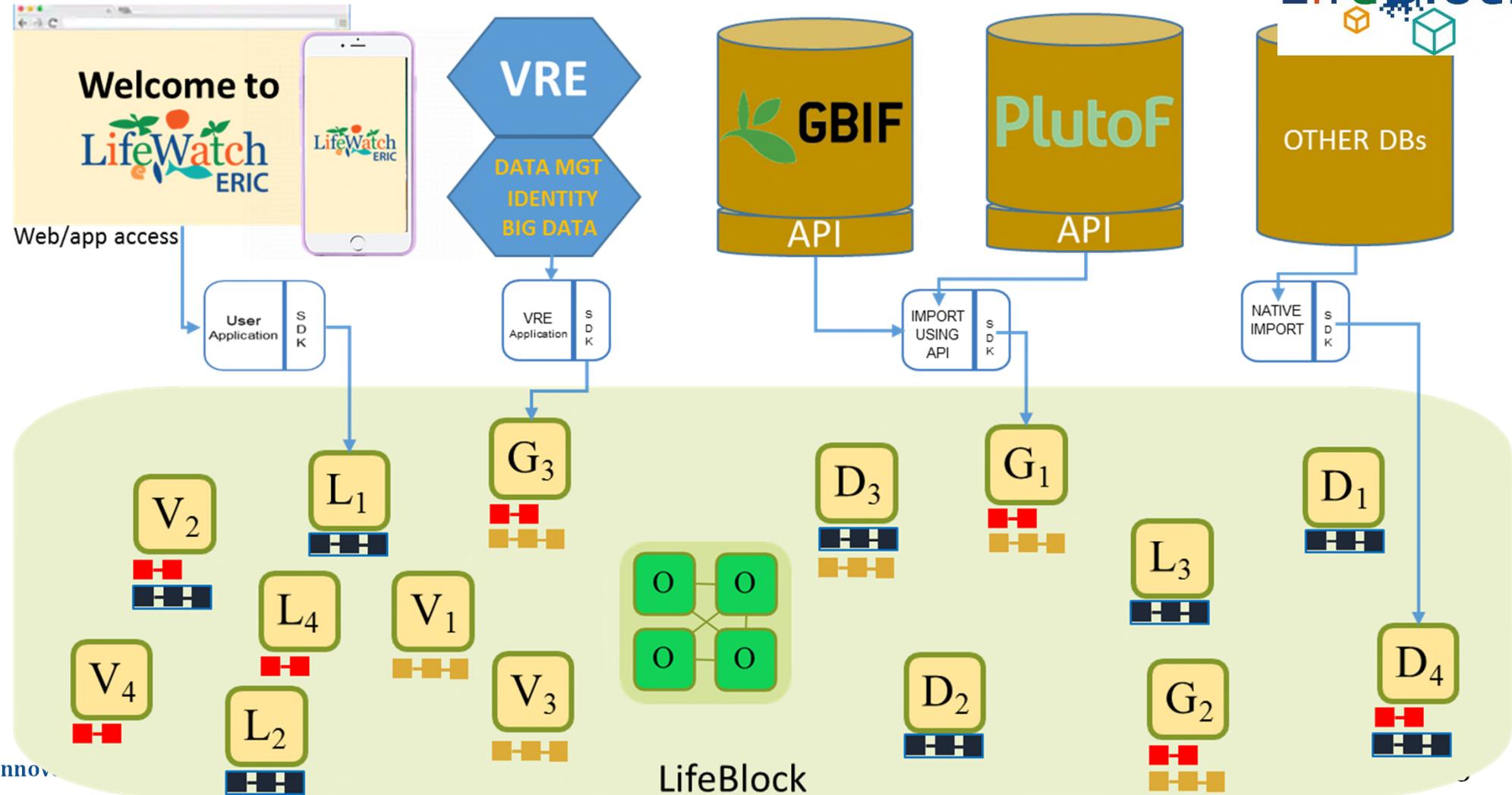
- Governance models
- Economic models
- Collaborative modules



### Thematic clustering by:

- Sub-communities
- Publications-authors
- Shared e-Tools used
- etc

# LifeBlock (-chain) structure





**A tool for the coordination &  
management of distributed  
constructions and operations**

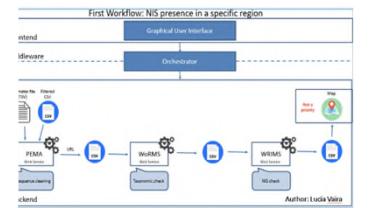


<https://www.youtube.com/watch?v=uIEpBcBYHFI>

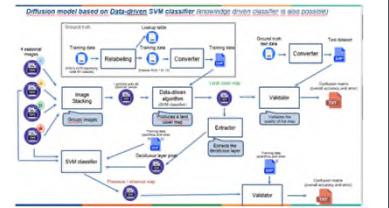
# Internal Joint Initiative Non-indigeneous (endemic) Invasive Species Workflows

Encapsulating and deploying curated e-science workflows, based on virtual research environments & blockchain technologies, to accelerate scientific research & innovation on invasive species

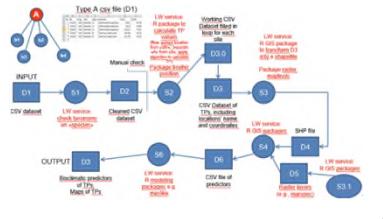
1 Multi-disciplinary approach in NIS detection in Europe using Artificial Reef Monitoring Systems -ARMS -



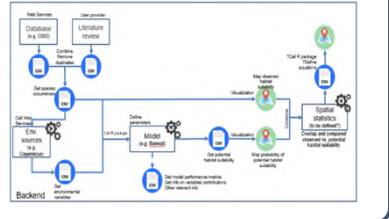
2 Combining diffusion modelling and remote sensing techniques to monitor and control the spread of invasive species. C.S: Ailanthus Altissima.



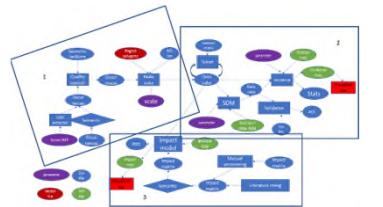
3 Functional biogeography of two widely distributed omnivorous invasive crustaceans



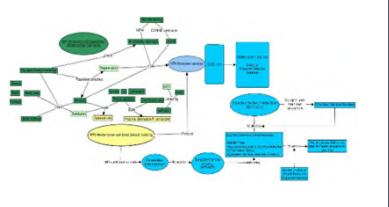
4 Metabarcoding: Applications for biodiversity monitoring and invasive species detection



5 Assessment of the effects of biotopes on the pressure and incidence of NIS



6 Mediterranean Forest Decay and Phytophthora VC



# Workflow execution examples ( Essential Biodiversity Variables -> Ecosystem Services )

**IJI NIS Workflow Environment**

Dashboard

Allianthus Altissima mapping

- Dashboard
- + Run new workflow
- Crustaceans functional biogeography
- Dashboard
- + Run new workflow
- Geographical validation

Tools

- Dark theme

**IJI NIS Workflow Environment**

Run a Crustaceans functional biogeography workflow

Workflow overview:

```

graph LR
    A[Read Tabular Data... SIA.csv] --> B[Shape file creator]
    B --> C[Check Taxonomy]
    C --> D[Input: Tax_validated]
    D --> E[Spatial Viewer .shp]
    E --> F[Geographical]
    F --> G[Concurrent links]
  
```

**IJI NIS Workflow Environment**

Run a Crustaceans functional biogeography workflow

Workflow overview:

- Workflow name
- Biological data on CN stable isotope
- Trophic position data
- Upload workflow

Workflow created

**IJI NIS Workflow Environment**

Aillanthus Altissima mapping

Dashboard

+ Run new workflow

Crustaceans functional biogeography

Dashboard

+ Run new workflow

Geographical validation

Tools

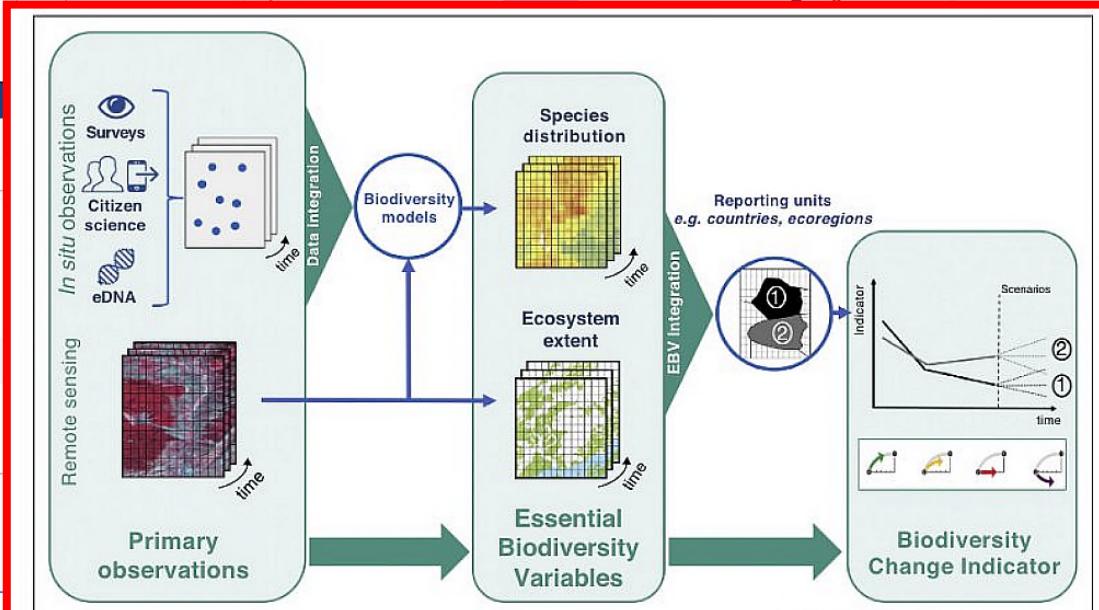
- Workflow studio
- Dark theme false

**IJI NIS Workflow Environment**

Continue workflow execution

Spatial map showing locations in Southern Europe and North Africa. A red dot is placed near the location of Malaga, Spain.

Name	Date	Lon, Lat	Valid	Select on map
Sa20pla experiment 2	16/04/2020, 10:23	-4.1838, 36.6787	✓	



You can access to a demo here: <https://youtu.be/yGC7Lzwbb6bs>

<https://youtu.be/AJfNzj0OGol>



Sign In with your credentials

charles.elton@lifewatch.eu

Log in

Have you forgotten your password?

# A great international ICT Team "in the kitchen"...

- Our working methodology coordinates directly 39 scientists and 36 ICT experts (among others, at the moment !)
- Continuous improvement guarantees the success of incoming challenges (i.e. Tesseract VRE & LifeBlock )



# **PARTE V.**

## **Algunas Conclusiones**

# Soporte de las TIC disruptivas a nivel:



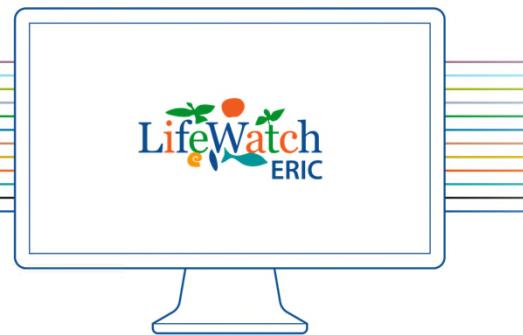
**ESTRATÉGICO:** El proceso de transición verde Europea pasa necesariamente por el de transformación digital. En este caso, los planes de la UE en su **Pacto Verde-Green Deal & Biodiversidad-Biodiversity 2030**, alineados con los ODS 2030, en un entorno de cambio climático global donde el lema-“motto” “Thinking globally, acting locally”, se lleve a cabo ahora más que nunca, considerando también la perspectiva ofrecida por el paradigma de la Europa de las Regiones a través de sus diferentes pero complementarias **RIS<sup>3</sup> (Regional) Research & Innovation Strategies for Smart Specialization**, y la inminente sucesora, la S4.

**TÁCTICO:** *“No reinventar la rueda”*: Reforzamiento de las Comunidades-de-Práctica – CoPs – existentes en el ámbito de la **Biodiversidad y Gestión Sostenible de los Ecosistemas**, mediante la federación de las “buenas prácticas” a través del reforzamiento de las e-Infraestructuras distribuidas de investigación como lo es **LifeWatch ERIC**. Contemplando las CoPs integradas por Investigadores Científicos y Tecnólogos, pero también Gestores y Decisores Medioambientales, Emprendedores-Empresas, y Ciencia Ciudadana en términos generales, de manera transdisciplinar y transgeneracional.

**OPERACIONAL:** Creación de Entornos Virtuales de Colaboración –Tesseract VRE– a modo de “**essential e-Research Collaboration middleware**” que garanticen la interoperabilidad (en términos generales, “FAIRness”) de manera abierta no sólo de los datos, informaciones, conocimientos (explícitos y tácitos) y e-servicios, sino además de las Comunidades-de-Práctica involucradas, garantizando también el reconocimiento y “contabilidad” de los desarrollos llevados a cabo de manera distribuida en un mundo globalizado, mediante también la valorización socioeconómica de los **Servicios Ecosistémicos asociados –LifeBlock–**.



# ¡ Muchas gracias por la atención !



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