



eLTER RI Strategic Plan

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Preface

This document reflects the commitment of the eLTER community to produce a **high-level strategy document** that **presents the essence, spirit, and uniqueness of the eLTER RI**. From September 2020 to May 2021, the collective efforts of the Strategic Planning team has been devoted to crystallizing our objectives, defining our *raison d'être*, and finding expression for our core values. In other words, we are defining where we want to go and how to get there, and for whom. To these ends, we collected existing material and synthesized the many inputs from internal and external stakeholders. Specific brainstorming sessions to collect input from the eLTER community were organized during two main project meetings of eLTER PPP and eLTER PLUS. The consensually-agreed upon goal was to prepare a synthetic document that would be understandable by a broad audience of diverse stakeholders.

This document should be considered a first **step in an iterative and interactive process** and a work-in-progress for the months and years to come. As planned, we foresee periodic revision and re-assessment of the Strategic Plan based on continuing consultations with internal and external bodies - including the Interim Council (IC) and the Scientific Advisory Board (SAB) - during the implementation phase. This iterative process will give us the flexibility and adaptability to best align our strategic goals with novel scientific questions and environmental issues, with emerging needs of stakeholders, as well as with the priorities of the European Research Area policy. We will deliver a revised version of the Strategic Plan at the end of the PPP project, i.e., when the eLTER RI scope and services will be fully defined.

eLTER is already a **well-established endeavour** and the Strategic Plan complies with the specific recommendations and guidelines we received during the ESFRI evaluation process. The Strategic Plan reflects our commitment to make eLTER a *“Pan-European infrastructure addressing long-term multi-disciplinary ecosystem studies which is filling a major gap identified in the ENV RIs landscape”* (eLTER evaluation report 12.03.2018). In addition to the contributing steps defined above, we built upon ESFRI recommendations to reach a comprehensive and inclusive agreement on our vision, mission, and strategic goals. We have strived to avoid the mere repackaging of existing documents and material. We have instead accounted for the progress that has been made on the many facets of the project over the past three years (2017-2020), and this entire process was conducted in tight collaboration with WP leaders of the PPP and PLUS projects. Importantly, we have also benefited from fresh ideas and perspectives provided by the many researchers who joined eLTER since the initiation of the PPP and PLUS projects.

In addition to its role in conveying the inspiration driving eLTER RI, we hope that this Strategic Plan will serve as a **framing document** for the multiple tasks of the preparatory phase including the communication strategy, the work on socio-economic indicators, service portfolio and key performance indicators.

This version of the eLTER Strategic Plan is for internal reference and it will serve as the basis for further dedicated discussions with the Interim Council as well as it will be the basis for dedicated (target groups) specific versions such as glossy overviews for promotional purposes.



eLTER Preparatory Phase Project

Preamble

Humanity has entered the Anthropocene, a new period of the Earth in which humans have become a geological and ecological force. Our planet is on an unsustainable path, with myriad environmental challenges threatening the continued well-being of humankind. eLTER's four Research Challenges (1) Biodiversity loss and land use change, (2) Climate change and greenhouse gases, (3) Eutrophication and pollution, and (4) Sustainable use of resources - Socio-Ecological Systems belong to the major environmental issues demanding urgent attention, simply because they threaten the long-term viability of our planet for human life.

Earth's ecosystems are life-supporting systems on which human existence depends. The recent pandemic has dramatically reminded us how much our lives rely on the complex interactions between living organisms and their environment, between people and nature. Understanding the functioning and the trajectory of these systems at both local and global scales represents a profound research challenge that no single discipline can fully address. The social and bio-geo-physical dimensions of these challenges are intimately intertwined. This calls for the development of a holistic - or whole-system - approach that goes beyond the mere juxtaposition of disciplinary inputs, but rather a truly integrative, transdisciplinary research framework that synergistically and seamlessly brings together multiple knowledge bases to confront sustainability challenges. This new knowledge and working framework is pivotal if we want to reverse ongoing environmental degradation and steer socio-ecological systems toward sustainability.

This Strategic Plan explains why, how, and for whom the eLTER RI will adopt this whole-system framework to study the very thin layer of earth, from the lower atmosphere down to the lithosphere, where most of our lives and activities take place. Our objectives are directly relevant to, and correlated with, the UN Sustainable Development Goals, especially Clean water and sanitation (SDG 6), Climate Action (SDG 13), Life on Land (SDG 15) and Life below water (SDG 14). eLTER RI will contribute directly to current European Environmental Strategies and Initiatives such as the Biodiversity Strategy 2030 and the European Green Deal as well as the implementation of framework directives (i.e. Water Framework Directive). Our vision, mission and strategic goals reflect the uniqueness of the eLTER RI: a commitment for the long-term trans-disciplinary study of representative European life-supporting systems, the provision of relevant knowledge, data and services to a wide range of stakeholders and a willingness to foster collaboration between science, civil society and policy-makers to address key environmental challenges from the local to the Pan-European scale. When we succeed, the eLTER RI will bridge a critical gap in Europe's environmental RI landscape to the benefit of Europe's citizens and those around the world.

Vision

eLTER responds to the challenge of understanding the complex interactions between people and nature over the long term. Environmental sustainability can only be achieved on the basis of the robust knowledge and empirical evidence needed to identify and mitigate human impacts on ecosystems. eLTER catalyzes scientific discovery and insights through its state-of-the-art research infrastructure, collaborative working culture, and transdisciplinary expertise. This enables the development and application of evidence-based solutions for the wellbeing of current and future generations.

Mission

The mission of eLTER is to facilitate high impact research and catalyse new insights about the compounded impacts of climate change, biodiversity loss, soil degradation, pollution, and unsustainable resource use on a range of European ecosystems and socio-ecological systems, representing the “critical zone” in which we live. With our distributed physical infrastructure and scientific expertise, we aspire to provide Europe and the world with the scientific capacity to improve our understanding of terrestrial, freshwater, and transitional water ecosystems. Combined with our socio-ecological approach to studying integrated human-nature systems and our commitment to integrating stakeholder knowledge, we provide a solid foundation to inform evidence-based policy making and management solutions for addressing current and emerging environmental challenges.

The pan-European, in-situ research infrastructure will serve multiple scientific communities with high-level central facilities and distributed, well-instrumented eLTER Sites and socio-ecological eLTER Platforms (henceforth called eLTER facilities). Optimized overall operation will coordinate between the central and national components, and facilitate their integration under one coherent and sustainable RI. Continent-wide, novel data services and products will result from combining harmonized standard observations at the sites with information from a wide range of other sources. These services will be accessible to a broad diversity of stakeholders from local to continental scales. As a fundamental component of eLTER’s identity, we will synergistically collaborate with diverse ecosystem/environmental research infrastructures and networks across Europe and the world.

Strategic Goals

We define four main strategic goals that capture the multi-facet dimensions of eLTER RI (Figure 1). Each strategic goal includes several key objectives.



Figure 1 : Overview of eLTER RI strategic goals. The four goals will contribute to two main achievements indicated in the center.

A. Facilitating innovative research for addressing grand societal challenges.

The eLTER RI aims to increase the scientific capacity, efficiency, visibility, and attractiveness of the European Research Area (ERA), to support management and policy making for a sustainable future. It will seamlessly bring together researchers of ecosystem ecology and biodiversity, the critical zone, and socio-ecological systems to address grand societal challenges from a systemic perspective. eLTER RI will meet requirements from scientific, policy and business stakeholders in response to topical environmental policy questions across scales – from local to continental (e.g. ERA contributions to UN SDGs, IPBES and IPCC, and related EU and national policy frameworks). eLTER RI will develop and provide innovative research methods, which will be tested and implemented at its in-situ facilities distributed throughout Europe.

Key objectives:

1. **Enable scientific collaboration of multiple research communities** across scales (local, regional, continental & global) and disciplines. This is required for addressing the grand environmental challenges in an integrated and innovative approach, and catalyzing an attractive, inclusive and efficient working environment.
2. **Attract excellent science** to the eLTER facilities for research. Enable both site-level and network -level, continental scale research and catalyze scientific collaboration at eLTER *in situ* facilities through the availability of harmonized instrumentation and data from various sources, local scientific and public knowledge, and access to the relevant stakeholders.
3. **Advance the capacity to predict long-term trends** and system trajectories and to **enable upscaling and forecasting** the ecosystem responses to environmental changes by interlacing site-specific and continental scale research to disentangle related response mechanisms.
4. **Enable break-through advancements in response to Research Challenges addressed by eLTER RI. Examples are:**
 - a. **Biodiversity research:** Scientific advance in understanding processes of biodiversity dynamics in response to changing environmental conditions and as drivers of ecosystem functioning. This is crucial for better understanding of ecological processes and for deriving management recommendations at an unprecedented level of detail and sufficiently well covered at continental scale.
 - b. **Climate-Food-Water nexus:** Combining multi-scale data with multi-scale modeling tools to address resource availability. This is crucial for the prediction of key processes of food production and water provision as well as for the design of management and adaptation strategies to combat the adverse effects of climate change.
 - c. **Fundamental understanding on the interlinked biogeochemical element cycles at exemplary sites** covering major European environmental gradients. This is crucial for a quantitative understanding of ecosystem services and functions

driving the net balance of greenhouse gases, distribution and removal of pollutants, provisioning of nutrients and water security.

- d. **Sustainable use of resources - Socio-Ecological Systems:** study integrated social and biophysical systems, their interactions and feedbacks, with input from researchers representing diverse disciplinary expertise and non-academic stakeholders. This is crucial for facilitating **holistic research on human-environment interactions** and for maximizing social and environmental policy relevance.

B. Designing and operating a distributed and highly functional network of eLTER in-situ facilities across Europe.

Our aim is to integrate existing and newly established eLTER Sites and eLTSER Platforms into a pan-European, distributed research infrastructure supported by user-friendly centralized services. The RI will benefit the individual *in situ* facilities and their teams through harmonized design and instrumentation, secured long-term funding and high-level collaborations. Reversely, these advancements will shape a network fit for addressing questions at the continental scale in a concerted manner. The distributed RI will serve a wide range of scientific disciplines and stakeholder groups. eLTER is specifically dedicated to achieve long-term sustainable operations and therein collaborating closely and synergistically with environmental RIs and other initiatives nationally, in Europe and globally.

Key objectives:

1. **Implement a multifunctional site and platform network** representing a wide range of terrestrial, freshwater and transitional waters ecosystems. To achieve continental-scale representativeness, eLTER will identify gaps in the distribution of existing sites and platforms and in the infrastructural development on the basis of robust site metadata and negotiate site upgrading with the respective National Funding Agencies.
2. **Implement a nested design** with several site categories and platforms, enabling both in-depth site-level research as well as cross-site continental upscaling.
3. **Nurture technological, methodological and operational innovation** related to the collection, harmonization, and dissemination of environmental in-situ and socio-ecological data and knowledge, and invest in **capacity building** and **knowledge transfer** across all stakeholders for establishing new technologies.
4. Harmonize operations across sites and platforms through a framework of **eLTER Standard Observations** that are founded on state-of-the-art and cost-efficient methods for probing our environment.
5. Establish **strategic partnerships** to promote collaboration and co-location of in-situ facilities with existing and emerging environmental monitoring networks and research infrastructures and initiatives in Europe and globally. Research cooperation will be further pursued and developed through data and knowledge exchange, joint training programs, and coordinated environmental policy advocacy. Such steps will assure productive cross-fertilization of expertise and knowledge, and increase the potential up-take of eLTER services, thereby magnifying the impact of both eLTER RI and its other, related RIs

c. **Creating a unique and widely accessible service portfolio.**

The comprehensive eLTER RI service portfolio will be of direct scientific and societal relevance and serve multiple stakeholder categories. It will be elaborated in compliance with existing reference schemes such as European Open Science Cloud (EOSC) and co-designed by continuous screening of the usability and evaluating the feedback from users of the services. The eLTER Service Portal will be the one-stop gateway to all eLTER RI resources, supporting the collection of, and access to, harmonised data from eLTER in situ facilities and access to other services provided by in-situ facilities and centrally. Options for co-developing tools and services in technical and strategic collaborations will be continuously explored with both external and internal users.

Key objectives:

1. **Provide services to a broad range of 7 stakeholder (user) categories**, comprising external stakeholder categories like scientists, funding agencies, peer RIs, policy decision makers, industry, and the general public, while internal users are site-based researchers, site managers, data managers, and internal eLTER service providers.
2. **eLTER services:** Users will require a number of services from within and beyond the eLTER RI - some will be IT-based (e.g. catalogue, storage) and others will not (e.g. training, site access). The topic service areas from the eLTER RI proposal (Quality Assurance for Data; Modelling and Analysis Tools; Design Interoperability and Synthesis; Technological Innovation and Development) can combine a range of services from the RI and beyond to deliver tailored thematic service packages to support eLTER stakeholders. These thematic service packages will come from a variety of sources:
 - a. Services designed within the RI to **respond to its stakeholder requirements**. These will be unique RI services supporting and building on the place-based research undertaken by the eLTER RI.
 - b. Services from EOSC (EOSC core services e.g. authentication, service catalogue). Augmenting eLTER designed services with EOSC core services will ensure compatibility with other RIs and the wider European research landscape.
 - c. **Third-party services** (e.g. from other RIs) will also form an integral part of service offerings to users. These could be identified and accessed through the EOSC marketplace.
3. **Service Portfolio Delivery:** Services will be evaluated, commissioned and prioritised using processes defined by the **service portfolio management system**. Continuous innovation in responding to user needs is necessary to sustain the success of the eLTER RI and this will require effective portfolio management processes including defining and responding to new service needs and continuously reviewing and improving the service portfolio.
4. **Service Management:** eLTER will adopt service management standards used by EOSC in order to utilise existing knowledge within the EOSC service community and ensure compatibility with other EOSC Marketplace and EOSC Hub services. Consultation with

internal and external users will be a key part of the service portfolio management processes.

5. **Continuous Improvement:** As part of the service delivery, we will implement a continuous quality improvement lifecycle with stakeholders as described below:

a. Define new services or change existing services

Define the desired outcomes for the service, analyse its impact on existing services and determine what is required to offer the service.

b. Approve new or modified services

Assess whether the service meets the needs of the RI and determine if it is cost-effective to include in the service portfolio

c. Review service portfolio

The service portfolio will be assessed at regular intervals to ensure that the services continue to align with the eLTER RI requirements, are kept up-to-date and remain economically viable.

Examples of potential eLTER services responding to stakeholder needs

Currently, the comprehensive feedback from stakeholder groups on their service requirements from eLTER RI is analyzed. Some examples of potential services and the stakeholder groups they address are:

1. Business and Industry - co-developing innovative sensors in response to the standard observation needs
2. Government and policy decision makers - a generic tool to visualise the time series for key environmental parameters at a given place or at the European scale.
3. Researchers and Science - Create Information Clusters for sites and platforms, where eLTER in-situ Standard Observations and legacy data are complemented with relevant data from other sources, e.g. environmental monitoring networks, EO data providers (ESA, NASA), developers of analytical services and scenario-testing models, industry partners, and others.

Cookie cutting services will support users in harvesting data from these information Clusters and provide place based data from a variety of information providers e.g. Copernicus, EuroStat and combine it with eLTER Site information.

4. Civil society - provide educational material on eLTER's wholly system approach and other ecological topics for students (from primary to high school) and use field visits at eLTER Sites for deepening theoretical knowledge.
5. Internal Stakeholders - managing physical access to sites across the entire distributed RI.

Underpinning this will be training programs for the diverse stakeholder groups. This will be achieved through the provision of a training platform that will combine face to face and on-line learning modules to address the needs of each stakeholder group.

D. Promote collaboration, integration, and a conducive working culture.

eLTER RI aspires to exemplary global citizenship with high ethical and environmental standards reflected in its collaborative and inclusive working culture within the RI and between the RI and stakeholder communities. The RI will strive to establish productive and synergistic relations with other, related RIs across Europe and globally, to maximize the uptake of its services, strengthen its policy impact, avoid redundancy, and make productive use of complementary services provided by sister RIs. Within the RI, eLTER will create a collaborative working culture through its integrative governance structure, and will advance a transdisciplinary research framework encouraging cooperation between multiple disciplines and knowledge sources. As diversity is a core value and catalyst towards a stronger, more resilient, and more productive research community, eLTER will invest in the current and next generation of European scientists and strengthen diversity of its research community by adopting policies to encourage participation of diverse individuals, particularly from those communities that suffer from systemic bias and discrimination.

Key objectives:

- 1. Establish eLTER RI as a recognized and networked scientific community committed to integrated governance.** eLTER RI will promote a culture of engagement, participation, and collaboration among researchers from Sites and Platforms across Europe through the establishment and maintenance of a **Site and Platform Forum (SPF)**, development and use of **communication tools** tailored to encourage transparency and participation, and encouragement and initiation of **collaborative research and training initiatives**. The SPF will act as a hub for knowledge exchange and catalyzation of collaborative initiatives, will enhance a sense of collective identity, and will provide a forum for feedback and input regarding RI activities and future directions, all of which will enhance coordination and collaboration between and among National Coordinators (NCs) and between NCs and the central RI administration.
- 2. Establish a working culture specializing in inter- and transdisciplinary approaches.** eLTER will develop novel tools for attracting and communicating with diverse stakeholder communities to convey scientific information and facilitate a productive and pluralistic multi-directional knowledge exchange. Proactive and transparent collaboration and working culture will enable ambitious transdisciplinary research and meaningful stakeholder engagement.
- 3. Education for inclusive science.** eLTER scientists will undergo transversal and transdisciplinary training to develop a broad range of capacities necessary for working with stakeholders, including stakeholder engagement, citizen science, recognizing and confronting biases, and training for working across disciplinary boundaries.
- 4. Become a European and global hub for scientific and policy career development and attractive opportunities in academia, research, and at the science-society interface and provide an exemplary leadership role in creating an inclusive, participatory community.** eLTER's investment in physical infrastructure will be paralleled by its investment in people. eLTER will assist in developing creative, scientific, and interpersonal skills among its researchers, while simultaneously championing equity, openness, and transparency in all of its administrative, research,

and educational activities. Realizing that diversity provides a foundation for scientific excellence, eLTER will enact administrative politices and educational tools to promote diversity and inclusiveness, while directly challenging and working to overcome existing systemic barriers, biases and discrimination in the scientific community.

- 5. Enact collective/RI-wide environmental management and behaviours consistent with the eLTER vision and mission.** eLTER will address the grand environmental challenge not only through its research activities, but also through its institutional behavior. eLTER will adopt environmental standards of operation, from the central RI to the Site/Platform scale, to reduce the environmental impact of RI operations and educate its community regarding the implications of our behaviors (e.g., travel, food, material waste, and energy consumption). Impact will be monitored and constantly improved.

Performance Monitoring Plan

eLTER RI is committed to conducting periodic assessments of RI development and its progress towards achieving its Strategic Goals and Key Objectives. eLTER RI will conduct two types of assessments, a cost-benefit analysis and a socio-economic impact assessment, which will provide transparent and publicly-accessible information regarding RI performance.

- The cost-benefit analysis will provide accurate estimates of monetary investments versus economic benefits of outputs ranging from research and educational services to estimated economic benefits of research implementation (e.g., through the protection of ecosystem service provision).
- The socio-economic impact assessment will be developed in accordance with contemporary, pluralistic criteria, including impacts on society, economics, and the environment, evaluated using diverse quantitative and qualitative indicators, such as human and social capital formation, innovation, contribution to public policy development, and (importantly) concrete and measurable improvements in environmental conditions at multiple spatial scales from the local to the global. Impact will be reported as outputs, outcomes, and long-term impact.

These assessments will be used internally for self-evaluation and improvement, and delivered to stakeholders for external review. Taken together, the cost-benefit analysis and the socio-economic impact assessment will provide a broad picture of the contribution of eLTER RI to Europe in both quantitative (monetary and others) and qualitative terms.

Finally a list of Key Performance Indicators (KPIs) will be developed to assess the impact of each key objective towards achieving the respective strategic goal. These KPIs will be associated with measurable impact indicators to allow for constant monitoring and assessment of the Strategic Plan.

Core Values of eLTER RI

Due to human activity, the planet has reached global environmental limits that deprive an increasing portion of humanity of their potential for sustainable livelihoods and need for a healthy environment. The eLTER RI community is committed to contributing to global efforts to mitigate and reverse global environmental degradation.

“eLTER Enables Scientific Research to Confront and Overcome Global Environmental Challenges”

The eLTER RI is built upon a wide diversity of cultures, stakeholder networks and scientific expertise representing more than 25 European countries. Its multi-cultural and transdisciplinary spirit is the core strength of the eLTER RI.

To maintain and amplify this core strength, eLTER RI is committed to:

- A fundamental holistic approach in investigating Life Supporting Systems
- Research integrity
- Enhancing inclusiveness, collaboration, and collective intelligence
- Policy relevant, stakeholder driven science and RI development
- Transparency and responsiveness
- Technological and social innovation
- Continuous self-assessment and improvement