Annual Report 2024

Contents

Preface

It is an honour to introduce my first ELIXIR Annual Report as ELIXIR Director. Having arrived in March 2024 and formally taken on the role in June, the past year has been spent immersing myself in ELIXIR. I am gaining a deep appreciation of the infrastructure's reach, ambition and impact, and my role in ensuring its continued growth and success.

2024 was the first year of the ELIXIR Scientific Programme 2024-28 - a period of laying foundations, establishing new initiatives and strengthening our strategic direction. We launched foundational activities within the four tiers of our strategy - Science, Technology, Nodes and People. This included an open call for science projects, supporting projects that bridge across multiple ELIXIR communities ensuring that ELIXIR continues to drive convergence and interoperability across life science research resources.

As part of the Programme, we introduced infrastructure support for two key services: the ELIXIR Training e-Support System (TeSS) and the LifeScience Login, providing stability for users across Europe. Our commitment to developing expertise and cultivating talent has taken shape through projects like Node Support, PeoplePulse, and Train-the-Trainer, including the expansion of the ELITMa training programme - an initiative to strengthen operations and management within ELIXIR Nodes.

ELIXIR's ability to bring together communities and drive collaboration was demonstrated through the establishment of two new Focus Groups: the Domestic Animals Genome and Phenome Focus Group and the Pathogen Data Focus Group, and the maturation of the Cancer Data Focus Group to a Community. These additions reflect our commitment to facilitating data-driven research across diverse domains, and our responsiveness to scientific challenges with global impact.

We also saw success in securing new funding and partnerships. The launch of two major EU-funded projects - ELIXIR-STEERS and EOSC-ENTRUST - highlighted our leadership in coordinating European bioinformatics service provision, while the award of B1MGplus (starting in 2025) ensures that ELIXIR remains at the forefront of efforts to implement the vision of the 1+Million Genomes initiative. Our influence extends beyond individual projects; in 2024, ELIXIR released its position paper on Framework Programme 10, helping to shape the future of European research funding.

Strategic partnerships have remained at the centre of our approach, with notable developments including a Memorandum of Agreement with the US National Institutes of Health (NIH), the formalisation of our collaboration with Instruct-ERIC and numerous successful staff exchanges. ELIXIR's influence was also evident in the extensive engagements with the European Open Science Cloud (EOSC) and the European Health Data Space (EHDS), ensuring that life science data infrastructure is strongly connected with the emerging EU data space landscape while continuing to be built on strong, FAIR principles.

ELIXIR has always been a collaborative enterprise, and the continued expansion of our membership underlines its relevance and impact. This year, Austria and Romania, two of our most recent Observers, joined ELIXIR-STEERS, while Malta submitted an application to join ELIXIR as a full Member - clear signals of recognition of the value of ELIXIR's role in uniting European bioinformatics services.

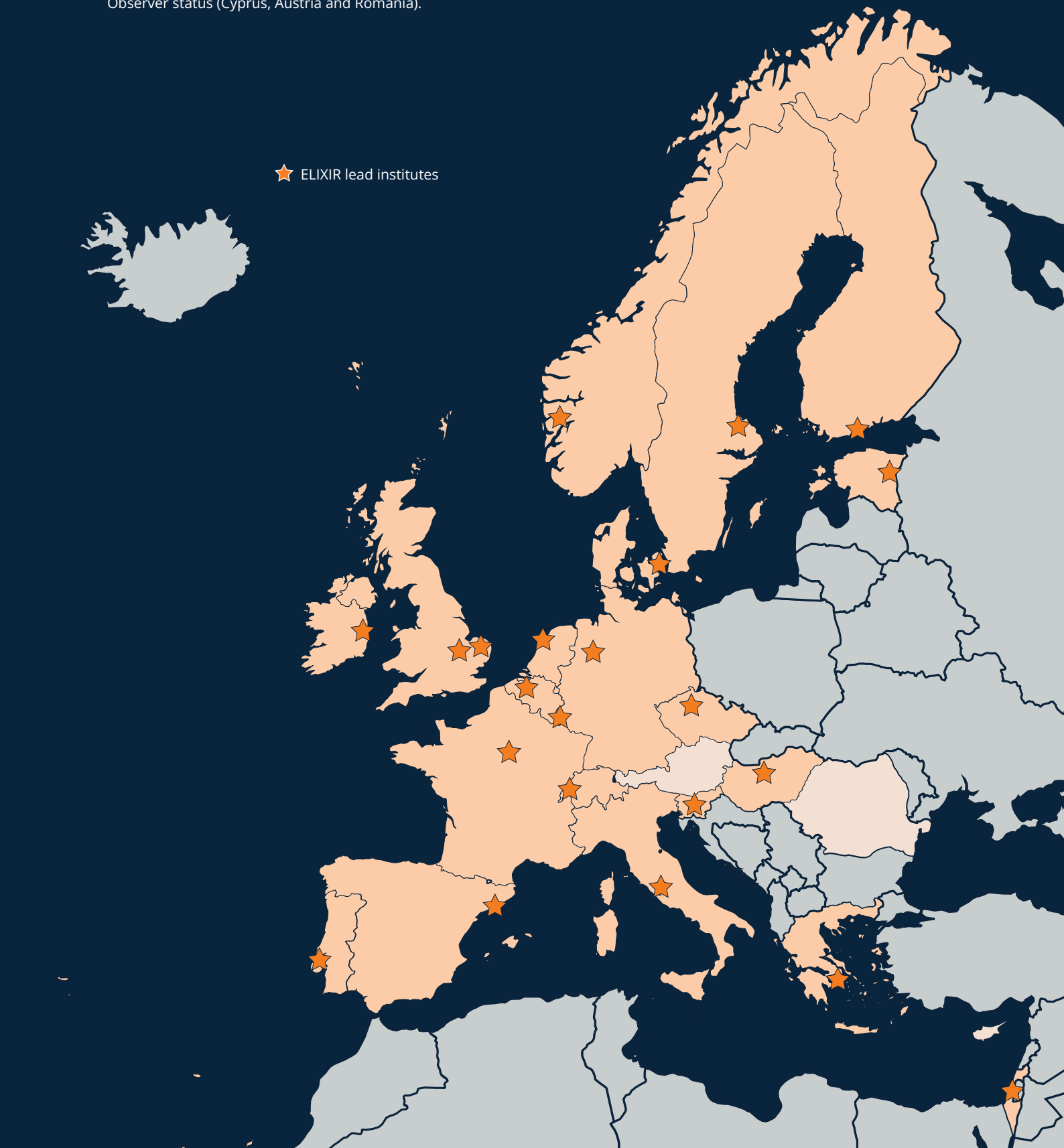
Our community continues to thrive through flagship events, with a successful All Hands Meeting in Uppsala, an energetic BioHackathon in Barcelona and strong ELIXIR representation at the European Conference on Computational Biology (ECCB) in Turku and the biannual International Conference on Research Infrastructures (ICRI) in Brisbane. ELIXIR partners also excelled in competitive funding calls, securing seven projects in the OSCARS open call and winning funding for European AI Factories across five countries. These successes underscore the strength of our network and the expertise of our Nodes in leading cutting-edge bioinformatics initiatives.

As we reflect on a year of progress, I am grateful for the dedication and vision of the ELIXIR community. The work of our Nodes, partners and funders is instrumental in building a sustainable, integrated life science data infrastructure. With a strong foundation in place, we look forward to the coming years with ambition and confidence - driving open, collaborative science to advance research and innovation across Europe and beyond.

Tim Hubbard

ELIXIR Director
Cambridge, March 2025

ELIXIR follows a Hub and Nodes model, where the Hub's role is to coordinate activities across the Nodes. Nodes are a network of organisations coordinating national ELIXIR activities, each established by an ELIXIR member state. In 2024 there were 22 Nodes (21 countries and EMBL-EBI) and three countries with Observer status (Cyprus, Austria and Romania).



ELIXIR in 2024

Driving EU projects forward

13 ONGOING PROJECTS

6 NEW PROJECTS

4 COORDINATION ROLES

ELIXIR's portfolio of EU projects included six new projects starting in 2024 and 13 ongoing projects, four in coordination roles (starred).

EU PROJECTS STARTING IN 2024

- *ELIXIR-STEERS
- EOSC-EVERSE
- *EOSC-ENTRUST
- EVORA
- Genome of Europe
- OSCARS

EU PROJECTS AWARDED IN 2024 (STARTING 2025)

- *B1MGplus
- CANDLE

ONGOING EU PROJECTS IN 2024

- AgroServ
- Biodiversity Genomics Europe
- canServ
- EOSC4Cancer
- *Genomic Data Infrastructure
- PathOS
- PROPHET
- RItrainPlus
- BiCIKL
- *BY-COVID
- EOSC-Future
- ISIDORe
- EUCAIM

In 2024, ELIXIR

Funded **12** new Commissioned Services from the Scientific Programme 2024-28 with a total investment of

€10.2 M:

SCIENCE TIER

3 Commissioned Services (€4 million)

TECHNOLOGY TIER

6 Commissioned Services (€4.6 million)

NODE TIER

1 Commissioned Service (€640,000)

PEOPLE TIER

2 Commissioned Services (€960,000)

Ran **1** open call for Commissioned Service funding in the Science tier of the Scientific Programme 2024-28, with **13** projects selected

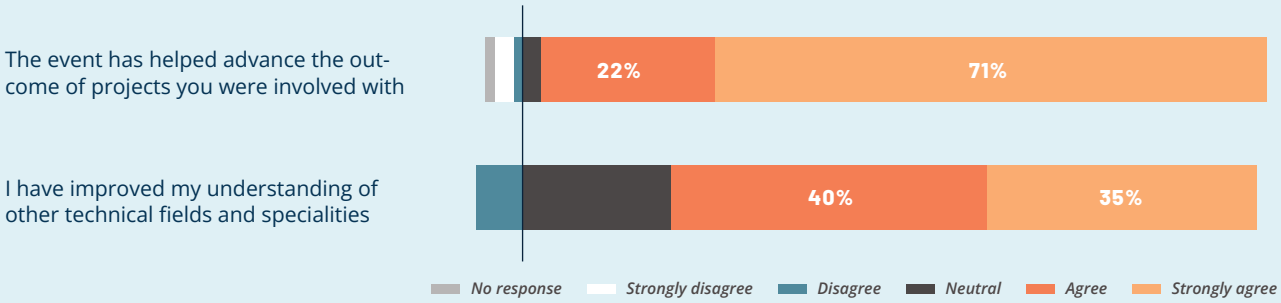
Funded **13** ongoing Commissioned Services from the Scientific Programme 2019-23 with **€732,475** distributed in 2024

Funded **40** travel grants, **5** staff exchanges and **1** industry day, with **€105,000** distributed in 2024

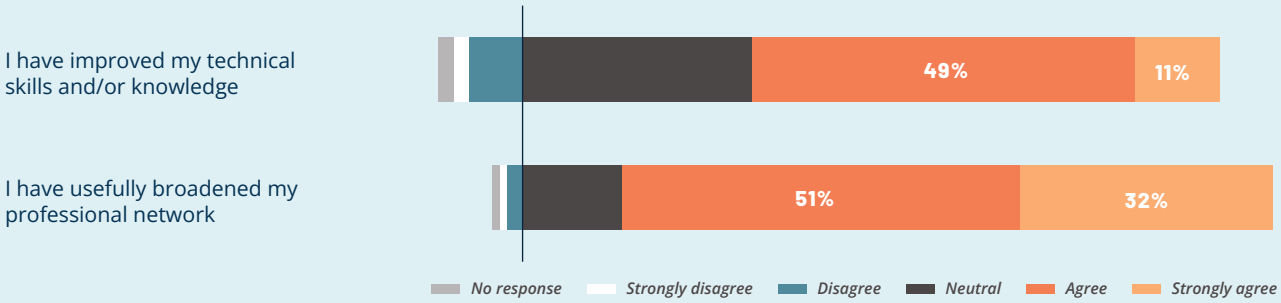
Welcomed **2** new Focus Groups: Domestic Animals Genome and Phenome Focus Group and the Pathogen Data Focus Group, and **1** new Community, the Cancer Data Community, which matured from a Focus Group.

Hosted high impact events

All Hands Meeting 2024



BioHackathon Europe 2024



Boosting standards in machine learning

In 2024, the ELIXIR Machine Learning Focus Group published the DOME Registry[1] in GigaScience[2], with the publishers making DOME entries mandatory for all machine learning submissions[3]. The registry is a curated database of the annotations across a number of supervised machine learning models in biology, encompassing both published and unpublished studies. It provides researchers with access to standardised evaluations of model compliance to the DOME (Data Optimization Model Evaluation) recommendations, an overall indicator of model transparency, which were published in 2021[4].

The DOME recommendations have been highly influential since publication, with the paper being accessed over 22,000 times, with 131 citations and an altmetric score of 80 (as of January 2025). They provide structured guidelines for reporting key aspects of machine learning studies, including data handling, optimisation techniques, model evaluation and interpretability, ensuring that critical details are transparently documented for the scientific community. Stakeholders also include publishers, funders, innovators and policymakers, who all have an interest in assessing the trustworthiness of machine learning research.

Machine learning is a subset of artificial intelligence and was instrumental in the 2024 Nobel prize for Chemistry, awarded to the developers of AlphaFold for protein structure prediction. ELIXIR's leadership in the standardisation of machine learning methods has been driven by ELIXIR Italy and ELIXIR Greece, and has benefitted from connections across ELIXIR, particularly the Platforms.

DOME Registry

Over 22,000 views of the DOME recommendations paper since 2021

Supporting ELIXIR's scientific and technical women

Since 2023, the ELEAD programme has supported ELIXIR women in leadership roles in ELIXIR through mentoring and professional training.

Three types of support are offered:

- Mentoring pairs: mentees are matched with experienced senior mentors from ELIXIR and its extended network to support career development
- Peer mentoring: groups of participants engage in guided and confidential peer discussions to exchange experiences and build connections
- Professional training: expert-led sessions develop leadership skills essential for career progressions

ELEAD first ran as a pilot programme during 2023. The second edition, scheduled for 2025, will have a larger cohort of 16 women, more face-to-face events to strengthen networking and the option for those outside the programme to attend selected training sessions.

"My greatest revelation was the benefits of peer mentoring. Engaging with other women in similar positions, in a semi-structured format, on challenges we encountered in our professional lives, was hugely impactful. It provided alternative points of view and novel solutions and showed I wasn't alone as we were all facing similar challenges."

Danielle Welter, ELIXIR Luxembourg

1 *https://registry.dome-ml.org/*
2 *https://doi.org/10.1093/gigascience/giae094*
3 *http://gigasciencejournal.com/blog/dome-webinar-on-ml-recommendations*
4 *https://doi.org/10.1038/s41592-021-01205-4*

Strengthening Europe's pandemic preparedness

Between 2021 and 2024, the BY-COVID project, coordinated by ELIXIR, supported pandemic preparedness across Europe. Effective viral genome surveillance relies on automation, and the project's approach was to link existing components, supported by ELIXIR and other research infrastructures, into a single modular and scalable solution.

Galaxy Europe provides compute, tools and connection functionalities, WorkflowHub is used to ensure trustworthy and FAIR workflows, provenance is maintained with RO-Crate, and the CRG COVID-19 Viral Beacon provides visualisations.

As a result, a public infrastructure is now available for automated pathogen analysis workflows, including sample analysis, genome annotation, variant monitoring and the generation of data for dashboards. Genome surveillance initiatives can reuse the entire system on-premises or individual components as required.

Outputs have been used in other EOSC projects: EuroScienceGateway, EOSC4Cancer, and TIER2.

WorkflowHub

RO-Crate

ENA European Nucleotide Archive

Galaxy EUROPE

"We have built a scalable viral genome surveillance system that is not a black box: it generates high-quality, reproducible results transparently; it is ready-to-use and open; and it is modular enough to be repurposed for different needs."

Wolfgang Maier, Tools Developer, Galaxy Europe Team, University of Freiburg

"As a result of regular time with my mentor, I now have a much more clear vision of how I want to contribute to science and how I can use my strengths and interests to achieve this vision."

Mallory Freeberg, EMBL-EBI

"Taking part in ELEAD was a transformative experience for me. It gave me clarity on my career path, helped me navigate challenges in my day-to-day job and boosted my confidence in making important decisions."

Laura Portell, ELIXIR Spain

New EU grants

In 2024, two EU-funded projects started with ELIXIR as coordinator.

ELIXIR- STEERS

TIMELINE:	**FEBRUARY 2024 - JANUARY 2027**
BUDGET:	**€4M**
WEBPAGE:	**ELIXIR-EUROPE.ORG/ABOUT-US/HOW-FUNDED/EU-PROJECTS/STEERS**

ELIXIR-STEERS is a three-year project involving institutes from all ELIXIR Nodes. Technically, it addresses an important area of scientific need: the provision of software and workflows to life scientists, to maximise productivity in research whilst minimising energy usage. It will:

1. Create a toolkit for robust, reproducible and green software and workflows
2. Enable cross-border data analysis in the life sciences by embedding common practice across the whole European Research Area via the ELIXIR Nodes
3. Partner in Europe and internationally for global competitiveness and sustainability

The project addresses the need for good software and workflow management, which is essential for reproducible and efficient analysis of life science data. By adopting common analysis tools and good workflow practices, the project aims to minimise duplication, reduce energy consumption and lower the carbon footprint in computational life science, particularly in resource-intensive applications like AI.

ELIXIR-STEERS builds on the achievements of two previous EU-funded projects: ELIXIR-EXCELERATE (2015-19), which helped establish ELIXIR as a coordinated European life science infrastructure, and ELIXIR-CONVERGE (2020-23), which enhanced data management and stewardship across ELIXIR Nodes.

By improving standards and best practices in research software and workflows and supporting the development of ELIXIR Nodes, ELIXIR-STEERS strengthens Europe's position in global research while supporting environmental sustainability and enhancing international collaboration.

EOSC-ENTRUST

TIMELINE:	**MARCH 2024 - FEBRUARY 2027**
BUDGET:	**€4.2M**
WEBPAGE:	**EOSC-ENTRUST.EU**

EOSC-ENTRUST aims to enhance European interoperability for sensitive data access and analysis. Led by ELIXIR, with the EUDAT Collaborative Data Infrastructure as a key partner, the three-year project brings together partners from 15 European countries.

EOSC-ENTRUST is building a European network of Trusted Research Environments (TREs) for sensitive data and developing a common blueprint, or reference architecture, for federated data access and analysis. TREs provide secure platforms for handling sensitive datasets, enabling data privacy and legal compliance in research involving confidential information.

The project brings together providers of operational TREs from 15 European countries with a shared goal to implement, validate and promote their capabilities through a common European framework using shared standards and common legal, operational and technical language.

EOSC-ENTRUST is creating a reference architecture for interoperability, based on the EOSC Interoperability Framework, which addresses legal, organisational, technical and semantic interoperability aspects of TREs. It includes driver projects in genomics, clinical trials, social science, and public-private partnerships to test and refine the blueprint and facilitate secure data analysis through federated workflows.

Targeted outreach activities will expand the provider network and policy papers and guidelines will enable a long-term operational TRE framework within EOSC. EOSC-ENTRUST is working closely with the SIESTA and TITAN projects, funded in the same call, to provide trusted environments for sensitive data management in EOSC.

Our services

Services are provided by the ELIXIR Nodes to researchers around the world to support the efficient manipulation, analysis, storage and exchange of life science data. In 2024 there were **612** ELIXIR services.

Selected services are recognised as having global significance for researchers by being assigned one of three badges of quality: **ELIXIR Core Data Resources, ELIXIR Deposition Databases and ELIXIR Recommended Interoperability Resources**. In 2024, the portfolio of Core Data Resources was reviewed and two resources were identified as being at the end of their lifecycle.

2024 saw an increase in the number of ELIXIR **Multi-Node Services**, where two or more ELIXIR Nodes manage governance and operations to improve long-term sustainability. Eight Multi-Node services across 12 ELIXIR Nodes were active in 2024, each run by between two and four Nodes.

ELIXIR introduced **Infrastructure Service** funding in 2024, reserved for stable services with activities such as operations, maintenance, and governance, which are hard to sustain through other mechanisms. LifeScience Login (implementing ELIXIR AAI) and the Training e-Support System, TeSS, were designated the first ELIXIR Infrastructure Services.

Infrastructure services:

LIFESCIENCE LOGIN

- **52,107** logins per month with **99.5%** availability
- Enabled members from over **6,000** institutions to use their identities to log in via LifeScience Login
- Connected **257** production services
- More than **12,200** active users

ELIXIR TESS

- **122** content providers
- **2,985** training materials

612

TOTAL SERVICES

8

SERVICES ACROSS 12 NODES

32

CORE DATA RESOURCES

17

ELIXIR DEPOSITION DATABASES

21

RECOMMENDED INTEROPERABILITY RESOURCES

See each Platform section for the number of services associated with the Platform

Our Scientific Programme

Nodes

During 2024, the 30-month Node Support Commissioned Service proposal was written, approved and initiated.

Node Support

NODES 17 NODES, WITH FIVE FURTHER NODES RECEIVING FUNDING TO ATTEND MEETINGS
LEADERSHIP ELIXIR SWITZERLAND AND NORWAY
FUNDING €651,000

The Commissioned Service supports all of ELIXIR's Nodes to operate a federated research infrastructure by:

1. Boosting Node financial sustainability by creating a knowledge base to support the preparation of funding applications and responses to requests for information
2. Improving alignment with national open science plans and national research policies
3. Increasing industry engagement at the Node level and establishing a common support strategy across ELIXIR

People

During 2024, the PeoplePulse, Train-the-Trainer and ELEAD 2.0 Commissioned Service proposals were written, approved and initiated. People development is augmented by the Capacity Building and Knowledge Exchange Programme which includes staff exchanges, travel grants, knowledge exchanges and industry days.

PeoplePulse

NODES 11
LEADERSHIP ELIXIR GERMANY AND PORTUGAL
FUNDING €378,000

The PeoplePulse Commissioned Service aims to drive personal and professional growth within ELIXIR through:

1. Improved onboarding in ELIXIR via a pilot of onboarding webinars
2. Increased visibility of the diverse contributions of ELIXIR people
3. Understanding roles and training needs and maintaining a directory of Node individuals
4. Updating and expanding the ELIXIR Training in Management (ELITMa)
5. Running training, knowledge exchange events and Node case studies on impact

Train-the-Trainer

NODES 9
LEADERSHIP ELIXIR SWEDEN AND SWITZERLAND
FUNDING €370,000

The Train-the-Trainer Commissioned Service addresses ambitions of all four tiers of the Scientific Programme. The project aims to:

1. Recognise the work of the instructors and grow the ELIXIR-GOBLET Train-the-Trainer instructor community
2. Create and deliver five new training modules to support the ELIXIR community
3. Design, develop and roll out a Train-the-Trainer mentorship programme

ELEAD

NODES 10
LEADERSHIP ELIXIR GERMANY AND SPAIN
FUNDING €212,000

ELEAD 2.0 (ELIXIR LEadership And Diversity mentoring programme) provides structured mentorship, peer support and professional training to women in leadership roles in ELIXIR.

The programme helps to address the underrepresentation of women in leadership roles in STEM (science, technology, engineering and mathematics) by building leadership confidence, enhancing career progression and fostering a more inclusive research environment.

Technology

Reproducible analytics & infrastructure

Federated service delivery

Compute Platform

34 services

The ELIXIR Compute Platform aims to build and integrate cloud, compute, storage and access services for the life science research community.

SCIENTIFIC PROGRAMME 2024-28

In 2024, the ELIXIR Compute Platform focused on secure data access, multi-cloud deployment and Trusted Research Environments (TREs) to support life sciences research. Key milestones included the Compute face-to-face meeting, progress on passwordless authentication for LifeScience Login (LS Login)[5], and closer collaboration with EOSC[6], GA4GH[7], EuroHPC[8] and the EOSC-ENTRUST[9] project.

Efforts to enhance advanced service access control focused on how researchers authenticate to computing environments. Passwordless login was introduced to LS Login, allowing users to authenticate using security keys instead of passwords. This system, based on the web authentication standard WebAuthn[10], is needed to improve security, particularly for services handling sensitive research data. The system was tested using Apereo CAS[11], a web-based authentication system for managing user logins across multiple services, with full deployment expected in 2025.

In addition, a centralised policy agreement tracking system was developed allowing researchers and service providers to define and record terms of use. This system, integrated into LS Login, helped streamline compliance for services that require acceptance of policies before access is granted. Regular online engagement sessions were organised to provide updates on secure authentication developments and promote uptake of the service for both end users and service providers. These sessions, open to researchers and service providers, were recorded and made available via the ELIXIR TeSS (Training e-Support System)[12] and a dedicated YouTube channel[13].

Work to secure sensitive data access for analysis in defined use cases using in ELIXIR On Cloud services was carried out using LS Login to support federated authentication models. An overview of TREs, Secure Processing Environments (SPEs) and Trusted Execution Environments (TEEs) was created to inform future security frameworks.

The Platform work on multi-cloud infrastructure deployment focused on improving cloud-based research workflows. This included the implementation of ELIXIR On Cloud[14] services for users in Germany, the Netherlands and Sweden, and the integration of the GA4GH TES (Task Execution Service)[15], allowing researchers to run complex computational workflows on different cloud-based and high-performance computing systems.

Efforts continued to enhance sustainability, accounting and provenance for federated analytics, with work on a JSON schema for resource tracking to help research organisations optimise their computing infrastructure.

EU PROJECTS

The Compute Platform strengthened its role in the EOSC Federation, with experts contributing to the EOSC United EC proposal which will test the ELIXIR On Cloud compute framework and other use cases in the new EOSC EU node compute service. The Platform supported the EU-funded EVERSE project[16], contributing expertise to developing best practices in software reproducibility and sustainability. Platform experts also worked on the EOSC-ENTRUST and OSCARS[17] EU projects to develop standards for tracking and sharing research computing activity across institutions.

COLLABORATIONS WITHIN ELIXIR

The face-to-face meeting in Brno, Czech Republic, set strategic priorities for the Compute Platform Programme in 2024-26. It focused on aligning activities with the ELIXIR 2024-28[18] programme, integration with major European projects and promotion of cloud computing, data security and federated analytics. Funding strategies and the ELIXIR On Cloud services roadmap were also discussed.

5 *https://lifescience-ri.eu/ls-login.html*
6 *https://research-and-innovation.ec.europa.eu/strategy/strategy-research-and-innovation/our-digital-future/open-science/european-open-science-cloud-eosc_en*
7 *https://www.ga4gh.org*
8 *https://eurohpc-ju.europa.eu/index_en*
9 *https://eosc-entrust.eu*
10 *https://en.wikipedia.org/wiki/WebAuthn*
11 *https://www.apereo.org/programs/software/cas*
12 *https://tess.elixir-europe.org*
13 *https://youtube.com/@elixiraai988?feature=shared*
14 *https://elixir-cloud.dcc.sib.swiss*
15 *https://www.ga4gh.org/news_item/ga4gh-tes-api-bringing-compatibility-to-task-execution-across-hpc-systems-the-cloud-and-beyond*
16 *https://everse.software*
17 *https://oscars-project.eu*
18 *https://zenodo.org/records/12819244*

Data Platform

177 services

Research data management & knowledge sharing

Federated service delivery

The goal of the ELIXIR Data Platform is to increase the use, re-use and value of life science data by providing users with sustainable data resources within a coordinated and scalable data ecosystem.

SCIENTIFIC PROGRAMME 2024-28

The ELIXIR Data Platform launched its 2024–28 Programme activities with a face-to-face meeting in Padova, Italy, in October 2024. Key priorities include enhancing credit attribution systems, advancing scalable data curation and building robust, accredited database ecosystems. Discussions also addressed aligning FAIR principles with practical implementation, supporting long-term data usability.

Activities on data brokering included a survey on brokering roles and challenges and advancing the Multi-Omics Adapter for Repository Submissions (MARS) project to improve data linkage across repositories. The credit and recognition system APICURON was improved by introducing leaderboards, gamification and contributor clustering, and integrating with FAIRsharing for improved metadata tracking.

FAIRification gaps in supplementary datasets and proposed strategies for data integration were summarised in the deliverable Best Practices in Literature Biocuration[19]. In addition, the Data Platform worked with publishers (EMBO, IOP, Pensoft) to improve annotation workflows to ensure that literature-derived data are indexed and reusable. The periodic review of Core Data Resources (CDRs) was completed, ensuring ELIXIR databases meet FAIR and sustainability standards. Processes for ELIXIR Community Databases governance processes were also defined.

Supplementary data stored in BioStudies, once indexed and searchable through SIBiLS/BiodiversityPMC, will provide a valuable resource to support impact assessment of both the Global Core Biodata Resources (GCBR) and the ELIXIR Community databases. Accession numbers are increasingly present in supplementary data.

EU PROJECTS

The FAIRClinical project launched, with involvement of members of the Health Data Focus Group (ELIXIR Luxembourg, UK and Switzerland). It aims to turn supplementary data in SIBiLS and BioStudies, along with associated published case report forms, into FAIR Digital Objects.

Experts from the Data Platform contributed to the EU projects ELIXIR-STEERS, EVERSE and FIDELIS, all playing key roles in EOSC. The collaborations focused on enabling interoperability, scaling data resources and promoting FAIRification across EU infrastructures. ELIXIR's achievements in credit attribution and scalable curation were showcased at the EOSC Symposium, demonstrating its key role in fostering data connectivity and reuse.

COLLABORATIONS WITHIN ELIXIR

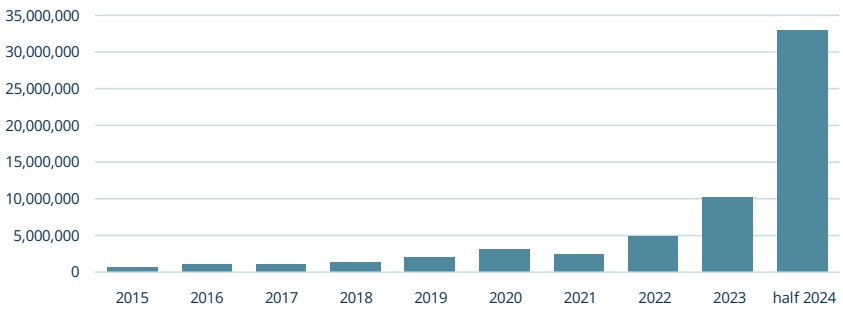
Data Platform experts expanded their collaborations with the ELIXIR Machine Learning (ML) Focus Group, both sharing an emphasis on the importance of data FAIRness in ML. The groups contributed to the DOME Registry, published in 2024, which provides a service for researchers to detail ML methods transparently to enable reproducibility. Following release, both groups added entries to the resource. The Platform and Focus Group also collaborated to ensure data readiness for ML applications and contributed to Cellular and molecular research projects.

Collaboration between ELIXIR Data Platform co-leads and the EOSC Focus Group continued, helping to shape the FIDELIS project, which is establishing mechanisms for identifying trustworthy resources within EOSC. The CDR framework and the ELIXIR Community Databases concept have been key in expanding the concepts across EOSC.

COLLABORATIONS OUTSIDE ELIXIR

Experts from the Platform strengthened ties with Instruct-ERIC and Euro-Bioimaging, formalising partnerships to enhance structural biology and imaging data initiatives. Collaboration with the International Society for Biocuration (ISB) resulted in endorsement of the APICURON platform to credit and recognise biocurators, with plans to expand its user base and features.

Patrick Ruch joined the EOSC expert group on open scholarly publications, contributing expertise on open access data curation. Silvio Tosatto and Federica Quaglia joined the EOSC expert group on research software, ensuring ELIXIR's continued engagement in shaping best practices for research software development and integration within the EOSC framework.



Global Core Biodata Resources accession numbers identified in suppdata

19 https://zenodo.org/records/15007096

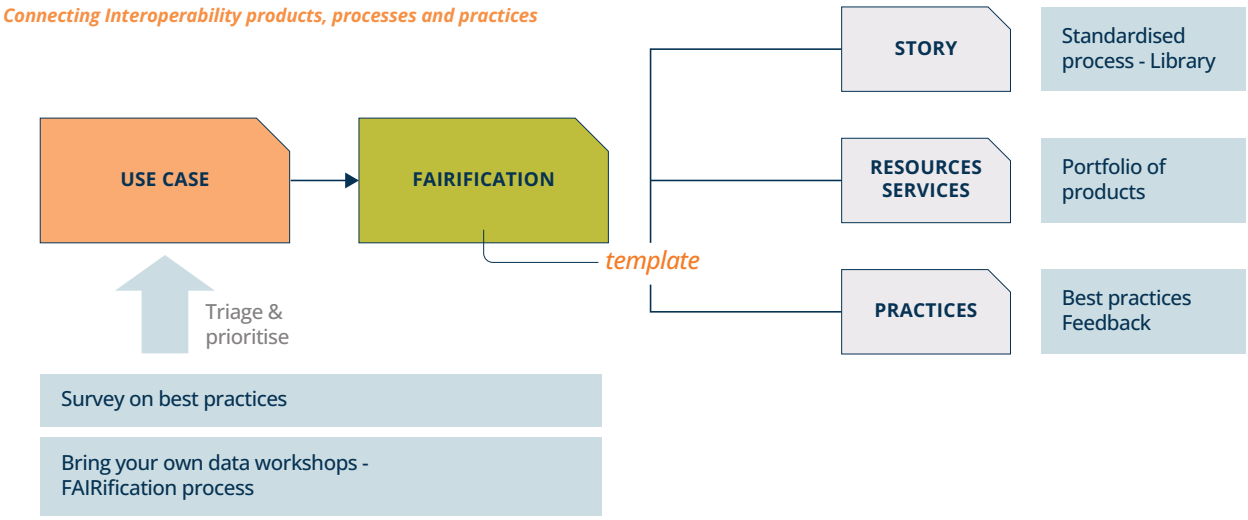
Interoperability Platform

56 services

Research data management & knowledge sharing

Federated service delivery

The Interoperability Platform helps people and machines discover, access, integrate and analyse biological data. It encourages the life science community to adopt standardised file formats, metadata, vocabularies and identifiers and works internationally to achieve its goals.



SCIENTIFIC PROGRAMME 2024-28

During 2024, the joint editorial board of the FAIR Cookbook and the RDMkit coordinated content addition and provided research data management support, guidance and training. A collection of Research Data Management User Journeys and FAQs[20] was published to illustrate common user journeys through the ELIXIR research data management ecosystem. The FAIRsharing service was integrated even more closely with the Data Stewardship Wizard (DSW) to join up the Research Data Management dots[21]. A first set of Interoperability Stories[22] has been released, with work ongoing to define a FAIRification framework and gather information on state of the art interoperability practices.

PLATFORM SERVICES

The Recommended Interoperability Resource (RIR) service collection label, awarded to 21 of the 56 Interoperability Platform services, is being reviewed and evaluated. The outcome will define future work, which may include new quality assurance processes. As part of ongoing maintenance tasks in the Scientific Programme 2024-28, the FAIR Cookbook, the RDMkit and FAIRsharing have improved features, functionalities and content.

EU PROJECTS

OSTrails, DSW and FAIRsharing are at the core of the EOSC architecture for FAIR planning, tracking, assessing and assisting. In the FAIR-IMPACT project, FAIR packaging of all research objects in EOSC was achieved using RO-Crate. In the TIER2 project, FAIRsharing delivered the Editorial Reference Handbook[23], partnering with publishers to support a shared culture of responsible data practices.

COLLABORATIONS WITHIN ELIXIR

The work between the FAIR Cookbook and RDMkit, as well as the FAIRification framework is closely linked to the RDM Community of experts and practitioners. The FAIRsharing Community Champion programme is creating a dedicated collection of standards, databases and data policies, as well as factsheets for and with the participation of representatives of each of the ELIXIR Communities, attributing credit and recognition via their ORCID. In addition, the FAIRsharing registry is being referenced in the APICURON resource of the Data Platform, linking curators to the databases they contribute to.

COLLABORATIONS OUTSIDE ELIXIR

The collaboration and engagement with the NIH Office of Data Science Strategy (ODSS) continued, via the annual FAIR session at the Bio-IT World conference with presentations on the FAIR Cookbook, FAIRifications process and RDMkit.

20 https://doi.org/10.5281/zenodo.14710085
21 https://elixiruknode.org/blog/2024/joining-up-the-research-data-management-dots
22 https://doi.org/10.5281/zenodo.14808615
23 https://tier2-project.eu/news/tier2-pilot-8-editorial-reference-handbook-partnering-publishers-support-shared-culture-responsible-data-practices

Tools Platform

349 services

Reproducible analytics & infrastructure

Federated service delivery

The ELIXIR Tools Platform is a network of ELIXIR researchers and software developers interested in creating, maintaining and extending research software, and enabling code interoperability, by following good practices throughout the software lifecycle.

SCIENTIFIC PROGRAMME 2024-28

The Platform's experts collaborated with Europe PMC[25] to provide citation metrics in the ELIXIR Research Software Ecosystem (RSEc[26]). Two ELIXIR Communities, Single-Cell Omics and Human Copy Number Variation, were selected for focused software benchmarking activities, enhancing reproducibility in these critical areas. New GitHub actions for workflow submission have been developed to improve the accessibility and usability of complex scientific workflows.

PLATFORM SERVICES

The bio.tools[27] software registry continued its growth, surpassing 30,000 registered tools. Improvements include new features, user interface enhancements and the development of linters: automated tools for ensuring metadata quality. Regular releases and refinements of the EDAM ontology enhanced semantic interoperability across bioinformatics resources. Progress was also made in integrating datasets with the OpenEBench[28] platform, strengthening benchmarking capabilities.

The ELIXIR Software Management Wizard[29] developments included a new login page to facilitate better software management practices. Galaxy's workflow editor[30] was enhanced and the use of the TotalPerspectiveVortex plugin was investigated for improved workflow scalability.

EU PROJECTS

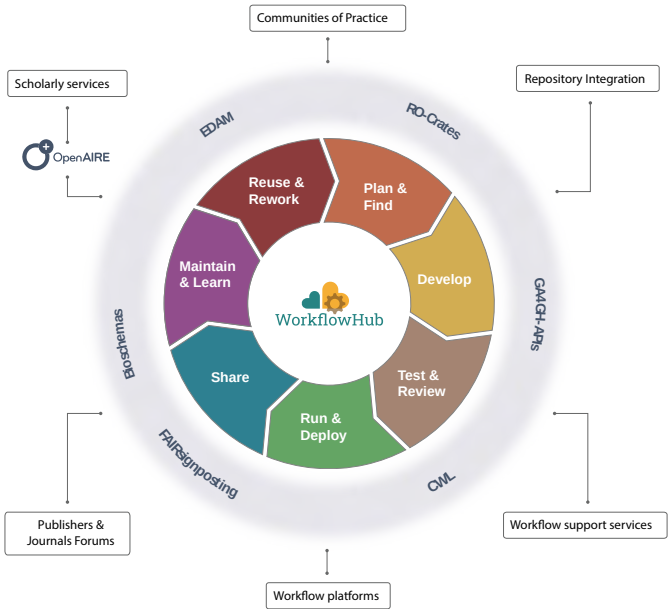
The Platform focused on aligning efforts, with ELIXIR-STEERS[31] and EVERSE[32], to maximise synergies and avoid duplication. Preparations for environmental impact assessment of workflows are underway, aligning with EU sustainability goals.

COLLABORATIONS WITHIN ELIXIR

Partnership with the ELIXIR Training Platform was enhanced, resulting in the development of comprehensive training materials for tools and workflows. There was increasing engagement with ELIXIR Communities for targeted benchmarking activities, WorkflowHub[33] onboarding events, curation of bio.tools and EDAM[34] and alignment with Galaxy[35] and the Galaxy Community.

COLLABORATIONS OUTSIDE ELIXIR

The Tools Platform has maintained and developed collaborations with many European and global infrastructures, institutions and projects to maximise the impact and visibility of its efforts. Specifically, collaboration with bioimaging consortia supported developments in the EDAM Bioimaging ontology and contributed to Galaxy, WorkflowHub, the ELIXIR RSEc and the BioImage Informatics Index[36] registry. Ongoing collaboration with the Australian BioCommons[37] spans EDAM, bio.tools, Galaxy, WorkflowHub and the RSEc. Additionally, the open source Bioconductor[38] community started collaborating with ELIXIR to integrate closely with EDAM and the ELIXIR RSEc, funded by the Chan Zuckerberg Initiative. Finally, outreach efforts included participation in international conferences such as ECCB2024 and the Galaxy Community Conference, showcasing ELIXIR Tools Platform achievements, for example, updates to the Software Management Wizard.



The ELIXIR Research Software Ecosystem connects platforms, services and resources, e.g. using the WorkflowHub registry for computational workflows.

Source: WorkflowHub: a registry for computational workflows (2024)[24]

24 https://arxiv.org/abs/2410.06941
25 https://europepmc.org
26 https://research-software-ecosystem.github.io
27 https://bio.tools
28 https://openebench.bsc.es
29 https://smw.dsw.elixir-europe.org/wizard
30 https://galaxyproject.org/learn/advanced-workflow/basic-editing
31 https://elixir-europe.org/about-us/how-funded/eu-projects/steers
32 https://everse.software
33 https://workflowhub.eu
34 https://edamontology.org/page
35 https://usegalaxy.eu
36 https://biii.eu
37 https://www.biocommons.org.au
38 https://www.bioconductor.org

Training Platform

36 services

Research data management & knowledge sharing

Federated service delivery

SPLASH – Skills, Professional development, Learning Assessment, Support and Help

The ELIXIR Training SPLASH portal provides an accessible "one-stop shop" for trainers working across all phases of the training lifecycle.

Source: All Hands Training Platform poster (2024)[40]

The mission of the Training Platform is to build and promote standards for training, support and align the training efforts and activities of the ELIXIR Nodes, and deepen connections across the European and global training ecosystem.

SCIENTIFIC PROGRAMME 2024-28

Notable outputs include an updated version of the Training Metrics Database[40] and the release of SPLASH, a portal for trainers containing training lifecycle resources. The first version of the FAIR Training Handbook was rolled out, contributing to FAIR Training at a global level.

The Training Platform face-to-face meeting was held in Prague in March, and the Platform contributed to the All Hands Meeting with a mini symposium on Enriching synergies across the ELIXIR Training Platform and the Science Tier[41] and two workshops: A world-café approach to identify training- related needs across the ELIXIR ecosystem and Collaborative solutions for enhancing inclusiveness of training.

EU PROJECTS

The Training Platform played a role in a number of EU Projects, particularly those involving multiple ELIXIR Nodes:

- EOSC4Cancer - contributed to the deliverable: A guidance document for the EOSC4Cancer learning pathway[42]
- RITrainPlus - contributed to a training course
- PHENET - contributed to a course on data management, including Train-the-Trainer
- ELIXIR-STEERS - contributed to the creation and delivery of the Train-the-Trainer ELITMa modules

COLLABORATIONS WITHIN ELIXIR

The Training and Data Platforms worked together to define processes for reward and recognition across traditionally unrecognised activities, such as training and curation. Activities of both the FAIR Training and Learning Path Focus Groups were aligned to Training Platform objectives. Finally, the Training Platform co-designed Commissioned Services tasks, including Train-the-Trainer and ELITMa activities, to complement and improve planned and ongoing Platform activities.

COLLABORATIONS OUTSIDE ELIXIR

Engagement and alignment with efforts at the global level included the delivery of training workshops, for example an Introduction to ML for the Australian BioCommons, participation in NIH coordination calls, and regular alignment calls with peers in the Australian BioCommons Bioinformatics Training Cooperative. The Platform presented a session on Assessment of learning (short format training) at the Global Bioinformatics Education Summit.

39 *https://f1000research.com/posters/13-538*
40 *https://tmd.elixir-europe.org/world-map*
41 *https://zenodo.org/records/13819968*
42 *https://zenodo.org/records/10200523*

Science

Human data and translational research

ELIXIR aims to support a sustainable infrastructure for human genomics and translational data across Europe, enabling life science research and its translation to medicine. For genomic data to be used to its full potential, we need better access, analysis and management of data at the scale of millions of participants.

ELIXIR works to achieve this through connecting people and activities across different projects and operational structures. These include networks of experts brought together through ELIXIR Communities and Focus Groups, EU-funded projects like GDI, and funded projects in the Human Data and Translational Research priority area of the Scientific Programme 2024-28.

SCIENTIFIC PROGRAMME 2024-28

In 2024, funding was awarded to five Commissioned Service projects, to advance the human genomics strategic objectives of the ELIXIR Scientific Programme 2024-28. Two of the projects will focus on enhancing data deposition in FEGA: streamlining metadata submission to national portals, expanding data access across Nodes and promoting data integration and capacity building for genomic data reuse. To develop federated data analysis, projects will provide interoperable and secure integration of sensitive data, in partnership with FEGA nodes, biobanks and the ELIXIR Core Data Resources. Best practices for federated learning in RDMkit will be developed, along with secure protocols to enable encrypted data outputs. Finally, partners will also work towards linking human genomic data with other data types, enhancing data reusability and discovery.

ELIXIR has a role as a neutral broker and coordinator of several implementation projects for the 1+MG initiative. The initiative is an effort across 26 countries to enable secure access to high-quality genomics and corresponding clinical data across Europe for better research, personalised healthcare and health policy making. One such project is the European Genomic Data Infrastructure (GDI) project, which aims to support the deployment of the 1+MG infrastructure and runs until 2026.

In 2024, GDI made significant progress towards advancing the technical infrastructure with capacity increasing in all countries, and Cyprus, Hungary, Malta and Romania joining the project[43]. Six GDI nodes (Finland, Luxembourg, Norway, Portugal, Spain and Sweden) demonstrated an end-to-end deployment of the infrastructure, illustrated by three use cases, one from cancer and two from infectious diseases[44]. Cross-project activities resulted in agreement on a number of scenarios to be delivered in production. This resulted in the definition of a minimum viable product (MVP), the requirements of which were then mapped onto user journeys. The GDI Allele Frequency Browser was demonstrated in 2024 with a video explaining how this could be used to help understand severe COVID-19 and benefit the healthcare sector[45].

Progress was made in legal and sustainability tasks, not only in informing the technical work to ensure future usability within the European legal framework, but also in developing a proposal for a legal entity to govern and operate the 1+MG initiative in the long term as part of the European Health Data Space (EHDS). This entity will complement other data interoperability activities of the EHDS and provide advanced functionalities, like record-level discoverability, for scientists and clinicians. It will also develop an approach to managing human genomic information that can be incorporated in the national Health Data Access Bodies. The infrastructure is expected to benefit non-human areas, including other EU Data Spaces like EOSC, where most components can be reused without significant modifications.

As defined in the 1+MG Framework[46], the GDI infrastructure uses synthetic data until the necessary legal entity is operational. GDI will work collaboratively with the newly-launched Genome of Europe project, which is creating a pan-European reference database consisting of a minimum of 100,000 genomes representative of European citizens. In addition, the GDI project has incorporated a colorectal cancer use case that was originally part of the HealthData@EU pilot project.

To strengthen the partnership between GDI and the European Federation of Cancer Images (EUCAIM), a memorandum of understanding was signed with the commitment to enable cross-border access and data analysis in governance, technical infrastructure and use cases, and the identification of mutual areas of collaboration. In addition, ELIXIR, partnered with 13 research infrastructures as part of the canSERV project to provide transnational access (TNA) cancer research services across Europe.

43 *https://gdi.onemilliongenomes.eu/news/new-countries-joining-gdi-project*
44 *https://gdi.onemilliongenomes.eu/news/gdi-technical-infrastructure*
45 *https://www.youtube.com/watch?v=XZAKgOPSWKo*
46 *https://framework.onemilliongenomes.eu*

Cancer Data

The ELIXIR Cancer Data Focus Group became an ELIXIR Community in early 2024, following the publication of its white paper in Nature Cancer[47]. The Community brings together experts and resources to gather, manage and analyse clinical and biomedical data. By joining forces with other initiatives and EU projects, the Community aims to enhance both data infrastructure and the accessibility, quality and interoperability of data to accelerate discoveries in biomedical research and improve decision-making. Monthly Community meetings involved presentations from invited speakers covering key cancer-related projects, methods and data resources within and external to ELIXIR. Members of the Community played key roles in applications to four of the 2024 EU Cancer Mission calls, supporting ELIXIR's efforts to remain engaged in these important objectives.

Federated Human Data

The Federated Human Data Community aims to build a federated ecosystem of interoperable services enabling global access to genomic and biomolecular data, with an overall goal of accelerating research, data sharing and FAIR data implementation. In 2024, the Community focused on deploying Federated EGA (FEGA) nodes (currently standing at seven with active data flow), and enhancing FEGA and GDI interoperability to facilitate federated human data management. Community members contributed to several EC-funded projects, including EOSC-ENTRUST, EOSC4Cancer and EUCAIM, collectively working to enhance data FAIRness. Three projects were awarded Commissioned Service funding following the open call. There was a successful FEGA workshop at the All Hands Meeting, and the face-to-face Community meeting decided to prioritise training material development to support onboarding FEGA nodes.

Human Copy Number Variation

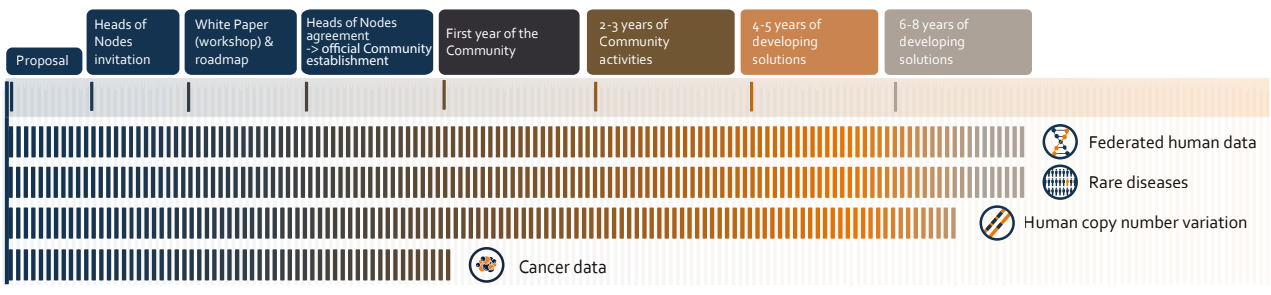
The Human Copy Number Variation (hCNV) Community coordinates information about and tools for best practices for the analysis and use of structural genome variation data. It closely aligns with ELIXIR Platforms and ELIXIR-supported services, such as Beacon and Galaxy. The Community aims to provide domain-specific expertise to other Communities, specifically Rare Diseases and Cancer Data. In 2024 the Community launched a new initiative to provide germline CNV reference data through a Beaconised cross-platform repository for curated CNV datasets (currently in the prototype stage). The Community also contributed to the further development of the Beacon schemas and the addition of CNV data and related tools to the Galaxy ecosystem.

Rare Diseases

The Rare Disease Community aims to facilitate the discovery and reuse of data to advance research on rare diseases. As part of a Commissioned Services project[48] Community activities were mapped to international rare diseases research initiatives, informing Community plans for 2025. ELIXIR participated in the European Joint Programme on Rare Diseases EU project, which launched its virtual platform of resources featuring FAIR Data Points for resource discovery and Beacon v2 for datasets discovery. Activities continued in the European Rare Diseases Research Alliance (ERDERA) project, with participation from the Community. ERDERA is aligning with ELIXIR and GDI to design federated data discovery and data analysis for the diagnosis of rare disease patients, with the involvement of the European Genome-phenome Archive (EGA) and the RD-Connect Genome-Phenome Analysis Platform (GPAP).

Health Data

The Health Data Focus Group aims to identify alignments across ELIXIR Nodes and distill best practices to produce recommendations to ELIXIR in three principal areas. These are 1) finding and uniting health data, 2) improving health data through optimised curation and terminology mappings, and 3) extracting useful information from unstructured electronic health records. During the first quarter of 2024, the Focus Group welcomed Patrick Ruch (ELIXIR Switzerland) as third co-lead.



47 *https://www.nature.com/articles/s43018-023-00717-6*
48 *https://elixir-europe.org/internal-projects/commissioned-services/rare-disease-infrastructure*

Cellular and molecular research

The Cellular and molecular research priority area aims to address complex challenges in cellular and molecular research by developing innovative solutions for data management, analysis and sharing.

In 2024, the priority area engaged with stakeholders, including through a cross-Community workshop, to shape its five-year strategy. An analysis of challenges and opportunities identified barriers around data integration, standardisation and collaboration, particularly in multimodal studies. This led to the creation of a vision to unify diverse siloed data, with the following objectives:

1. **Establish strategic collaborations** with European Strategic Forum for Research Infrastructures, academic societies and organisations
2. **Advocate for foundational research** to increase funding and visibility of cellular and molecular research at the European level
3. **Coordinate standardisation and data stewardship** to drive the development of community-driven and FAIR standards for data management
4. **Connect technologies and users** to bridge the gap between ELIXIR's technological advancements and the needs of diverse cellular and molecular research communities
5. **Identify opportunities** in emerging scientific areas that require infrastructure, databases or connections within and beyond ELIXIR
6. **Provide support** to ELIXIR's cellular and molecular research Communities, ensuring their continued success and growth

Following an open call, four projects were identified to further these objectives[49]:

- Advancing structural and functional ontologies of disordered proteins
- DBTLHub: Towards a one-stop shop for connecting databases, datasets and tools for the Design-Build-Test-Learn cycle in biotechnology
- Spatial2Galaxy - There is no Galaxy without Space
- Next level of reproducible, comparable and integrable metabolomics

In 2025, a second open call will be launched, and the priority area will continue to work with ELIXIR groups and external stakeholders to champion and interconnect fundamental cellular and molecular research data and resources.

Biodiversity, food security and pathogens

The Biodiversity, food security and pathogens priority area enables research in biodiversity, food security (including agroecology and agrobiodiversity) and pathogens through data mobilisation and integration activities. In 2024, the priority area developed its strategy, launched key projects and strengthened connections between research communities.

ELIXIR Communities were involved through key events and activities, including the All Hands Meeting, an inter-Community meeting and an analysis to identify strengths, challenges, threats and opportunities. The consultations led to the refinement of the priority area strategy, due to be published in early 2025. The strategy identifies five objectives:

1. **Federation** - strengthen interactions between research activities and biodata resources by supporting existing community networks
2. **FAIR data** - support and develop connected biodata resources that ensure visibility, findability, usability and sustainable access to research data
3. **Analysis** - promote tools and workflows that facilitate reliable and reproducible data analyses and help connect developers with user communities
4. **Standards** - support the development and adoption of community standards and research data management best practices
5. **Training** - support training and knowledge exchange for data management, analysis tools and workflows and biodata resources

The first open call for projects was launched and four projects were selected:

- E-PAN: "Enhancing pan-genome analysis in plants"
- FAIRyMAGs: Optimising Metagenomics Assembled Genomes building
- HARVEST: Handling and alignment of plant research FAIRification – value through the use of ELIXIR data, standards and tools
- Odyssey: Connecting molecular and geographical biodiversity data

In 2025, the focus will shift to delivering the strategic objectives, including a second open call with an emphasis on interdisciplinary, cross-topic projects.

49 *https://elixir-europe.org/news/science-open-calls-2024*

Our Communities

ELIXIR Communities bring together experts from selected life sciences areas to develop standards, services and training. They capture user needs from across ELIXIR Nodes and partner organisations and drive the portfolio of services in ELIXIR Platforms. ELIXIR Communities provide a mechanism to reach out to defined groups of experts including the other research infrastructures on the European Strategy Forum on Research Infrastructures (ESFRI) Roadmap.

Communities are eligible to apply for ELIXIR Commissioned Service funding to support their activities and developments. Under the ELIXIR Scientific Programme 2024-28, calls for Community Commissioned Service projects were run as part of Science tier open call.

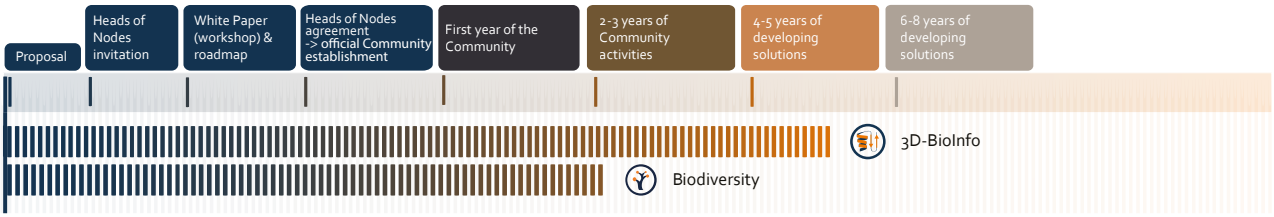
In 2024, there were 18 ELIXIR Communities, including one new Community - Cancer Data, which matured from a Focus Group. The selection of new Communities is based on a well-defined process outlined in the ELIXIR Communities Handbook[50].

3D-BioInfo

ELIXIR 3D-BioInfo Community compiles information and promotes standards for structure-based data and tools. Representatives from ten ELIXIR Nodes met monthly in 2024 to coordinate the Community's activities. In 2024, eight additional research groups provided predicted structures via the 3D-Beacons Network. The Community has an ongoing collaboration with the nf-core community to provide NextFlow training workshops on workflows to generate predicted protein structures[51]. Work on the protein-ligand complexes dataset to benchmark computer-aided drug design tools is now over 70% complete. Throughout 2024, the Community held a series of webinars covering AlphaFold structures, protein-ligand complexes, protein design, protein-protein complexes, protein language models and nucleic acids[52]. In June 2024, the Community held a training workshop in protein-ligand interactions with 33 attendees and 12 trainers from four ELIXIR Nodes (EMBL-EBI, France, Germany and Switzerland). A manuscript describing geometric parameters for base-base arrangements is in progress and an Annual General Meeting and a joint hackathon with the Intrinsically Disordered Community are planned for 2025.

Biodiversity

The Biodiversity Community aims to enhance the connection of data and tools for biodiversity research through ELIXIR services and infrastructures, and expand ELIXIR Node activities in the biodiversity domain. During 2024, Community online meetings included presentations from representatives of projects, resources and tools developed by ELIXIR and other biodiversity research infrastructure initiatives. Progress was made on the Implementation Study evaluating biodiversity data with a focus on databases, analysis tools, services and infrastructures. The Implementation Study surveyed biodiversity-related projects, stakeholders and materials for training and knowledge transfer. At the All Hands Meeting in Uppsala, the Biodiversity Community held a joint workshop with the Plant Sciences Community, boosting cross-disciplinary dialogue. The Community also participated in the BioHackathon 2024 contributing to FAIR Biodiversity Genomics annotations. Throughout the year, the Community was involved in shaping the strategy for the Biodiversity, food security and pathogens priority area of the Scientific Programme 2024-28.



50 *https://doi.org/10.7490/f1000research.1119695.1*
51 *https://nf-co.re*
52 *https://elixir-europe.org/communities/3d-bioinfo/webinar-series*

Food and Nutrition

The ELIXIR Food and Nutrition Community aims to standardise food and nutrition data, develop ontologies for better interoperability and enhance tools for data and metadata standardisation. In 2024, the Community worked on a new Commissioned Service project focussing on food systems. The project aims to integrate and develop databases to shed light on the ecological processes and dynamics within a microbial community during fermented foods production. This work will support the management of plant-based food fermentation, where pre-selected starter strains are rarely used, even in large-scale production. The process currently relies heavily on empirical knowledge, as the complex interactions within microbial communities and the metabolic networks responsible for producing safe, nutritious products are not yet fully understood. The study will involve cross-disciplinary collaboration with the Microbiome, Metabolomics and System Biology Communities.

Galaxy

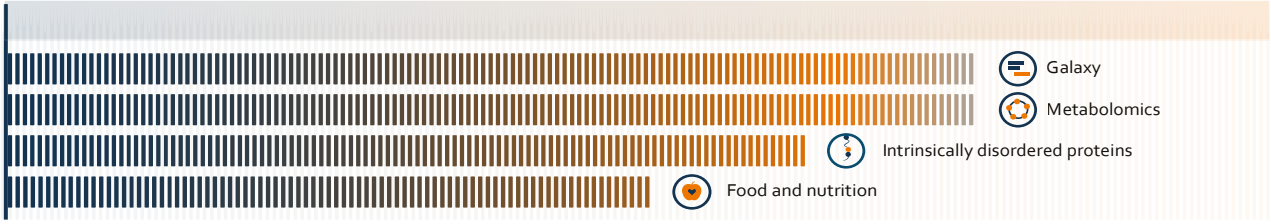
The ELIXIR Galaxy Community aims to advance open, reproducible and accessible data analysis across Europe and beyond by supporting the development and adoption of the Galaxy platform. The key highlight in 2024 was the Community face-to-face meeting held alongside the 2024 Galaxy Community Conference (GCC2024)[53] in Brno, Czech Republic, promoting collaboration among researchers, developers and trainers. The Community collaborated with other ELIXIR Communities, especially Single-Cell Omics, through the Galaxy Single-cell and Spatial Omics Community. Together, the Communities added 15 new tools, six training resources and mirrored subdomains across servers in 2024. The Single-Cell Omics Community also piloted a Community hackathon, engaging with Galaxy and non-Galaxy scientists to pool domain knowledge. In September 2024, UseGalaxy.EU[54] reached 100,000 registered users, doubling its user base from 2022 and reinforcing its position as a leading platform for European researchers. The launch of UseGalaxy.it, hosted by CINECA ADA Cloud, enhanced computational resources for the Italian research community. The Galaxy Training Network expanded its reach with the Galaxy Training Academy 2024, a global online self-paced learning event. The Galaxy Codex was developed to collect Galaxy wrappers from various repositories, providing a comprehensive list of available Galaxy tools.

Intrinsically Disordered Proteins

The ELIXIR Intrinsically Disordered Proteins Community aims to support the development of standards, tools and resources to accelerate the identification, analysis and functional characterisation of intrinsically disordered proteins. The Community focuses on simplifying data access, curating literature, developing a centralised knowledge base, integrating data into ELIXIR Core Resources and improving analytical tools. In 2024, an ELIXIR Commissioned Service project was initiated to advance structural and functional ontologies and address limitations in capturing the dynamic nature of disordered proteins. 2024 was rich in connections, with the Community joining two major projects, IDPfun2 (leverages AI and molecular behaviour for functional characterisation) and IDP2Biomed (bridging IDP research with biomedical applications). The Community joined the CAID3 Challenge[55], aimed at identifying the most effective methods for disorder prediction and organising training activities on resources such as MobiDB, DisProt and PED. Significant efforts were made in the biocuration of disorder-related data within curated databases, reinforcing the Community's commitment to enhancing the accessibility and reliability of IDP-related knowledge.

Metabolomics

The goal of the ELIXIR Metabolomics Community is to advance the standardisation and interoperability of metabolomics data by collaborating with experimental scientists and developers and providing training. In 2024, the Community presented workshops at ECCB and the ELIXIR All Hands Meeting, demonstrating the practical FAIRification of metabolomics datasets and promoting integration with other omics domains. The work on the Multi-omics Adapter for Repository Submissions (MARS) and further development of the mzTab-M format helped streamline metabolomics data submission workflows. As part of ELIXIR-STEERS, the Community started a review of related ELIXIR services with the aim of improving their adoption and FAIRness. The Implementation Study - Next level of reproducible, comparable and integrable Metabolomics (RCIM) - led by the Community member, Franck Giacomoni, was awarded as part of the Cellular and molecular research open call and will launch in 2025. In 2024, Claire O'Donovan (EMBL-EBI) stepped down as the Community's co-lead, and Helge Hecht (ELIXIR Czech Republic) was elected as her replacement.



53 *https://galaxyproject.org/events/gcc2024*
54 *https://usegalaxy.eu*
55 *https://caid.idpcentral.org/challenge#timeline*

Microbial Biotechnology

The ELIXIR Microbial Biotechnology Community aims to support the development of a knowledge-based infrastructure for microbial biotechnology, including building scalable metabolic models and a unified semantic ontology for microbial biotechnology. The Community develops training and engagement activities with the research community and industry. In 2024, Community members hosted seminars and use case discussions from experts in the field. Funding was received for a new Commissioned Service project with the aim of standardising tools, datasets and models across the design-build-test-learn (DBTL) cycle of biotechnology. In addition, members of the Community participated in the annual meeting of the ELIXIR Industrial Advisory Board. Community members drafted a position white paper about the Community's vision, which will be submitted in 2025.

Microbiome

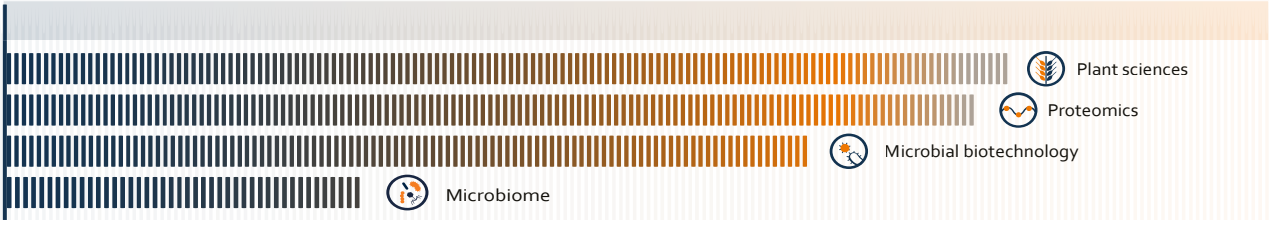
Building on its expanded scope and new members, the Microbiome Community aims to promote collaboration and advance microbiome-derived sequence analysis standards and multi-omics integration. Two ELIXIR Commissioned Service projects submitted by the Community were accepted in 2024: FAIRyMAGs – focusing on optimising metagenome-assembled genome workflows, training materials, real data evaluation and resource allocation tools; and Odyssey – aiming to connect molecular and geographical biodiversity data, bridging molecular biology with environmental research. The Community participated in the BioHackathon Europe 2024 and contributed to two projects, one on the federated microbiome analysis service to explore scalable solutions for multi-omics analyses across diverse microbiome datasets[56], and the other on Galaxy CoDex to address resource sustainability and strengthen ties to the microGalaxy ecosystem[57]. The Galaxy CoDex initiative, in collaboration with EDAM, improved the annotation of microbiome-related tools, workflows, and terms, enhancing accessibility and standardisation. In 2024, the Community worked on integrating the MGnify v5 Amplicon Workflow into Galaxy advanced federated analysis. Community members also contributed to the microGalaxy publication[58] and provided tutorials in the Galaxy Training Academy's Microbiome Analysis track.

Plant Sciences

The ELIXIR Plant Sciences Community unites researchers from computer science and plant biology to develop services that integrate and link different types of data. The Community supports both fundamental and applied plant sciences in the context of climate change, agroecology, food security and sustainable agriculture. In 2024, the Community engaged in various initiatives to advance data integration, standardisation and interoperability. At BioHackathon Europe 2024, Community members contributed to projects working on the integration of ARC RO-Crate into Dataverse and SEEK[59] and the creation of Multi-omics Adapter for Repository Submissions (MARS)[60]. The Community extended Bioschemas and ARC RO-Crates to support agrosystem resources. As part of the BioHackathon Germany projects, the members collaborated with other experts to extend MIAPPE-Wizard into ISA-Wizard to enhance metadata handling across disciplines[61]. The Community also organised a workshop with BioCypher and BioChatter focusing on integrating knowledge graphs with AI-driven chatbots to address plant-specific use cases. The Community was involved in the EU-funded projects, AgroServ and PHENET, and held a training event on research data management in plant sciences with EMPHASIS. Two Commissioned Service projects – E-PAN and HARVEST – were granted to support the Community's activities and will start in 2025.

Proteomics

The ELIXIR Proteomics Community coordinates computational proteomics activities within ELIXIR. Its overall goal is to develop and maintain sustainable proteomics tools and data resources. With no Commissioned Service activity funding in 2024, activities of the Community were less than in previous years. The Community worked closely with the Data Platform and contributed proteomics data to REDIPortal, a resource from ELIXIR Italy enabling A-to-I RNA editing data. REDIportal provides an accurate, sustainable and accessible tool that has interconnections with ELIXIR Core Data Resources related to proteomics datasets, such as UniProt and PRIDE.



56 https://github.com/elixir-europe/biohackathon-projects-2024/blob/main/21.md
57 https://github.com/elixir-europe/biohackathon-projects-2024/blob/main/11.md
58 https://doi.org/10.1101/2024.12.23.629682
59 https://github.com/elixir-europe/biohackathon-projects-2024/blob/main/19.md
60 https://github.com/elixir-europe/biohackathon-projects-2024/blob/main/23.md
61 https://www.denbi.de/de-nbi-events/1765-3rd-biohackathon-germany-metadata-annotation-i

Research Data Management

The ELIXIR Research Data Management (RDM) Community brings together RDM experts, in close collaboration with ELIXIR Platforms, Communities and Focus Groups, to coordinate best practices and guide the use of ELIXIR RDM services. In 2024, a peer-reviewed Community white paper was published in F1000[62]. The Community has concluded the first year of the DATAREX Implementation Study, which aims to facilitate knowledge sharing, develop resources for RDM service providers, coordinate RDM training and content and make recommendations for enhancing data brokering services. As part of the project, the Community held workshops on Data Steward Handbook content creation, best practice content creation for RDM resources and RDM landscape and user journeys, attracting 30 participants from a range of Nodes.

Single-Cell Omics

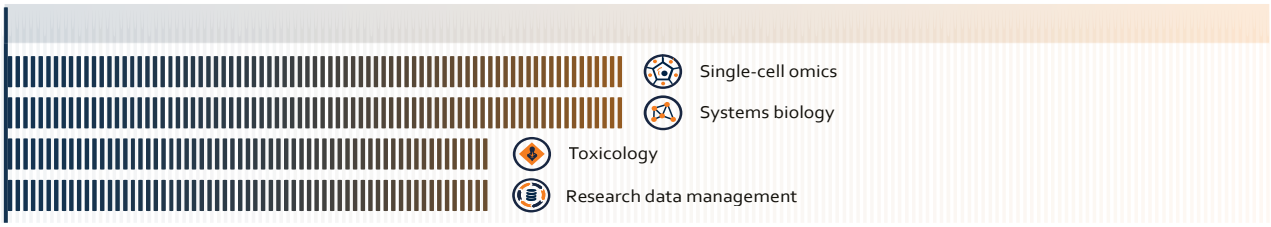
The ELIXIR Single-Cell Omics Community identifies challenges in the fast-moving field of Single-Cell and Spatial omics and coordinates an international effort to best serve the needs of researchers. In 2024, the Community focused on training, tools, and interoperability in the Implementation Study: Single-Cell Omics Network of ELIXIR. Based on a training gap survey conducted in 2023, the Community's Training work package designed a course for spatial omics data analysis training with 14 experts from seven countries. The first instance of this course took place in Switzerland with over 50 participants from around Europe. The lecture recordings and materials were publicly available for the participants to more easily replicate the course in their own country afterwards. The Community organised a hackathon, SpaceHack 3.0, to improve user guides for spatial transcriptomics. The hackathon gathered 72 participants to work on nine projects across four different sites, including two in the US. The Community held a workshop at the All Hands Meeting - Multitask perturbation modeling for single-cell omics - and led a BioHackathon Europe 2024 project PerturbBench: large-scale benchmarking of perturbational modelling tools in complex single-cell data. Ongoing efforts include establishing interoperability standards and guidelines with other international efforts, for example, IO-FAST and GESTALT.

Systems Biology

The ELIXIR Systems Biology Community aims to bring systems biology models together to interpret FAIR data and facilitate the use of ELIXIR resources by the European and global research community. In the final meeting of the Community's Implementation Study, plans to integrate systems biology tools into bio.tools were discussed, following a BioHackathon project in 2023[63]. Members reviewed the requirements for FAIRifying systems biology models, leading to a set of recommendations to be published in 2025. A strategy for collaborating with other ELIXIR Communities was also defined. Other major outputs in 2024 were the publication of the paper Making PBPK models more reproducible in practice[64] and the update of the Community white paper on F1000[65]. In 2024, the Community members co-led two workshops at the All Hands Meeting and presented Community activities at other ELIXIR and external meetings, including the ELIXIR Data Platform face-to-face meeting, the Disease Maps Consortium Meeting, Foundations of Systems Biology in Engineering, and Mathematical Models of Life. The Community is involved in two newly-funded Commissioned Services projects – DBTLHub and Next level of reproducible, comparable and integrable Metabolomics – both of which will start in 2025.

Toxicology

The ELIXIR Toxicology Community brings together ELIXIR with researchers in the fields of toxicology, safety and regulation. Community members exchange knowledge about important services and co-develop solutions to support the research. In 2024, the Community held two workshops as part of the INTOXICOM Implementation Study, where ELIXIR experts and computational toxicologists collaborated on improving services like FAIRsharing and FAIR Cookbook, which play key roles in supporting data FAIRification efforts. The report on the first workshop has been published on BioHackrXiv[66]. The FAIRsharing Toxicology Community Champion coordinated the reviewing of toxicology databases and standards (fairsharing:3496) and started gathering information about the adoption of ELIXIR solutions as part of ELIXIR-STEERS. The Toxicology Community continues its collaboration with Bioschemas, which is used to make various research outputs more FAIR. In 2024, Toxicology Community members also participated in BioHackathon Europe 2024 and collaborated with the Systems Biology and Metabolomics Communities.



62 https://doi.org/10.12688/f1000research.146301.2
63 http://doi.org/10.37044/osf.io/zxc8m
64 https://doi.org/10.1093/bib/bbae569
65 https://doi.org/10.12688/f1000research.126734.2
66 http://doi.org/10.37044/osf.io/un2rw

Our Focus Groups

Biocuration

The Biocuration Focus Group aims to advance biocuration by strengthening collaboration, improving credit attribution and supporting training initiatives. In 2024, the group worked with the International Society for Biocuration (ISB) to ensure alignment between ELIXIR efforts and global biocuration advancements. A session at the ELIXIR Data Platform face-to-face meeting highlighted the importance of transparent attribution systems for curators and database contributors. The group continued collaborating with APICURON, an ELIXIR-supported platform designed to credit and acknowledge biocuration efforts, aiming to secure ISB endorsement, ensuring broader adoption of the tool. The group also collaborated with the Training Platform and ISB to identify existing e-learning resources and develop biocuration training modules.

Domestic Animals Genome and Phenome

The Domestic Animals Genome and Phenome Focus Group was launched in July 2024 to support genotype to phenotype analysis for farmed and companion animal species. The group has met monthly to prepare their white paper and have delivered seminars to widen participation, for example presenting in the nf-core Animal Genomics Special Interest Group. Members of the group attended cross-Community workshops for developing the strategy for the two ELIXIR strategic areas: Biodiversity, food security and pathogens; and Cellular and molecular research. The group will continue to explore the positioning of current data resources for domestic animals within the ELIXIR Scientific Programme 2024-28.

Environmental Impact

The Environmental Impact Focus Group aims to assess and reduce the negative environmental impacts of ELIXIR, and of computational biosciences in general. The group has collaborated with the Tools Platform, the Galaxy Community, the impact staff exchange and ELIXIR STEERS, and presented an ELIXIR external webinar. During the year, the Focus Group raised awareness of environmental impact in the bioinformatics community and reduced the energy footprint of bioinformatics workflows. Both measures were implemented in the Galaxy framework, displaying the carbon footprint of each task and reusing previous computations where possible.

EOSC

The EOSC Focus Group brings together ELIXIR members who participate and lead activities in EOSC funded projects and EOSC Association Task Forces and Opportunity Areas, according to the ELIXIR EOSC Strategy[67]. In 2024, representatives of the group were active in various EOSC projects and Task Forces. During the year ELIXIR supported the submission of a successful EOSC Association-coordinated project, EOSC United, to test key ELIXIR services with the new EOSC EU Node compute capabilities. ELIXIR also participated in the proposal of a life science research node in the new EOSC federation as part of a consortium including ELIXIR, EMBL, Euro-Bioimaging ERIC and Instruct-ERIC.

FAIR Training

The FAIR Training Focus Group supports the implementation of FAIR principles in training materials. In 2024 Focus Group members drafted a manuscript tailoring FAIR principles for training materials, and published the FAIR training handbook[68]. The group held a training workshop for the Toxicology Community and participated in the FAIR by design workshop[69]. The group continued to support the Training Platform by providing content and feedback to the SPLASH website[70] and providing support to the ELIXIR lesson template[71].

Learning Paths

The Learning Path Focus Group comprises members from various ELIXIR Nodes who share expertise and align diverse perspectives on advancing learning paths within the research infrastructure ecosystem. In 2024, the group focused on developing an agnostic protocol, to be documented in a handbook and serve as a comprehensive resource for trainers and training providers. Collaborating with the Training Platform, ELIXIR Communities, TeSS, Train-the-Trainer and e-learning initiatives, the group helped enrich ELIXIR SPLASH website content. Ongoing advocacy and collaborations aims to contribute to strengthening training capacity and impact across ELIXIR and beyond.

67 *https://zenodo.org/records/7120997#.Yzqb71LMI1J*
68 *https://elixir-europe-training.github.io/ELIXIR-TrP-FAIR-training-handbook*
69 *https://training.scilifelab.se/events/fair-training-material-by-design*
70 *https://elixir-europe-training.github.io/ELIXIR-Training-SPLASH*
71 *https://github.com/elixir-europe-training/ELIXIR-TrP-LessonTemplate-MkDocs*

Machine Learning (AI)

The ELIXIR Machine Learning (ML) Focus Group aims to meet the emerging need for ML expertise in five areas: developing standards, enhancing reproducibility, benchmarking tools, providing training and enhancing integration across ELIXIR. The group continues to produce outputs primarily through the three task forces, including publications on the DOME Registry[72] and synthetic data for infectious diseases[73]. Members of the Focus Group are now part of the SYNTHIA project[74], an IHI-funded project focused on the use of synthetic data towards advancing healthcare innovation.

Pathogen Data

The ELIXIR Pathogen Data Focus Group was launched in 2024 to work towards a distributed and interoperable network of regional and national pathogen data hubs. The group initially undertook a comprehensive landscaping exercise to identify key competencies and explore pathways to engage external stakeholders. Members held discussions to delineate the group's scope of activities and understand its position with respect to the Science tier in ELIXIR Scientific Programme 2024-28. It was agreed that the Focus Group spans all Science tier activities. The Focus Group is working on its white paper.

Professionalising Careers in Research Infrastructures

The Professionalising Careers in Research Infrastructures Focus Group works to strengthen career structures in research infrastructures by improving job classification and recognition. The group's first year report highlights findings from an extensive analysis of job postings across ELIXIR, revealing inconsistencies in role definitions and gaps in standardisation. A key challenge has been the lack of clear career pathways, especially for non-traditional roles. To address this, the group recommends refining job categories, improving the consistency of job postings and ensuring expired listings remain accessible for reference. Looking ahead, the group will focus on refining classification systems, identifying skill gaps and mapping role distributions across ELIXIR.

Research Data Alliance Activities

The ELIXIR Research Data Alliance (RDA) Activities Focus Group brings together ELIXIR members in RDA Working Groups and Interest Groups to identify and leverage opportunities and synergies. The group held a joint workshop with the Global Open Research Commons RDA group at the ELIXIR All Hands Meeting and was featured during a national level RDM event co-organised by ELIXIR Switzerland. Travel grants supported representation at two RDA Plenaries and reports were published from 21st[75] and 22nd[76] Plenaries. Engagement with the RDM Community and GDI project resulted in new highlight sections being added to the plenary reports and continued bi-directional knowledge exchange.

72 *https://doi.org/10.1093/gigascience/giae094*
73 *https://www.tandfonline.com/doi/10.1080/17460913.2024.2400853*
74 *https://www.ihi-synthia.eu*
75 *https://doi.org/10.5281/zenodo.10721761*
76 *https://doi.org/10.5281/zenodo.13921850*

Our outreach

Publications and policy impact

Key ELIXIR-supported publications in 2024

ELIXIR's scientific legacy as a research infrastructure is showcased on the ELIXIR Impact Dashboard[77]. The annual Europe PubMed Central[78] text-mining process[79] identified 153 research publications that received support from ELIXIR in 2024. Over the past decade, ELIXIR-supported research publications have seen a continuous increase in citations. In 2024, ELIXIR-supported publications received over 8000 citations, which is a 2000 increase in number of citations compared to 2023. To build capacity across Nodes on the topics of impact, two impact training workshops[80] were organised by ELIXIR Portugal, Italy and Norway.

TITLE	ATTENTION SCORE[83]	ELIXIR GROUP OR ELIXIR-COORDINATED PROJECT
The 1+Million Genomes Minimal Dataset for Cancer[84]	56	B1MG, GDI
Systematic detection of co-infection and intra-host recombination in more than 2 million global SARS-CoV-2 samples[85]	54	BY-COVID
Mobilisation and analyses of publicly available SARS-CoV-2 data for pandemic responses.[86]	9	ELIXIR-CONVERGE, BY-COVID, EOSC Life
Recording provenance of workflow runs with RO-Crate.[87]	12	ELIXIR Compute Platform ELIXIR Belgium and Spain
The ELIXIR Biodiversity Community: Understanding short- and long-term changes in biodiversity[88]	5	ELIXIR Biodiversity Community ELIXIR France, Switzerland, Greece
Scalable, accessible and reproducible reference genome assembly and evaluation in Galaxy[89]	334	Galaxy Community ELIXIR Biohackathon project

Table 1: A selection of ELIXIR-supported publications in 2024

News ● *X* ●
Blogs ● *Bluesky* ●
Clinical Guidelines ● *Reddit* ●

Policy impact

The ELIXIR Impact Dashboard presents the influence of ELIXIR's work on policy-related documents. In 2024, ELIXIR's projects, resources and key achievements were referenced in 20 policy documents, reports, guides for grantees and funding calls, bringing the total number of citations to 348 (data source: Overton.io). Policy-related documents are typically published by funding bodies, such as the European Commission, intergovernmental organisations, such as the World Health Organisation, and governments within and beyond Europe.

					
TITLE	Nordic research infrastructure collaboration[90]	Implementing the European Health Data Space Across Europe[91]	Horizon Europe Programme Guide (for funding grantees) v.4.1 (2024)[92]	ESFRI Landscape Analysis	ESFRI Report: Funding of Research Infrastructures[93]
ORGANISATION	NordForsk (funder)	European Institute of Innovation and Technology	European Commision	European Strategy Forum for Research Infrastructures (ESFRI)	European Strategy Forum for Research Infrastructures (ESFRI)
MENTIONS OF ELIXIR	ELIXIR Norway, ELIXIR Finland	ELIXIR as a whole	FAIRsharing, RDMkit, Data Stewardship Wizard, ELIXIR Deposition Databases, ELIXIR Core Data Resources	ELIXIR as a whole	ELIXIR as a whole

77 *https://elixir-europe.org/about-us/impact/publications*
78 *https://europepmc.org/*
79 *https://f1000research.com/articles/13-1547*
80 *https://elixir-europe.org/events/impact-and-more-workshop*
81 *https://www.altmetric.com/about-our-data/the-donut-and-score*
82 *https://www.nature.com/articles/s41588-024-01721-x*
83 *https://www.nature.com/articles/s41467-023-43391-z*
84 *https://www.microbiologyresearch.org/content/journal/mgen/10.1099/mgen.0.001188*
85 *https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0309210*
86 *https://f1000research.com/articles/12-499/v2*
87 *https://www.nature.com/articles/s41587-023-02100-3*
88 *https://norden.diva-portal.org/smash/get/diva2:1836029/FULLTEXT01.pdf*
89 *https://eithealth.eu/wp-content/uploads/2024/04/EIT_Health_ThinkTank_Implementing_the_EHDS_across_Europe.pdf*
90 *https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf*
91 *https://zenodo.org/records/14770891*

Collaborations beyond Europe

In 2024, the process of updating the ELIXIR International Strategy began, including aligning it with the ELIXIR Scientific Programme 2024–28. The revised strategy will focus on strengthening global visibility, fostering strategic partnerships and advancing policy development. To support these efforts, ELIXIR refreshed its international collaboration webpage[92], showcasing its expanding worldwide engagement.

Below are summaries of ELIXIR's five main international collaborations in 2024, which include Australian, US and global organisations. In addition, there were focused activities in Canada and Latin America:

- ELIXIR's Director, Tim Hubbard presented a Genome Canada British Columbia's Data Literacy webinar, covering ELIXIR's bioinformatics infrastructure and its role in data-driven research.
- In Colombia, ELIXIR participated in the ISCB Latin America - International Conference on Bioinformatics, contributing to a talk and panel discussion on advancing bioinformatics across the region.
- In Chile, ELIXIR's infrastructure and services were highlighted during a session at the 4th Annual Latin America visit of the HORIZON 2020 MSCA RISE project REFRACT, strengthening ties with researchers and organisations in the region.

Australian BioCommons

In 2024, Australian BioCommons and ELIXIR co-hosted a satellite meeting at the International Conference of Research Infrastructures in Brisbane, Australia. This interactive session promoted the successes of the Euro-Australian partnership in molecular life sciences, focusing on collaborative achievements since 2020 and the strategic approaches that facilitated them.

Additionally, a two-day meeting in Melbourne brought together representatives from both organisations to explore the landscape of international human genomics data sharing and analysis activities, fostering dialogue and mutual learning.

The partnership gained additional visibility at the ELIXIR All Hands Meeting where a delegation from Australian Biocommons participated in a panel discussion on global collaboration.

National Institutes of Health's Office for Data Science Strategy

ELIXIR strengthened its collaboration with the National Institutes of Health's (NIH) Office for Data Science Strategy (ODSS) through a formalised Memorandum of Agreement (MoA) in September. This agreement recognises many years of productive collaboration, including reciprocal invitations at events, joint sessions at major scientific conferences and collaborations on projects.

In 2025, NIH ODSS representatives contributed to a panel discussion on global collaboration at the ELIXIR All Hands Meeting. The ELIXIR and the NIH communities further engaged at events such as Bio-IT World and the NIH Data Sharing and Reuse Seminar.

Representatives from five ELIXIR Nodes - Greece, Portugal, Spain, Belgium, and the UK - participated in a five-month staff exchange with the NIH's National Cancer Institute (NCI) Division of Cancer Epidemiology and Genetics (DCEG). This covered areas such as FAIR data interoperability, federated solutions, and data preservation and research access. Activities included webinars, virtual meetings and a three-month visit by Ana Teresa Freitas, Head of ELIXIR Portugal, to DCEG.

Research Data Alliance

ELIXIR continued to collaborate with the Research Data Alliance (RDA) and maintained leadership in the Life Science Data Infrastructures Interest Group alongside global partners such as the Australian BioCommons, the NIH Office of Data Science Strategy and H3ABioNet in Africa. The year's two RDA Plenary Meetings included sessions on federated infrastructure which featured GA4GH driver activities, Galaxy and the 1+ Million Genomes initiative.

ELIXIR travel grants supported representation at both RDA plenary events and reports were published from 21st[93] and 22nd[94] Plenaries. Other highlights of the collaboration include ELIXIR contributions to the RDA endorsed Global Open Research Commons (GORC) International Model recommendation and ELIXIR leadership in the new Health Data Commons GORC Profile Working Group (ELIXIR Sweden) and FAIRification of Genomic Annotations Working Group (ELIXIR Norway).

92 *https://elixir-europe.org/collaborations/international-collaborations*
93 *https://doi.org/10.5281/zenodo.10721761*
94 *https://doi.org/10.5281/zenodo.13921850*

Global Alliance for Genomics and Health

Global Alliance for Genomics & Health
Collaborate. Innovate. Accelerate.

ELIXIR met regularly with the Global Alliance for Genomics and Health (GA4GH) to update its strategic leads on key progress within European initiatives. GA4GH and ELIXIR co-hosted a workshop at the All Hands Meeting focusing on advancing genomic standards to improve interoperability. In September 2024, ELIXIR brought together a global group of research infrastructure specialists working at the forefront of genomics data management for a two-day meeting ahead of the GA4GH Plenary. The event provided valuable opportunities to discuss shared challenges and priorities, while strengthening collaborations across Europe, Australia, USA and Canada. ELIXIR was further represented at both GA4GH Connect and the GA4GH Plenary, reinforcing its commitment to global data-sharing efforts.

Global Biodata Coalition

GLOBAL BIODATA COALITION

In 2024, ELIXIR and the Global Biodata Coalition (GBC) strengthened their collaboration in support of critical biodata resources. The GBC published a white paper[95] outlining strategies for the long-term sustainability of these resources, and launched an open letter campaign, with over 400 signatures from global stakeholders, highlighting the need for coordinated efforts to maintain open access to scientific data. ELIXIR continued to keep its Core Data Resources (CDR) selection process aligned with the GBC Global Core Biodata Resources (GCBR) accreditation, ensuring a consistent approach to maintaining essential data infrastructures.

Industry

In 2024, ELIXIR's industry programme coordinated the provision of bioinformatics services for use by industry, built capacity across Nodes to improve industry engagement, organised and attended industry conferences, and conducted exercises to understand industry usage. Highlights of 2024 include:

- Three categories of ELIXIR services[96] from five Nodes (Switzerland, Italy, Germany, Ireland and Finland) were integrated into the EIC (European Innovation Council) Service Catalogue[97]. These services, now available for industry use, cater for needs in training, consultancy and secure compute infrastructure for life science data and bioinformatics analysis.
- The ELIXIR Innovation and Industry Group[98] brought together experts in ELIXIR Nodes to build capacity in industry engagement as part of the Scientific Programme 2024-28.
- Three Industry Engagement Days (ELIXIR Czech Republic, ELIXIR Italy and EMBL Heidelberg)[99] were organised to raise the visibility of Node resources and identify common research interests with industry partners.
- ELIXIR representatives from the Hub and Nodes presented at major international industry conferences, including BiotechX[100], Bio-IT World[101] and the Festival of Genomics and Biodata[102].

ELIXIR was also involved in EU-funded projects to understand industry involvement in open data and open science. The BY-COVID report on the industry value of infectious disease data identified over 1,000 patents mentioning COVID-19 Data Portal resources[103]. As part of the PathOS project, a survey assessing the costs and benefits of UniProt highlighted micro-sized companies' concerns about their viability without access to open data. To understand industry approaches to using and providing open-source software, the ELIXIR-STEERS project has worked on building connections with a range of companies[104].

These efforts collectively aimed to strengthen ELIXIR's relationship with industry, enhancing innovation and collaboration in life science data and bioinformatics.

95 *https://zenodo.org/records/14727224*
96 *https://partnerservices.eismea.eu/partner/elixir-europe*
97 *https://partnerservices.eismea.eu/index.php/service-catalogue*
98 *https://elixir-europe.org/intranet/innovation-and-industry*
99 *https://elixir-europe.org/internal-projects/commissioned-services/capacity-building-knowledge-exchange*
100 *https://app.terrapinn.com/event/biotechx-eu-2024*
101 *https://www.bio-itworldexpo.com*
102 *https://www.genomicseducation.hee.nhs.uk/events/festival-of-genomics-biodata-2023*
103 *https://zenodo.org/records/13886402*
104 *https://elixir-europe.org/about-us/how-funded/eu-projects/steers/wp5*

Our Nodes

ELIXIR BELGIUM

LEAD INSTITUTE: VIB
WEBSITE: WWW.ELIXIR-BELGIUM.ORG

HIGHLIGHTS

20
Services

25-50
People

14
Co-leads of ELIXIR groups

Services
- Implemented 'Bring Your Own Data' into UseGalaxy

Groups
- Finalised the MARS (Multiple-omics Adapter for Repository Submission) proof of concept, developed during the Biohackathon

Training
- Organised a Research Software Engineers day in Belgium
- Contributed to ELIXIR Training SPLASH, a website gathering ELIXIR training products and resources

EU projects
- Delivered the Infectious Diseases Toolkit as part of BY-COVID
- Implemented metadata schemas for Metabolights and ENA in DataHub, used in the deCYPher project

Other activities
- Further developed the ELIXIR Toolkit Theme as a foundational framework for toolkits and documentation, the theme has been used for 20 projects to date.

ELIXIR CZECH REPUBLIC

LEAD INSTITUTE: INSTITUTE OF ORGANIC CHEMISTRY AND BIOCHEMISTRY OF THE CAS
WEBSITE: WWW.ELIXIR-CZECH.CZ

HIGHLIGHTS

73
Services

150-200
People

14
Co-leads of ELIXIR groups

Key changes
- Petr Baldrian replaced Luděk Matyska as scientific delegate on the ELIXIR Board

Services
- Co-managed the ELIXIR Infrastructure Service, LifeScience Login, with ELIXIR Finland
- Molstar served over 800,000 unique IP addresses

Training
- Co-organised ten workshops, 1 summer school and 2 conferences, including a three-day ELIXIR Czech Republic conference focused on data management, attracting nearly 100 experts

Other activities
- The University of Chemistry and Technology, Prague received INTER-COST funding, Palacký University Olomouc received industry funding and Masaryk University received facility funding
- Participated in two staff exchanges: Sharing tools and methods of analysis of the GC% in transcriptomes and genomes (with ELIXIR Slovenia) and Biological membrane ontology (with ELIXIR Netherlands)

ELIXIR DENMARK

LEAD INSTITUTE: UNIVERSITY OF COPENHAGEN
WEBSITE: WWW.ELIXIR-DENMARK.ORG

HIGHLIGHTS

1
Services

<25
People

4
Co-leads of ELIXIR groups

Key changes

- Signed a new Collaboration Agreement with the ELIXIR Hub, establishing the University of Copenhagen as the Node's lead institute
- Welcomed Jan Gorodkin, University of Copenhagen, as new Head of Node

Services

- Developed and consolidated the bio.tools software registry, following transition to the University of Southern Denmark
- Bio.tools now contains more than 30,000 software annotations, including the majority of ELIXIR tools

Groups

- Drove adoption of the Proteomics Community's proteomics metadata standard, now widely used in leading data analysis software
- Contributed to the selection of fit-for-purpose workflows in the Proteomics Community

Training

- Organised the Annual Danish Bioinformatics Conference in Copenhagen with five workshops offered to 200 attendees

EMBL-EBI

LEAD INSTITUTE: EMBL-EBI
WEBSITE: WWW.EBI.AC.UK

HIGHLIGHTS

32
Services

>200
People

22
Co-leads of ELIXIR groups

Services

- Many ELIXIR Core Data Resources developed or launched new functionality addressing how genetic variation is linked to disease
- Integrated the AlphaMissense tool, developed by Google DeepMind, into data resources including Ensembl and UniProt
- Integrated pathogenicity predictions and data from external sources, including Open Targets, into the Ensembl Variant Effect Predictor

Groups

- Co-led communities including Microbiome, Proteomics, 3D BioInfo, Biodiversity and Federated Human Data

EU projects

- The MGnify database, an ELIXIR Core Data Resource, used to find new enzymes able to extract proteins from animal by-products as part of the BlueRemediomics project

Other activities

- 1,696 attendees joined our 11 Industry Programme workshops
- UK Research and Innovation (UKRI) confirmed £80.7 million of funding for EMBL-EBI's technical infrastructure, to be spread over six years

ELIXIR ESTONIA

LEAD INSTITUTE: UNIVERSITY OF TARTU
WEBSITE: ELIXIR.UT.EE

HIGHLIGHTS

9
Services

<25
People

6
Co-leads of ELIXIR groups

Services

- The ELIXIR Recommended Interoperability Resource, g:Profiler, served 19.4 million user queries
- Co-managed the ELIXIR Infrastructure Service, TeSS, with ELIXIR UK

Training

- Ran 31 courses with 426 active participants, including basic R and Python programming, g:Profiler, FAIR principles, Bring Your Own DMP, OpenRefine, Dataverse and Tableau

EU projects

- Co-led the development of the Infectious Diseases Toolkit, part of BY-COVID, including the organisation of contentathons

Other activities

- ELIXIR Estonia added to the Estonia 2024 Infrastructure Roadmap 2024[105]
- Participated in two BioHackathon projects: Enhancing bio.tools by semantic literature Mining and ELIXIR FAIR lesson plan handbook: advancing the FAIR skills of researchers and data stewards

ELIXIR FINLAND

LEAD INSTITUTE: CSC – IT CENTER FOR SCIENCE
WEBSITE: WWW.ELIXIR-FINLAND.ORG

HIGHLIGHTS

13
Services

75–100
People

12
Co-leads of ELIXIR groups

Services

- Co-managed the ELIXIR Infrastructure Service, LifeScience Login, with ELIXIR Czech Republic

Training

- Delivered 25 bioinformatics courses with 1400+ participants on AI, HPC, data analytics and data management

EU projects

- Represented ELIXIR and life science research infrastructures in AARC TREE
- Co-lead technical deployment of GDI infrastructure, demonstrating functionalities with five other GDI nodes and providing compute services to generate synthetic genomic data
- Delivered reports on secure processing environment specifications in EOSC-ENTRUST and TEHDAS2
- Deployed the Finnish Cross Border Gateway instance and the National Connector enabling secure data exchange between the National Contact Point and the Central Services in the HealthData@EU Pilot project

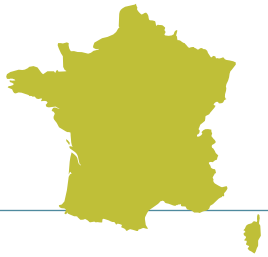
Other activities

- CSC - IT Center for Science was selected as an EuroHPC AI Factory
- Hosted the ECCB 2024 conference (University of Turku and CSC – IT Center for Science)

105 https://etag.ee/wp-content/uploads/2024/01/Teadustaristu_teekaart_kogumik-2024.pdf

ELIXIR FRANCE

LEAD INSTITUTE: IFB-CORE
WEBSITE: WWW.FRANCE-BIOINFORMATIQUE.FR



HIGHLIGHTS

34
Services

50–75
People

20
Co-leads of ELIXIR groups

Groups
- Co-led the new ELIXIR Cancer Community and the Biodiversity, Pathogens and Food Security priority area

Training
- Revitalised the Training Metrics Database, now hosted by ELIXIR Slovenia, developed by ELIXIR Sweden, and supported by ELIXIR France
- Held a ELIXIR-GOBLET Train-the-Trainer course in Marseille, with 18 participants

EU projects
- Published guidelines for data management in the AGENT project[106]

Other activities
- Co-led and participated in the BioHackathon project: Galaxy CoDex - Ensuring Galaxy community sustainability through resource aggregation and annotation
- Co-led the BioHackathon project: Integrating Bioconductor packages into the ELIXIR research software ecosystem using EDAM

ELIXIR GERMANY

LEAD INSTITUTE: FORSCHUNGSZENTRUM JÜLICH GMBH
WEBSITE: WWW.DENBI.DE/ELIXIR-DE

HIGHLIGHTS

139
Services

100–150
People

38
Co-leads of ELIXIR groups

Key changes
- Grew by three institutes, with six institutes joining and three leaving
- Welcomed two Heads of Node: Oliver Kohlbacher (University of Tübingen) and Alexander Sczyrba (Forschungszentrum Jülich)

Services
- Supported over 100000 registered users of the European Galaxy Server across 112 countries, an increase of 40000 since 2023, including more than 2200 LS Login users

Training
- Delivered 60 training courses with over 1200 participants
- Organised de.NBI Summer School 2024 on bioinformatics for microbial omics and co-organised the Galaxy Academy with 3000 registered participants
- Organised the third Biohackathon Germany in Kassel with 85 participants and the fifth Annual Industrial Forum Meeting with 40 participants

EU projects
- Established the FEGA node, using de.NBI/ELIXIR-DE cloud infrastructure, obtained federal approval for the national genomics initiative (genomDE), and continued deploying the GDI infrastructure
- Improved methods for assessing the environmental impact of scientific computing in Galaxy, leading to both improved energy efficiency and user experience

Other activities
- Served over 3714 de.NBI Cloud users and more than 1275 projects and organised the seventh de.NBI Cloud user meeting
- Participated in the ELIXIR staff exchange: Lipid Metadata Enhancement to Simplify Data Submission and Curation (LIMES-DASC)

106 *https://doi.org/10.5281/zenodo.12625360*

ELIXIR GREECE

LEAD INSTITUTE: BIOMEDICAL SCIENCES RESEARCH CENTER "ALEXANDER FLEMING"
WEBSITE: WWW.ELIXIR-GREECE.ORG

HIGHLIGHTS

35
Services

50–75
People

20
Co-leads of ELIXIR groups

Services

- Co-led the implementation of the DOME registry[107] for capturing DOME annotations[108]
- Contributed to the redesign and implementation of the Training Metrics Database

Training

- Contributed to ELIXIR Training SPLASH website
- Led activities to define standard operating procedures for the Training Platform and Training Coordinators

EU projects

- Coordinated the EVERSE project, ensuring alignment with ELIXIR-STEERS activities on research software indicators and reward and recognition frameworks
- Contributed to the IHI project SYNTHIA on synthetic data generation using machine learning

Other activities

- Coordinated the Mongoose staff exchange with ELIXIR Germany and ELIXIR Netherlands on single cell data, leading to a publication[109]
- Contributed to the BRIDGE staff exchange, strengthening connections with the NIH on FAIR software and FAIR machine learning
- Coordinated deployment of the GDI starter kit through a staff exchange with ELIXIR Sweden

ELIXIR HUNGARY

LEAD INSTITUTE: INSTITUTE OF ENZYMOLOGY, RESEARCH CENTRE OF NATURAL SCIENCES, HUNGARIAN ACADEMY OF SCIENCES
WEBSITE: WWW.BIOINFORMATICS.HU

HIGHLIGHTS

32
Services

<25
People

2
Co-leads of ELIXIR groups

Services

- Developed the Node website to include a registry of bioinformatics resources and projects
- Added four new services: Cancer Hallmarks, EpigenPlot, Metaanalysis Online and UniTmp
- Installed and maintained the open Galaxy server at Semmelweis University, Budapest

Training

- Ran 60 bioinformatic training courses across eight universities
- Trained 69 PhD students as part of ELIXIR Hungary research groups

Other activities

- Organised a national bioinformatics conference in collaboration with the Hungarian Bioinformatics Society, and an artificial intelligence conference, HUN-REN ÖK
- Increased the number of research group leaders to 36, publishing 180 papers[110]

107 https://registry.dome-ml.org/intro
108 https://doi.org/10.1093/gigascience/giae094
109 https://www.sciencedirect.com/science/article/pii/S2001037024001417
110 https://www.bioinformatics.hu/hu/node/97

ELIXIR IRELAND

LEAD INSTITUTE: UNIVERSITY COLLEGE DUBLIN, NATIONAL UNIVERSITY OF IRELAND
WEBSITE: ELIXIR-IRELAND.IE

HIGHLIGHTS

10
Services

25-50
People

5
Co-leads of ELIXIR groups

Groups

- 10 Node services added to the Service Delivery Plan:
- Two new training service: Bioconductor and Ribosome profiling
- Five new software services: Phylogenomic inference Model Finder, Ribosomal profiling in Galaxy, Ribosomal profile mapping, Multiple Alignment, Machine learning peptide bioactivity
- Three new databases: RNA editing, Ribosome profiling, Cancer genetic dependencies

Training

- Received funding from the Chan Zuckerberg Initiative for the course, Delivering High-Quality Bioconductor Training for a Worldwide Community

EU projects

- Contributed Genome of Ireland clinical use cases to form a collection of GDI user stories
- Wrote and narrated the GDI technical demonstration video on allele lookup of monogenic causes of severe COVID-19 outcomes

ELIXIR ISRAEL

LEAD INSTITUTE: WEIZMANN INSTITUTE OF SCIENCE
WEBSITE: G-INCPM.WEIZMANN.AC.IL

HIGHLIGHTS

0
Services

<25
People

4
Co-leads of ELIXIR groups

Key changes

- Welcomed four institutes: Bar Ilan University, The Hebrew University, Ben Gurion University and Technion – Israel Institute of Technology

Groups

- Contributed to four ELIXIR Communities: 3D-Bioinfo, Research Data Management, Single-Cell Omics and Metabolomics
- Participated in the DATAREX study and the ELIXIR Biohackathon programme committee

Training

- Organised one workshop and co-organised one course
- Participated in the RItrainPlus management training programme

Other activities

- Joined the national Israel Research Core Facilities initiative
- Delivered two seminars introducing ELIXIR Israel activities and opportunities
- Participated in several projects at the Biohackathon

ELIXIR ITALY

LEAD INSTITUTE: CONSIGLIO NAZIONALE DELLE RICERCHE (CNR)
WEBSITE: ELIXIR-ITALY.ORG

HIGHLIGHTS

70
Services

100–150
People

27
Co-leads of ELIXIR groups

Key changes
- Welcomed one new institute, Istituto Fondazione Italiana Oncologia Molecolare (IFOM)
- Francesca De Leo appointed as Deputy Head of Node, joining Silvio Tosatto

Services
- Developed the Italian Galaxy Server, UseGalaxy.it, as part of the EuroScienceGateway project, with plans for six national Galaxy instances

Training
- Delivered 12 short-format courses and an online winter school, and co-organised a one-year bioinformatics higher-level course, engaging nearly 400 participants in total

EU projects
- Hosted two events for the technical work packages of ELIXIR-STEERS
- The Italian node of the Federated EGA passed the test phase

Other activities
- Established collaboration agreements with the Italian node of BBMRI, the Reserchalize platform, Scientifica Venture Capital, Confindustria Bari-Bat and the Alliance Against Cancer
- Participated in two staff exchanges (SPARKLE and YEAMENE) and one Industry Engagement Day

ELIXIR LUXEMBOURG

LEAD INSTITUTE: LUXEMBOURG CENTRE FOR SYSTEMS BIOMEDICINE
WEBSITE: ELIXIR-LUXEMBOURG.ORG

HIGHLIGHTS

5
Services

<25
People

8
Co-leads of ELIXIR groups

Services
- Deployed an OpenStack/ Virtual Private Cloud
- Published DS-PACK - a tool for the end-to-end support of controlled access human data[111]
- Established three service agreements for hosting Disease Maps

Groups
- Hosted two RDM Community events: the Data Stewardship Handbook Contentathon (involving a staff exchange) and the RDM Community Implementation Study meeting
- Contributed to the Systems Biology Community project SYBEL, and hosted a study workshop

Training
- Delivered 11 courses: three in R, two in REDCap, three on statistics and data science, one on Disease Maps and one Train-the-Trainer (with ELIXIR Germany)

EU projects
- Led work on GDI long-term sustainability and the development of the GDI user portal
- Led the BY-COVID use case on molecular mechanisms of SARS-CoV-2
- Coordinated the CHIST-ERA FAIRClinical project

111 https://www.nature.com/articles/s41597-024-03326-9

ELIXIR NETHERLANDS

LEAD INSTITUTE: DUTCH TECHCENTRE FOR LIFE SCIENCES (DTL) – HEALTH-RI
WEBSITE: WWW.HEALTH-RI.NL/EN/ELIXIR

HIGHLIGHTS

10
Services

75–100
People

19
Co-leads of ELIXIR groups

Groups

- As part of the Toxicology Community and INTOXICOM project, held two workshops - FAIRification of toxicological research output (pre-print[112]) and Leveraging ELIXIR resources
- As part of the RDM Community and DATAREX project, held Data Stewards Handbook workshops, led a BioHackathon project on FAIR Lesson Plans (part of LEARN-FAIR) and authored the RDM Community paper[113]

Training

- Coordinated the consolidation and expansion of the ELITMa training portfolio, and led the Node Data Management Strategy module as part of PeoplePulse

EU projects

- Developed a national GDI deployment prototype

Other activities

- Received funding for two projects in the Thematic Digital Competence Center for Life Science and Health program - a FAIR tool framework and FAIR education resources
- Co-organised the annual Health-RI and BioSB conferences, and kick-off meeting of the Dutch research and medical software network (DReaMs)
- Organised a national BeaconV2 workshop

ELIXIR NORWAY

LEAD INSTITUTE: UNIVERSITY OF BERGEN
WEBSITE: WWW.ELIXIR.NO

HIGHLIGHTS

13
Services

50–75
People

14
Co-leads of ELIXIR groups

Key changes

- Welcomed new Deputy Head of Node, Eivind Hovig

Groups

- Co-led the new Pathogen Focus group and Cancer Data Community
- Co-led the Node Development Commissioned Service and a work package in the PeoplePulse Commissioned Service
- Awarded projects in two Commissioned Services: Biodiversity, food security and pathogens, and Human data and translational research

Training

- Delivered 20 training courses on data management and data analysis

EU projects

- Organised workshops for the architecture work package of EOSC-ENTRUST

Other activities

- Launched the Pathogens Portal Norway[114] in partnership with the Norwegian Institute of Public Health
- Deployed a fully operational Norwegian node of FEGA[115]
- Participated in the NIH-funded Pathogen Data Network[116]

112 https://osf.io/preprints/biohackrxiv/un2rw_v1
113 https://doi.org/10.12688/f1000research.146301.2
114 https://www.pathogens.no
115 https://ega.elixir.no
116 https://pathogendatanetwork.org

ELIXIR PORTUGAL

LEAD INSTITUTE: INSTITUTO DE ENGENHARIA DE SISTEMAS E COMPUTADORES (INESC-ID)
WEBSITE: BIODATA.PT

HIGHLIGHTS

11
Services

75-100
People

12
Co-leads of ELIXIR groups

Key changes

- Two Node institutes merged forming the Gulbenkian Institute for Molecular Medicine (GIMM)

Training

- Ran two iterations of the data management course, Ready for Biodata Management Intensive, the first Portuguese training course accredited by the European Credit Transfer and Accumulation System

EU projects

- Continued deployment of the Portuguese GDI infrastructure to manage sensitive data
- Organised two workshops on impact and environmental sustainability in research infrastructures as part of ELIXIR-STEERS

Other activities

- Participated in the SPARKLE staff exchanges on impact, contributing to both PeoplePulse and the development of a Node impact strategy
- Participated in the BRIDGE staff exchange, resulting in a new collaboration with the NIH
- Undertook multiomics data analysis using MOFA2 for Portuguese partners outside ELIXIR

ELIXIR SLOVENIA

LEAD INSTITUTE: UNIVERSITY OF LJUBLJANA
WEBSITE: ELIXIR-SLOVENIA.ORG

HIGHLIGHTS

15
Services

25-50
People

14
Co-leads of ELIXIR groups

Key changes

- Welcomed Barbara Koroušić Seljak as Head of Node, replacing Brane Leskošek

Services

- Hosted the updated Training Metrics Database and operational and training versions of Data Stewardship Wizard
- Provided short and long-read sequencing and targeted metabolomics, and analysed genomics and transcriptomics data for 15 EU, industry and national projects

Training

- Delivered three courses and over ten lectures on ELIXIR Slovenia's HPC services
- Developing a e-learning module as part of the Train-the-Trainer Commissioned Service

EU projects

- Established the Slovenian GDI node and strengthened the 1+MG Mirror Group

Other activities

- Started coordinating a national project on AI - AI4Sci - led by the Jožef Stefan Institute
- Started coordinating the EUTOPIA-HEALTH project, funded by Horizon-WIDERA and led by the University of Ljubljana
- Participated in the EC Joint Action EUnetCCC, the European Network of Comprehensive Cancer Centers

ELIXIR SPAIN

LEAD INSTITUTE: SPANISH NATIONAL BIOINFORMATICS INSTITUTE (INB)
WEBSITE: INB-ELIXIR.ES

HIGHLIGHTS

40
Services

25–50
People

26
Co-leads of ELIXIR groups

Services
- Released a GA4GH Beacon outreach video[117] as part of IMPaCT, a Spanish precision medicine programme

Groups
- Co-led the Cellular and molecular research and Human data and translation research priority areas
- Co-led the new Cancer Data Community (including co-authoring its white paper), and the Pathogens Data Focus Group

Training
- Continued collaborating with the Spanish Supercomputing Network (RES) to deliver research data management courses - the third edition of a beginners course and the first edition of an advanced course for sensitive data
- Published a training handbook: Integration of the sex and gender dimension in life sciences research[118] as part of the EOSC Life project

EU projects
- Coordinated the EOSC4Cancer, CGI-Clinics and MDDB projects and co-coordinated the EVERSE project
- Led Pillar III of GDI and deployment of the Spanish GDI Spanish infrastructure
- Coordinated the IHI VICT3R project and participated in the IHI SYNTHIA project

Other activities
- Awarded project funding including: IMPaCT-Data-2, Pathogens Data Network, EDIII, SQANTI-Annot and OHDO: Open health research digital objects lifecycle tool
- Participated in three ELIXIR staff exchanges enabling Central EGA to support the creation of the Portuguese and Swiss FEGA nodes

ELIXIR SWEDEN

LEAD INSTITUTE: NBIS – NATIONAL BIOINFORMATICS INFRASTRUCTURE SWEDEN
WEBSITE: NBIS.SE

HIGHLIGHTS

2
Services

100–150
People

21
Co-leads of ELIXIR groups

Services
- Released a updated version of the Human Protein Atlas with major new features

Training
- Ran over 40 courses including the RaukR summer school, ELIXIR-GOBLET Train-the-Trainer, and Ethical, legal and social implications in research infrastructures and core facilities

EU projects
- Continued GDI infrastructure deployment and defining the project minimal viable product, organised a GDI cross-pillar workshop
- As part of PHENET, enhanced the training skills of European agroecology researchers
- Received the first datasets from industry partners in the BIGPICTURE project

Other activities
- Awarded increased funding from Swedish Research Council, SciLifeLab, the KAW Foundation and Vinnova
- Provided bioinformatics support to 300 principal investigators in over 350 projects
- Hosted the ELIXIR All Hands Meeting 2024 in Uppsala
- Submitted the first real datasets to FEGA

117 https://www.youtube.com/watch?v=Z13sklz9Ylk
118 https://doi.org/10.5281/zenodo.13767883

ELIXIR SWITZERLAND

LEAD INSTITUTE: SIB SWISS INSTITUTE OF BIOINFORMATICS
WEBSITE: WWW.SIB.SWISS

HIGHLIGHTS

45
Services

100–150
People

29
Co-leads of ELIXIR groups

Groups

- Co-led of the Biodiversity, Pathogens and Food Security priority area
- Co-lead in Node Development and Train-the-trainer Commissioned Services and participated in PeoplePulse

Training

- 58 trainers delivered 55 courses reaching over 1330 participants
- Organised a spring school on Structure-based computer-aided drug design, in collaboration with the ELIXIR 3D-BioInfo Community
- Co-led the ELIXIR-GOBLET Train-the-Trainer project, to enhance training skills in ELIXIR

Other activities

- Received renewed funding from the Swiss Confederation[119]
- Participated in a staff exchange with ELIXIR Finland, ELIXIR Spain and the Central EGA with the aim of joining the FEGA consortium in early 2025
- Launched the Swiss Pathogen Portal
- Coordinated the Pathogen Data Network, a project with an international consortium including partners from ELIXIR

ELIXIR UK

LEAD INSTITUTE: THE EARLHAM INSTITUTE
WEBSITE: ELIXIRUKNODE.ORG

HIGHLIGHTS

31
Services

100–150
People

39
Co-leads of ELIXIR groups

Key changes

- Welcomed two new institutes (Queen Mary University of London and Swansea University)

Services

- Launched MARS, a Multi-omics Adapter for Repository Submissions, which brokers metadata to BioSample, the ENA and MetaboLights using ISA-JSON

Groups

- Co-led the RDM Community and the Data Steward Handbook hackathon, and co-authored user stories from ELIXIR's Research Data Management resources
- Co-led the Learning Paths Focus Group and a Biohackathon project for developing learning paths, and provided support across ELIXIR in developing learning paths

Training

- Completed the ELIXIR-UK DaSH project[120], a training fellowship for data stewards, delivering 60 short training videos, 27 resource contributions,10 case studies on FAIR data and 17 courses

EU projects

- Co-developed, with major publishers, the Editorial reference handbook[121] to help journal editors put FAIR into practice using FAIRsharing and resources like WorkflowHub
- Launched the mTeSS-X project, funded by OSCARS and in collaboration with the PANOSC research infrastructure

Other activities

- Secured five-year Node funding from BBSRC with an extended budget and including a flexible fund to support community participation, career development and ambassadorial work
- Helped secure a £34 million investment from UKRI to establish BioFAIR, a national digital research infrastructure bridging gaps between life sciences researchers, digital research technical professionals and institutional digital research infrastructures to drive the widespread adoption of FAIR data principles across the UK.

119 https://www.sib.swiss/news/swiss-confederation-renews-sib-funding-for-2025-2028?mtm_campaign=SMU&mtm_source=newsletter&mtm_medium=email
120 https://elixiruknode.org/activities/fellowship/
121 https://publishers.fairassist.org

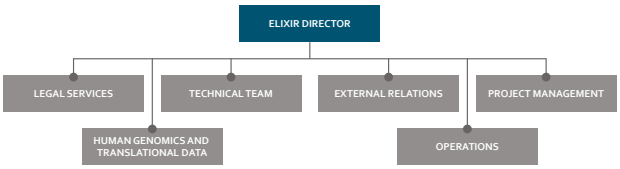
Coordination and governance

ELIXIR Hub

The ELIXIR Hub has six teams which together coordinate and support all ELIXIR Nodes and members:

- External Relations
- Human Genomics and Translational Data
- Legal Services
- Operations
- Project Management Office
- Technical

Together with the ELIXIR Director, the heads of the six teams form the ELIXIR Hub Management Team. The staff in the Hub represent a mix of nationalities and cultures, reflecting the diversity of ELIXIR.



CHANGES AND ADDITIONS

On 1 March 2024, Tim Hubbard joined as the new ELIXIR Director.

In the Operations team, Sara Ashraf joined as the Finance Officer and Louise Lattimore joined as the Executive Assistant to the Director. Mercedes Steiner moved from the Project Management team to the Operations team to support the administrative requests in ELIXIR.

Andrea Guzmán Mesa joined the External Relations team as the International Relations Officer and Deborah van Wyk joined as the Digital Content Editor.

In the Legal Services team, Louiza Kalokairinou joined as Legal and Ethics Officer to support ELSI practices within ELIXIR and Zoya Khan joined as a legal intern. There were three new starters in the Project Management team: Maria Dolores Fernandez, Maria Tyler and Yuliia Sydorenko. Mihail Anton joined the Technical team as Senior Science Officer for Tools and Training Platforms.

Flags of nationalities

Governance

The ELIXIR Director leads the ELIXIR Hub and is responsible to the ELIXIR Board for implementing the ELIXIR Scientific Programme. The Board is the highest decision-making body in ELIXIR, and is composed of representatives from ELIXIR Member States and EMBL.

The ELIXIR Scientific Advisory Board (SAB) is an advisory body to the ELIXIR Board and the ELIXIR Director, made up of leading experts from around the world. It advises the Board on ELIXIR's scientific strategy - including the ELIXIR Scientific Programme - and reviews ELIXIR Nodes, including applications from Node candidates. SAB members are appointed by the ELIXIR Board.

The Heads of Node (HoN) Committee advises the ELIXIR Board and the Director regarding ELIXIR's activities. The committee is composed of representatives from ELIXIR Nodes which are appointed by following national processes.

The Industry Advisory Committee (IAC) consists of experts from the private sector, ranging from SMEs to large multinational companies, who provide high-level strategic advice as deemed appropriate by the ELIXIR Board, Director and the Heads of Nodes Committee. The IAC advises on aspects including the implementation of the ELIXIR Scientific Programme activities and the ongoing development of ELIXIR's industry support actions, ELIXIR's scientific collaborations with European and global initiatives as well as any industry needs or initiatives that ELIXIR should address. Members of the IAC are appointed by the ELIXIR Board.

ELIXIR Board members

Chair: Alexander Goesmann (Germany)
Vice Chair: Zsuzsanna Dosztányi (Hungary)
Vice Chair: Christine Orengo (UK)

MEMBER	ADMINISTRATIVE DELEGATE	SCIENTIFIC DELEGATE
BELGIUM	Virginie Storms	
	Michele Oleo	
	Didier Flagothier	
CZECH REPUBLIC	Jan Burianek	Luděk Matyska (stepped down in November 2024, replacement to be appointed)
DENMARK	Mads Rugaard Christensen	Veit Schwämmle
EMBL	Plamena Markova-Anderson	Sameer Velanka (replaced Alvis Brazma in April 2024)
		Edith Heard
ESTONIA	Toivo Räim (stepped down in December 2024, replacement to be appointed)	Jaak Vilo
	Priit Tamm	
FINLAND	Laura Taajamaa	Per Öster
	Sirpa Nuotio	
FRANCE	Catherine le Chalony	Hugues Roest Crollius
GERMANY	Annette Kremser	Alexander Goesmann
		Rolf Backofen
GREECE	Argyro Karachaliou	Babis Savakis
		Christos Ouzonis
HUNGARY	Klára Horváth (stepped down in July 2024, replacement to be appointed)	Zsuzsanna Dosztányi
IRELAND	Fiachra MacCanna (replaced Brendan O'Reilly in October 2024)	Maria Nash
ISRAEL	Barak Gatenyo	Iris Eisenberg
ITALY	Mauro Bertelletti	Rita Casadio
LUXEMBOURG	Romain Martin	Bert Verdonck
	Bruno Rodrigues	
NETHERLANDS	Ana de Castro	Ruben Kok
NORWAY		Inge Jonassen
PORTUGAL	Marta Abrantes	Miguel Rocha
	Tiago Saborida	
SLOVENIA	Albin Kralj	Damjana Rozman
SPAIN	Ignacio Baanante	Fátima Sanchez
SWEDEN	Alexander Darin-Mattsson (replaced Malin Sandström in September 2024)	Björn Andersson
SWITZERLAND	Doris Wohlfender-Bühler	Christian von Mering
UK	Mark Palmer	Christine Orengo
	Amanda Collis	

ELIXIR Heads of Nodes Committee

Chair: Tim Hubbard (ELIXIR Director)

MEMBER	HEAD OF NODE	DEPUTY HEAD OF NODE
BELGIUM	Frederik Coppens	Kim De Ruyck
CZECH REPUBLIC	Jiří Vondrášek	Karel Berka
DENMARK	Jan Gorodkin (replaced Lars Juhl Jensen in October 2024)	
EMBL-EBI	Johanna McEntyre	
	Ewan Birney	
ESTONIA	Hedi Peterson	Kairi Koort
FINLAND	Tommi Nyrönen	Ilkka Lappalainen
		Susanna Repo
FRANCE	Anne-Françoise Adam-Blondon	
	Guy Perrière	
GERMANY	Alexander Sczyrba	Irena Maus
	Oliver Kohlbacher	
GREECE	Martin Reczko	Christoforos Nikolaou
HUNGARY	Balázs Győrffy	
IRELAND	Denis Shields	Colm Ryan
ISRAEL	Dan Ben-Avraham	
ITALY	Graziano Pesole	Silvio Tosatto, Francesca De Leo (appointed in August 2024)
LUXEMBOURG	Reinhard Schneider	Wei Gu
NETHERLANDS	Jaap Heringa	
NORWAY	Sushma Nagaraja Grellscheid	
PORTUGAL	Ana Teresa Freitas	Inês Chaves
SLOVENIA	Barbara Koroušić Seljak	
SPAIN	Alfonso Valencia	Salvador Capella-Gutierrez
SWEDEN	Bengt Persson	Jessica Lindvall
SWITZERLAND	Christophe Dessimoz	
UK	Carole Goble	
	Neil Hall	

ELIXIR Scientific Advisory Board members

Chair:

DOREEN WARE
(USDA ARS, Cold Spring Harbor Laboratory, USA)

Vice Chair:

PHILIP BOURNE
(University of Virginia, USA)

PHILIP BOURNE
(University of Virginia, USA)

FIONA BRINKMAN
(Simon Fraser University, Canada)

MELISSA HAENDEL
(Oregon Health and Science University, USA)

JANET KELSO
(Max Planck Institute for Evolutionary Anthropology, Germany)

DANIELLE KEMMER
(Novo Nordisk Foundation, Denmark)

PAUL KERSEY
(Kew Gardens, UK)

BARTHA MARIA KNOPPERS
(McGill University, Canada)

ERIC MESLIN
(University of Toronto, Canada)

NICOLA MULDER
(UCT Computational Biology Group (NBN), South Africa) (stepped down in November 2024)

BF FRANCIS OUELLETTE
(Bioinformatics.ca, Canada)

AUGUSTO RENDON
(Genomics England, UK)

SUSAN WALLACE
(University of Leicester, UK) (stepped down in November 2024)

DOREEN WARE
(USDA ARS, Cold Spring Harbor Laboratory, USA)

ELIXIR Industry Advisory Committee members

Chair:

FILIP PATTYN
(FAQIR, Belgium)

Vice Chair:

CATHERINE SIRVEN
(Bayer, France)

IAN BARRETT
(AstraZeneca, UK)

THOMAS EXNER
(Seven Past Nine GmbH, Germany)

RICHARD FINKERS
(GenNovation B.V., the Netherlands)

ANDREAS KREMER
(ITTM, Luxembourg)

KLAUS MAISINGER
(Illumina, UK)

GEERT DE MEYER
(Waltham Petcare Science Institute, MARS UK, UK)

FILIP PATTYN
(Chair), FAQIR, Belgium

JÖRG PEPLIES
(Ribocon GmbH, Germany)

ELIZABETH REYNOLDS
(General Bioinformatics, UK)

HELENA SAUNDERS
(Syngenta, UK)

CATHERINE SIRVEN
(Vice Chair) (Bayer, France)

BÉRÉNICE WULBRECHT
(ONTOFORCE, Belgium)

Financial data

At the 2013 EMBL Council summer meeting, ELIXIR's legal framework was unanimously approved, including its status within EMBL as a 'Special Project' as well as EMBL's membership of ELIXIR (EMBL/2013/16/Rev 1). The legal framework of ELIXIR is based on the ELIXIR Consortium Agreement (ECA), which has been concluded among countries and EMBL. With its entry coming into force in 2013 ELIXIR has evolved into an independent, internationally operated infrastructure.

The budget of ELIXIR is set annually by the ELIXIR Board and all funds related to its activities, including its surplus/deficit, ring-fenced within EMBL's accounts.

		31/12/2024	2024		31/12/2023
		ACTUAL	REVISED	BUDGET	ACTUAL
		€000	€000	€000	€000
INCOME					
ELIXIR Member state contributions					
Ordinary contributions	(a)	7,734	7,800	7,800	7,676
Foreign exchange (loss)/gain on sterling contributions	(b)	-		-	(89)
Grant income	(c)	1,732	3,100	3,000	1,975
Other income		(1)		-	-
Net Income		**9,465**	**10,900**	**10,800**	**9,562**
EXPENDITURE					
Activities with Nodes					
ELIXIR Funded Meetings and Signature events		632	800	800	324
Commissioned services		4,403	4,400	4,400	2,749
Total expenditure Activities with Nodes		**5,035**	**5,200**	**5,200**	**3,837**
Secreteriat					
Salaries		2,760	2,600	2,600	1,614
Running costs		441	300	300	884
Total expenditure Secreteriat		3,201	2,900	2,900	2,498
Support and Admin Infrastructure costs		884	1,000	1,000	1,221
Grant expenditure incurred		2,431	3,000	3,000	2,251
Total expenditure		**11,551**	**12,100**	**12,100**	**9,807**
SURPLUS/(DEFICIT)	(d)	(2,086)	(1,200)	(1,300)	(245)

(a) ELIXIR Member state contributions

	31/12/2024	31/12/2023
	€000	€000
BELGIUM	225	211
CYPRUS*	3	3
CZECH REPUBLIC	97	74
DENMARK	156	145
ESTONIA	13	10
FINLAND	110	104
FRANCE	1,150	1,172
GERMANY	1,722	1,623
GREECE	84	94
HUNGARY	63	49
IRELAND	111	86
ISRAEL*	151	134
ITALY	842	866
LUXEMBURG	21	16
NETHERLANDS	388	366
NORWAY	179	212
PORTUGAL	92	89
SLOVENIA	22	18
SPAIN	586	569
SWEDEN	248	242
SWITZERLAND	306	319
UNITED KINGDOM	1,229	1,274
TOTAL	7,798	7,676

* Adjusted payment modalities:

Cyprus contribution as an Observer over 2019–23 Programme was limited to 30% of their full contribution as an ECA signatory. Over the 2024–28 Programme, Cyprus is expected to become a full member. Its contribution will be added on top of the 2024–28 Member State contributions to the Financial Plan.

VALUES IN €000	INVOICE/2024	BUDGET/2024
Cyprus	3	11
Israel	151	188
Total	154	199

(b) Foreign exchange (loss)/gain on sterling contributions

The UK pays its Member State contribution in Sterling (ELIXIR/2015/28) as a hedging mechanism for currency movements, considering that most of ELIXIR staff expenditures are in Sterling. The nominal loss arises from difference between the value of these contributions valued in Euros at the date of payment and the date of the approval of the 2024 ELIXIR budget due to fluctuations of the value of Sterling against the Euro in this period.

(c) Grant Income

	2024	2023
	€000	€000
GRANT INCOME EARNED	1,732	1,975
GRANT EXPENDITURE INCURRED	(2,431)	(2,251)

(d) Surplus/(Deficit)

This deficit is deducted from the EMBL general reserve. ELIXIR impact to the EMBL general reserve has been ring-fenced for the use by ELIXIR.

(e) The following countries have amounts due or prepaid at 31 December 2024:

VALUES IN €000	CONTRIBUTION OWING
GREECE	(178)
TOTAL	(178)

Glossary of abbreviations (used more than once)

AAI	Authentication and Authorisation Infrastructure
AI	Artificial Intelligence
CDR	Core Data Resources
CNV	Copy Number Variation
DCEG	Division of Cancer Epidemiology and Genetics (NIH)
DOME	Data Optimization Model Evaluation
EC	European Commission
ECCB	European Conference on Computational Biology
EHDS	European Health Data Space
EGA	European Genome-phenome Archive
ELEAD	ELIXIR LEadership And Diversity mentoring programme
ELITMa	ELIXIR Training in Management
EMBL-EBI	European Molecular Biology Laboratory-European Bioinformatics Institute
ENA	European Nucleotide Archive
EOSC	European Open Science Cloud
ERIC	European Research Infrastructure Consortium
EU	European Union
EUCAIM	European Cancer Imaging Initiative
FAIR	Findable, Accessible, Interoperable, Reusable
FEGA	Federated European Genome-phenome Archive
GA4GH	Global Alliance for Genomics and Health
GBC	Global Biodata Coalition
GCBR	Global Core Biodata Resources
GDI	Genomic Data Infrastructure
GORC	Global Open Research Commons
HPC	High-Performance Computing
IAC	Industry Advisory Committee
IHI	Innovative Health Initiative
ML	Machine Learning
NIH	National Institutes of Health
ODSS	Office of Data Science Strategy (NIH)
RDM	Research Data Management
RIR	Recommended Interoperability Resource
SAB	Scientific Advisory Board
TRE	Trusted Research Environment
UKRI	UK Research and Innovation

Full ELIXIR Glossary

Credits and Acknowledgments

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