



ELIXIR Scientific Programme

2024-28 Ambitions and Outcomes



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Ambitions and Outcomes

This document summarises the ambitions and outcomes of the ELIXIR Scientific Programme 2024-28. It supplements the Full Programme¹ and the Executive Summary Brochure².

Summary

Tier 1 - Science: Enable scientists to access and analyse life science data

- Connect the latest developments and established data resources to realise the potential of cellular and molecular biology
- Mobilise and integrate molecular data to support transnational research programmes in biodiversity, food security and pathogens
- Provide the infrastructure to support the discovery, access, sharing and analysis of human genomics data and linked phenotypic/other data on a massive scale

Tier 2 - Technology: Deliver services to support federated data management and analytics in life science

- Provide data and knowledge management infrastructure to support open, data-driven research in the life sciences
- Develop our infrastructure to enable end-to-end management of life science software, workflows and containers
- Develop a federated pan-European technical infrastructure for life scientists to access data, storage and compute services

Tier 3 - Nodes: Equip ELIXIR Nodes for successful long-term operations

- Nodes have the operational capabilities to contribute to a European infrastructure for data
- Nodes are aligned with national research priorities and open science policies
- Nodes are fundamental to national industry ecosystems and engage in EU-wide industry efforts
- Nodes are empowered and supported in their efforts towards long-term sustainability

Tier 4 - People: Develop people and capacity to benefit science and society

- All users of ELIXIR services have access to training, resources and expertise
- Nodes are well equipped to efficiently manage and run a distributed infrastructure
- ELIXIR technical and scientific staff have the skills needed for operational excellence and impact
- ELIXIR is a diverse network of people who are appropriately credited for their work

¹ <https://elixir-europe.org/sites/default/files/documents/elixir-programme-24-28-full.pdf>

² <https://elixir-europe.org/sites/default/files/documents/elixir-scientific-programme-2024-28-brochure.pdf>



Tier 1 - Science: Enable scientists to access and analyse life science data

Cellular and molecular research

1.1 Connect the latest developments and established data resources to realise the potential of cellular and molecular biology

- A comprehensive set of open solutions is available to develop, manage and publish FAIR by design datasets and digital objects (for example, tools, workflows, data, models, operating procedures, case studies) for reproducible research in new areas of bioscience
- New and established ELIXIR services for cellular and molecular biology form a semantically interoperable and complementary network of FAIR data and tools which can be readily discovered, understood and integrated into novel analyses
- Demonstrated and comprehensive collections of interoperable tools, data, knowledge and training are available to researchers working on cross-modality problems involving structural, omics and imaging datasets in cellular and molecular biology
- Co-developed projects and knowledge sharing are established with EuroBioimaging and INSTRUCT research infrastructures to answer multimodal research questions
- FAIR collections of machine learning and systems biology models, supporting data and tools are routinely available, and an ecosystem of reusable models is available to answer basic and applied research questions
- ELIXIR services are in place to support the needs of the European Research Infrastructure for Industrial Biotechnology (IBISBA) research infrastructure and the European bioindustry

Biodiversity, food security and pathogens

1.2 Mobilise and integrate molecular data to support transnational research programmes in biodiversity, food security and pathogens

In the areas of biodiversity, food security and pathogens:

- A coordinated and comprehensive portfolio of activities is built via ELIXIR Communities (existing and newly created) and externally funded projects (national and transnational)
- Nodes broker biomolecular data into accessible reference collections for the research community
- Nodes are established as integral components of national data management programmes
- Nodes run a suite of services allowing molecular, cellular and imaging data to be routinely mobilised, connected and analysed
- Large and well-curated datasets are available for artificial intelligence analysis, high performance computing service use and advanced analytics
- Collaborations link to other disciplines and infrastructures to facilitate seamless data management, connectivity and analysis for the research community



Human data and translational research

1.3 Provide the infrastructure to support the discovery, access, sharing and analysis of human genomics data and linked phenotypic/other data on a massive scale

- Researchers (including research clinicians) use ELIXIR's infrastructure, operating within the European data space landscape, for human genomic, phenotypic (including broader set of high throughput omics), imaging and demographic data to support discovery, analysis, innovation and integration of research findings into the clinic and healthcare
- Millions of human genomes are discoverable and exploited in a biomedical setting through ELIXIR-supported infrastructure and community-endorsed standards, software, workflows and analysis environments across ELIXIR Nodes
- Federated analysis of data is demonstrated for use, for example, in rare disease, cancer, common complex disease, preventative disease, pharmacogenomic studies
- Partnerships linking human data to other disciplines and infrastructures are well established and mechanisms for data deposition are defined and agreed across Nodes
- Industry supports the deployment of the EU data spaces by providing solutions based on ELIXIR-supported standards



Tier 2 - Technology: Deliver services to support federated data management and analytics in life science

Research data management and knowledge sharing

2.1 Provide data and knowledge management infrastructure to support open, data-driven research in the life sciences

- Our key data services, represented by the Core Data Resources forum, have strong connections through ELIXIR Nodes to user and developer communities and international expert groups
- The human and machine usability of our large scale resources is enhanced and data deposition is enabled through standards and brokering
- Our research data management infrastructure allows researchers and research communities at all scales to easily and cost-effectively make all Europe's life science data FAIR, enhancing the usability of large scale resources and supporting community-driven data curation
- The ELIXIR knowledge management infrastructure drives attribution and recognition of data depositions, biocuration, software development and other open science contributions using well-recognised global frameworks
- The ELIXIR research data management knowledge ecosystem is sustained, enabling the connection of new services and the maintenance and co-creation of new content
- A strong and extensive training programme is an integral part of the research process, co-developed by life scientists and service developers, supporting all aspects of life science knowledge management, and connected to appropriate international expert groups such as the Research Data Alliance, the Research Software Alliance and the International Society for Biocuration

Reproducible analytics and infrastructure

2.2 Develop our infrastructure to enable end-to-end management of life science software, workflows and containers

- A mature ecosystem is in place to support the software lifecycle from the software management plan to deployment and long-term retention of code
- Research software engineers in the life sciences have guidelines, training and registries to ensure software and workflows are open and reproducible, managed using the techniques developed for FAIR and open research data
- Our work on co-developing standards with organisations such as the Global Alliance for Genomics and Health enables the composition of authentication, data, compute and workflow services using only open, standards-based APIs
- Dialogue with the international Galaxy developers enables the adoption of open interfaces, increased integration of ELIXIR services, and adoption throughout the ELIXIR Communities addressing their diverse needs including sensitive workflows



- Established protocols, services and technical standards together with availability of key data resources allow life science researchers to make effective use of Europe's new and expanding high performance computing facilities (EuroHPC) as well as cloud services (EOSC, GAIA-X).
- Accounting for resource use across infrastructure services allows service providers and research users to connect resources to requirements based on agreed priorities

Federated service delivery

2.3 Develop a federated pan-European technical infrastructure for life scientists to access data, storage and compute services

- A comprehensive set of agreed technical standards, protocols and cost-recovery models allows researchers to perform distributed and/or federated analysis over national data services, clouds and secure processing environments
- Researchers can seamlessly access resources across Europe via a single, secure login providing authentication, authorisation, auditing and accounting
- ELIXIR Deposition Databases and Core Data Resources are at the heart of a distributed network of European data repositories with technical interoperability and standardised impact assessment
- Specialist Communities can find, develop and share collections of services, operating procedures and guidelines to meet their complex needs through familiar technologies
- ELIXIR's key infrastructure services are identified, developed, recommended and sustained
- ELIXIR Nodes contribute to a growing portfolio of multi-Node services, supported, developed and promoted by a distributed network of experts



Tier 3 - Nodes: Equip ELIXIR Nodes for successful long-term operations

Node operations

3.1 Nodes have the operational capabilities to contribute to a European infrastructure for data

- Nodes have in place appropriate governance structures and successful procedures for effective coordination and operations
- ELIXIR enables knowledge sharing between Nodes and establishes an implementation toolkit for adoption of good practice
- Nodes have effective communication channels with national partners and relevant stakeholders

National research and open science policy alignment

3.2 Nodes are aligned with national research priorities and open science policies

- National funders recognise ELIXIR Nodes as key components of the data infrastructure when funding major research initiatives
- National funders increasingly reference ELIXIR resources in open science policies and guidelines

Integrating Nodes with industry and innovation

3.3 Nodes are fundamental to national industry ecosystems and engage in EU-wide industry efforts

- Industry, particularly small and medium-sized enterprises, benefit from the services, technologies and expertise of ELIXIR Nodes
- ELIXIR Nodes and industry collaborate and innovate to form mutually beneficial ecosystems
- ELIXIR develops a portfolio of case studies communicating the value to industry of public investments in open data infrastructures
- ELIXIR engages in key EU-level industry initiatives, providing solutions based on ELIXIR supported standards

Demonstrating impact and supporting sustainability

3.4 Nodes are empowered and supported in their efforts towards long-term sustainability

- Nodes staff are equipped with the skills and knowledge to confidently demonstrate the performance and impact of their work to national and international funders and policymakers



- ELIXIR has systems in place (for example, to track the number of users, training beneficiaries and publications) to demonstrate public value to a range of stakeholders, including the European Strategic Forum on Research Infrastructures
- ELIXIR works with, and learns from, evaluation and impact specialists through EU- and internally-funded projects
- Information and good practice in securing funding from national and other funding sources is shared across Nodes



Tier 4 - People: Develop people and capacity to benefit science and society

Users of ELIXIR services

4.1 All users of ELIXIR services have access to training, resources and expertise

- ELIXIR gives users access to a Europe-wide training programme for the creation and stewardship of all types of digital asset
- ELIXIR develops and maintains ELIXIR's Training Portal (TeSS)
- ELIXIR strengthens and scales up national user training programmes by supporting trainer development, fostering knowledge sharing and exchange of materials, building capacity and driving adoption of good practice between Nodes (based on the FAIR training principles)

Management and operational staff

4.2 Nodes are well equipped to efficiently manage and run a distributed infrastructure

- Personnel are supported to run efficiently organised Nodes, with good understanding of distributed research infrastructures in general, and ELIXIR operations in particular
- A peer-to-peer network (a community of practice) enables ELIXIR people, particularly those with an operational role, to receive support and guidance and actively share knowledge with others
- Management and operational staff are well prepared to meet the organisational, business and ethical, legal and social implications (ELSI) of the Genomic Data Infrastructure project and emerging life science and research infrastructure challenges

Technical and scientific staff

4.3 ELIXIR technical and scientific staff have the skills needed for operational excellence and impact

- Nodes are supported to become training providers and national centres of excellence in the FAIR stewardship of all types of digital assets
- A training programme enables all Nodes to maximally benefit from technical roadmaps and associated services
- Technical and scientific staff are well prepared for the requirements of emerging life science and research Infrastructure challenges (for example, the Genomic Data Infrastructure).



A diverse people network

4.4 ELIXIR is a diverse network of people who are appropriately credited for their work

- ELIXIR provides mechanisms to recognise community and organisational contributions to research infrastructure development, operations and impact
- Mechanisms for recognition of contributions and the long-term development of people are in place
- ELIXIR operates a set of people development tools (for example, knowledge sharing and capacity building schemes) which are well understood and utilised by all Nodes
- ELIXIR is a well-connected network of people with a strong sense of belonging
- ELIXIR has a long-term plan for increasing the diversity of individuals in the infrastructure, and equity, diversity and inclusion (EDI) support and training ensures a diverse and inclusive selection process for all ELIXIR leadership roles