SciLifeLab

Breakthrough Technologies in Molecular Life Science to Power Precision Medicine and the Future of Healthcare in Sweden

Executive Summary in English

Our vision is that by 2035, Sweden will be a world leader in introducing groundbreaking biotechnological methods and AI in healthcare to ensure patient-centered, transformative care. To achieve this, we are establishing a unique cluster of excellence that enables the continuous development and integration of molecular profiling and imaging with AI-driven data analysis at Sweden's university hospitals. The aim is to enable precision medicine and a changed way of working in healthcare, and to promote the growth of new companies.

At the core are new precision medicine units at SciLifeLab's seven nodes, jointly run with universities and hospitals connected to SciLifeLab's world-leading infrastructure. Here, researchers and clinicians collaborate directly to analyze patient samples using state-of-the-art biotechnology and combine molecular and clinical data for AI-based decision support.

Together, we are creating an internationally leading network, located at university hospitals, that accelerates biotechnology and AI innovation to enable technology-based and data-driven clinical trials and rapidly improve patient care.

This environment will also be very attractive to the pharmaceutical industry, both in terms of nationally coordinated clinical trials and as a breeding ground for new biotechnology and diagnostics companies, attracting global investment and talent. Sweden has strategic advantages in the form of high-quality care, comprehensive patient registries, and broad support for medical innovation.

The preparatory project (November 2025–March 2026) will develop a roadmap for implementation, governance, data management, AI tools, industry collaboration, and community engagement. The initiative aims to accelerate the introduction of new technologies in healthcare for the benefit of patients, industry, and society. By establishing groundbreaking life science and AI technologies equally and accessibly throughout the country, Sweden can take a leading position in next-generation healthcare with solutions that can also be scaled up globally.

Sammanfattning på svenska

Vår vision är att Sverige år 2035 är världsledande i att införa banbrytande bioteknologiska metoder och AI i hälsosjukvården för att säkerställa patientcentrerad, transformativ vård. För att nå dit etablerar vi ett unikt excellenskluster som möjliggör kontinuerlig utveckling och integrering av molekylär profilering och avbildning med AI-driven dataanalys vid Sveriges universitetssjukhus. Syftet är att möjliggöra precisionsmedicin och ett förändrat arbetssätt inom vårdens, och främja tillväxt av nya företag.

Kärnan är nya precisionsmedicinska enheter vid SciLifeLabs sju noder, gemensamt drivna med universitet och sjukhus som kopplas samman med SciLifeLabs världsledande infrastruktur. Här samarbetar forskare och kliniker direkt för att analysera patientprover med toppmodern bioteknik och kombinera molekylära och kliniska data för AI-baserat beslutsstöd.

Tillsammans skapar vi ett internationellt ledande nätverk, förlagt vid universitetssjukhusen som accelererar bioteknik- och AI-innovation för att möjliggöra teknikbaserade och datadrivna kliniska prövningar och snabbt förbättrar patientvården.

Denna miljö blir samtidigt mycket attraktiv för läkemedelsindustrin, dels med avseende på nationellt koordinerade kliniska prövningar, men även som grogrund för nya bioteknik- och diagnostikföretag, och genom att attrahera globala investeringar och talang. Sverige har strategiska fördelar i form av högkvalitativ vård, omfattande patientregister och brett stöd för medicinsk innovation.

Förberedelseprojektet (nov 2025–mars 2026) kommer ta fram en färdplan för implementering, styrning, datahantering, AI-verktyg, industrisamverkan och samhällsengagemang. Initiativet syftar till att påskynda införandet av nya teknologier i vården till nytta för patienter, näringsliv och samhälle. Genom att etablera banbrytande life science- och AI-teknologier jämlikt och tillgängligt i hela landet kan Sverige ta en ledande position inom nästa generations hälso- och sjukvård med lösningar som även kan skalas upp globalt.

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1. The Vision

By 2035, Sweden is a global leader in accelerating the translation of breakthrough biotechnology and AI into patient centric transformative healthcare and growth of new business.

Our vision is that by 2035, Sweden will have established a world-leading excellence cluster that constantly innovates and translates breakthrough technologies from biotechnology and life science AI to medicine. Our cluster will develop and integrate cutting-edge molecular profiling and imaging technologies with artificial intelligence-driven data analytics to empower precision medicine and transform healthcare.

Fig. 1.
National distribution of the planned excellence cluster integrating SciLifeLab with the University hospitals.

The cluster will create a new ecosystem, by bringing together the national biotechnology infrastructure SciLifeLab, operated by the government and all Swedish life science universities on the one hand, with the university hospitals and their associated healthcare systems on the other. The cluster will thus create an internationally leading hub that accelerates biotechnology and life science AI innovation, enables innovative technology-based and data-driven clinical trials and rapidly improves patient care. This will provide a uniquely attractive environment for academic clinical researchers and industry to run next generation and nationally coordinated clinical trials in Sweden, provide a fertile ground for the foundation of new biotechnology and diagnostic companies, attract investments and keep and attract highly educated persons to Sweden. The cluster will thus make a key contribution to propel Sweden into a leading position in breakthrough life science technologies and next generation health care and make this equally available across the country and scalable to a global market.

Fig.2.
Core implementation concept of the excellence cluster to create a set of joint precision medicine units where SciLifeLab technology and data experts and clinicians work side by side.

The core of implementing our vision is to create a set of new precision medicine units across Sweden, that are jointly operated by SciLifeLab and its partner universities and university hospitals at each of the seven SciLifeLab technology infrastructure sites, that are co-located with the vast majority of life science company employees in Sweden. In these new units, leading academic technology developers and data scientists will work side by side with clinicians to jointly engage in translating cutting-edge technologies—genomics, proteomics, metabolomics, spatial biology and advanced imaging and life science AI — into clinical practice and to enterprises across Sweden. The key to achieve this will be, first, to expose patient samples in the regular hospital workflows to state-of-the-art biotechnology for rapid exploration and, second, to combine molecular and health data for artificial intelligence-based analysis and clinical decision making.

This new concept of physically integrating the best technology and life science AI with clinical research and university hospital health care in Sweden, will enable earlier diagnosis, personalized treatment strategies, and real-time monitoring of disease progression and patient outcomes. We foresee a healthcare system where AI-powered insights from molecular and clinical data seamlessly inform decision-making, leading to improved outcomes and more cost-effective care. The concept will make Sweden attractive for industry to engage, initiate clinical trials, invest and collaborate and for start-ups, SME's and large companies to test and validate their products.

1.1 Key Actors

The excellence cluster is on the one hand built upon SciLifeLab, as the well-established national research infrastructure that has propelled Sweden into a leading position in molecular biotechnology for the life sciences and, also through its large data driven life science program, has built up unprecedented competence in data and AI driven life science in Sweden. It is supported by SciLifeLab's founding universities (Karolinska Institutet, KTH Royal Institute of Technology, Uppsala University, Stockholm University) as well as its partner universities that host its national sites (Umeå University, Örebro University, Linköping University, University of Gothenburg and Chalmers University of Technology, as well as Lund University). On the other hand, the cluster builds on the new national alliance of Sweden's university hospitals that has been formed in 2025, and provides a unique opportunity for a nationally coordinated approach to translate new technologies into healthcare. It furthermore builds on the strong clinical genomics platform that SciLifeLab has already established together with several of the medical faculties and university hospitals.

Key partners at each institution will include leading biotechnology and AI experts, researchers in basic science, clinical researchers and practicing clinicians. Importantly, to ensure long term and broad impact into the whole health care system, the consortium will include the National Board of Health and Welfare as well as representatives of the regional health care systems, through their national working group on generating a roadmap for precision medicine. This will be complemented by strong collaboration with biotechnology, imaging and diagnostics companies, as well as pharmaceutical industry and European and international collaborations.

1.2 Strategic Advantages

Firstly, Sweden's unique strengths lie in its high quality and equitable healthcare system, comprehensive and long-term patient registries, and a strong tradition in and broad public support for molecular life sciences and new approaches in medicine. Secondly, SciLifeLab provides Sweden with an unparalleled national state of the art research infrastructure for the most advanced molecular biotechnology and bioinformatics, which is leading in Europe. SciLifeLab has already demonstrated successful translation of genomics into clinical practice with its clinical genomics infrastructure and together with the SciLifeLab partner organisation Genomic Medicine Sweden, that this can be scaled to the regional healthcare system. Our advantage is therefore the unique ability to now couple cutting-edge biotechnology across all technologies and life science AI development directly with clinical implementation and achieve this in a coordinated fashion at the national scale. Such a coordinated and scalable approach is urgently needed for Sweden to be part of the biotechnology and artificial intelligence revolutions that will shape the future health care.

By bringing these key strengths together, our cluster will ensure rapid translation of technology innovations into clinical practice and patient benefits, which will lead to economic growth in biotechnology, diagnostics and drug development and improve the quality of health care for society. Compared to other initiatives, our unique advantage is that we integrate the whole portfolio of molecular biotechnology, from genomics, via proteomics to spatial biology and imaging, with artificial intelligence, and translate this to health care in direct collaboration with the university hospitals in a coordinated national framework, and hence providing an excellence cluster framework attractive to industry and investors.

1.3 Potential for Growth and Competitiveness

The cluster has the potential to create significant value for patients, healthcare providers, industry, and society. For patients, this means better diagnostics, more effective therapies, and improved survival and quality of life. For industry, the cluster provides an innovation pipeline and testbed for new technologies in health care, opportunities for interdisciplinary collaboration between molecular biology, computer science and medicine, and an advanced technology based nationally coordinated clinical trial infrastructure. For Sweden, the cluster strengthens our global competitiveness in AI, biotechnology and precision medicine, attracts investment, talents and fosters new biotechnology, diagnostics and service companies that can scale internationally. The six month preparatory project will develop Key Performance Indicators for growth and competitiveness impact.

1.4 Societal Benefit and Important External Factors

Sweden's publicly trusted regulatory framework, high ethical standards, and commitment to equitable healthcare across the country provide a strong foundation for this cluster. Gender equality, climate-neutral operations, and responsible innovation and use of AI will be integrated into the cluster. Geopolitical shifts and global health challenges (e.g., pandemics, ageing society, surging healthcare costs and chronic disease burden, climate change related health challenges) underline the urgency of building resilient national capabilities in precision medicine quickly. Key external factors influencing this vision include health data organization and legislation in Sweden and international competition in biotechnology, that the cluster will proactively address from the start.

1.5 Realization of the Vision

The vision will be realized by reaching six key objectives.

1. establishing complementary precision medicine units at the seven universities and university hospitals, jointly operated together with SciLifeLab,

2. developing a joint secure data environment to integrate clinical and molecular data at scale,

3. develop and deploy AI-driven data analysis and provide decision support tools to use molecular insights in clinical practice,

4. scaling technology innovation through co-creation with industry, creation of spin-offs and commercial partnerships,

5. Create a new technology-based precision medicine infrastructure for clinical trials to improve patient stratification and provide new explorative endpoints.

6. Providing an environment to attract additional investments (e.g. venture capital, EU funding, establishment of companies - new or big companies moving to Sweden)

Key success factors to realize the vision include a strong and inclusive national governance of the cluster, close alignment with universities as well as healthcare challenges and clinical needs that can be addressed by new biotechnology and life science AI, and strategic and long-term sustainable funding, for which this call by Vinnova provides a unique opportunity. Challenges such as regulatory changes for health data sharing, and rapid adoption of innovative technologies by clinicians and healthcare professionals will be addressed through coordinated national strategies for building a competence network in AI and biotechnology precision medicine and close alignment with the regions and health care authorities.

1.6 SWOT Analysis

Strengths
National infrastructure (SciLifeLab), leading biotechnology development and service, leading data driven life science, bioinformatics and life science AI, world-class researchers, strong university hospitals next to leading preclinical and clinical research, large potential for clinical integration, new opportunity for national coordination with the national alliance of university hospitals, pioneering examples of impact of new biotechnology to common disease diagnosis and treatment.

Weaknesses
Fragmented health data access across regions, different cultures for innovation and translation between research infrastructure, universities and medical school research and hospitals, need for strategic and sustainable long-term funding, limited scale-up investment opportunities for innovative spin-off companies in Sweden.

Opportunities
Accelerated adoption of breakthrough biotechnology and life science AI in healthcare, providing novel precision medicine solutions for common disease, high potential to attract international investments, especially from pharma industry and technology and IT companies.

Threats
Intense international competition, need for modernization of Sweden's health data regulation, risk of Sweden falling behind in the Nordics, risk of brain and investment drain in precision medicine if neighboring countries can provide a more attractive environment.

2. Project Implementation

To prepare the implementation of our cluster vision, we outline here the concrete steps to be undertaken in the six-month preparatory project.

2.1 Overall Goals and Results

By March 2026, the consortium will have established a roadmap to establish the cluster and apply for phase II funding. The roadmap will include a detailed implementation plan needed to reach the six key objectives in order to realize our vision (*see* 1.5.). It will therefore, first, provide a blueprint to set up comprehensive precision medicine units jointly operated with SciLifeLab at all university hospitals in Sweden. The overall aim will be to make them complementary in technology and clinical need focus, to address major disease areas (*e.g.* cancer, cardiovascular, neurodegenerative, and metabolic disorders) and breakthrough technologies (*e.g.* genomics, proteomics, metabolomics, spatial biology, imaging) in the most effective fashion. Second, the roadmap will outline the technical requirements and necessary regulatory changes to create a secure national data environment that allows to integrate the clinical and molecular datasets effectively at scale, so that, third, new AI tools can be developed and rapidly validated for clinical use. Fourth, the roadmap will develop a strategy on how to make the cluster an engine for innovation in precision medicine, by nationally supporting biotechnology and life science AI innovation for health care and co-creation with industry partners and investors. Fifth, it will define how a platform for technology-driven clinical trials in a nationally coordinated fashion can be established, drawing inspiration from the recently funded FOCU.SE trial in precision cancer medicine. Last but not least, the roadmap will propose a strong and nationally inclusive governance for the technology cluster, taking inspiration from the successful model of the well-established SciLifeLab Board and its system of reference, steering and advisory groups. Importantly, national and regional impact, sustainability and societal engagement will be built into the cluster governance by engaging with key stakeholders, including authorities, regions and patient organizations, from the start (*see* 3.3).

At the end of the first phase, the consortium will thus present a detailed roadmap for how to position Sweden as a European leader in biotechnology and AI empowered precision medicine and transformed health care by 2035.

2.2 Activities

The preparatory project will achieve its goals through six work packages:

WP1
Implementation plan for joint precision medicine units at university hospitals
(co-lead: SciLifeLab/local host university/university hospital).

WP2
Define the regulatory and technical requirements to set up a joint secure data environment
(lead: SciLifeLab/KI/KTH).

WP3
Prioritize new AI tools for data analytics and clinical decision support
(lead: KI, KTH, SciLifeLab DDLS programme and bioinformatics platform).

WP4
Develop a strategy to improve the precision medicine innovation pipeline and strategic industry collaborations (lead: SciLifeLab, UU, industrial partners).

WP5
Plan for a national platform for technology driven clinical trials in precision medicine
(lead: KI, University hospitals).

WP6
Governance, sustainability, and societal engagement (lead: SciLifeLab, national alliance).

2.3 Conditions
Dependencies include regulatory frameworks for data sharing, technical alignment between SciLifeLab and healthcare IT systems, and sufficient engagement of overcommitted clinical staff. Uncertainties include evolving EU regulations on AI and data. The project mitigates these risks by bringing the national biotechnology infrastructure and national alliance of university hospitals together and engaging with health authorities and regions, policy makers, and industry stakeholders, as well as EU collaborators, including the TEF-Health project, from the start, for example as EU project partners, observers and in dedicated advisory groups.

2.4 Budget and Costs
For phase I, which is planned from November 1st, 2025 to March 31st 2026, the budget will prioritize two full-time scientific project managers, one on the biotechnology/AI side at SciLifeLab and one on the health care side at Karolinska University Hospital, to work with the large group of stakeholders to coordinate the activities and deliver a roadmap for cluster implementation and application to phase II funding. In addition to the funding of key personnel, an additional budget is planned to support meetings and travel of the stakeholders involved in the cluster, as well as a public hearing to promote societal engagement and impact. In addition, some funding will be reserved for specific services or consultants for specialized expertise (*e.g.*, legal and ethical frameworks, data security), ensuring knowledge transfer to the cluster consortium.

2.5 Gender Perspective
The project will actively promote gender balance in leadership and scientific roles. Current steering and project leadership already show similarly strong representation of women and men. Gender perspectives will also be integrated into research design (e.g., sex differences in disease and underlying biology) and innovation practices, ensuring equitable impact of precision medicine advances.

3. Project Team and Actors

3.1 Project Partners

The consortium consists of SciLifeLab, its founding universities (KI, KTH, SU, UU), national partner universities (UmU, ÖrU, LiU, GU/Chalmers, LU), and, via their national alliance, all university hospitals in Sweden. Together they bring together leading expertise in molecular biotechnologies, life science AI, basic science, clinical research and highest quality health care. Industry partners (biotech, pharma, diagnostics) will contribute with innovation and translational expertise, and ability to provide new innovative biotechnology at scale.

3.2 Team and Leadership

The steering group includes leading researchers, biotechnology and infrastructure experts, and clinical leaders across Sweden: SciLifeLab director, co-director and infrastructure director Jan Ellenberg, Mia Phillipson, Annika Jenmalm; KI translational experts Clara Hellner and Carl Johan Sundberg; KTH deputy president Mikael Lindström, and biotechnology expert Amelie Eriksson Karlström; UU translational expert Eva Tiensuu Janson and vice rector Mats Larhed; SU leading scientists Lena Mäler and Gunnar von Heijne and Karolinska University Hospital CEO Christophe Pedroletti and director of medical diagnostics Mathias Axelsson.

In addition, the project aims to engage the national alliance of university hospitals following their September inaugeral meeting. This high-level group provides a uniquely strong balance of scientific excellence, clinical leadership, and healthcare management expertise. Together, they will ensure credibility, effective governance, and strong links to research, technology, infrastructure, policy and practice.

3.3 Other Actors

Additional stakeholders will include the Health and Social Affairs Authority, represented by its Director General Björn Eriksson, the health care regional working group on the roadmap to precision medicine, represented by its chair Jonas Claesson, and European and international collaborators. An industry advisory board will include pharmaceutical companies, successful biotech firms, diagnostics companies, AI enterprises and Swedish investors. Patient organizations and representatives will be engaged to ensure societal relevance and support for innovation in health care.