

UiO:Life Science

Strategy 2025–2029



Preface

Background

The current <u>UiO strategy for the life sciences</u> was approved by the University Board on 11 September 2014. UiO:Life Science was established as an interdisciplinary strategic initiative by the same board on 10 March 2015 and approved to continue for five more years on 5 May 2020.

Mandate for the strategy work

On 20 April 2022, UiO:Life Science was commissioned by the rector's office to prepare a new strategy for the strategic initiative, encompassing the following directives:

- Be concise and build upon the current strategy
- Contribute to the realization of UiO Strategy 2030
- Cover the breadth of life sciences, including human biology, ecology, biodiversity and sustainability, within and outside the life science building
- Clearly position the strategic initiative and life sciences within a broader context, emphasizing its role in addressing contemporary societal challenges and sustainability goals through interdisciplinary research, education, and innovation.
- Ensure that the strategic initiative adds value to the faculties and museums.

An inclusive process involving relevant faculties and museums was emphasized.

The work

In consultation with the respective units, the following working group was appointed by the UiO:Life Science board on 22 September 2022:

Associate Professor Katerini Storeng, Center for Development and the Environment (SUM)

Professor Hugo de Boer, Natural History Museum

Professor Marit Inngjerdingen, Institute of Clinical Medicine, Faculty of Medicine

Professor Geir Kjetil Ferkingstad Sandve, Department of Informatics, The Faculty of Mathematics and Natural Sciences

PhD fellow Yael Friedman, Department of Philosophy, Classics, History of Art and Ideas, Faculty of Humanities

Consultant Tom Pike, external

The working group was tasked with producing a draft strategy that:

- 1. Adheres to the directives from the rectorate
- 2. Evaluates the achieved results of established measures in light of the landscape in which the strategic initiative operates.
- 3. Explores ambitions, opportunities, and key actions along with associated resource requirements
- 4. Proposes thematic focus areas and chief priorities as a foundation for the strategic initiative's continuation in the upcoming operational period from 2025 to 2029.

The working group has had seven meetings in the period from September 2022 to April 2023.

In December 2022, two input meetings were held with the faculty management and other units at UiO. Additionally, a survey was conducted in which important collaboration partners and external actors were invited to participate. A draft of the strategy document was presented to the University Board on 6 September and in the dean's meeting on 20 September 2023. The final strategy has been adjusted according to the input received in these meetings.

1. Introduction

Our society today faces major challenges related to climate, environment, biodiversity, food security, and public health. Achieving sustainability across economic, social, and environmental dimensions is imperative to address these issues comprehensively. We require innovative methodologies, holistic problem-solving approaches, and novel monitoring and prediction tools. Moreover, broader interdisciplinary and sector-wide strategies necessitate new political and financial mechanisms.

Over the past decade, the life sciences field has undergone substantial transformations and made remarkable progress. Notably, breakthroughs in gene editing (such as CRISPR-Cas9 technology), DNA sequencing, and computational techniques, including bioinformatics and the utilization of artificial intelligence (AI) and machine learning, have revolutionized biological research. These technologies hold profound implications for biological and medical research, promising advancements in nature management, sustainable food production, and novel therapies that offer hope for more effective treatment responses and improved health outcomes, enhancing quality of life for many people.

The University of Oslo (UiO) Strategy 2030 emphasizes that the quality and comprehensiveness of research and education places the university in a unique position nationally and forms the basis of its status as a leading European research-intensive comprehensive university. UiO's overall goals are to:

- promote independent, ground-breaking and long-term research
- educate students with the knowledge, ability and willingness to create a better world
- strengthen the dialogue with the outside world and work to ensure that knowledge is put to use
- be an innovative organization and an attractive place to work and study

Many sub-goals and aspirations outlined within these main objectives align with the emerging trends in life sciences, emphasizing interdisciplinary problem-solving approaches (see definition of terms in Appendix 1). UiO:Life Science serves as a tool for university leadership to actively promote and facilitate such interdisciplinary collaboration. This involves identifying opportunities for constructive interaction across organizational units, initiating and supporting initiatives and activities that transcend traditional departmental or faculty boundaries, and addressing challenges that cannot be tackled by any single discipline alone.



This strategy document outlines the overarching vision and ambitions of the strategic initiative. Past and ongoing activities are cited solely as illustrations in the ensuing discussion. No specific action plan proposals have been formulated; the decision which measures to adopt to achieve the outlined ambitions and priorities rests with the UiO:Life Science board.

The alignment with **UiO strategy for the life sciences** is briefly described in Appendix 2.

The working group has operated under the assumption that allocated resources from 2025 to 2029 will remain at a level similar to that of 2023.

2. The working group's assessment of achieved results 2015 - 2023

In the realm of research, UiO:Life Science stands out as the primary catalyst for fostering extensive collaboration across departments and faculties at UiO. The convergence environments (CE) have emerged as pivotal mechanisms, offering adaptability to address contemporary societal challenges swiftly and efficiently. Researchers and students who are involved gain valuable insights into other disciplines, grasping the broader relevance of their own research beyond their specific fields. Feedback from PhD candidates and postdocs indicate that their experience enhances their appeal to prospective employers both within and outside academia. So far, 20 projects have been initiated through three generations of allocations, most recently in autumn 2021 (CE-III). The evaluation process, involving a broad international panel, appears mature and effective. The distribution of the 131 project participants across faculties, depicted in Figure 1, reveals that The Faculty of Mathematics and Natural Sciences (MN) and Faculty of Medicine (MED) are the largest, followed by Faculty of Social Sciences (SV) and Faculty of Humanities (HF). All eight faculties are represented, underscoring a broad interpretation "life sciences" at UiO. In autumn 2022, the six leaders of the first-generation Convergence Environments (CE-I) reported receiving approximately NOK 430 million (NOK MNOK) in external funding, with NOK 355 MNOK attributed significantly to their status as a Convergence Environment. The UiO investment in this generation amounted to around NOK 60 million.



■ MED ■ OD ■ MN ■ SV ■ HF ■ JUS ■ UV ■ TF ■ Andre

Figure 1. Distribution of 131 principal investigators (PIs) in convergence environment I – III between the faculties. The group "Andre" (Other) includes mainly employees at the Natural History Museum and at Oslo University Hospital. OD is Faculty of Dentistry, JUS is Faculty of Law, UV is Faculty of Educational Sciences, and TF is The Faculty of Theology.

In terms of innovation, the SPARK Norway program has since the start in 2018 evolved into a leading platform for nurturing early-stage innovation ideas from academia into viable products and services within the healthcare industry. The 19 projects that were completed by March 2023 (SPARK alumni) have, among other things, established nine companies, of which six are based on the original SPARK project, and raised a total of NOK 73 million in external funding (UiO:Life Science investment NOK 22.6 million). In addition, the program has contributed significantly to linking researchers, industry professionals and the ecosystem in closer contact. The projects that are part of SPARK Norway have no requirements for interdisciplinary work at the start, but the network the participants meet, which forms the most important part of the program, consists of people from different faculties and collaboration partners. UiO:Life Science has also supported the establishment of UiO Growth House (Veksthuset).

UiO:Life Science has had more limited room for action on the education side, but one successful measure is the annual award of about 50 summer scholarships in 40 projects. Funds are also provided to develop new or to modify existing life science courses adapted to broad target groups.

An annual conference, launched in a new format as *Norway Life Science* in February 2023, has showcased the strong position of UiO within life sciences in a clear and appropriate manner. The conference has also become an important meeting place for all life science actors in Norway.

In addition to support for the Center for Bioinformatics and the Center for Philosophy and the Sciences (CPS), strategic funds have been allocated to prepare two Lancet reports and to establish the technology and research workshop LagLivLab and the Center for Pandemics and One-Health Research (P1H). Funding calls to organize open life science events at UiO and to boost cooperation with international research environments are announced twice a year.

A brief description of the operation of UiO:Life Science and identified challenges is given in Appendix 3.

3. What is Life science?

Life science is the study of living organisms (animals, plants, humans) and life processes. Common definitions emphasize the basic disciplines biology and medicine, supported by chemistry, physics, and mathematical fields. However, UiO:Life Science expands upon this concept by encompassing any field that promotes new ways of understanding the relationship between life science and society. Social sciences and humanities play a particularly crucial role in examining the social, ethical, legal, and political implications of scientific, biomedical, and technological advancements, as well as the growing life science industry.

With this definition, the strategy of UiO:Life Science encompasses areas such as medicine, human biology, ecology, biodiversity, environmental challenges, and sustainability, both within and outside the new life science building.

4. Social challenges within life sciences

Among the main societal challenges where life sciences are expected to make vital contributions are:

Aging population and chronic diseases: As the population ages both in Norway and globally, the prevalence of chronic diseases such as cancer, diabetes, and Alzheimer's increases. New innovative therapies and personalized treatments with tailored medication can improve health outcomes and quality of life for older adults.

Global health and pandemics: The COVID-19 pandemic demonstrated the need for rapid and effective responses to new infectious diseases to prevent and control pandemics. There is an urgent demand for better diagnostic tools, treatments, and vaccines. Additionally, decision-makers in society need to be informed and equipped to make evidence-based decisions, supported by revised legislation.

Sustainable solutions to environmental challenges: It is imperative to reduce greenhouse gas emissions, preserve biodiversity, promote knowledge-based natural resource management, and mitigate the effects of climate change.

Food security and nutrition: With an expected global population of 9 billion by 2050, more food must be produced with fewer resources. We are obligated to develop new food technologies and more sustainable and efficient food systems with reduced food waste.

Technological innovation: Extensive development of new technology is needed in healthcare, food production, and environmental protection. Particularly important is harnessing the opportunities within AI, machine learning, and big data in an innovative and secure manner.

It is noteworthy that addressing each of these challenges involves clear ethical and social implications. This includes questions about genetic privacy, equal access to healthcare services, and the use of genetic information in decision-making processes. A principal goal must be to ensure that research and technology are used for the benefit of society as a whole.

5. A vision for UiO:Life Science

Interdisciplinary collaboration is essential for addressing the societal challenges described above. However, the university's traditional hierarchical structure with faculties, departments, and research groups (in addition to museums and other interdisciplinary units) can lead to silo-thinking and limited interaction among individuals, units, and disciplines across this structure. UiO:Life Science aims to implement measures and tools that break down these silos and lay the groundwork for fruitful and innovative collaboration across established disciplines.

This leads to a vision for UiO:Life Science:

Interdisciplinary solutions to complex societal challenges within life sciences

6. Ambitions

UiO Strategy 2030 sets clear and ambitious goals for the university's activities in *research*, *education*, and *innovation*. The strategy of UiO:Life Science aligns with each of these points and aims to demonstrate the university's commitment to interdisciplinary collaboration within life sciences, both internally and externally. Additionally, a fourth dimension, cultivating a cross-disciplinary culture, is emphasized, demanding dedicated attention and action. Determining the most effective means to achieve these various goals and the appropriate tools to establish efficient initiatives in each case, tailored to the resource requirements, will be the responsibility of the UiO:Life Science board. It is important to stress that the successful implementation of many actions depends on collaboration with other actors within the university organization (see Appendix 3), requiring continuous effort and follow-up from UiO:Life Science. To capitalize on emerging opportunities, maintaining a productive dialogue with university leadership, and furthering close interaction and knowledge exchange with other units are also critical.

Research

UiO:Life Science aims to initiate and support outstanding interdisciplinary research projects and other research-oriented initiatives that:

- 1. Originate from ambitious researchers who identify common interests across established disciplines.
- 2. Contribute to solve significant and complex societal challenges within health, environment, and sustainability.
- 3. Develop visionary research leaders with robust interdisciplinary expertise and collaboration skills.
- 4. Have the potential, capacity, and willingness to attract additional external funding.



The establishment of UiO:Life Science as a strategic initiative at UiO highlights the importance of interdisciplinary research within life sciences and its central role in addressing significant societal challenges. It is within interdisciplinary environments that new groundbreaking ideas often emerge, and the initiative is aimed at actively promoting and supporting the development of such ideas through targeted initiatives and measures.

Basic research remains pivotal, even in projects with clearly defined applications. Over the coming fiveyear period, the goal of UiO:Life Science is to further strengthen UiO's position as a globally leading research arena. This will be achieved by prioritizing interdisciplinary research with the potential to yield original and perhaps unexpected results that could not have been attained within separate disciplines. The strategic initiative will leverage accumulated experience to select new projects where each participating party experiences mutual benefit from participation while possessing critical expertise fundamental to the overall success of the project.

In general, the research arenas and meeting places supported by and through UiO:Life Science aim to break down barriers between disciplines and promote increased understanding and knowledge-sharing across fields, developing research leaders with the motivation and expertise to lead interdisciplinary groups. The strategic initiative also aims to promote the establishment of interdisciplinary regional and national arenas and networks and follow up on positive spin-off effects from supported environments.

Thus, UiO:Life Science plays a crucial role in gathering and mobilizing resources, expertise, and knowledge from various fields to address the major societal challenges we face. Through interdisciplinary collaboration and a holistic approach, the strategic initiative has the potential to contribute to innovative solutions and lay the foundation for a better future for all of us.

Education

UiO:Life Science aims to facilitate interdisciplinary education at all levels. This includes to:

- 1. Provide students with broad competence, perspectives, and understanding valuable for the job market.
- 2. Familiarize students with methods and terminologies outside their own field so that as future researchers, they will find it easier to initiate collaborations across disciplines.
- 3. Utilize shared teaching in interdisciplinary courses as a tool to create new collaborative networks that can also be leveraged in research.
- 4. Reduce or remove structural barriers limiting the migration of students between departments and faculties.
- 5. Stimulate interdisciplinary life science through activities beyond the regular curriculum.



The inclusive definition of life sciences also opens new opportunities in education. To effectively address today's challenges in health and the environment, it is necessary to reduce communication barriers between different fields and create a shared educational vision characterized by a collective and unbiased identity. This vision can challenge the scientific assumptions within natural sciences, social sciences, and humanities, and contribute to eradicating the distinction between nature and society. The desired learning outcomes will serve interdisciplinary capacity building at UiO, from the ground up. Students and young researchers should be given the opportunity to develop critical and pluralistic thinking, acquire good problem-solving skills, and have the ability to recognize biases, assess conflicting perspectives, and analyze ethical concerns. This will prepare UiO graduates in the best possible way to face future challenges in life sciences.

Interdisciplinary education has three dimensions: *content*, *participation*, and *teaching*. Interdisciplinary *content* can be achieved by learning common methods, by illuminating a common theme through different methods, or by learning through the implementation of a joint project. Interdisciplinary *participation* involves bringing students from different parts of the university together to exchange perspectives, promote diversity, and contribute to cross-pollination of ideas and methods. Interdisciplinary *teaching* will provide new opportunities to establish teaching teams consisting of staff members from different faculties, which can significantly expand the boundaries of collaboration. This can lay the groundwork for the establishment of new research and educational frameworks across faculties and enable both more innovative research projects and broader use of scientific infrastructure and funding opportunities.

Innovation

UiO:Life Science aims to contribute to the utilization of knowledge as new products and services in society. This includes to:

- 1. Identify, support, and develop promising innovation ideas within life sciences and health.
- 2. Strengthen the potential for discovering innovative solutions through the establishment of interdisciplinary teams.
- 3. Integrate innovation into education and research and enhance knowledge about innovation processes among students and university staff.
- 4. Foster networking across UiO and with external partners (clusters, industry).



Interdisciplinarity is of great importance for all the societal missions of a university, but innovation holds a special position as it typically relies heavily on interdisciplinarity to occur.

While most innovation projects at UiO traditionally originate from a discovery made in a specific and focused scientific area, they always depend on contributions from and active collaboration with various other disciplines to be realized and to have significance and value in society. Such contributions can come from various natural science, engineering, and social science disciplines. UiO:Life Science, as an independent interdisciplinary university unit, can have a significant impact on the number, quality, and success rate of innovation projects at UiO by facilitating interdisciplinary collaboration and overcoming organizational barriers. The SPARK Norway program has produced very good results in this area. Moving from interdisciplinary projects to genuine interdisciplinary partnerships not only consolidates UiO's ability to realize the potential of research results but also enables societal problems to be addressed by interdisciplinary teams from the outset. Such an approach increases the likelihood of finding innovative solutions. The position of the strategic initiative also provides an opportunity to contribute to coordinated innovation efforts internally at UiO and in collaboration with external actors. In the strategy period, interaction with UiO Growth House is especially relevant.

Culture building

UiO:Life Science aims to disseminate knowledge about life sciences in the society and promote an inviting, inclusive, and development-oriented culture within the field of life sciences by:

- 1. Contributing to build the necessary knowledge, skills, and attitudes to identify and exploit interdisciplinary opportunities within both research, education, and innovation.
- 2. Creating meeting places for all key stakeholders as a tool to strengthen and develop future life science research and industry.
- 3. Implementing appropriate measures to ensure that the activities in the Life Science Building, when operational, meet UiO's ambitions and the government's intentions.



To succeed in interdisciplinary research and practice, it is necessary to have more than just factual knowledge about other disciplines. Competence and an open mindset toward other fields are necessary to identify interdisciplinary opportunities, find suitable collaborators, and establish well-functioning teamwork. This entails recognizing one's own limitations and looking beyond local disciplinary perspectives. The challenge is not only to bridge established divides between disciplines but also to create new ones or at least combine existing research methods. Productive partnership requires that everyone understands the skills, interests, values, knowledge traditions, and motivations of their collaborators.

For *students*, the university should encourage interdisciplinary learning experiences to ensure that they get exposed to the more subtle assumptions, attitudes, and taken-for-granted practices of other fields. Regarding *research*, the university should promote a culture that is open and egalitarian with no fear of failure. This may require a change in organizational behavior and norms, which can be challenging within existing faculties since they often have a primary interest in promoting their own specific discipline. For *society*, it is important that the University of Oslo as an institution not only asks critical questions but also acts as an inviting and cooperative problem solver. A more outward-facing university depends on having meeting places where relevant societal challenges can be discussed (and in the longer term solved) with other key stakeholders in politics, business, and social development. The Norway Life Science Conference is a good example of how this can be done.

Overall, the positive consequences of an open and interdisciplinary culture are indisputable, but without a dedicated effort, the "buzzword factor" may dominate. It is therefore an important task for UiO:Life Science to anchor such a culture at the University of Oslo, which will furthermore be imperative for realizing the opportunities provided by the new life science building.

Intersections

The common distinction made between research, innovation, and education (and here cultural development) may easily give the impression that actions within each area operate independently of each other. Therefore, it is important to emphasize that UiO:Life Science also aims to *coordinate different types of activities with each other*. This includes:

- Operating at the intersection of research and innovation
- Contributing to incorporating knowledge about innovation into education
- Supporting educational initiatives that provide students with a broader academic understanding

UiO:Life Science shall adopt a broad approach to interdisciplinarity and leverage synergies between activities and across disciplines to reach the entire university, the society, and the business sector.

7. Overall priorities and thematic focus

Interdisciplinarity is not an end goal in itself, but rather a tool to achieve meaningful results that surpass what individual disciplines could achieve alone. However, it is important to note that *interdisciplinarity* does not necessarily guarantee *quality*. For the legitimacy of UiO:Life Science, it is crucial to never renounce *quality*; any supported action should be *solid* and *academically strong*, and in many cases *excellent*. The working group does not recommend that the initiative establishes thematic calls for funds or that applications within certain thematic fields are given preference in the evaluation process. Nevertheless, the group will emphasize that many research fields within life sciences are *not* necessarily related to human health from a natural science or medical perspective. Therefore, information and recruitment efforts in connection with future funding calls should aim to attract a broad range of project proposals representing the entire field of life sciences (see Chapter 4). This includes projects in the social sciences and humanities as well as in biodiversity and other natural science areas.

For each individual UiO:Life Science action, it must be assessed to what extent the achieved impact corresponds to both the intentions, the allocated amounts, and the administration's use of resources. It may also be interesting to assess how the initiative's activities have actually influenced the interdisciplinary culture at UiO, so that appropriate adjustments and improvements can be made.

Appendix 1. Concept clarification

The importance of collaboration between different disciplines to address complex issues in health and sustainability is increasingly recognized, often referred to collectively as *interdisciplinary* (used consistently throughout this text). At times, it may be desirable to describe different levels of such collaboration, from low to high integration:

- *Multidisciplinarity* (additive) involves collaboration between researchers from various disciplinary fields, but each field retains its distinctiveness and boundaries.
- *Interdisciplinarity* (interactive) analyzes, synthesizes, and harmonizes connections between disciplines into a coordinated and coherent whole.
- *Transdisciplinarity* (holistic) integrates natural, social, and health sciences within a humanistic context. Boundaries between disciplines are transcended, emphasizing holistic understanding.

UiO:Life Science has primarily focused on the two highest levels but can also support initiatives at the lowest level, especially for groups and fields with the potential for more extensive collaboration with other disciplines.

Furthermore, UiO and UiO:Life Science have used the term *convergence* to describe the close interaction between different environments and disciplines needed to ensure quality and relevance in interdisciplinary projects.

Radical interdisciplinarity suggests that collaboration challenges traditional perceptions of which disciplines can mutually benefit from contributing to the solution of a complex problem.

Appendix 2. Alignment with the existing strategy

Major parts of the content in <u>UiO strategy for the life sciences</u> from 2014 remain relevant. The need for a separate strategy for UiO:Life Science was primarily triggered by:

- The current strategy is written for *all* life science activities at UiO, including Centre for Molecular Medicine Norway (NCMM). At the same time, essential points in the strategy were used to define, among other things, the "Mandate for LV initiative" (University Board, 10 March 2015). This leads to some ambiguity in roles. In particular, the strategy's vision, "International competitiveness in life sciences," is a clear goal for the entire UiO and not something a limited strategic initiative can fulfill, and the pillar "Recruit, educate, and develop talents" provides few signals about what UiO:Life Science should contribute to. Furthermore, the section "Three cross-cutting approaches" contains several strategic goals that the strategic initiative cannot or should not accomplish. Following the instructions from the rectorate, UiO:Life Science has for example, unlike its predecessors EMBIO and Molecular Life Science (MLS), not allocated funds for scientific infrastructure.
- The life science building is no longer in the planning stage; it is in the process of being completed.
- Society has a generally increased awareness of issues related to sustainability, environment, biodiversity, food security, and especially pandemic preparedness.
- The innovation system at UiO has developed significantly during this period, including the establishment of SPARK Norway (pilot 2017, full operation 2018) and UiO Growth House (started in 2022).
 - Building interdisciplinary competence through education is emphasized more strongly.

The strategy of UiO:Life Science is based on the UiO strategy (which it does not replace but complements) and is kept brief by not repeating matters mentioned in the latter that are still applicable.

Appendix 3. Role, function, objectives, and identified challenges

Since its inception in 2015, UiO:Life Science has operated in a dual manner. Some initiatives are driven by the administrative staff, while others are carried out by various other units based on funds allocated through both open and fixed calls for proposals. Both approaches aim to initiate and support interdisciplinary activities in research, education, and innovation that might otherwise have been challenging to establish. The strategic initiative has operated dynamically with a short time horizon for most projects and a development plan that is constantly evolving. Consequently, support from UiO:Life Science rarely has a permanent character; typically, granted funds are expected to be used for planning, launch, and subsequent operation for a limited period. After this, the unit itself must take over and ensure the continuation of the activity. A key characteristic of both models is that the strategic initiative does not operate alone but interacts effectively with internal and external partners of UiO.

Although the Faculty of Medicine is the formal host of UiO:Life Science and provides some administrative support, the strategic initiative has, during its first two operational periods, reported directly to the rectorate via its board. This organizational model enables the strategic initiative to operate as an independent entity with a focus on interdisciplinary collaboration, while being closely integrated into the university's structure and actively collaborating with internal and external partners.



Despite positive developments since 2015, the feedback meetings held in December 2022 revealed that the operation of a unit like UiO:Life Science still faces some distinct challenges:

- It can be difficult to define what interdisciplinary or radically interdisciplinary genuinely implies.
- Similarly, finding *good metrics* to document the impact of implemented measures can be demanding. For example, it is assumed that the strategic initiative has contributed to a more interdisciplinary collaboration culture at UiO, but this has not been documented through dedicated surveys.
- The initiative has *few channels for sharing important experiences* regarding interdisciplinary collaboration.
- Life science activities are largely located within MN and MED. It is essential to establish mechanisms to ensure that participants from humanities and social sciences are involved as equal partners and not merely as service providers.
- Employees and students do not readily visit the initiative's website unless they are specifically looking for information on calls for proposals, etc. This can make it challenging to disseminate information about calls and activities and ensure that it reaches the intended audiences.
- Workshops held in connection with convergence environment processes bring people together across disciplines, but students and employees largely lack regular meeting places for this purpose.
- Departments and faculties have fairly well-defined activity profiles. It is more unclear where the responsibilities of UiO:Life Science begin and end, which can make it harder to see the full picture.

Continuous efforts are underway to address all these issues.