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Where Worlds Align: Insights from the Joint GGBN–ISBER Conference on Biodiversity and Biobanking, Cape Town, October 2025

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The 2025 Joint GGBN–ISBER Conference in Cape Town united biodiversity, environmental, and biomedical biobanking communities from 38 countries. The event highlighted biobanks as interdisciplinary and collaborative infrastructures for addressing global challenges—pandemics, biodiversity loss, and food security, among others. Recurring themes throughout the conference were as follows: (1) Harmonization and Quality—adoption of best practices and standards where possible to ensure global interoperability and sample integrity; (2) Equitable Governance—crafting flexible, transparent frameworks for sample and data sharing that uphold sovereignty and benefit local communities; (3) Technological and Data Integration—using artificial intelligence, omics technologies, and standardized metadata to transform physical specimens into scalable digital resources; and (4) Resilient Infrastructure—securing long-term investment in regional biobanking networks and targeted training to build enduring capacity, embedding sustainability by design and safeguarding local knowledge.

Keywords: biobanking, biobank networks, biodiversity biobanking

Introduction

The 2025 Joint Biobanks Conference was held from September 29 to October 3, 2025, in Cape Town, South Africa. The Global Genome Biodiversity Network (GGBN), the International Society for Biological and Environmental Repositories (ISBER), the Biodiversity Biobanks South Africa, and the Medical Biorepositories of South Africa (MBirSA) brought together biodiversity, environmental, and biomedical biobanking communities at a time when global challenges increasingly demand integrated scientific infrastructures. The meeting was attended by 173 delegates from 38 countries across the globe to discuss various topics surrounding the role of biobanks, now and in the future, and across multiple disciplines. In-person delegates constituted 72% of the total attendance. From a continental perspective, the African continent accounted for 62% of the attendees, from 13 African countries, with an overwhelming majority from South Africa (see Fig. 1). Hosting the meeting in South Africa reflected a strategic effort to strengthen engagement with low- and middle-income

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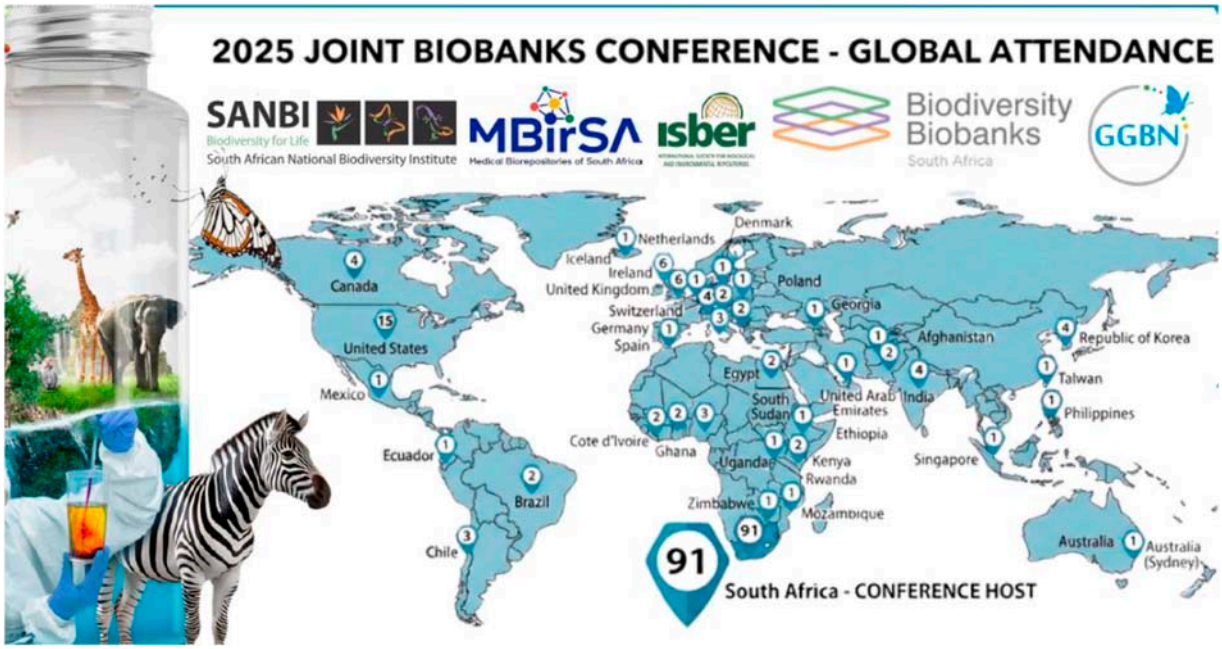

FIG. 1. Participants (in-person and online) by country.

countries and to expand African participation in the field of biobanking. The conference therefore provided a unique opportunity for interested parties on the African continent to attend a state-of-the-art international conference. While 35% of the delegates did not indicate an association with a specific organization, both ISBER and GGBN accounted for 24% each of the attendees, and 5% of delegates were students (another 12% did not complete this field).

By uniting biodiversity and medical biobanks, the conference highlights the essential role that biorepositories play in advancing science, improving health, and safeguarding biodiversity. As biodiversity loss, threats from emerging infectious diseases, food insecurity, and climate-related events all intensify, the importance of collaboration across biobanking domains—leveraging shared experiences, lessons learned, and interoperable tools—has become central to the effectiveness of biobanking as a collective research infrastructure.

This report summarizes key themes emerging from the conference and reflects on how stronger collaboration across biobanking communities can strengthen global research capacity and improve responses to interconnected environmental, agricultural, and societal challenges.

Where Worlds Align: The Convergence of Biodiversity and Biomedical Biobanking

Biodiversity biobanks are essential for addressing the biodiversity crisis and One Health, providing historical and current insights into molecular biodiversity, and linking research to conservation.

Across the **GGBN sessions** dedicated to biodiversity biobanking, the necessity became clear for robust, standardized, and ethically governed biorepositories to ensure long-term sample integrity, accessibility, and scientific significance. Biodiversity research, genetic monitoring, biological conservation, forensics, wildlife health, species reintroduction efforts, disease control, natural resource management, and food security, among others, depend on this, as demonstrated in the various presentations. Fundamental challenges lie in infrastructure and governance, and many institutions reported financial constraints, inadequate laboratory facilities, and logistical barriers. Such obstacles demand locally tailored strategies, long-term capacity building, and equitable international collaboration that preserves local expertise and data sovereignty.

Legal and regulatory frameworks, particularly around Access and Benefit-Sharing,[1] remain a double-edged sword. While regulations are needed in order to prevent exploitation and to ensure fair benefit distribution, overly complex permitting systems strongly affect the exchange of biological material and risk impeding noncommercial (e.g., taxonomic or conservation-focused) research. Presentations underscored the need for balanced policies—safeguarding biodiversity without stifling scientific progress. Data quality and interoperability are equally critical. Heterogeneous datasets, evolving collection practices, and inconsistent metadata often hinder reuse and integration. The push for persistent identifiers, controlled vocabularies, and standardized workflows reflects a clear consensus: full traceability from specimens to tissues and derived data is essential. The integration of expert curation with automation ensures both accuracy and scalability, while shared databases and standards as offered by GGBN are proving vital for cross-institutional collaboration.

Botanical and microbial biorepositories highlighted the transformative potential of biodiversity biobanks. Botanical repositories were shown to boost biodiversity conservation, and specialized plant biobanks, through systematic conservation of crop wild relatives and landraces, are fueling pre-breeding pipelines for climate-resilient agriculture. Meanwhile, the microbial biobanks in the conference's spotlight reveal the immense value of collections from biodiverse regions where ecological challenges are acute. These collections (bacteria, fungi, yeasts, and viruses) support human and animal health, biotechnology, agriculture, and innovation, yet remain underfunded and underrepresented.

The **ISBER sessions** of the Joint Biobanking Conference examined the evolving landscape of biobanking, with a strong emphasis on standardization, innovation, and global collaboration, especially within the African community. Grounded in ISBER Best Practices[2] and aligned with international frameworks such as International Organization for Standardization (ISO)[3] and Qualification in Biorepository Science,[4] the sessions reinforced that high-quality, harmonized processes remain central to ensuring biospecimen and data integrity, regulatory compliance, and long-term viability of biobank operations.

A key focus was the development of resilience and sustainability, with presentations highlighting the untapped potential of patient leftover samples as valuable research resources in Africa. The concept of "sustainability by design" was highlighted as a requirement from inception and included financial, ethical, legal, social, environmental, and technical dimensions, ensuring biobanks remain viable and impactful over time.

The conference further emphasized global connectivity and infrastructure through initiatives such as Biobanking and Biomolecular Resources Research Infrastructure—European Research Infrastructure Consortium[5] that showcased a federated, government-supported model across Europe. Biorepositories in North America, Asia, and large-scale biodiversity and environmental specimen banks highlighted their biobanks as essential infrastructure for retrospective analyses, environmental monitoring, and pandemic preparedness. Talks on the ISBER Best Practices highlighted unified processes that enable cross-border research, long-term sustainability, and cohesive global infrastructure.

A central theme was the One Health[6] approach, positioning biobanking as a bridge between human, animal, and environmental health. These interconnected systems were further strengthened by advances in data science, with sessions exploring big data, multiomics integration, and artificial intelligence (AI). Emerging tools such as AI-compliant consent models underscored a shift toward more dynamic, participant-centered governance, while reinforcing the importance of interoperability and secure data ecosystems.

Ethical, legal, and social considerations[7] remained critical, particularly regarding benefit sharing and community engagement in South Africa. Initiatives such as MBirSA and Pan-African Biobanking Network highlighted strategic efforts to build coordinated national and continental networks, strengthen capacity, and enhance global visibility.

Conclusions

The conference underscored that biobanks constitute active infrastructures essential for enabling future innovation and navigating socioeconomic crises, such as climate-resilient agriculture, pandemics, conservation planning, and remediation. However, the conference also highlighted that although transition is taking place, it faces uneven infrastructure development, funding and workforce limitations, and complex regulatory frameworks.

The future of biobanking depends on interdisciplinary collaboration and sustainability by design. This requires a shift from fragmented efforts toward a unified global ecosystem characterized by harmonized standards, balanced governance, and stronger collaboration that include the following:

- Harmonization and Quality: Adherence to ISBER Best Practices and ISO standards to ensure data interoperability and sample integrity across borders, while allowing tailored approaches where necessary (e.g., in many areas of biodiversity biobanking[8]).
- Equitable Governance and Collaboration: Developing balanced ABS frameworks that protect data sovereignty—particularly in biodiversity-rich regions like Africa—without stifling noncommercial scientific research.
- Technological and Data Integration: Leveraging AI, multiomics, and standardized metadata to transform physical specimens into scalable digital assets.
- Resilient Infrastructure: Strengthening national programs and continental networks to ensure capacity development and the preservation of globally represented, local expertise.

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