Introduction to Open Science

Prof Chris Prom

Dr Dominic Agyei Dankwah

Outline

- What is Open Science
- Why Open Science Matters
- Open Science Barriers and Challenges
- Overcoming Challenges

Introduction

Open Science Word Cloud by Pownall et al. 2023

What is Open Science?

- A practice that makes the entire research lifecycle, including data, methods, and results, transparent, accessible, and reusable to improve scientific quality.
  - *Promotes collaboration, verification, and cumulative knowledge building by enabling others to scrutinise, replicate, and build upon research outputs.*
  - *Enhances equity in knowledge access by reducing barriers to information, particularly for researchers in resource-constrained settings.*
  - *About removing barriers to knowledge and making science a public good*

Factors influencing the adoption of Open Science

Reproducibility Crisis

- *Concerns over the ability to replicate the results of existing studies affected trust in scientific research, the allocation of resources, and the formulation of policies based on scientific evidence.*

Publication biases

- *Traditional peer review, while a cornerstone of scholarly communication, has been criticised for its potential for bias, lack of transparency, and sometimes hindering innovative research.*

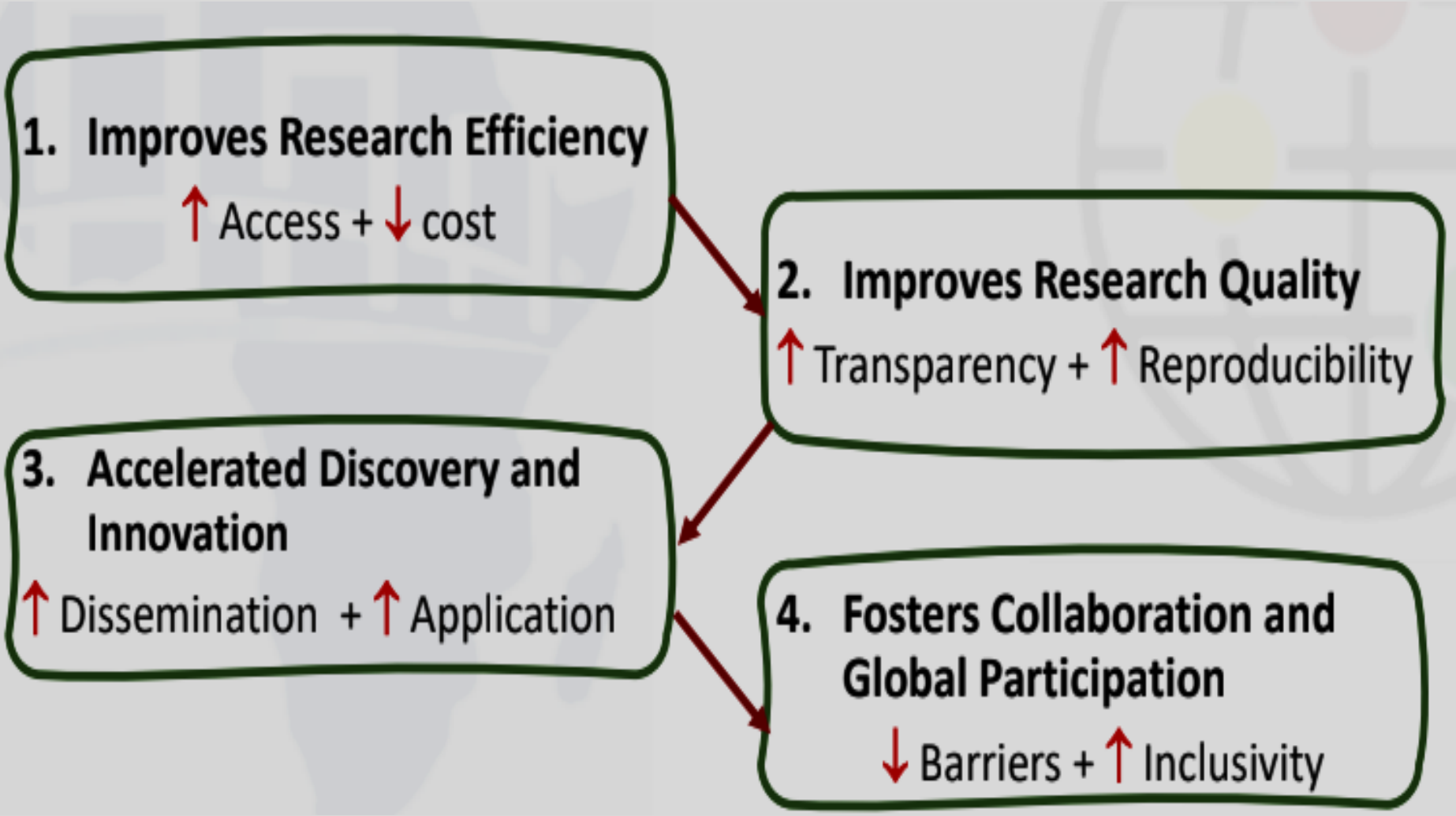
Accessibility issues

- *Costly subscription-based publishing and paywalls locking up knowledge, excessive profiteering by publishers.*

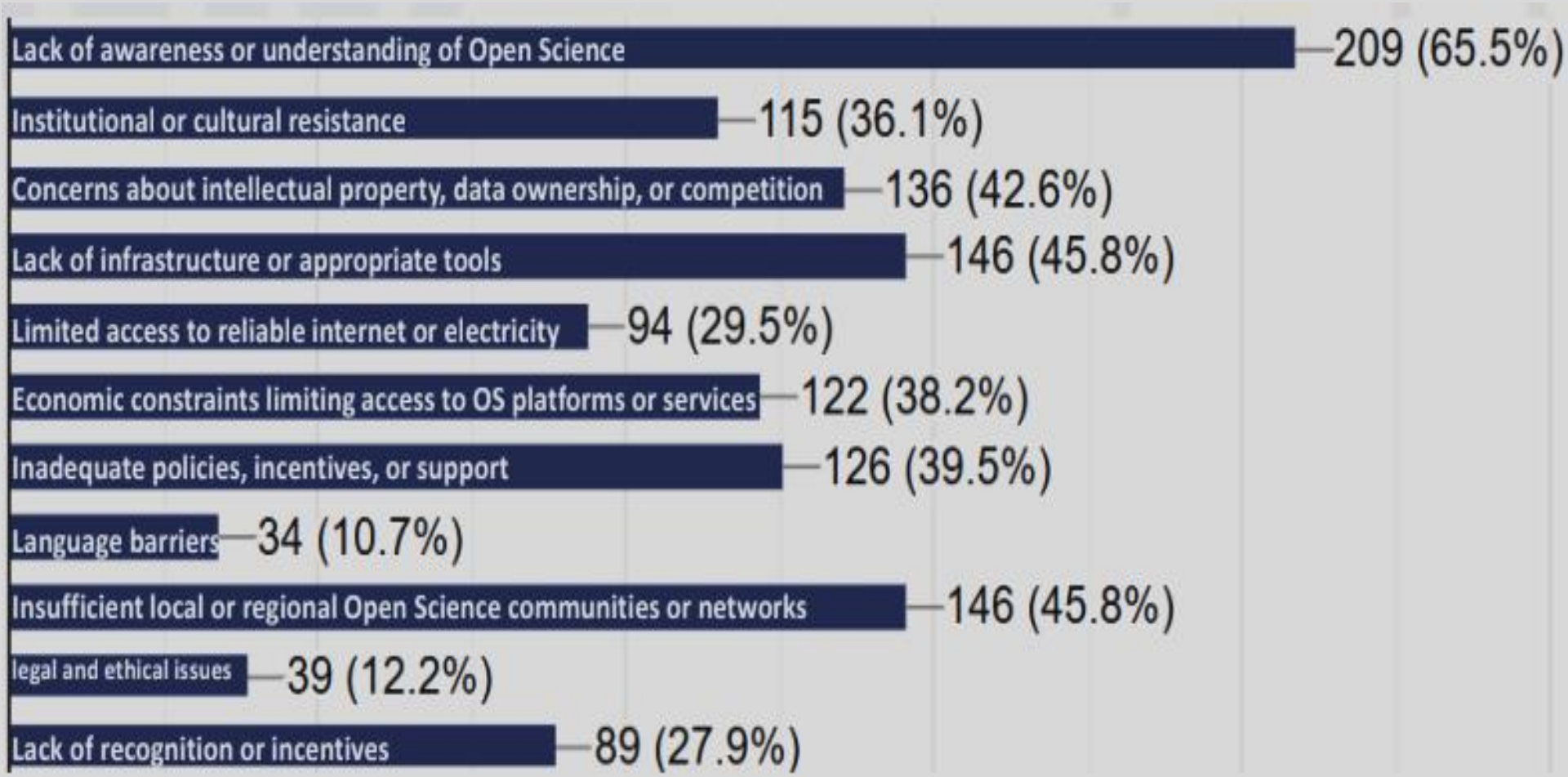
Collaboration/interdisciplinary studies

- *Traditional research models often operated within disciplinary and geographical silos, limiting the exchange of ideas and methodologies.*

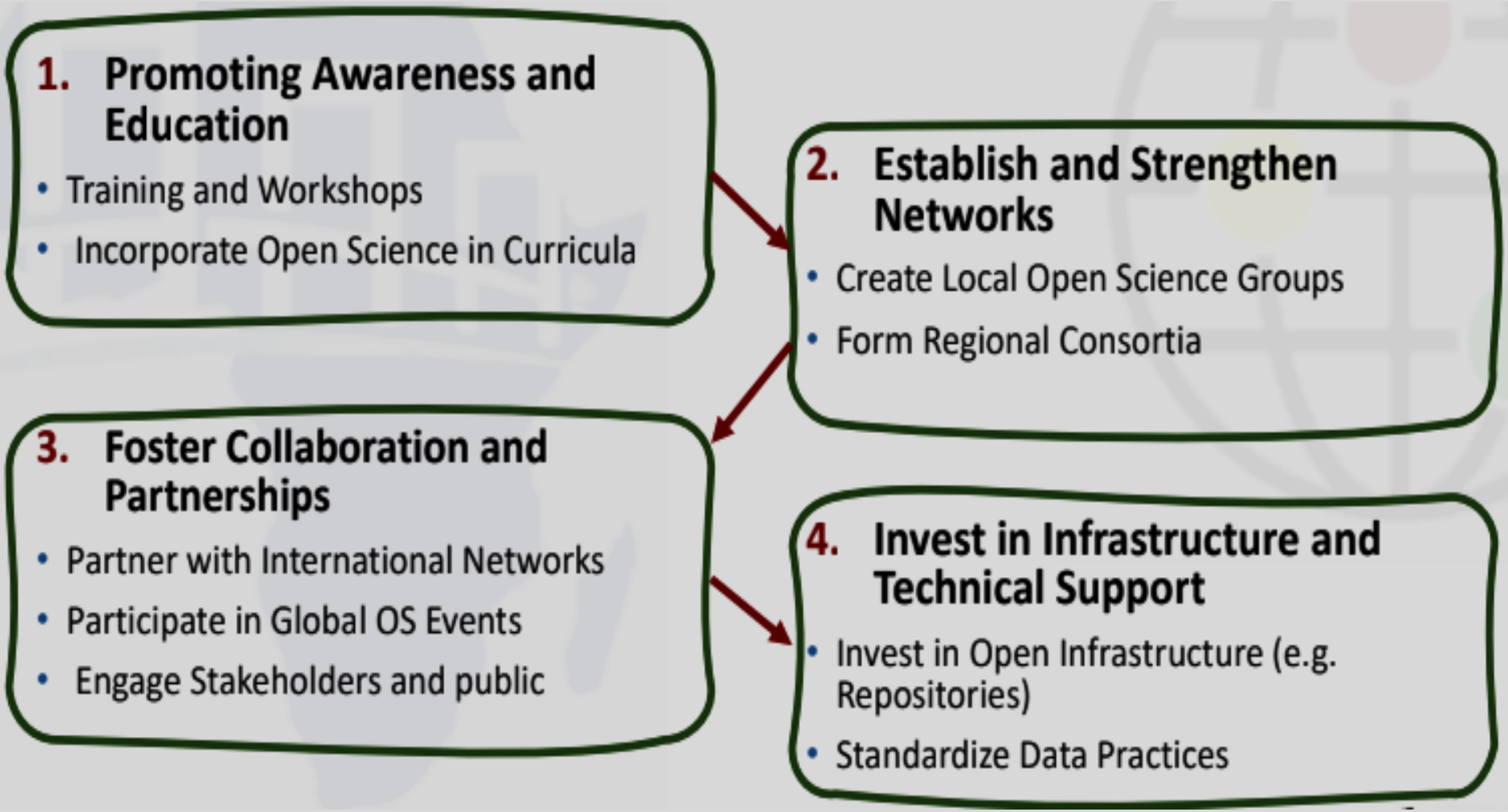
Why Open Science matters



Open Science Barriers and Challenges



Overcoming Challenges



Overcoming Challenges

5. Establish Financial Models and Policies

- Explore sustainable funding models
- Encourage formation and adoption of Institutional OS Policies

6. Create Legal and Ethical Frameworks

- Use and promote clear, standard open licenses
- Develop guidelines and tools to help researchers navigate ethical issues

7. Create Cultural Change and Incentivization

- Identify and support OS Champions
- Highlight OS Success Stories
- Redefine Academic Success (Use alternative metrics (altmetrics))
- Rewarding OS practices

8. Promote Inclusivity and Equity

- Develop and disseminate open science resources in local languages
- Support Underrepresented Groups

Overcoming Challenges

Promotion of diamond open access journals

- *Supports cost-free publishing and access*
- *Removes financial barriers associated with APCs*
- *Enables broader participation, especially for researchers and institutions with limited funding.*
- *Strengthens local and regional journals by allowing institutions, libraries, and scholarly communities to retain control over publishing processes and standards.*

Data Deposits and Open Data

- *In USA is driven by Federal Policy, Nelson Memo (2022)*
- *mandates that federal agencies ensure free, immediate, and equitable access to federally funded research, including both peer-reviewed publications and underlying scientific data.*
- *Options such as those in https://zenodo.org/records/10651775 (Harvard Biomed Repository Index)*
- *Figshare, Dryad, Zenodo, etc.*

Data Management

- *Nelson Memo, as cause*
- *Most larger institutions in USA have hired positions*
- *Often funded by research dollars, indirect costs*
- *Advisory services, development of data management plans, and curation*
- *Data Curation Network as a potential model for Ghana?*

Conclusion

Opens science:

- **Promotes equity and transparency**
- **Critical for resource-limited settings**
- **Requires collective effort**

Open vs. closed systems

Prof Chris Prom

Dr Dominic Agyei Dankwah

Outline

- Genuinely Open systems
- Open vs Closed Systems
- Credible Open Systems & Journals
- Warning Signs of Pseudo-Open
- Open Access Journals
- Evaluation Checklist
- Implications for Researchers

Genuinely Open systems

- Free and immediate access (no paywalls)
- Clear reuse rights (Creative Commons licenses)
- Transparency in methods, data, and review
- Aligned with Budapest Open Access Initiative

Open vs Closed Systems

- Open: OJS, DSpace, Zenodo, Mendeley (interoperable, community-driven)
- Closed: Scopus, Web of Science, EndNote (restricted access, proprietary)
- Hybrid/limited: ResearchGate (free but proprietary control)

Characteristics of credible Open Systems & Journals

- Clear peer-review and editorial policies
- Transparent governance and editorial boards
- Indexed in trusted directories (e.g., DOAJ)
- DOIs, ORCID integration, archiving policies
- Transparent fee structures

Warning Signs of Pseudo-Open

- No clear license or reuse rights
- Aggressive calls for papers
- Weak or absent peer review
- Hidden or inconsistent APCs
- Fake indexing or misleading metrics
- Superficial editorial board

Open Access Models

- Green: self-archiving in repositories
- Gold: immediate open access (often APCs)
- Diamond: no fees for authors/readers
- Hybrid: subscription + optional OA

Navigating and Avoiding APCs

- Green: self-archiving in repositories
- Gold: immediate open access (often APCs)
- Diamond: no fees for authors/readers
- Hybrid: subscription + optional OA

Evaluation Checklist

- Is licensing clear and permissive?
- Is peer review transparent?
- Indexed in DOAJ?
- Are APCs justified or absent?
- Editorial integrity evident?

Implications for Librarians/Researchers

- Protects reputation and research integrity
- Ensures compliance with open science policies
- Enhances visibility and reuse
- Supports equitable knowledge access

Conclusion

- Critical evaluation is essential
- Open access has multiple pathways
- Avoid predatory publishing

Data Sovereignty in Open Science

Prof Chris Prom

Dr Dominic Agyei Dankwah

Outline

- Concept
- Importance
- Ownership
- Control
- Institutional Responsibility

Concept of Data Sovereignty

The principle that data is governed by the legal, ethical, and institutional frameworks of the context in which it is generated, while also being shaped by where it is stored, hosted, and accessed.

- *In practice, this becomes complex for African researchers whose data may be collected locally but stored in repositories hosted in the Global North or governed by external platforms and policies.*

Why Data Sovereignty Matters

It ensures ethical stewardship of data, protects national and institutional interests, and safeguards sensitive or community-linked information.

- *For African research contexts, it is also critical for preventing external appropriation of locally generated knowledge and ensuring that benefits from research are not disproportionately externalised.*
- *It supports responsible openness while resisting forms of extractive data practices.*

Ownership of Research Data

Ownership is often multi-layered: researchers, institutions, funders, communities, and sometimes external collaborators may all hold partial claims.

- *In many African research projects funded externally, funder policies or publisher agreements may override institutional claims, limiting reuse rights and local control.*
- *This raises important questions about whether African institutions retain meaningful ownership or only nominal rights over their own data.*

Control and Governance

- Control refers to who determines access, reuse, storage, and sharing conditions.
- *When repositories are hosted in the Global North, control may shift through platform policies, licensing terms, or infrastructure dependencies.*
- *Governance frameworks must therefore address not only ethical access but also infrastructural dependency, ensuring African institutions retain authority over permissions, embargoes, and secondary use of their data.*

Institutional Responsibility

- Institutions must develop clear data governance policies that assert rights over locally generated data, even when externally funded or internationally hosted.
- *This includes investing in local or regional repositories, strengthening data stewardship capacity, negotiating fair data management agreements with funders, and embedding FAIR principles in ways that do not compromise local autonomy or context-specific ethics.*

Access to Research Outputs

- Access must be framed beyond openness alone to include fairness, reciprocity, and contextual sensitivity.
- *Key questions include: Who benefits from access? Who can reuse data commercially or academically? Do external repositories impose conditions that disadvantage local researchers or communities?*
- *Equitable access should not result in asymmetric control or extraction of value from African knowledge systems.*

Conclusion

- Data sovereignty in open science is not only about openness and compliance but also about power, infrastructure, and equity.
- *For African researchers, it requires balancing global visibility with local control, ensuring that data generated within African contexts remains ethically governed, institutionally protected, and equitably beneficial to local research ecosystems.*