

TWN
Third World Network

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Background and Context-Setting

Digital Sequence Information (DSI) has become central to contemporary scientific research, biotechnology, pharmaceutical development, synthetic biology, agriculture, and pandemic preparedness. Rapid advances in sequencing technologies, bioinformatics, artificial intelligence, and cloud computing have enabled genetic resources to be increasingly accessed, utilized, and commercialized through digital sequence data rather than through direct transfer of physical biological materials. This transformation has profound implications for access and benefit sharing governance, sovereignty, scientific collaboration, human rights, and biosecurity.

This study examines the governance practices of selected DSI databases from the perspective of international law, sovereign rights, human rights, accountability, and data justice. It critically analyzes how existing DSI-sharing infrastructures interact with obligations under the Convention on Biological Diversity (CBD), the Nagoya Protocol, and the expectations of the UNESCO Recommendation on Open Science 2021, as well as emerging law and policy around DSI governance.

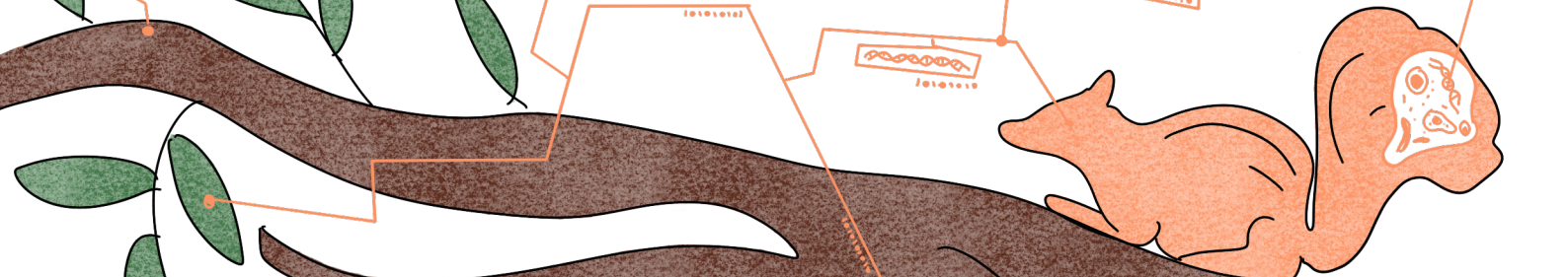
The study argues that prevailing DSI-sharing practices are often presented as neutral expressions of “open access”. However, in practice, many existing systems enable access to genetic sequence data without corresponding obligations relating to transparency, accountability, traceability, provider rights, or benefit sharing. The result is a governance environment where biodiversity-rich developing countries and Indigenous Peoples and local communities (IPLCs) increasingly lose control not only over DSI utilization, but also over how genetic resources and traditional knowledge originating from their territories are utilized.

The report undertakes a comparative assessment of selected DSI databases and platforms frequently relied upon in scientific and policy processes, including GenBank (based on the International Nucleotide Sequence Database Collaboration), Global Initiative on Sharing All Influenza Data (GISAID), and the Global Biodiversity Information Facility (GBIF). The study evaluates these systems across several elements of the data life-cycle, including data submission, data access conditions, due diligence mechanisms, traceability, country-of-origin recognition, benefit-sharing obligations, transparency, audit rights, and safeguards against misuse.

The study finds that while some databases have introduced limited accountability measures, prevailing governance approaches continue to prioritize unrestricted circulation of sequence information over equitable benefit sharing obligations. Responsibilities relating to legality, consent, benefit sharing, and compliance with national laws are largely externalized to data providers and national authorities, while database operators and users often remain insulated from meaningful obligations.

Seen critically, the current DSI databases are not merely technical infrastructures for scientific exchange. They are systems of digital power that shape who controls genetic information, who benefits from its utilization, and who bears the risks associated with its misuse. The study, therefore, approaches DSI governance not only as an access and benefit-sharing (ABS) issue, but also as a question of digital justice, global inequality, democratic governance of scientific infrastructures, and above all as a question of fundamental economic, social, and cultural rights.





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Implications for Data Justice and Economic, Social, And Cultural Rights (ESCR)

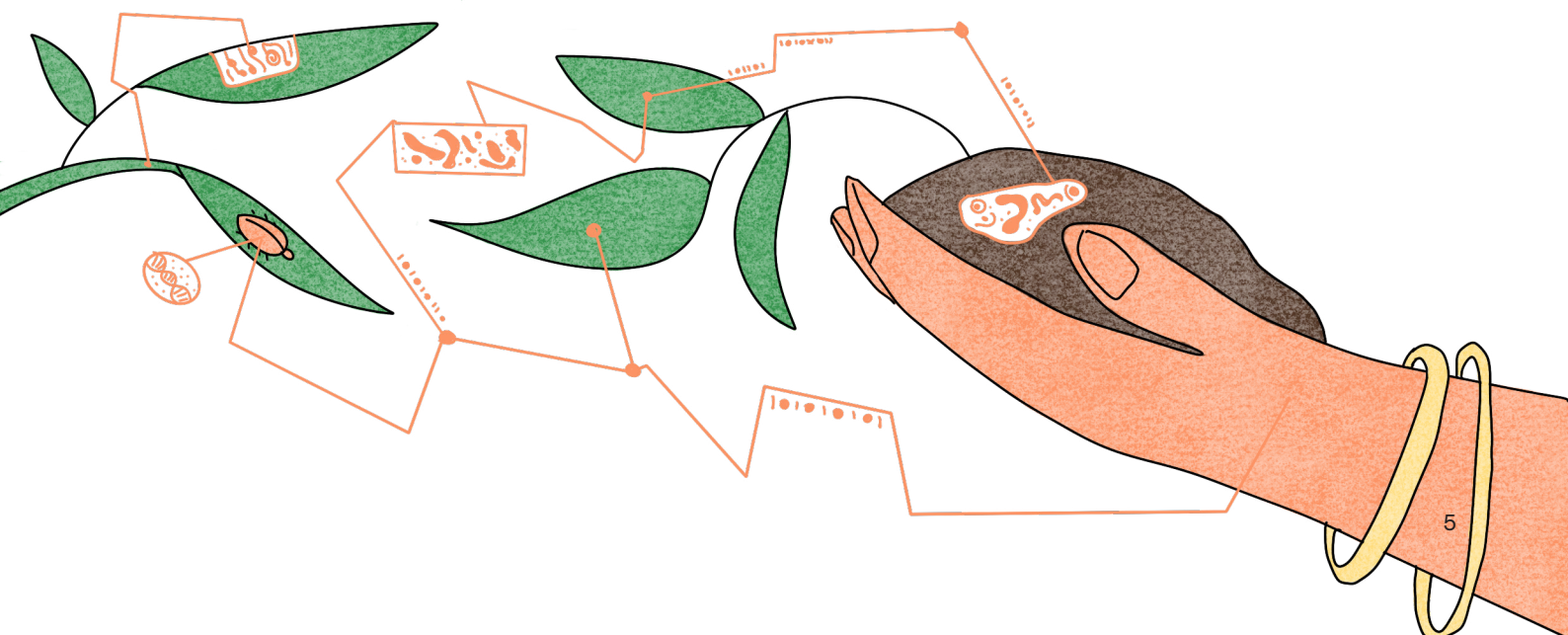
2.1 Data Injustices

- **Anonymous access and weak traceability:** Many databases permit unrestricted or weakly regulated access to DSI without mandatory user identification, data access agreements, or audit rights for competent legal authorities. This creates significant gaps in accountability and undermines transparency regarding who accesses sequence information and for what purposes.
- **Concentration of infrastructural power:** Governance of major DSI infrastructures remains concentrated within a small number of institutions and developed countries. This concentration creates structural asymmetries whereby technological infrastructure, computational capacity, and downstream commercial value generation remain largely controlled by actors in the Global North.
- **Biopiracy and extraction without accountability:** Existing DSI-sharing systems allow genetic sequence information originating from biodiversity-rich countries to be accessed and utilized globally without enforceable obligations relating to benefit sharing or provider consent. Once sequence information enters large databases, downstream utilization often becomes difficult to monitor or regulate, weakening the practical implementation of access and benefit-sharing obligations.
- **Erosion of sovereign and provider rights:** Existing database practices often fail to adequately recognize country-of-origin information, national ABS laws, or rights of Indigenous Peoples and local communities. This weakens sovereign authority over genetic resources and diminishes the ability of provider countries and communities to participate meaningfully in governance over the utilization of biodiversity-derived information.
- **Externalization of responsibility:** Database operators generally place responsibility for legality and compliance entirely upon uploaders or users while assuming limited institutional responsibility themselves. This governance approach enables the circulation and utilization of DSI without effective due diligence or verification mechanisms.

- **Biosecurity and cyber-biosecurity risks:** Unrestricted and anonymous access to sensitive sequence information increases significant biosecurity risks, particularly where pathogens with pandemic potential or other hazardous biological materials are involved. The absence of robust oversight mechanisms undermines responsible governance of sensitive biological information.
- **Misinterpretation of Open Access and Open Science:** The study finds that prevailing interpretations of “open access” frequently equate openness with unconditional or anonymous access, while the UNESCO Recommendation on Open Science 2021 emphasizes that openness must be accompanied by responsibility, public accountability, sensitivity to conflicts of interest, vigilance against social and ecological consequences.

2.2 Implications for Economic, Social, and Cultural Rights

- **Right to sovereignty over natural resources and self-determination:** Unregulated utilization of DSI may undermine the ability of states and communities to exercise meaningful control not only over such information, but also on biodiversity resources and traditional knowledge originating from their territories.
- **Right to development:** When sequence information as well as derived products and technologies are commercialized without equitable sharing of benefits, developing countries are excluded from opportunities not only to profit from the bioeconomy but also to participate in, and benefit from scientific, and technological advancement.
- **Right to enjoy the benefits of scientific progress:** Existing governance systems frequently permit extraction of scientific value from biodiversity-rich regions without corresponding commitments to technology transfer, research partnerships, capacity building, or equitable access to resulting innovations.
- **Rights of Indigenous Peoples and local communities:** When DSI databases promote access to DSI without safeguarding the benefit sharing opportunities, the inaction of governments to regulate such databases and their users significantly undermines the right of people to self-determine the wider application of their knowledge, innovation, and practices relating to biodiversity resources and benefit from such application.





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Sector-Specific Pathways for Data and Development Justice

Building a DSI sharing environment respectful of the sovereignty of states, human rights, and international law

The study proposes the development of a DSI sharing environment that respects state sovereignty, human rights, and international law, for preventing digital biopiracy and advancing socio-economic justice. Rather than relying on a single centralized system, the report envisions an ecosystem of multiple interoperable databases offering diverse services across the DSI life cycle, while ensuring respect for the rights of genetic resource providers. States may establish, designate, or authorize databases accountable through international agreements or national/sub-national policy action. Special attention should be paid to governing the “first point of upload” of DSI.

Zero anonymous access: Mandatory user registration and data access agreements

Databases hosting DSI should require user registration, identity verification and legally binding data access agreements, which ensure benefit sharing obligations apply to DSI users. Anonymous access should not be legitimized. User identification is essential for ensuring accountability, promoting trust, and supporting biosecurity safeguards.

Zero discrimination: Guaranteeing access to DSI

Access to DSI should be made available to “all verified users” without distinction of any kind, such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status

Recognition of provider rights and country-of-origin information

Databases should preserve and communicate country-of-origin information and relevant provider rights associated with genetic resources. Recognition of origin is necessary both for benefit sharing purposes and for respecting sovereign rights over biodiversity.

Due diligence and compliance with ABS frameworks

Databases should undertake due diligence to verify that users uploading and/or utilizing DSI comply with applicable national laws and international obligations relating to access and benefit sharing. Database policies should not externalize this responsibility.

Interoperability with accountability

DSI governance systems should promote interoperability between sequence databases while maintaining standards required for accountability, traceability, and responsible access. Interoperability should not become a justification for weakening governance safeguards.

Integrating biosecurity and cyber-biosecurity safeguards

Governance systems for DSI should integrate safeguards against misuse, including oversight mechanisms for access to sequence information. Responsible sharing of sequence information must include consideration of public safety and security implications.

Cooperation with competent authorities and access to grievance redressal

Databases must cooperate with competent national and international authorities, including by providing access to relevant data and logs, and by recognizing data audit rights in accordance with law. Accessible grievance redressal mechanisms should be made available to the users of databases in cooperation with such legal authorities.



Nithin Ramakrishnan is a Senior Researcher at the Third World Network. His work focuses on access to genetic resources and the fair and equitable sharing of benefits arising from their use. He follows and analyzes negotiations in international forums, including the Convention on Biological Diversity, the International Treaty on Plant Genetic Resources for Food and Agriculture, and the World Health Organization.

This report is part of a research collaboration between IT for Change and Third World Network (TWN) under the [Centering Equity and Justice in Global Data Governance](#) project, a collaborative initiative anchored by IT for Change, with support from the Fair Green and Global Alliance (FGG) and the Center for Global Digital Justice (CGDJ). The project aims to advance sector-specific, contextually grounded data justice principles rooted in Global South perspectives, developed in collaboration with progressive civil society organizations and people's movements. Through this engagement, the project examines the impacts of digitalization and datafication in critical domains— including public health, biodiversity, food sovereignty, and climate change mitigation and adaptation— to articulate justice-oriented approaches to data governance.



Read the full
report [here](#)

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