

DIGITAL GENETIC INFORMATION AND CONSERVATION

- Data from DNA or RNA can be stored digitally. This is known as Digital Sequence Information (DSI).
- International agreements are unclear on how to administer DSI and share the benefits arising from it.
- The benefits from genetic resources are therefore not always shared equitably, even though this is a responsibility of governments under international law.
- Openly accessible DSI is essential for research including vaccine development and species conservation, and any new rules to govern its use must not curtail access.
- The post-2020 global biodiversity framework is an opportunity to guarantee equitable sharing of DSI benefits, while ensuring essential research can continue.

What is the issue?

Differences in the way individuals and species look, act and function are the result of genetic diversity passed on by DNA or RNA. Genetic material that contains this information can have a commercial value, so **many countries exercise sovereign rights over genetic resources** that originate from within their territories.

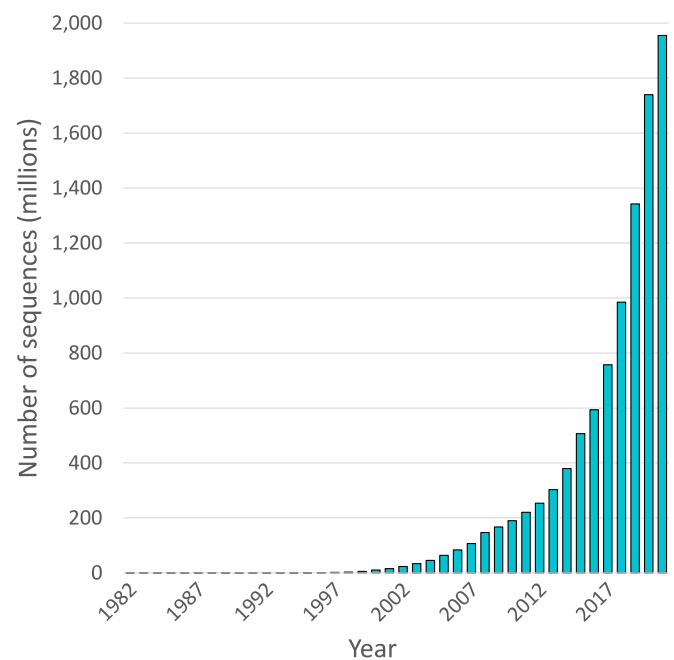
Many countries also require that the **benefits of research or commercialisation are shared with the providing country or indigenous peoples and local communities** before they grant access to genetic resources.

At the international level, agreements to govern access and benefit sharing have been developed; for biodiversity the most prominent is the [Nagoya Protocol](#) to the UN Convention on Biological Diversity (CBD).

Technological advances in recent years have made it simple and affordable to sequence genomes and store this data digitally. However, **the Nagoya Protocol is unclear on how to administer genetic sequence data, known as Digital Sequence Information (DSI)**. The **lack of international agreement on this issue means that benefits resulting from DSI are sometimes not shared equitably**.

At the same time, DSI is often made freely available to enable 'big data' science. Hundreds of billions of sequences are stored in public databases, which double in size every few years on average. This **freely available DSI is used for research** that benefits everyone such as vaccine development and species conservation.

Clear rules administering the sharing of DSI benefits at the international level are therefore vital to ensure equity, but could risk undermining the use of DSI for essential research if not designed and implemented carefully.



Growth of sequence records within GenBank, one of the main public DSI databases. Source: GenBank statistics

Why is this important?

Ensuring equitable benefit sharing of genetic resources is a longstanding commitment of the global community, an objective of the CBD and therefore a **responsibility of Parties under international law**.

Beyond fulfilling these legal obligations equitable benefit sharing can maximise the overall **benefits for users and providers** of genetic resources and the environment; **strengthen the legitimacy of the CBD**; and **foster a sense of justice**.

Publicly accessible DSI is a **tool for scientific research used by the public and private sectors**. Much of this research **supports sustainable development** including advances in medicine, sustainable agriculture, conservation and ecosystem restoration. For example, virologists used SARS-CoV-2 DSI to design diagnostic kits for COVID-19 and then the vaccines now in global use, and conservationists relied on DSI to bring the California condor back from the brink of extinction. In fact, nearly all conservation research uses DSI, so researchers' access to it is important **to deliver global sustainable development goals**.

All countries use and provide DSI, so **any future agreement would affect every national government**.



*DSI was used to guide breeding efforts that restored the California condor (*Gymnogyps californianus*) to the wild. By comparing DSI between California and Andean condors and with other birds, researchers revealed the species' population histories.*

Image: California condor juvenile and mother © [jrbelli](#)

What can be done?

Policymakers should find a balance between 'open access' DSI, which is a scientific resource that can be used to benefit everyone, and the equitable sharing of benefits, which is an important principle of sustainable development.

Parties to the CBD should first **agree a definition for DSI** to help clarify the structure of future arrangements, how these might be implemented and the necessary resources. The [post-2020 global biodiversity framework](#) offers governments an opportunity to do so and to consider **mechanisms that recognise and reward sovereign**

contributions of DSI to public databases, while **enabling research**. Parties can find common ground on three principles:

- the need for **DSI-based research to continue**;
- DSI's contribution to **protecting biodiversity**;
- the need for **fair and equitable sharing of benefits** from DSI.

To address these principles together, **more research is needed to understand the trade-offs of various policy options**.

Multilateral options that are simple to understand and implement are likely to be more effective than bilateral arrangements between countries. Complex 'tracking and tracing' of DSI and its use will create bureaucracy and be difficult to manage globally.

Agreements could vary depending on the context of and benefits arising from DSI use. For example, researchers might rely on DSI from many different countries to develop new livestock feed to lower the amount of phosphate in livestock manure. Benefit sharing could be monetary, or non-monetary through other benefits such as reduced phosphate pollution and improved water quality. In public health applications, benefit sharing could take the form of vaccine and medicine distribution.

Resolving the DSI issue will **require compromises from multiple stakeholders**. Researchers will likely need to adapt to a new regime where the use of DSI comes with certain obligations or limitations, and countries that wish to exert sovereign rights over data should be clear about the unintended consequences of impractical tracking and tracing options.

All Parties to the CBD must appreciate that **DSI is a useful tool for conservation** and biological research, while ensuring benefits arising from it are shared equitably.

Where can I get more information?

IUCN Issues Brief: post-2020 global biodiversity framework
[iucn.org/resources/issues-briefs/post-2020-global-biodiversity-framework](https://www.iucn.org/resources/issues-briefs/post-2020-global-biodiversity-framework)

IUCN's submissions to the post-2020 framework:
[iucn.org/theme/global-policy/our-work/convention-biological-diversity-cbd/post-2020-global-biodiversity-framework/post-2020-resources](https://www.iucn.org/theme/global-policy/our-work/convention-biological-diversity-cbd/post-2020-global-biodiversity-framework/post-2020-resources)

IUCN SSC Conservation Genetics Specialist Group:
[iucn.org/commissions/ssc-groups/cross-cutting/conservation-genetics](https://www.iucn.org/commissions/ssc-groups/cross-cutting/conservation-genetics)

IUCN Congress 2020 Resolution 93 (on genetic diversity):
portals.iucn.org/library/sites/library/files/resrecfiles/WCC_2020_RES_093_EN.pdf