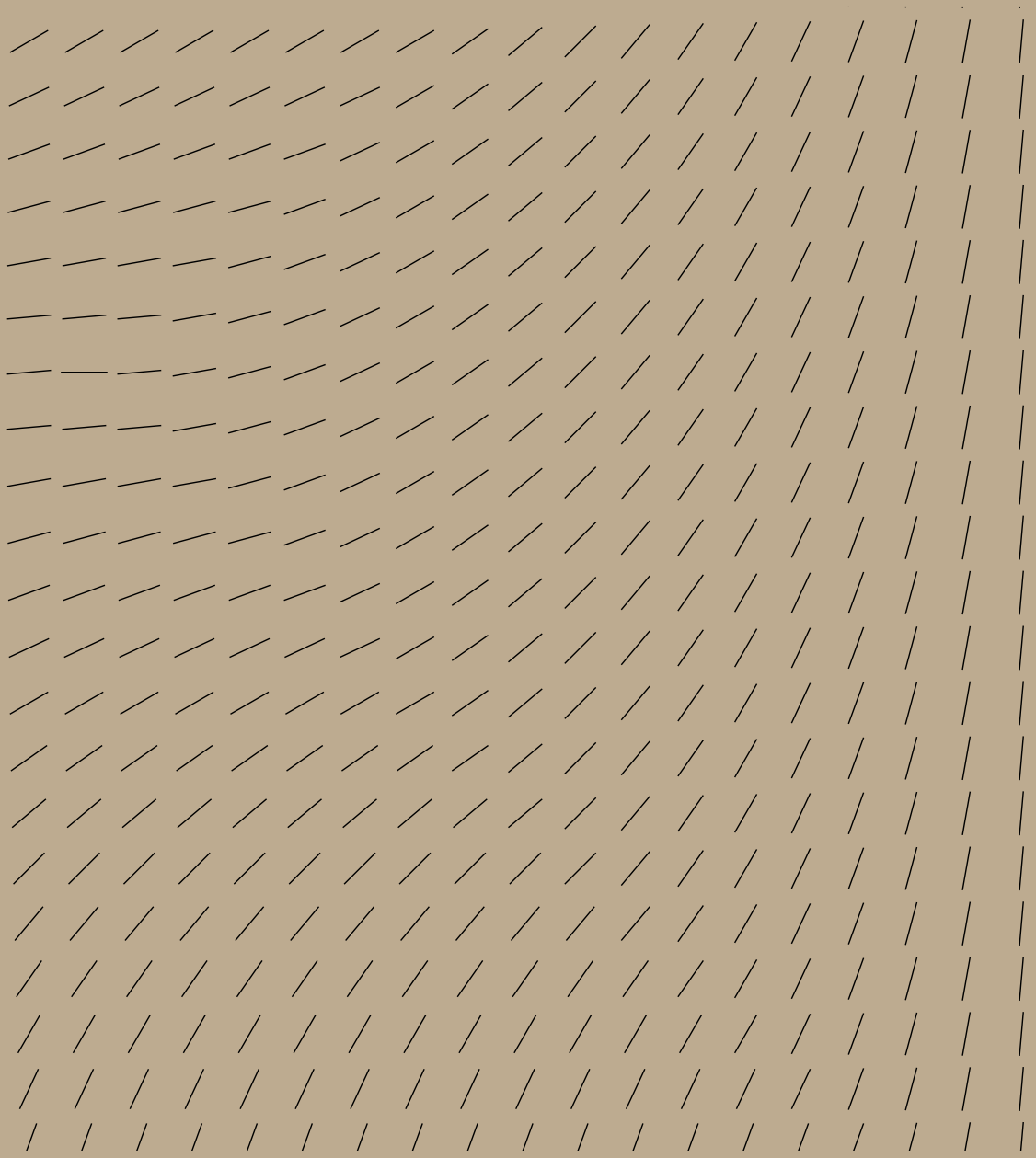

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Access and benefit-sharing on digital sequence information

Policy paper in view of the COP15 UN Biodiversity Conference in Montreal in December 2022

Imprint

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Executive Summary

In December 2022 at the UN Biodiversity Conference (COP15) in Montreal, the 196 countries party to the UN Convention on Biological Diversity are set to conclude negotiations on the Post-2020 Global Biodiversity Framework, a strategic plan to halt the rapid extinction of species. A dealbreaker between the global South and the global North could be whether digital sequence information (genetic data) is part of access and benefit-sharing, one main instrument of the Convention on Biological Diversity.

The open sharing of digital sequence information is crucial in biotechnology, for example in the development of SARS-CoV-2 vaccines. At the same time, the open sharing of digital sequence information could impede the fair and equitable sharing of benefits arising from the utilization of genetic resources. Therefore, the question of digital sequence information could be a dealbreaker between the biodiversity-rich global South and the global North.

In preparation of the COP15, six policy options have been prepared by the working group on the Post-2020 Global Biodiversity Framework. An intellectual property and data law perspective can add to this debate as it aligns the seemingly opposing policy goals of predictable (monetary) benefits and enables research and innovation by assessing the policy option’s ability to allocate digital sequence information efficiently. Out of the six policy options, the three policy options most likely to present a solution and a political compromise are assessed from the intellectual property and data law perspective:

- Option 2 of standard mutually agreed terms is unlikely to meet the policy goals because misaligned incentives impede the generation of benefits. The requirement to track the use of digital sequence information renders the enforcement of benefit-sharing impossible.
- Option 3 of a multilateral fund is preferred over Option 2. Still, micro-levies on laboratory equipment could lead to jurisdiction shopping, and access fees would require a careful implementation to not hinder research.

- Option 6, a levy or tax on products of genetic resources, is a promising approach, but the current proposal mixing a bilateral and a multilateral system could hinder research and innovation.
- If choosing a hybrid solution, a vertical approach aligned with the use of digital sequence information in research and innovation should be considered.

Because the policy options currently considered are still wide-ranging, the following general principles are suggested: Solutions outside a de facto intellectual property right such as taxes and levies should be favored, or benefit-sharing must occur late in the value chain so that no distinction between commercial and non-commercial use and re-use is necessary. Any policy option involving the International Nucleotide Sequence Database Collaboration must be based on the whole database, not individual sequences. These principles strongly speak against standard mutually agreed terms as a policy option and for a solution based on policy options 3 and 6.

I. Background: The upcoming negotiations on digital sequence information

Facing evidence of a devastating biodiversity loss, the Convention on Biological Diversity (CBD)[1] was adopted in 1992. The objectives of the CBD are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources.[2] The third objective, the access and benefit-sharing (ABS), has been implemented in the Nagoya Protocol[3] in 2010. In the bilateral mechanism established by the Nagoya Protocol, users of genetic resources must first obtain prior informed consent before accessing a genetic resource and then negotiate benefit-sharing with providers in mutually agreed terms (MAT).[4] To ensure compliance with ABS, the EU implemented the Nagoya Protocol in 2014 as due diligence obligations of users within the EU.[5]

Since 1992, biotechnology has advanced rapidly, DNA sequencing is cheap and easy, and the sequenced data is made publicly available in open access databases. But whether benefits arising from the utilization of such data need to be shared like from genetic resources is heavily disputed between the parties to the CBD and the Nagoya Protocol. The Conference of the Parties first addressed this issue in 2016 and termed such data digital sequence information (DSI).[6] While some countries currently cover DSI by their

[1] The Convention on Biological Diversity, 5 June 1992, 1760 U.N.T.S. 79.

[2] Art. 1 CBD.

[3] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, Tenth Meeting of the Parties to the Convention on Biological Diversity, U.N. Doc. UNEP/CBD/COP/DEC/X/1 (29 October 2010).

[4] See Art. 5 (1), 6 (1) Nagoya Protocol.

[5] Regulation (EU) No 511/2014 of the European Parliament and of the Council of 16 April 2014 on compliance measures for users from the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization in the Union (Text with EEA relevance), OJ L 150/59, 20 May 2014.

[6] *Conference of the Parties to the Convention on Biological Diversity*, Decision XIII/16, U.N. Doc. CBD/COP/DEC/XIII/16, 16 December 2016.

national legislation,[7] other parties like the European Union find that DSI "could be considered to be out of scope of the ABS Regulation".[8]

DSI is a placeholder term currently under negotiation and could potentially encompass the data from nucleotide sequences (DNA and RNA) to proteins, epigenetic modifications and metabolites or, even broader, associated information.[9] Therefore, DSI is a political term not commonly used in biology. In this analysis, the term DSI means nucleotide sequence data (NSD) as the lowest common denominator of negotiated definitions, but it is acknowledged that the term DSI could potentially include other information. However, the term DSI is only used when referring to NSD with ABS obligations. When there are no ABS obligations, the term NSD will be used.

30 years have passed since the adoption of the CBD. Still, few ABS contracts have been concluded,[10] and monetary benefits received from ABS are negligible[11] compared to the estimated 700 billion USD required per year[12] to finance biodiversity conservation. Of the countries that currently require benefit-sharing from the utilization of DSI, none have received monetary benefits.[13] Meanwhile, 25 percent of animal and plant species are threatened with extinction.[14]

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[7] For an overview, see *Bagley et al.*, Fact-finding Study on How Domestic Measures Address Benefit-sharing Arising from Commercial and Non-commercial Use of Digital Sequence Information on Genetic Resources and Address the Use of Digital Sequence Information on Genetic Resources for Research and Development, U.N. Doc. CBD/DSI/AHTEG/2020/1/5, 29 January 2020.

[8] *European Commission*, Guidance Document 2021/C 13/01, 2.3.5.

[9] See most recently *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/4/L.3, 26 June 2022, pp. 2 (k) f.

[10] *Pauchard*, Resources 6 (2017), Art. Nr. 11, 11: "Between 1996 and 2015, 217 such agreements for commercial research and 248 for non-commercial research have been concluded".

[11] According to an assessment and review of the effectiveness of the Nagoya Protocol from 2018, only 16 countries have reported having received monetary benefits from the utilization of genetic resources. The assessment remained inconclusive because countries did not report consistently, but the numbers that were given remain below 500,000 USD in total, see *Subsidiary Body on Implementation*, Analysis of Information Contained in the Interim National reports and Information Published in the Access and Benefit-Sharing Clearing House, U.N. Doc. CBD/SBI/2/INF/3, 15 May 2018, pp. 27 f.

[12] *Deutz et al.*, Financing Nature: Closing the global biodiversity financing gap, 2020, p. 10.

[13] *Bagley et al.*, Fact-finding Study on How Domestic Measures Address Benefit-sharing Arising from Commercial and Non-commercial Use of Digital Sequence Information on Genetic Resources and Address the Use of Digital Sequence Information on Genetic Resources for Research and Development, U.N. Doc. CBD/DSI/AHTEG/2020/1/5, 29 January 2020, p. 25.

[14] *IPBES*, Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019, p. 239.

A “deal to save biodiversity”[15] is direly needed and is currently negotiated as the Post-2020 Global Biodiversity Framework. These negotiations include the question of how to address DSI and are set to conclude at the UN Biodiversity Conference, the Fifteenth Conference of the Parties (COP15) in Montreal, in December 2022.

Six policy options were prepared by the working group on the Post-2020 Global Biodiversity Framework to structure the negotiations:[16]

1. Status Quo
2. Current bilateral mechanism applied to DSI
3. Standard mutually agreed terms
4. A Multilateral fund financed through payments and contributions like access fees or a micro-levy on laboratory equipment
5. Enhanced technical and scientific capacity and cooperation
6. No ABS on DSI
7. 1 per cent levy on retail sales of genetic resources

[15] *Gilbert*, Scientists warn deal to save biodiversity is in jeopardy, Nature, 30 June 2022, <https://www.nature.com/articles/d41586-022-01805-w> (last accessed 9 August 2022).

[16] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, pp. 7 ff.

II. Methodology: The intellectual property and data law perspective

A multi-criteria analytical framework with defined policy goals and assessment criteria was developed to assess these different policy options for the upcoming negotiations.[17] These five policy goals are:

1. Potential to deliver predictable monetary benefits
2. Potential to deliver predictable non-monetary benefits
3. Access to public databases remains open
4. Does not hinder research and innovation
5. Potential to contribute to the conservation and sustainable use of biodiversity

This analysis will **draw on parallels between ABS and intellectual property (IP)** to **identify connections between** these **policy goals** and the other defined **assessment criteria**. This perspective helps align the seemingly opposing policy goals of generating predictable benefits while at the same time enabling research and innovation. This perspective assumes that the benefits generated can then be used fairly and equitably to contribute to biodiversity conservation and sustainable use, such as through establishing a multilateral fund.

A. ABS on DSI as a de facto intellectual property right on data

The IP and data law perspective is based on shared characteristics of ABS and IP. These shared characteristics are a to some extent similar justification as a property right and the immaterial, non-rivalrous nature of the object of this property right.[18] ABS has therefore been termed a de facto intellectual property right (IPR) by some scholars.[19] However, while IPRs (ideally) balance dynamic and static efficiency by exceptions and limitations of the IPR, such instruments do not exist in ABS, making ABS a de facto

[17] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, paras. 10 ff.

[18] See *Klünker*, Die genetische Ressource als Immaterialgut (forthcoming).

[19] See *Godt*, Eigentum an Information, 2007, p. 362; *Kock*, in: Metzger/Zech, Sortenschutzrecht, 2016, Einf. D no. 31.

IPR with a broader horizontal and prolonged vertical effect.[20] Including DSI in ABS obligations extends[21] the already broad scope of ABS and results in **ABS on DSI as a de facto IPR on data**.[22]

From this perspective, the debate on data property rights and data regulation in the EU in the past years can inform the design of ABS on DSI without a formal IPR. In 2015, the European Commission launched the Digital Single Market Strategy and opened the debate on data ownership as part of building a European data economy.[23] The proposal sparked a lively debate on data property in academia.[24] It was assessed that even without a defined property right, "data is treated as if intellectual property protection exists while in fact there is none".[25] Since then, the European Commission's focus has shifted from a data property right to an access and re-use approach that has subsequently been cast into a series of legislation on data.[26]

This debate on a new IPR on data can be used to assess the policy options on DSI from an IP perspective. From an IP perspective, it must first be asked whether granting an exclusive property right on an immaterial good that would otherwise be in the public domain can be justified. One justification is economic and renders that to avoid market failure, IPRs internalize positive externalities from producing an immaterial good. An IPR incentivizes the production of an intangible good (dynamic efficiency).[27] However, **the dynamic efficiency argument does not support ABS on DSI**. First, costs of generating new data (sequencing DNA) decrease exponentially[28] meaning there does not

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[20] See *Kock*, in: Metzger/Zech, Sortenschutzrecht, 2016, Einf. D no. 31–40; *Zech*, GRUR Int. 2019, 453, 454.

[21] It should be noted that under some jurisdictions ABS on DSI is not an extension of ABS because term genetic resources is already understood as including DSI, see *Bagley et al.*, Fact-finding Study on How Domestic Measures Address Benefit-sharing Arising from Commercial and Non-commercial Use of Digital Sequence Information on Genetic Resources and Address the Use of Digital Sequence Information on Genetic Resources for Research and Development, U.N. Doc.CBD/DSI/AHTEG/2020/1/5, 29 January 2020, p. 16.

[22] See *Zech*, GRUR Int. 2019, 453, 454.

[23] *European Commission*, Digital Single Market Strategy for Europe, COM(2015) 192 final, 5 June 2015, pp. 14 f.

[24] See *Drexl et al.*, Data Ownership and Access to Data - Position Statement of the Max Planck Institute for Innovation and Competition of 16 August 2016 on the Current European Debate, 2016, <https://papers.ssrn.com/abstract=2833165> (last accessed 9 August 2022); *Kerber*, GRUR Int. 2016, 989; *Wiebe*, GRUR Int. 2016, 877; *Zech*, JIPLP 11 (2016), 460.

[25] *Wiebe*, GRUR Int. 2016, 877, 878.

[26] E.g. the Open Data Directive, the Data Governance Act, and most recently the proposal for a Data Act. See also *Specht-Riemenschneider*, MMR 2022, 809, 810.

[27] Regarding dynamic and static efficiency, see *Landes/Posner*, The Economic Structure of Intellectual Property Law, 2003, pp. 12 ff.

[28] See *National Human Genome Research Institute*, DNA Sequencing Costs: Data, <https://www.genome.gov/about-genomics/fact-sheets/DNA-Sequencing-Costs-Data> (last accessed 28 July 2022).

seem to be a market failure that mandates an IPR as an incentive to produce data. A similar argument has been brought against data property in the EU debate.[29] Second, the provider (country) of the genetic resource is generally not the same person or institution who is sequencing the genetic resource, that is generating the data. **ABS on DSI would be primarily justified by the deontological reasoning of fairness and equitability.** Therefore, one could question whether, from an IP perspective, the current property rights approach of ABS is the best solution. A fair and equitable sharing of benefits could perhaps also lie outside of commodification of genetic resources while preserving the genetic data commons.[30]

B. Efficient allocation of DSI to generate benefits

With dynamic efficiency not being a solid justification for ABS on DSI, it is even more critical to ensure the efficient allocation of DSI if a property rights approach is taken (static efficiency).[31] The efficient allocation of data is also at the center of the recent EU data legislation.[32] Assessing the policy options from an allocative efficiency perspective allows reconciling the often seen as opposing goals of research and innovation and benefit-sharing: In order to share benefits, these benefits must be generated first. Benefits are generated when DSI is allocated efficiently. With the focus on generating benefits and thus allocating DSI efficiently, the two goals of delivering (monetary) benefits and not hindering research and innovation align.[33]

The following analysis will draw on criteria from IP and data law to assess the policy options in their ability to allocate DSI efficiently and thus meet the policy goals of predictable benefits and not hindering research and innovation. These criteria are:

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[29] See *Zech*, CR 2015, 137, 244 f.; *Drexl et al*., Data Ownership and Access to Data - Position Statement of the Max Planck Institute for Innovation and Competition of 16 August 2016 on the Current European Debate, 2016, <https://papers.ssrn.com/abstract=2833165> (last accessed 9 August 2022), p. 2 f.; *Kerber*, GRUR Int. 2016, 989, 993.

[30] Such as a biodiversity tax, see policy option 6 below on p. 14.

[31] The balance between dynamic and static efficiency is a classic conflict in IP law, see *Schäfer/Ott*, Lehrbuch der ökonomischen Analyse des Zivilrechts, 2020, p. 747.

[32] See most recently recital 2 *European Commission*, Data Act Proposal, COM(2022) 68 final, 23 February 2022.

[33] This is also in line with the draft elements of a decision for COP15, see *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/4/L.3, 26 June 2022, p. 2 (a); see also *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Co-Leads' Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources Since the Third Meeting of the Open-Ended Working Group on the Post-2020 Global Biodiversity Framework, U.N. Doc. CBD/WG2020/4/INF/4, 10 June 2022, p. 8 (d).

1. the **transaction costs** of the policy options, which might hinder generating benefits, and
2. the incentives of the policy option for **use and re-use of DSI** to generate benefits.

According to the Coase theorem, the initial distribution of property rights will not affect the allocation of a resource if transaction costs are zero.[34] Transaction costs of DSI, understood as the "costs resulting from the transfer of property rights"[35], in this case, the right to use DSI, thus affect the efficient allocation of DSI.

Though high transaction costs can hinder the generation of benefits from DSI, other mechanisms may disincentivize the use of DSI too. Drawing from the EU data regulatory approach of open data, it is also crucial to facilitate the re-use of DSI for the efficient allocation of DSI.

C. Cumulative innovation properties of DSI as data

Two specific properties of NSD need to be considered when assessing the policy options. First, NSD is an intermediate good, which means it is "produced with the intent of being combined and transformed to create other information goods"[36]. NSD are not only produced with that intent; often the production (the sequencing) requires the comparison with other NSD. Innovative processes using NSD are, therefore highly cumulative, and enabling follow-on innovation is even more critical.[37] Second, to avoid blocking effects, genomics has evolved into one of the most open disciplines regarding data sharing and has developed the core infrastructure of the International Nucleotide Sequence Database

[34] See *Coase*, J.L. & Econ. 3 (1960), 1, pp. 15 f.; see also *Allen*, J. Institutional Econ. 11 (2015), 379.

[35] *Allen*, Transaction Costs, in: Bouckaert/De Geest (eds.), Encyclopedia of Law and Economics, Vol. I, 2000, p. 893, 901. Transaction costs can also be understood more broadly as the "costs establishing and maintaining property rights" (*Allen*, ibid at 898).

[36] *Koutroumpis/Leiponen/Thomas*, Ind. Corp. Chang. 29 (2020), 645, 646; see also *Duch-Brown/Martens/Mueller-Langer*, The Economics of Ownership, Access and Trade in Digital Data, 2017, JRC Digital Economy Working Paper 2017-01, <https://www.ssrn.com/abstract=2914144> (last accessed 9 August 2022), p. 28.

[37] Cf. *Scotchmer*, Innovation and Incentives, 2004, p. 127.

Collaboration (INSDC).[38] This use of data needs to be kept in mind when analyzing policy options with regard to their impact on research and innovation.

The following analysis will use the IP and data law perspective to identify connections between the policy goals and the criteria developed to assess the policy options. However, not all policy options will be analyzed. No further analysis of options 0 and 1 is included because of the evident deficiencies of the status quo and the bilateral system.[39] Options 4 and 5 are excluded because they do not deliver predictable monetary benefits and are therefore not regarded as a realistic political outcome. However, option 4 of enhanced technical and scientific capacity and cooperation could be part of a hybrid solution.[40]

[38] See *Sara/Hufton/Scholz,* Compatible or Incompatible? DSI, Open Access and Benefit-sharing, 2021, <https://osf.io/nw8g9> (last accessed 9 August 2022), p. 6 ff.

[39] At the latest meeting in Nairobi, it was also noted that "no participant advocated for a fully bilateral system for benefit-sharing from DSI", see *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Co-Leads' Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources Since the Third Meeting of the Open-Ended Working Group on the Post-2020 Global Biodiversity Framework, U.N. Doc. CBD/WG2020/4/INF/4, 10 June 2022, p. 6 para. 20 (a).

[40] See below at p. 16.

III. Option 2: Why standard MAT are not a solution for DSI

Looking at option 2 from the current bilateral mechanism, standardization of MAT may seem to be the natural solution to reduce transaction costs. In contrast to the status quo, under this policy option, no prior informed consent needs to be obtained when DSI are accessed, but instead, with each access, a standard MAT would apply.[41] Under option 2.1, each party would determine standard MAT at the national level, and depending on the national implementation, the benefit-sharing obligations could be triggered at many different points in the value chain.[42] Under option 2.2, one or more standard MAT are agreed upon at the international level.[43] Both options do not require an individual negotiation,[44] and would therefore resemble a public license similar to the Creative Commons licenses often used in copyright law.[45] Compared to no standardization, **transaction costs can be assumed to be reduced by standard MAT.** However, the following analysis suggests that standard MAT, like public licenses, disincentivize the use and reuse of DSI and, therefore the generation of benefits.

A. Misaligned incentives impede the generation of benefits

1. DISINCENTIVES IN THE USE OF DSI

While standardization will reduce transaction costs, standardization alone will not lead to the use of DSI and thus generate benefits. The reason lies in competing licensing conditions – either between different countries in the case of national level standardized MAT or between or between internationally standardized licenses on DSI and NSD without any restrictions. **This competition in licensing conditions disincentivizes the**

[41] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, p. 7 para 4.

[42] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, p. 7 para. 5.

[43] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, pp. 7 f. paras. 6–8.

[44] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021 p. 7 para. 4.

[45] See *Contreras*, Intellectual Property Licensing and Transactions, 2022, p. 594 f.

use of DSI with higher monetary benefit-sharing obligations and leads to fewer benefits generated from the use of DSI.

The underlying assumption is that DSI and NSD can be substitute goods to a certain extent, especially in the case where, e.g. the same species is present in two countries and one mandates ABS on DSI while the other leaves DSI in the public domain (NSD) or NSD of a genetic resource is already made publicly available in the INSDC before the coming into force of ABS laws.[46] If DSI and NSD are not substitute goods, the information paradox with regard to the value of a specific sequence applies: A user does not know the taxonomic, analytical or economic value of a particular sequence unless they have analyzed the sequence.[47] Because a single sequence bears no value and needs to be compared with many other sequences through bioinformatical tools to derive biological meaning,[48] the information paradox is even potentiated in the case of NSD and DSI.

As a result, standard MAT on a national level will disincentivize the use of DSI from countries with higher monetary benefit-sharing obligations and would lead to jurisdiction shopping (criterion 16).[49] On an international level, DSI licenses will still compete regarding commercial/non-commercial use obligations[50] or with NSD without any licenses. Even if parties agreed to only one license for all DSI, DSI would still compete with other NSD. Therefore, standardized MAT would lead to a race to the bottom of DSI licensing conditions.[51] Ultimately, fewer benefits from DSI would be generated and hence shared. This competition between DSI and other NSD in the data market, not only in the utilization of DSI by enterprises for research and development but also by uni-

[46] Apart from legal concerns because of an retroactive effect (see *Godt/Šušnjar/Wolff*, Umsetzung des Nagoya Protokolls in EU- und nationales Recht, 2020, pp. 48 f.), it would also not be feasible technically to apply DSI licenses to these NSD because as of 2021, only about 40% of all sequences in the INSDC can be linked to a geographical origin of the sample, see *Leopoldina*, Den offenen Zugang zu digitalen Sequenzinformationen erhalten, 2021, p. 19.

[47] The information paradox theory was founded by *Arrow*, Economic Welfare and the Allocation of Resources for Invention, in: National Bureau of Economic Research (eds.), The Rate and Direction of Inventive Activity, 1962, p. 609, 615. Regarding its application to the question of data ownership, see *Duch-Brown/Martens/Mueller-Langer*, The Economics of Ownership, Access and Trade in Digital Data, 2017, JRC Digital Economy Working Paper 2017-01, <https://www.ssrn.com/abstract=2914144> (last accessed 9 August 2022), p. 36.

[48] See *Rohden et al.*, Combined study on Digital Sequence Information (DSI) in public and private databases and traceability, U.N. Doc.CBD/DSI/AHTEG/2020/1/4, 31 January 2020, p. 63.

[49] See also *Sara/Hufton/Scholz*, Compatible or Incompatible? DSI, Open Access and Benefit-sharing, 2021, <https://osf.io/nw8g9> (last accessed 9 August 2022), p. 14 noting that "[t]he resulting legal uncertainty could lead to mass avoidance (e.g. filtering to exclude anything with a license that is not open and unrestricted)".

[50] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, p. 8 para. 7.

[51] See also *Vogel et al.*, Plants, People, Planet 2022, 13, 16.

versities and research institutes in basic research, stresses the importance of applying ABS to the whole NSD corpus, not only on NSD from some countries.[52]

2. DISINCENTIVES IN THE RE-USE OF DSI

Because DSI is an intermediary data good[53], the re-use of DSI is also crucial for innovation and thus the generation of benefits. Re-use of DSI means that the information obtained from the use of DSI (such as determining a sequence or its annotation) is made publicly available again, and license conditions facilitate re-use. Two main elements of the **standard MAT policy option effectively hinder the re-use of DSI: The distinction between commercial and non-commercial utilization of DSI and the viral nature of license conditions**.

First, as the Nagoya Protocol provides that research contributing to the conservation and sustainable use of biodiversity should be promoted and encouraged, "including through simplified measures on access for non-commercial research purposes"[54], national laws on ABS and the resulting MAT often contain clauses differentiating between utilization for commercial or for non-commercial purposes regarding benefit-sharing obligations.[55] Such a distinction is also envisioned in the policy option of standard MAT.[56] Though the objective is not to hinder research and innovation as one policy goal,[57] the distinction early in the value chain effectively hinders re-use, and instead of encouraging research and innovation, it favors commercial utilization with short value chains.[58] By comparison, the EU Open Data Directive explicitly mandates the re-usability of public-

[52] *Rohden et al.*, Combined study on Digital Sequence Information (DSI) in public and private databases and traceability, U.N. Doc.CBD/DSI/AHTEG/2020/1/4, 31 January 2020, p. 63; *Scholz et al.*, Nat. Commun. 13 (2022), Art. Nr. 1086, 3.

[53] See above at p. 7.

[54] Art. 8 (a) Nagoya Protocol.

[55] E.g. in South Africa, see *Klünker/Richter*, Digital Sequence Information between Benefit-Sharing and Open Data – How to Advance the Legal Framework, 2022, Max Planck Institute for Innovation & Competition Research Paper No. 22-11, <https://www.ssrn.com/abstract=4135144> (last accessed 9 August 2022), pp. 7 f.

[56] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, p. 8 no. 7; it is also mentioned as one criterium for analysis of the policy options, see p. 11 para. 11.

[57] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, p. 10 para. 4.

[58] See *Klünker/Richter*, Digital Sequence Information between Benefit-Sharing and Open Data – How to Advance the Legal Framework, 2022, Max Planck Institute for Innovation & Competition Research Paper No. 22-11, <https://www.ssrn.com/abstract=4135144> (last accessed 9 August 2022), pp. 27 f.

ly funded research data for non-commercial *and* commercial purposes to facilitate re-use.[59]

Second, MAT transfer conditions and licenses such as the Creative Commons are often of a viral nature, meaning if transferred to a third party, the benefit-sharing obligations or restrictions to non-commercial research are handed downstream.[60] Especially in the highly cumulative innovation processes of DSI, these viral conditions could create severe innovation blocking effects.

Although the European Commission has opted for contractual data sharing in the proposed Data Act,[61] this is not an argument in favor of a contractual solution. One could argue that the Data Act concerns data from IoT products and as such applies after a product has entered the market,[62] and therefore much later in the value chain than DSI. However, it is also argued that the Data Act proposal does not only address aftermarkets.[63] The situation of DSI is also different in that the Data Act proposal seeks to break up data silos,[64] whereas NSD are currently made publicly available in core databases.[65] Indeed, the contractual approach of the Data Act proposal in general is met with criticism.[66] Earlier, the European Commission had noted that the contractual agreements on

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[59] Art. 10 (2) Open Data Directive.

[60] See *Winter*, The ABS Compliance Regime of the European Union, in: Chege Kamau (eds.), Global Transformations in the Use of Biodiversity for Research and Development, 2022, p. 419, 432 regarding MAT. A similar case is the "share alike" Creative Commons module.

[61] See Chapter II *European Commission*, Data Act Proposal, COM(2022) 68 final, 23 February 2022.

[62] Its objective specifically is to open up aftermarkets, such as repairing a product, and thereby avoid lock-in effects, see *European Commission*, Data Act Proposal, COM(2022) 68 final, 23 February 2022, p. 13 and Recital 28.

[63] *Specht-Riemenschneider*, MMR 2022, 809. This also reflected in the fact that the user of a product can make the data commercially available to third parties, see *Efroni et al.*, Position Paper regarding Data Act (Proposal of the European Commission, 23.02.22), 2022, <https://www.ssoar.info/ssoar/handle/document/79542> (last accessed 9 August 2022), p. 10; critically *Drexl et al.*, Position Statement of the Max Planck Institute for Innovation and Competition of 25 May 2022 on the Commission's Proposal of 23 February 2022 for a Regulation on Harmonised Rules on Fair Access to and Use of Data (Data Act), 2022, Max Planck Institute for Innovation & Competition Research Paper No. 22-05, <https://www.ssrn.com/abstract=4136484> (last accessed 9 August 2022), p. 6 para. 11

[64] Recital 2 *European Commission*, Data Act Proposal, COM(2022) 68 final, 23 February 2022.

[65] I am indebted to *Prisca von Hagen* for this observation.

[66] *Drexl et al.*, Position Statement of the Max Planck Institute for Innovation and Competition of 25 May 2022 on the Commission's Proposal of 23 February 2022 for a Regulation on Harmonised Rules on Fair Access to and Use of Data (Data Act), 2022, Max Planck Institute for Innovation & Competition Research Paper No. 22-05, <https://www.ssrn.com/abstract=4136484>, p. 120 para. 333; *Specht-Riemenschneider*, MMR 2022, 809, 818.

data, including clauses on the commercialization of the data, appear to limit the re-use of data.[67]

As a result, standard MAT may reduce transaction costs compared to no standardization. Still, this policy option disincentivizes the use of DSI and encourages a race to the bottom of benefit-sharing obligations. At the same time, it hinders the re-use of DSI. From this perspective, one must question whether the policy option of standard MAT will lead to the accrual of any significant benefits from the utilization of DSI.

B. Tracking requirement renders benefit-sharing enforcement impossible

Misaligned incentives in standardized MAT not only impede the accrual of benefits, but the **enforcement** (criterion 14) **of benefit-sharing obligations is also extremely difficult**. The reason lies in the cumulative nature of innovation processes of DSI and the handing-down of viral clauses in MAT. Because the policy option of standardized MAT envisions the payment of "fixed royalties on the successful commercialization of a product",[68] it requires the tracking of that DSI every time it is used for non-commercial purposes too, and even when many different sequences are used, but only one of them carries a benefit-sharing obligation.

However, in the latest negotiations in Nairobi in June 2022, progress was made in that tracking is increasingly regarded as a problem of technical feasibility (criterion 6) and of costs for establishing and maintaining such a system.[69] In particular, blockchain, which was initially debated as one technical means to implement the tracking of DSI

[67] *European Commission*, Commission Staff Working Document on the free flow of data and emerging issues of the European data economy, SWD/2017/02 final, 1 October 2017, p. 16.

[68] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, p. 8 para. 7.

[69] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/4/L.3, 26 June 2022, p. 3 (s).

utilization,[70] was recognized as technically not fit for DSI tracking and also too expensive and having a too high energy consumption.[71] Without tracking the utilization of DSI, however, benefit-sharing obligations can hardly be enforced.

C. Standard MAT unlikely to meet policy goals

Not only does the policy option of standard MAT disincentivize the use and re-use of DSI and thus impedes the accrual of benefits, but the tracking of DSI utilization is also technically unfeasible and thus makes benefit-sharing enforcement impossible. This analysis leads to low performance of standardized MAT on the policy goals: With no incentives for the use and re-use of DSI, the potential to deliver predictable benefits is low (1, 2); While access to public databases would remain open (3), standard MAT significantly hinder research and innovation (4); And perhaps most important, not only does the policy option not provide for a mechanism to direct monetary benefits into the conservation of biodiversity, but it hinders research on DSI and biodiversity (5), especially from countries of rich biodiversity because these are most likely to use restrictive licenses.

These difficulties already assume an ideal implementation of standard MAT and of a technical integration of the licensing conditions into the INSDC. But integration into the INSDC would meet many obstacles, some technical such as ensuring machine-readable format for all different licenses, to the cooperation of GenBank, the database based in the US, one of the few non-parties. A legally clear and certain implementation (criterion 7) would not be easy to achieve and require perhaps years of further negotiation. However, the political climate of the ongoing negotiations suggests that such an ideal im-

[70] Before, blockchain as a tracking solution was debated, see *Ad Hoc Technical Expert Group on Digital Sequence Information on Genetic Resources*, Report of the Ad Hoc Technical Expert Group on Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/DSI/AHTEG/2018/1/4, 20 February 2018, p. 10 para. 29 (c); and also in literature, though mostly critically, see *Scholz et al.*, Finding Compromise on ABS and DSI in the CBD, 2020, pp. 31–34; *Morgera/Switzer/Geelhoed*, Study for the European Commission on 'Possible Ways to Address Digital Sequence Information – Legal and Policy Aspects', 2019, pp. 19–21; *Oldham*, Digital Sequence Information - Technical Aspects, 2020, pp. 43–47; *Rohden et al.*, Combined study on Digital Sequence Information (DSI) in public and private databases and traceability, U.N. Doc. CBD/DSI/AHTEG/2020/1/4, 31 January 2020, pp. 57–61; *Winter*, LEAD 17 (2021), 3, 7; *Bagley*, "Just" Sharing - The Virtues of Digital Sequence Information Benefit-Sharing for the Common Good, 2022, <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3985083>, p. 31 f.

[71] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Co-Leads' Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources Since the Third Meeting of the Open-Ended Working Group on the Post-2020 Global Biodiversity Framework, U.N. Doc. CBD/WG2020/4/INF/4, 10 June 2022, p. 5 (c).

plementation is not realistic. **Choosing standard MAT could essentially mean postponing a substantive decision on ABS on DSI** to the negotiation of these standards.

A solution based on MAT would therefore have the considerable downsides of powerful IPRs while at the same time not being able to ensure static efficiency. The main problems of standard MAT are rooted in its application to some DSI only and its distinction between commercial and non-commercial use early in the value chain.

IV. Option 3: Copyright as a model for access fees and micro-levies on laboratory equipment

Instead of ABS on DSI based on MAT, policy options foreseeing the establishment of a fund present the opportunity to create an ABS system that delivers benefits and ensures that these benefits contribute to biodiversity conservation. Policy options that include the establishment of a fund are currently discussed under options 3 and 6.[72] These options and their sub-options suggest different means of how benefits are collected, but the two main differences compared to standardized MAT are that they apply to all NSD or only generate benefits indirectly and all policy options allow for a distinction between commercial and non-commercial utilization that does not block innovation.

It should be noted that it is not a multilateral fund per se that is favored in this position paper but the means of how benefits can be collected under such a fund. But a multilateral fund also has the potential to contribute to the conservation and sustainable use of biodiversity (policy goal 5), provided that its design mandates the financing of biodiversity conservation.

The means of how benefits are collected are very wide-ranging in the proposed policy options: From payment for access to DSI, payment for DSI-related services such as storing or analyzing DSI, a micro-levy on laboratory equipment or cloud-computing space, or biodiversity bonds.[73] For the purpose of this position paper, only two options related to IP will be examined:[74] a micro-levy on laboratory equipment and access fees to databases.

From an IP perspective, these options have commonalities with mechanisms in IPRs that deal with market failure resulting from high transaction costs. Copyright's solutions to market failure because of high transaction costs in individual licensing agreements

[72] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, pp. 8 f.

[73] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, pp. 8 f.

[74] This selection does not reflect a preference of the author for these options.

are statutory licenses and collecting societies.[75] Under German copyright law, the work may be reproduced without the consent in some cases under a statutory license if the rightsholder receives fair compensation.[76] The license is therefore not negotiated between the author and the user, and in contrast to the discussed standard MAT and public licenses, neither is the license a standard yet contractual license chosen by the author. To ensure remuneration of the author, collecting societies are established. Similar to the fee for copy machines to collect payment for the use of copyrighted works, the micro-levy on laboratory equipment would collect payment for generating DSI.[77] Similarly, access fees to databases of DSI could collect payments which the multilateral fund would then distribute. As in copyright law, **micro-levies on laboratory equipment and access fees can be expected to reduce transaction costs considerably**.[78]

A. A micro-levy on laboratory equipment

The main advantage of micro-levies on laboratory equipment would be that once sequenced, **a micro-levy on laboratory equipment does not impose barriers on the use and re-use of DSI** (static efficiency). This policy option would therefore perform well under the policy goals of open access to public databases (policy goal 3) and facilitation of research and innovation (policy goal 4).[79] However, micro-levies on laboratory equipment **could have a negative impact on sequencing in general, meaning less DSI and NSD are produced** (dynamic efficiency) if the levy is too high. Perhaps the strongest argument against such a micro-levy lies in that it could easily be circumvented if the sequencing were moved to a non-party such as the US. Therefore, this policy option will likely result in jurisdiction shopping (criterion 16).[80]

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[75] See *Searle/Brassell*, Economic approaches to intellectual property, 2016, p. 81 paras. 4.24 f.

[76] *Dreier*, in Dreier/Schulze, UrhG, 7th Ed. 2022, § 54 no. 1.

[77] I am indebted to *PD Dr. Michael Denga, LL.M.* for this comparison.

[78] Cf. *Morgera/Switzer/Geelhoed*, Study for the European Commission on 'Possible Ways to Address Digital Sequence Information – Legal and Policy Aspects', 2019, p. 39; *Maestre et al.*, Digital Sequence Information: An Evidence Review, 2020, p. 40.

[79] See on similar policy proposals *ABS Capacity Development Initiative/South African National Department of Environment, Forestry and Fisheries/Norwegian Government*, First Global Dialogue on Digital Sequence Information on Genetic Resources, 2019, p. 19; *Scholz et al.*, Finding Compromise on ABS and DSI in the CBD, 2020 p. 16.

[80] See *Scholz et al.*, Finding Compromise on ABS and DSI in the CBD, 2020, p. 19.

B. Access fees

Access fees, on the other hand, do not impact the sequencing **but could create barriers to the use and re-use of DSI** (see policy goal 3).[81] However, access fees also allow for discounted access fees in basic research depending on the country of access.[82] Depending on the implementation, this policy option would allow for the distinction between commercial and non-commercial use of DSI (criterion 11) without hindering research and innovation (policy goal 4). But this requires that access fees are based on the entire database and not individual sequences in the database or a fee on the "associated data",[83] because such differentiation would disincentivize the use and re-use of DSI, just like for standard MAT. A crucial issue is, therefore, how implementation in the INSDC would be handled, given that one of the three databases of the INSDC, GenBank, is based in the US, a non-party to the CBD and Nagoya-Protocol.[84] If the access fees were only implemented in the ENA and the DDBJ, access fees would likely result in jurisdiction shopping (criterion 16).[85]

A micro-levy on laboratory equipment and access fees would allow for monetary benefits, perhaps the most predictable compared to the other policy options (policy goal 1).[86] From copyright law, we can deduce that both options could also be implemented in a legally clear and certain way (criterion 8) which allows for compliance and enforcement (criteria 13–15).[87]

[81] See also critically *Leopoldina*, Den offenen Zugang zu digitalen Sequenzinformationen erhalten, 2021, p. 18.

[82] Such fees would not need to be based on the amount of sequences which originate from a country (critically *Leopoldina*, Den offenen Zugang zu digitalen Sequenzinformationen erhalten, 2021, p. 19), but rather be a need-based calculation.

[83] As is mentioned as an option, see *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, p. 8 paras. 12 f.

[84] See also *Maestre et al.*, Digital Sequence Information: An Evidence Review, 2020, p. 40.

[85] See also *Leopoldina*, Den offenen Zugang zu digitalen Sequenzinformationen erhalten, 2021, p. 19.

[86] See also *Scholz et al.*, Finding Compromise on ABS and DSI in the CBD, 2020, p. 19.

[87] See also *Scholz et al.*, Finding Compromise on ABS and DSI in the CBD, 2020, p. 18.

V. Option 6: A promising policy option with many open questions

Policy Option 6 proposes to finance the multilateral fund "through a 1 per cent levy on all retail sales of goods in developed countries arising from the utilization of genetic resources in cases where the bilateral PIC and MAT system is not implementable or practicable."[88] After the meeting in Nairobi in June 2022, a proposal for a multilateral benefit-sharing-mechanism was added, which provides that:

"Each developed-country Party shall, in accordance with Articles 20 and 15.7 of the Convention, take legislative, administrative or policy measures, as appropriate, to ensure that 1 per cent of the retail price of all commercial income resulting from all utilization of genetic resources, traditional knowledge associated with genetic resources or digital sequence information on genetic resources is shared through the multilateral benefit-sharing mechanism to support the conservation and sustainable use of biological diversity, unless such benefits are otherwise being shared on mutually agreed terms established under the bilateral system"[89]

A. Advantages of a levy or tax in general

This policy option essentially proposes a levy on certain products related to the utilization of genetic resources and is, therefore outside the realm of IP law. Nevertheless, a biodiversity tax or levy, in general, is a compelling proposition from an IP and innovation perspective because IP law is often considered not to be the instrument of choice for questions of distributive justice, and instead a tax is preferable.[90] It is even considered whether biodiversity conservation should not be delinked from the fairness and equity objective of ABS and instead be addressed through a tax.[91] Not only for distributive

[88] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/4/Add.1, 26 November 2021, p. 9.

[89] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/4/L.3, 26 June 2022, pp. 4 f.

[90] On welfare economics and distributive justice in general, see *Schäfer/Ott*, Lehrbuch der ökonomischen Analyse des Zivilrechts, 2020 p. 19. Similarly also *Zech*, GRUR Int. 2019, 453, 456; *Roca*, GRUR Int. 2021, 349, 358.

[91] *Laird et al.*, Science 367 (2020), 1200, 1201–1202; see also *Lawson/Humphries/Rourke*, J. World Intellect. Prop. 22 (2019), 103, 115 f.

justice but to internalize environmental externalities, a classic approach of welfare economics is the Pigouvian tax.[92] A tax would not only mean no transaction costs relating to ABS when using DSI.[93] A tax would also result in predictable monetary benefits (policy goal 1), ensure that access to public databases remains open (policy goal 3), and not hinder research and innovation (policy goal 4).[94]

B. The current proposal

The current proposal remains rather vague, in fact, it seems surprising that the only specific element pertains to the 1 per cent. It is unclear from this description how the bilateral mechanism and the levy would work together. A tax or levy on products would have many advantages, such as an application late in the value chain, access to databases remaining open and depending on the definition of the products, this option would yield monetary benefits. **However, these benefits only materialize if the tax or levy is based on specified product groups that commonly use NSD, not on the actual use.**

The current proposal provides that this policy option will be established parallel to a bilateral system with prior informed consent and MAT and that the levy would only apply if benefits are not shared otherwise. However, if such a mechanism is supposed to work in parallel to the bilateral mechanism meaning that utilization would need to be tracked, then it would not only combine the many disadvantages of a bilateral mechanism with a complicated implementation of a levy.[95] But this policy option addresses not only DSI but genetic resources and traditional knowledge too, instead of accounting for their differing justifications of ABS and informational properties. This leaves the impression that many new issues of conflict will be raised, the negotiation of which will drag on for

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[92] *Daly/Farley*, Ecological Economics, 2011, p. 430. Regarding a Pigouvian tax for biodiversity, see *Baumgärtner/Becker*, Ökonomische Aspekte der Biodiversität, in: Lanzerath/Mutke/Barthlott/Baumgärtner/Becker/Spranger (eds.), Biodiversität, 2008, p. 75, 96. Note that the Pigouvian tax is ideally equal to the marginal external costs and therefore is not directly applicable to the non-rival DSI. But a biodiversity tax could be extended to activities harming biodiversity, such as logging, see *Laird et al.*, Science 367 (2020), 1200, 1202; *Maestre et al.*, Digital Sequence Information: An Evidence Review, 2020, p. 42; *Morgera/Switzer/Geelhoed*, Study for the European Commission on 'Possible Ways to Address Digital Sequence Information – Legal and Policy Aspects', 2019, p. 37.

[93] *Lawson/Humphries/Rourke*, J. World Intellect. Prop. 22 (2019), 103, 116; similarly already *Winter*, Knowledge commons, intellectual property and the ABS regime, in: Kamau/Winter (eds.), Common Pools of Genetic Resources, 2013, p. 285, 298 (regarding a "biodiversity charge").

[94] See also *Sara/Hufton/Scholz*, Compatible or Incompatible? DSI, Open Access and Benefit-sharing, 2021, <https://osf.io/nw8g9> (last accessed 9 August 2022), p. 14 stressing the positive outcome of this policy option from an open access perspective.

[95] See also *Zech*, GRUR Int. 2019, 453, 456 (noting that "such a mechanism could only be introduced instead of and not on top of the existing Nagoya Protocol, since otherwise blocking effects would become dramatic").

years on the international level alone and will not be implementable in an efficient and timely manner (criterion 10).

VI. A hybrid solution could result in a chimera of policy options

Next to the proposal for establishing a multilateral benefit-sharing mechanism described in option 6, the draft recommendation from the latest meeting in Nairobi contains a proposal for a hybrid solution.[96] The draft recommendation refers to two hybrid options noted in previous documents that include a combination of options 1 and 2.2 and a combination of international MAT and the establishment of a multilateral fund.[97] From the above assessment, it follows that neither of these two hybrid options presents a solution that would meet the policy goals: The first hybrid option combines the deficiencies of standardized MAT with an additional layer of bilateralism. The second hybrid option looks to establish a multilateral fund, but the envisioned terms and conditions on sequences for commercial purposes would disincentivize the use of DSI as described above.[98]

Including these hybrid options exposes the problem that depending on the interpretation and implementation, very different options are currently discussed under the same label and very similar options under different labels.[99] If it were to be assessed that a "one size fits all" option is not feasible, then a hybrid solution should be carefully designed and not just present politically opposing views as a compromise. From the proposed hybrid options (option 6 and the additional hybrid approaches), it follows that hybridity could result in a chimera of a policy option combining the disadvantages of all policy options. Such a chimera of policy options would undermine legal clarity and certainty (criterion 8), compliance (criterion 15), and enforceability (criterion 14) because the solution is not easy to understand by providers and users (criterion 13).

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[96] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/4/L.3, 26 June 2022, p. 5.

[97] See *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Co-Leads' Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/INF/8, 18 November 2021 paras. 40 f.

[98] See above at p. 8.

[99] See also *Sara/Hufton/Scholz*, Compatible or Incompatible? DSI, Open Access and Benefit-sharing, 2021, <https://osf.io/nw8g9> (last accessed 9 August 2022), p. 11.

Instead, a hybrid solution should differentiate between different policy options in a manner that fits the actual use of DSI in the value chain. The current proposals differentiate in a way that does reflect the different layers of information (genetic resources, traditional knowledge, DSI) and the **actual use of DSI as an intermediate good used in highly cumulative processes where commercial and non-commercial use often overlap.** If a hybrid solution were to be chosen, such a solution could instead e.g. differentiate between certain groups such as microorganisms and specialized databases.[100] Therefore, a vertical approach based on the actual use instead of a horizontal approach should be considered.

[100] *Amber Hartman Scholz*, personal communication with the author, 25 July 2022.

VII. General principles of ABS on DSI from an IP and data law perspective

Because of the archetypal nature of policy options[101] and the possibility of hybrid options, it is essential to stress general principles for ABS on DSI. The following general principles were identified drawing from the IP and data law perspective:

1. **Solutions outside of (de facto) IPRs such as taxes and levies** should be favored because a de facto IPR is not necessary to produce DSI but hinders research and innovation and, thus the generation of benefits.
2. If ABS on DSI is designed as a de facto IPR, then **benefit-sharing should occur late in the value chain** so that **no distinction between commercial and non-commercial use and re-use** of DSI in the INSDC is necessary.
3. Any policy option involving the INSDC needs to be **based on the whole database**, not on individual sequences.[102]

These principles strongly speak against standard MAT as a policy option and for a solution based on policy options 3 and 6.

[101] *Open-Ended Working Group on the Post-2020 Global Biodiversity Framework*, Co-Leads' Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources, U.N. Doc. CBD/WG2020/3/INF/8, 18 November 2021, p. 4 para. 20.

[102] *Scholz et al.*, Nat. Commun. 13 (2022), Art. Nr. 1086, 3; *Sara et al.*, Open access: a technical assessment for the debate on benefit-sharing and digital sequence information, 2022, <https://zenodo.org/record/5849643#.Yt5j6i-21pQ> (last accessed 9 August 2022), p. 4.

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