SOVEREIGNTY IN THE CODE: ADDRESSING DIGITAL BIOPIRACY OF GENETIC RESOURCES THROUGH THE PGRABS BILL AND IPOPHL AI GUIDELINES

A Thesis
Presented to the
COLLEGE OF LAW
WEST VISAYAS STATE UNIVERSITY
La Paz, Iloilo City, Philippines

In Partial Fulfillment
of the Requirements of the Degree
JURIS DOCTOR

By

THERESE DIANE N. GERMINANDA
May 2025

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ABSTRACT

This research interrogates the shifting legal frontier of Digital Sequence Information (DSI) and the consequent regulatory threats to the Philippines' genetic patrimony. At the heart of this inquiry is the preservation of national sovereignty over resources endemic to the archipelago. As biotechnology evolves from tangible bioprospecting to the "dematerialization" of genetic resources, traditional safeguards specifically the Wildlife Act (R.A. No. 9147) and the Indigenous Peoples' Rights Act (R.A. No. 8371) which now confronts a formidable "biopiracy loophole." While these statutes rigorously mandate Prior Informed Consent (PIC) for physical extractions, they lack the teeth to regulate the utilization of digital DNA sequences residing in global databases. The result is a phenomenon of "digital ghosting," where the country of origin is systematically bypassed within the Access and Benefit-Sharing (ABS) regime.

Drawing upon the PGRABS Bill (H.B. No. 9143), the 2024 WIPO Treaty, and the 2025 IPOPHL AI Examination Guidelines, this study analyzes this enforcement vacuum. Case studies involving the Waling-waling (Vanda sanderiana) and the Magician's Cone Snail (Conus magus) illustrate the ease with which genetic data is transmuted into digital assets and commercialized without sovereign authorization.

The findings suggest that the Intellectual Property Code (R.A. No. 8293) is currently insufficient; it fails to compel the mandatory disclosure of digital biological origins. This oversight fosters a regime where AI-driven innovation permits the patenting of "digital derivatives" while denying equitable compensation to the State and its indigenous cultural communities. To rectify this, the research proposes a normative framework that integrates Indigenous Data Sovereignty and Biocultural Labels as machine-readable legal tags for DSI.

Ultimately, harmonizing the PGRABS Act with the IP Code is a constitutional imperative. It is only through such alignment that we can ensure scientific advancement remains subservient to the common good, thereby safeguarding the liberty of our people and nurturing their prosperity under the rule of law.

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CHAPTER I

INTRODUCTION

1.1 Background of the Study

The Philippines is globally recognized as one of the world's megadiverse countries, harboring a significant portion of the planet's flora and fauna, many of which are endemic to the archipelago.[1] To protect all that biological wealth, the country has spent decades building a legal fortress, all centered on the bedrock principle of Permanent Sovereignty over Natural Resources.[2]

This legal framework is anchored by statutes like the Wildlife Resources Conservation and Protection Act (R.A. No. 9147) and the Indigenous Peoples' Rights Act of 1997 (R.A. No. 8371).[3] These are not just administrative hurdles as they have established rigorous protocols for bioprospecting[4] that demand Prior Informed Consent (PIC)[5] and Access and Benefit-Sharing (ABS).[6] The goal is straightforward, which is to

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[1] Philippine House of Representatives, 18th Congress, 3rd Regular Session, House Bill No. 9143: *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (short title: "Philippine Genetic Resources Access and Benefit-Sharing Act" or "PGRABS Act"), Section 2; Thomas Greiber et. al., *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*, IUCN Environmental Policy and Law Paper No. 83 (Gland, Switzerland: IUCN, 2012)

[2] United Nations General Assembly, Resolution 1803 (XVII): *Permanent Sovereignty over Natural Resources*, 14 December 1962, U.N. Doc. A/5217; Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration), June 16, 1972, U.N. Doc. A/CONF.48/14/Rev.1, 11 I.L.M. 1416 (1972), Principle 21; Rio Declaration on Environment and Development, June 14, 1992, U.N. Doc. A/CONF.151/26 (Vol. I), 31 I.L.M. 874 (1992), Principle 2.

[3] Republic Act No. 9147, "Wildlife Resources Conservation and Protection Act," § 5(a), 14 (2001) (Phil.); Republic Act No. 8371, "The Indigenous Peoples' Rights Act of 1997" (1997) (Phil.)

[4] 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, Oct. 29, 2010, U.N. Doc. UNEP/CBD/COP/DEC/X/1, 50 I.L.M. 105 (2011), Article 22, para. 5(f); Philippe Sands et al., *Principles of International Environmental Law* (4th ed., Cambridge, United Kingdom: Cambridge University Press, 2018) ch. 10

[5] National Commission on Indigenous Peoples (NCIP), "Rules and Regulations Implementing Republic Act No. 8371," Administrative Order No. 1, series of 1998

[6] Intellectual Property Office of the Philippines (IPOPHL), "Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resource (GR), Traditional

ensure that the Philippines and its indigenous communities are not sidelined, but are instead treated as equitable partners in the process of scientific discovery.

However, the 21st century's rapid "dematerialization" of genetic resources[7] has left these traditional safeguards increasingly vulnerable. With the rise of Digital Sequence Information (DSI) which is the transcription of a species' genetic code into a machine-readable format,[8] biological "value" is no longer tethered to the physical specimen. In today's landscape, researchers do not necessarily need to trek into the field to extract a leaf or a vial of venom from Philippine soil to develop high-value pharmaceuticals or agricultural products.[9] All that is material to the process is to get their hands on the "digital blueprints" sitting in open-access global databases.

This shift in technology has paved the way for "digital biopiracy." knowing or giving its consent.[10] It's a phenomenon where the genetic data of Philippine endemics is funneled into biotechnological applications, think CRISPR-Cas9 gene editing or AI training models,[11] all without the Philippines ever knowing or giving its consent.[12]

While the 2024 WIPO Treaty on Intellectual Property and Genetic Resources and the 2025 IPOPHL AI Examination Guidelines aim for more transparency,[13] they do not always sit comfortably alongside the Intellectual Property Code (R.A. No. 8293). In fact, it often clashes with existing provisions, a tension that highlights the growing

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Knowledge (TK), Traditional Cultural Expressions (TCE), and Indigenous Knowledge, Systems and Practices (IKSP)," Introduction (April 2024)

[7] Houssen, W., R. Sara, and M. Jaspars. 2020. *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use*. (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity

[8] Secretariat of the Convention on Biological Diversity. 2020. *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources*. (CBD/DSI/AHTEG/2020/1/2); CBD, UNEP, and UNDP. 2025. *Multilateral Mechanism for the Fair and Equitable Sharing of Benefits from the Use of Digital Sequence Information on Genetic Resources: Frequently Asked Questions*.

[9] *Ibid.*

[10] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), § 2, 4(b), 4(j)

[11] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 11, 21; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, p. 3.; Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2), 32

[12] *Supra* 9*;* Republic Act No. 9147. (2001). *Wildlife Resources Conservation and Protection Act*, § 5(a), 14

[13] Intellectual Property Office of the Philippines. (2025). *Examination Guidelines of Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence*, Sections I, V, VI

friction between new international standards and the established domestic rules already on the books. The absence of mandatory disclosure for digital biological origins in patent applications has carved out a sovereignty gap. Essentially, digital assets pulled from Philippine biodiversity are being privatized on a global scale, all while the country of origin is left as a "digital ghost" in the value chain. It's a systemic oversight that lets the value slip away without a trace.[14]

As a result, the state is at a point where evaluating the proposed Philippine Genetic Resources Access and Benefit-Sharing (PGRABS) Act is not only helpful—it is urgent. [15] The question that begs to be answered is if such can actually fortify the state's legal defenses against digital biopiracy. This study aims to bridge the disconnect between environmental laws rooted in the 20th century[16] and the digital realities of the 21st. The goal is to ensure that even in the face of massive technological disruption, the "common good"[17] remains the controlling constitutional standard.

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[14] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 11, 31.; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, p. 2.; Rohden, F., et al. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, pp. 5, 46, 66–67.

[15] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 2, 5

[16] Secretariat of the Convention on Biological Diversity. (2002). *Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization*. Montreal: SCBD, p. 2; Intellectual Property Office of the Philippines. (2025). *Examination Guidelines of Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence*, § I

[17] Secretariat of the Convention on Biological Diversity. (2002). *Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization*. Montreal: SCBD, p. 2; Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: SCBD, pp. 2, 25; Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2); Philippe Sands et al., *Principles of International Environmental Law* (4th ed., Cambridge, United Kingdom: Cambridge University Press, 2018) ch. 1, 6, 11, 16-17; Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration), June 16, 1972, U.N. Doc. A/CONF.48/14/Rev.1, 11 I.L.M. 1416 (1972), Preamble, Principles 1-3, 5, 21; Rio Declaration on Environment and Development, June 14, 1992, U.N. Doc. A/CONF.151/26 (Vol. I), 31 I.L.M. 874 (1992), Preamble, Principles 1-3, 16.

1.2 Statement of the Problem

The Philippines is currently staring down a regulatory crisis in how it manages biological assets, sparked by the breakneck shift from physical bioprospecting to digital sequencing—a significant problem. While the **1987 Philippine Constitution** puts the burden on the State to protect and use natural resources for the common good,[18] the current legal framework is not built to capture the value of "dematerialized" genetic resources. It essentially operates with a set of rules that fail to see the very assets it is supposed to regulate.

This research specifically addresses the legal vacuum created when Philippine endemic species such as the Waling-Waling (*Vanda sanderiana*) or the Magician's Cone Snail (*Conus magus*) are reduced to Digital Sequence Information (DSI), and utilized without national authorization.[19]

Specifically, this study seeks to answer the following problems:

1. **The Inadequacy of Tangibility-Based Laws**

How does the current reliance of the Wildlife Resources Conservation and Protection Act (RA 9147) and the Indigenous Peoples' Rights Act (RA 8371) on "physical access" end up carving out a loophole for digital biopiracy? More

[18] Phil. Const. art. XII, §§ 1, 11, 19 (1987); United Nations General Assembly, Resolution 1803 (XVII): *Permanent Sovereignty over Natural Resources*, 14 December 1962, U.N. Doc. A/5217; Convention on Biological Diversity, June 5, 1992, 1760 U.N.T.S. 79, Art. 3

[19] W. Houssen, R. Sara, & M. Jaspars, *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use*, CBD/DSI/AHTEG/2020/1/3 (Montreal: Secretariat of the Convention on Biological Diversity, 2020), 2, 33; Cali Fund Guide (Multilateral Mechanism and the Cali Fund), CBD, UNEP and UNDP 2025, 2; Republic Act No. 9147, "Wildlife Resources Conservation and Protection Act," § 5(i), 14 (2001) (Phil.); Philippine House of Representatives, 18th Congress, 3rd Regular Session, House Bill No. 9143: *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources* ("PGRABS Act"), § 4(b), 14; Secretariat of the Convention on Biological Diversity, *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources*, CBD/DSI/AHTEG/2020/1/2 (2020), 32

importantly, to what extent does this gap violate the State's sovereign right to control access to its own genetic resources?

2. **The IPOPHL-PGRABS Conflict**

In light of the 2025 IPOPHL AI Examination Guidelines, is the current Intellectual Property Code (RA 8293) actually consistent with the PGRABS Bill (HB 8649)? Specifically, do they align when it comes to the mandatory disclosure of digital biological origins in patent applications?

3. **The Erosion of Indigenous Data Sovereignty**

How does the absence of a machine-readable legal mechanism such as Biocultural Labels actually impact the preservation of Traditional Knowledge especially in light of the benefit-sharing obligations under the CBD, the Nagoya Protocol and the Cali Fund?

4. **The Enforcement Gap**

Is the proposed criminalization of biopiracy under the **PGRABS Act** a constitutionally permissible exercise of police power?

1.3 Objectives

The primary objective of this study is the formulation of a normative legal framework capable of fortifying the Philippines' biological sovereignty. In an era increasingly defined by generative biology and artificial intelligence, the threat of digital biopiracy has become a sophisticated reality. Consequently, we must develop a structure that addresses these modern incursions directly. The goal isn't merely to update existing policy, but to ensure that the nation's legal defenses remain resilient against the rapid "dematerialization" of its genetic heritage.

Specifically, this research aims to:

1. **Evaluate the Legal Sufficiency of Physical-Centric Statutes**

The central aim of this study is to evaluate whether the Wildlife Resources Conservation and Protection Act (RA 9147)and the Indigenous Peoples' Rights Act (RA 8371) remain effective in regulating "dematerialized" access to genetic resources through Digital Sequence Information (DSI). It is a necessary inquiry. As the focus shifts from physical specimens to digital data, we must analyze the resulting impact on the constitutional mandate of Prior Informed Consent (PIC). Ultimately, the research seeks to determine if these established statutes can still uphold such fundamental requirements when the biological assets in question no longer possess a tangible form.

2. **Harmonize IP Policy with Biological Sovereignty**

This study seeks to scrutinize the 2025 IPOPHL AI Examination Guidelines to identify where they might overlap or conflict with the PGRABS Bill (HB 8649), particularly concerning the patenting of digital derivatives. It is a critical juncture for domestic policy. Beyond mere identification of these frictions, the research proposes the integration of a Mandatory Disclosure of Origin (MDO) requirement within the Intellectual Property Code (RA 8293). This proposed mechanism is specifically tailored for AI-assisted biotechnological inventions, ensuring that the legal framework governing intellectual property doesn't inadvertently bypass the nation's sovereign rights over its genetic data.

3. **Operationalize Indigenous Data Sovereignty (ID-S)**

The objective of this study is to examine the legal feasibility of integrating Biocultural Labels as machine-readable metadata. Such a mechanism is intended to prevent the "digital ghosting" of indigenous communities within the current global data ecosystem—a phenomenon that threatens to erase their contributions. Furthermore, the research assesses the role of the Cali Fund in ensuring that benefit-sharing for Philippine-derived DSI remains fair and equitable. By evaluating these digital safeguards, the study seeks to determine whether such frameworks can effectively bridge the gap between traditional heritage and the modern data economy.

4. **Analyze the Deterrent Effect of Criminalizing Biopiracy**

This study evaluates the penal provisions of the proposed **PGRABS Act** through the lens of Police Power. Specifically, it seeks to determine whether the introduction of criminal sanctions offers a superior deterrent against international digital biopiracy when compared to the current regime of administrative fines. It is a necessary assessment; the shift toward criminalization represents a significant escalation in state enforcement. Therefore, the research must analyze whether such a punitive approach is not only a constitutionally sound exercise of authority but also a practical necessity for safeguarding the nation's digital biological assets.

1.4 Significance of the Study

This research bears significant relevance to the rapidly shifting landscape of both international and domestic environmental law. It addresses a critical sovereignty gap, one precipitated by the increasing digitization of biological resources, and in doing so, provides actionable insights across several key sectors:

For the National Commission on Indigenous Peoples (NCIP):

This study provides a legal roadmap for modernizing Free and Prior Informed Consent (FPIC) protocols to encompass digital assets. Such an evolution is essential; it ensures that indigenous communities are not bypassed within the current data economy. Furthermore, the research assists in the operationalization of the IKSP Registry by proposing the integration of Biocultural Labels. This mechanism is designed to prevent the "digital ghosting" of traditional knowledge, ensuring that as biological data enters the global stream, its cultural and communal origins remain legally and digitally tethered to the source.

For the Intellectual Property Office of the Philippines (IPOPHL):

This study clarifies the application of the 2025 AI Examination Guidelines as they pertain to biotechnological inventions, with a specific focus on the Mandatory Disclosure of Origin for genetic data. Such clarity is vital in the current regulatory

climate. Furthermore, the research supports the broader mission of IPOPHL to strike a sustainable balance between fostering innovation and safeguarding the nation's cultural and biological treasures. By aligning these emerging AI standards with established disclosure requirements, the study ensures that technological advancement does not come at the expense of national sovereignty over biological assets.

For National Legislators and Policy Makers:

The study offers a robust constitutional analysis of the PGRABS Bill (HB 8649), specifically articulating a justification for the exercise of Police Power to criminalize biopiracy and safeguard digital sovereignty. The research provides a concrete framework for the Philippines to interface with the Cali Fund and other multilateral benefit-sharing mechanisms established under CBD Decision 16/2. By reconciling domestic enforcement with international obligations, the study ensures the State can effectively assert its rights within a rapidly evolving global environmental regime. Consequently, the work serves as both a legal defense of state authority and a strategic guide for multilateral engagement.

For the Scientific Community and Researchers:

This study defines the "safe harbor" conditions essential for ethical research, providing a much-needed map for scientists navigating the friction between Open Science and National Sovereignty. It is a delicate balance to maintain. Furthermore, the research advocates for the rigorous adoption of the CARE Principles; Collective Benefit, Authority to Control, Responsibility, and Ethics. This is primary to the management of Philippine-derived DSI. By establishing these clear parameters, the study ensures that scientific transparency doesn't inadvertently compromise the State's jurisdictional rights, ultimately fostering a research environment that is both legally compliant and ethically sound.

For Law Students and Legal Scholars:

This study contributes to the expanding body of Philippine Energy and Environmental Law by synthesizing modern technological advancements with

traditional property rights. Such an integration is timely. Furthermore, the research shall serve as a primary reference for future inquiries into Indigenous Data Sovereignty (ID-S) and the multifaceted legal implications of synthetic biology. By examining these intersections, the study ensures that established legal doctrines remain relevant in the face of rapid scientific progress. It isn't merely a summary of current law, but a foundational analysis for subsequent scholarship navigating the complex jurisdictional challenges of the digital biological age.

1.5 Research Methodology

This study utilizes a qualitative legal research methodology, specifically employing doctrinal and analytical approaches to examine the intersection of digital technology and biological sovereignty. The research is designed to identify and bridge the regulatory gap between existing physical-centric laws and present-day digital realities.

Doctrinal Research Approach

The primary method is the systematic analysis of “black letter law”. This involves:

Primary Sources

A thorough examination of the 1987 Philippine Constitution, the Intellectual Property Code or Republic Act No. 8293, the Wildlife Resources Conservation and Protection Act or Republic Act No. 9147, and the Indigenous Peoples’ Rights Act or Republic Act No. 8371.

Pending Legislation

A critical review of the PGRABS Bill or House Bill No. 8649 and its proposed penal and regulatory provisions.

Administrative Issuances

Analysis of the 2025 IPOPHL AI Examination Guidelines and joint administrative orders between the IPOPHL and NCIP.

Comparative and Jurisprudential Analysis

The study adopts a comparative lens to situate the Philippine experience within the global context:

International Frameworks

Analysis of the Nagoya Protocol, CBD Decision 16/2 (Cali Fund), and the 2024 WIPO Treaty.

Jurisprudence

Review of landmark Philippine Supreme Court rulings on public utilities and state sovereignty, as well as relevant international environmental law principles.

Qualitative Content Analysis

To ground the legal theory in practical policy, the researcher applies content analysis to:

Legislative Records:

Examining committee hearings, explanatory notes, and position papers related to the PGRABS Act.

Technical Literature:

Reviewing scientific reports on Digital Sequence Information (DSI) and Synthetic Biology to understand the technical nature of the resources being regulated.

Data Synthesis and Normative Proposal

The final phase of the methodology involves synthesizing these legal and technical findings to propose a normative framework. This framework will harmonize the protective mandates of the NCIP and DENR with the innovation-driven goals of the IPOPHL, ensuring constitutional compliance in a digitized environment.

1.6 Scope and Limitation

This study focuses primarily on the legal and constitutional dimensions of Digital Sequence Information (DSI) and the acute regulatory challenges it poses to Philippine biological sovereignty. The research scrutinizes the pivot from traditional physical bioprospecting to the digital utilization of genetic resources. Notably, it draws a parallel with the Electric Power Industry Reform Act (EPIRA) framework, wherein analogous principles of “natural monopoly” and the “common good” are applied to resource management. By examining these intersections, the study evaluates whether such established regulatory doctrines can be successfully adapted to the intangible nature of digital genetic data. Ultimately, the inquiry seeks to determine if the State's mandate to protect its natural wealth remains enforceable when those resources are dematerialized into the digital sphere.

Substantive Scope

The analysis of this study is limited to the "biopiracy loophole" created by the dematerialization of genetic resources. It scrutinizes the PGRABS Bill, the 2024 WIPO Treaty, and the 2025 IPOPHL AI Examination Guidelines to determine their efficacy in safeguarding national interests.

Geographic Focus

The study is confined to the Philippine setting, emphasizing the protection of endemic genetic resources.

Technological Limitation

The study discusses Artificial Intelligence (AI) and CRISPR genetic engineering, however it does so only to the extent that these technologies facilitate the utilization of DSI without proper Prior Informed Consent (PIC). The study does not delve into the purely technical or financial operational data of the biotechnological or power industries.

Furthermore, this study specifically prioritizes the Waling-Waling (*Vanda sanderiana*) and the Magician's Cone Snail (*Conus magus*) as primary case studies. This focus is substantiated by the following factors:

1. **Extreme Endemicity and High Commercial Value**

Both species are iconic representatives of Philippine biodiversity that possess clear "potential value" in global markets. The *Waling-Waling* represents the vulnerabilities in the floriculture and ornamental plant sector, while the *Conus magus* serves as the benchmark for the "financialization" of biochemical derivatives in the pharmaceutical industry.

2. **Existing Precedents of Utilization**

These species have a documented history of being targeted for research where the physical-to-digital transition is most evident. The *Conus magus*, for instance, has already transitioned into synthetic drug derivatives, making it the perfect specimen for evaluating the "materiality gap" in current laws.

3. **Prototypical Protection for Other Resources**

By establishing a robust legal framework for these "high-stake" species, this study aims to create a protective "halo effect" for other unique Philippine genetic resources. Successfully mandating Disclosure of Origin and Biocultural Labels for these two species provides the legal blueprint necessary to secure the thousands of other endemic flora and fauna that remain currently unprotected in the digital "grey zone".

1.7 Organization of the Study

This study is structured into seven chapters, designed to lead the reader from the technological standpoint of biological data to the formulation of a defensive legal framework for the Philippines.

Chapter I: Introduction

This chapter provides the foundational context of the research, identifying the regulatory crisis triggered by the transition from physical genetic specimens to Digital Sequence Information (DSI). It outlines the Statement of the Problem, the Objectives, and the Methodology, establishing the study's focus on bridging the gap between existing environmental statutes and 21st-century digital realities.

Chapter II: The Phenomenon of Digital Biopiracy

This chapter examines the economic and legal shift from tangible bioprospecting to the "dematerialization" of genetic resources. It explores how advanced technologies like AI and CRISPR facilitate the utilization of genetic data in a legal vacuum, bypassing traditional Access and Benefit-Sharing (ABS) mechanisms.

Chapter III: Vulnerability of Philippine Endemic Species

Utilizing a case-study approach, this chapter focuses on the Waling-Waling (*Vanda sanderiana*) and the Magician's Cone Snail (*Conus magus*). It illustrates the practical risks of "digital ghosting," where the genetic blueprints of these species will be potentially or are actually commercialized without the Prior Informed Consent (PIC) of the Philippine government or its indigenous communities.

Chapter IV: Indigenous Data Sovereignty (ID-S)

This chapter delves into the rights of Indigenous Peoples over their traditional knowledge and biological data. It introduces Biocultural Labels as a machine-readable legal shield, and pushes for a move toward the CARE Principles which are Collective Benefit, Authority to Control, Responsibility, and Ethics in the management of Philippine DSI.

Chapter V: The Philippine Legal and Policy Framework

This chapter provides a critical analysis of current and pending laws, including the Intellectual Property Code or Republic Act No. 8293, the PGRABS Bill or House Bill No. 8649, and the 2025 IPOPHL AI Examination Guidelines. It evaluates the consistency of these instruments with the 2024 WIPO Treaty and the constitutional mandate of the common good.

Chapter VI: Bridging the Regulatory Gap

This chapter synthesizes the findings to propose a harmonized regulatory path for the NCIP, DENR, and IPOPHL. It assesses whether the criminalization of biopiracy under the PGRABS Act is not constitutionally infirm on the exercise of Police Power to deter international digital theft.

Chapter VII: Conclusion and Recommendations

The final chapter concludes the study forwarding a normative constitutional position. Concrete policy recommendations shall be offered, including specific amendments to the IP Code to mandate the Disclosure of Digital Origin, ensuring that Philippine biodiversity remains a sovereign national asset in the digital age.

1.8 Definition of Terms

For the purposes of this study, the following terms are defined to clarify the legal and technical nuances of digital biopiracy and biological sovereignty:

- **Access and Benefit-Sharing (ABS)**: Refers to the international regime designed to ensure the use of genetic resources. and associated traditional knowledge contributes to the conservation of biodiversity, while compelling those profiting from nature to provide fair and equitable returns to the provider countries.

- **Biocultural Labels**: Machine-readable metadata tags embedded directly into data files to communicate the provenance, indigenous authority, and specific protocols for the use of genetic data and traditional knowledge in the digital environment.

- **Biopiracy**: The unauthorized extraction or utilization of biological resources or traditional knowledge, particularly when such resources are patented or commercialized without the prior informed consent of the country of origin or the relevant indigenous communities.

- **Bioprospecting**: The practice is conducted by corporations or research institutions to obtain biological resources for scientific inquiry or to develop high-value commercial products, such as pharmaceuticals, biotechnology, or agricultural crop species.

- **Biotechnology**: Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

- **Cali Fund**: A global multilateral mechanism established to facilitate the fair and equitable sharing of benefits arising from the use of Digital Sequence Information on genetic resources, primarily targeting high-revenue entities in sectors that rely on genetic data.

- **Dematerialization**: The shift from physical access to biological samples to the utilization of Digital Sequence Information (DSI). The dominating factor is the conversion of the physical aspect of a biological resource into a digital asset.

- **Digital Sequence Information (DSI)**: A placeholder term that broadly covers various types of technological data linked to a genetic resource and its derivatives, including but not limited to DNA and RNA sequences, which can be stored and accessed in public or private databases.

- **Genetic Resources**: Refers to genetic material which includes any material of biological origin containing functional units of heredity that possesses actual or potential value.

- **Indigenous Data Sovereignty (ID-S)**: The inherent right of Indigenous Peoples to govern the collection, ownership, application, and use of data regarding their people, lands, and resources, founded upon the principle of permanent sovereignty over natural resources.

- **Living Modified Organism (LMO)**: Any living organism that possesses a novel combination of genetic material obtained through the application of modern biotechnology, such as CRISPR-Cas9 genome engineering.

- **Mutually Agreed Terms (MAT)**: Contractual agreements negotiated between a provider of genetic resources and a user to establish the specific conditions for access and the fair and equitable sharing of benefits arising from their utilization.

- **Prior Informed Consent (PIC)**: A non-derogable legal condition for access to genetic resources, mandating that clear and unambiguous authorization from the provider State must precede any access or utilization.

- **Traditional Knowledge (TK)**: The collective knowledge, innovations, and practices of indigenous and local communities that are developed, sustained, and passed on from generation to generation, often providing the roadmap for the scientific utilization of biodiversity.

CHAPTER II

THE PHENOMENON OF DIGITAL BIOPIRACY

This chapter examines the economic and legal shift from tangible bioprospecting to the "dematerialization" of genetic resources. It explores how advanced technologies like AI and CRISPR facilitate the utilization of genetic data in a legal vacuum, bypassing traditional Access and Benefit-Sharing (ABS) mechanisms.

2.1 From Physical Specimens to Digital Sequence Information

The traditional paradigm of bioprospecting and international environmental law was constructed around the tangibility of biological material.[20] Under the original framework of the Convention on Biological Diversity (CBD) and the Nagoya Protocol (NP), a genetic resource was considered inseparable from its physical carrier. This tethering was absolute. Whether the material in question was a leaf, a vial of venom, or a tissue sample, the legal identity of the resource remained bound to its tangible form. It's precisely this historical reliance on physicality that now complicates modern regulation. As the value of biological assets increasingly resides in data rather than matter, the traditional legal focus on tangible specimens has become an obstacle to effective governance.

Consequently, the established protocols were designed for a world where access necessitated a physical transfer which is a premise that no longer holds true in an era of digital sequencing. The shift is fundamental. Because the law was built to regulate the movement of matter, it's now struggling to address a reality where biological value is transmitted as data rather than through a tangible exchange. We're effectively operating with a regulatory framework that stops at the border, while the resources it's meant to protect have already moved online.[21]

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[20] T. Greiber, et. al., *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. IUCN Environmental Policy and Law Paper No. 83. Gland, Switzerland: IUCN, ¶¶3–5, 25

[21] W. Houssen, et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use*. (CBD/DSI/AHTEG/2020/1/3). Montreal: SCBD, pp. 1, 10,; Rohden, F., Huang, S., Dröge, G., & Scholz, A. H. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability*. (CBD/DSI/AHTEG/2020/1/4). Montreal: SCBD, ¶3–14

This physical specimen model enabled provider States to exercise their sovereign rights by regulating the movement of tangible material across borders. It was a straightforward mechanism. By controlling physical access, the State could condition utilization upon the issuance of permits and the formal negotiation of Prior Informed Consent (PIC) and Mutually Agreed Terms (MAT). Consequently, sovereignty was anchored to the ability to intercept a physical object at the frontier. The traditional framework ensured that the State's authority remained absolute so long as the genetic resource was inseparable from its biological carrier.[22]

However, the rapid advancement of genomics and bioinformatics has triggered the "dematerialization" of genetic resources.[23] Through modern biotechnology, a physical specmen is no longer the endpoint of research but merely the starting point for sequencing.[24]

The shift begins with the extraction of DNA or RNA from a physical specimen. Using high-throughput sequencing technologies, the biochemical compostion of the organism is transcribed into Digital Sequence Information (DSI).[25]

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[22] Secretariat of the Convention on Biological Diversity. (2002). *Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization*. Montreal: SCBD, ¶¶7, 10, 42

[23] W. Houssen, et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, ¶¶31, 36; F. Rohden, et al., *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, ¶¶2, 15–16

[24] Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2), ¶¶9, 12; World Intellectual Property Organization. (2001). *Matters Concerning Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore – An Overview* (WIPO/GRTKF/IC/1/3), ¶6–7

[25] W. Houssen, et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, ¶¶2, 10, 21; Rohden, F., Huang, S., Dröge, G., & Scholz, A. H. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, ¶¶13–14, 41

This digital transcription transforms the "functional units of heredity" into machine-readable "A, C, G, T" codes that can be stored, duplicated, and shared instantaneously across global cloud-based databases. [26]

Once digitized, these sequences become the blueprnt for advanced technological applications, such as CRISPR-Cas9 genome engineering and synthetic biology, which no longer require the presence of the original physical material.[27]

2.2 The Dematerialization of Genetic Resources and the Nagoya Protocol Gap

The "dematerialization" of genetic resources refers to the separation of the informational value of an organism. from its physical, biological matrix. In the classical legal understanding, the genetic resource is inseparable from the tangible material be it a seed, a leaf, or any other specimen.[28] However, through the advancement of technology, that very premise is now challenged as it creates a profound shift in the existing international legal framework that only contemplates physical exchanges rather than digital downloads.

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[26] CBD, UNEP, and UNDP. 2025. *Multilateral Mechanism for the Fair and Equitable Sharing of Benefits from the Use of Digital Sequence Information on Genetic Resources: Frequently Asked Questions*.; Houssen, W., R. Sara, and M. Jaspars. 2020. *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use*. (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity; Rohden, F., S. Huang, G. Dröge, and A. H. Scholz. 2020. *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability*. (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity

[27] F. Rohden, et al., *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, ¶14; CBD, UNEP, & UNDP. (2025). *Multilateral Mechanism for the Fair and Equitable Sharing of Benefits from the Use of Digital Sequence Information on Genetic Resources: Frequently Asked Questions*, ¶2; Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, ¶¶2, 11, 21–22; Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2), ¶12

[28] M. 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* (CBD/DSI/AHTEG/2020/1/5). Montreal: Secretariat of the Convention on Biological Diversity; Convention on Biological Diversity. (1992). *Convention on Biological Diversity: Text and Annexes*. Montreal: Secretariat of the Convention on Biological Diversity; T. Greiber, et al. *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN; W. Houssen, et al. *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity

The pivot from physical bioprospecting to the utilization of Digital Sequence Information (DSI) has created a strategic vacuum.[29] What, then, incentivizes a State to develop synthetic derivatives without first seeking the Prior Informed Consent (PIC) of the state of origin? Primarily, it's the deliberate circumvention of the Nagoya Protocol's bilateral "access" requirement.[30] By converting a biological resource into digital code, the user State effectively decouples the information from its physical source.[31] This allows for downstream commercialization which is the creation of synthetic proteins or specialized enzymes, for instance, all without ever triggering the traditional benefit-sharing obligations that typically follow a physical collection.[32] It is a regulatory bypass that leaves the provider State with no legal hook into the resulting value.

Under Article 6.1 of the NP, access is generally triggered by the physical entry into a jurisdiction to collect biological samples.[33] The protocol's enforcement mechanisms, such as checkpoints. and internationally recognized certificates of compliance, are predominantly designed to track the movement of physical material across borders.[34] Consequently, when a researcher utilizes DSI obtained from a public

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[29] Greiber, T., et al. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. IUCN Environmental Policy and Law Paper No. 83. Gland, Switzerland: IUCN, ¶¶ 55, 60

[30] Secretariat of the Convention on Biological Diversity, *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources,* U.N. Doc. CBD/DSI/AHTEG/2020/1/2 (Mar. 3, 2020), ¶¶ 32, 63(iii); Secretariat of the Convention on Biological Diversity, *Fact-finding Study on How Domestic Measures Address Benefit-sharing Arising from Commercial and Non-commercial Use of Digital Sequence Information on Genetic Resources,* U.N. Doc. CBD/DSI/AHTEG/2020/1/5 (Jan. 20, 2020), ¶16

[31] Open-ended Working Group on the Post-2020 Global Biodiversity Framework, *Summary of Points from the Webinars on Policy Options and Criteria for Digital Sequence Information on Genetic Resources,* U.N. Doc. CBD/WG2020/3/INF/8 (Sept. 27, 2021), 24; Secretariat of the Convention on Biological Diversity, *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources,* U.N. Doc. CBD/DSI/AHTEG/2020/1/2 (Mar. 3, 2020), 32; Ad Hoc Open-ended Working Group on Benefit-sharing from the Use of Digital Sequence Information on Genetic Resources, *Report of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources,* U.N. Doc. CBD/WG2020/4/INF/4 (June 1, 2022), 22(b).

[32] Food and Agriculture Organization of the United Nations, *Selected Examples of Actual and Potential Applications of "Digital Sequence Information",* U.N. Doc. CBD/WG2020/3/INF/9 (Aug. 18, 2021) at 2; F. Rohden et al., *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability*, U.N. Doc. CBD/DSI/AHTEG/2020/1/4 (Mar. 2, 2020), ¶¶ 8.2, 8.4.

[33] W. Houssen, et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use*, U.N. Doc. CBD/DSI/AHTEG/2020/1/3 (Jan. 2020).; F. Rohden, et al., *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability,* U.N. Doc. CBD/DSI/AHTEG/2020/1/4 (Mar. 2, 2020); Secretariat of the Convention on Biological Diversity, *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources,* U.N. Doc. CBD/DSI/AHTEG/2020/1/2 (Mar. 3, 2020).

[34] *Ibid.*

database without ever touching the physical specimen, the traditional "access" trigger of the Nagoya Protocol is effectively bypassed.

The primary legal consequence of this gap is the erosion of the provider State's sovereign decision space.[35] Prior Informed Consent (PIC) is a non-derogable condition for access under CBD Article 15.5 and NP Article 6.1,[36] and yet these provisions are often interpreted as applying only to the intial physical collection.[37] Foreign entities may utilize the digital blueprints of Philippine endemics to conduct research and development, and create synthetic derivatives without ever seeking the consent of the Philippine government.[38]

This creates a "digital ghosting"[39] effect, where the country of origin was excluded from the benefit-sharing chain because no physical transfer occurred to trigger the standard ABS obligations.[40]

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[35] Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2), ¶¶ 32, 59; W. Houssen, et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: SCBD, ¶¶ 2, 11, 21, 31, 44.

[36] Convention on Biological Diversity. (1992). *Convention on Biological Diversity: Text and Annexes*, Art. 3, 15.1, 15.5. Montreal: Secretariat of the Convention on Biological Diversity.; 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. (2010). Art. 2, 6.1

[37] Greiber, T., et al., *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. IUCN Environmental Policy and Law Paper No. 83. Gland, Switzerland: IUCN, pp. 3–5, 65, 71..; Davis, K., & Borisenko, A. (2017). *Introduction to Access and Benefit-Sharing and the Nagoya Protocol: What DNA Barcoding Researchers Need to Know*. Pensoft Publishers, Sofia, pp. 12, 14, 19

[38] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), § 4(b), 7(e)..; Republic Act No. 9147. (2001). *Wildlife Resources Conservation and Protection Act*, § 5(a), 14

[39] Davis, K., & Borisenko, A. (2017). *Introduction to Access and Benefit-Sharing and the Nagoya Protocol: What DNA Barcoding Researchers Need to Know*. Pensoft Publishers, Sofia, pp. 12, 14, 19;

[40] Greiber, T., et al. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. IUCN Environmental Policy and Law Paper No. 83. Gland, Switzerland: IUCN, pp. 3–5.; Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2), 32, 42;Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 11, 31.; Rohden, F., et al. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, pp. 66–67

To bridge this gap, modern legal scholarship and recent international decisions, such as CBD Decision 16/2, have begun to lobby a technology-neutral interpretation of the term "genetic resource".[41] Further, the Cali Fund and the multilateral mechanism for DSI represent the first global attempts to close this loophole by imposing benefit-sharing obligations on commercial users of digital data.[42] For the Philippines, the challenge remains to harmonize national laws with these emerging international standards to ensure that digital access is treated with the same legal gravity as physical extraction.

2.3 Technological Applications: CRISPR, Synthetic Biology, and AI

The "dematerialization" of genetic resources is not mere legal theory. An array of transformative technologies that operate primarily in the digital domain drive its existence. These applications allow for the exploitation of biological value through the manipulation of Digital Sequence Information (DSI), effectively bypassing the physical checkpoints of the traditional access and benefit-sharing regime.

Several of these technological applications have gained tremendous attention and use in the biological landscape. For instance, CRISPR-Cas9 or the Clustered Regularly Interspaced Short Palindromic Repeats represents a definitive technological application of biotechnology that enables precise, targeted edits to a genome.[43] CRISPR-assisted research is inherently dependent on DSI, as the digtal sequence serves as the blueprint or roadmap for the gene-editing process. Moreover, because CRISPR can be applied to proxies or surrogate species[44] using downloaded sequence data, it allows for the utilization of a country's genetic resources without the need for physical access to the original specimen.

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[41] Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2).; Informal Co-Chairs' Advisory Group. (2022). *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* (CBD/WG2020/4/INF/4), pp. 8–11.; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, pp. 2–3

[42] Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2).; CBD, UNEP, and UNDP. (2025). *The Cali Fund: Frequently Asked Questions*

[43] W. Houssen, et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, ¶¶2, 12, 21–22

[44] IUCN Species Survival Commission (SSC). (2016). *IUCN SSC Guiding Principles on Creating Proxies of Extinct Species for Conservation Benefit*. Version 1.0. Gland, Switzerland: IUCN, pp. 1, 5–6, 10.

Another prevalent avenue is the field of Synthetic Biology recognized as further development and a new dimension of modern biotechnology that seeks to design, manufacture, and modify genetic materials.[45] This field encompasses the creation of novel combinations of genetic material, often resulting in Living Modified Organisms (LMOs) that did not previously exist in nature. Synthetic biology allows for the recreation of biochemical processes through synthetic synthesis rather than natural extraction.[46] Moreover, the highly uncertain and potentially irreversible nature of synthetic biology applications triggers heightened duty of care and the application of the Precautionary Principle under international law.[47]

Lastly, another undeniable technological source of mainstream use is AI and machine learning. These have become the primary tools for mining global databases, specifically gentic ones.[48] AI models analyze millions of DSI entries to identify specific genes responsible for high-value traits.[49] Large-scale commercial DSI users utilize AI to optimize the development of products in the pharmaceutical, agricultural, and industrial sectors.[50] As AI-driven research moves at an exponential pace, the traditional, slow-moving process of negotiating bilateral Mutually Agreed Terms (MAT) becomes

[45] Conference of the Parties to the Convention on Biological Diversity. 2016. *Decision XIII/17: Synthetic Biology*, ¶4; IUCN Species Survival Commission (SSC). 2016. *IUCN SSC Guiding Principles on Creating Proxies of Extinct Species for Conservation Benefit*. Version 1.0. Gland, Switzerland: IUCN, ¶¶4, 14.

[46] W. Houssen, et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use*. (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, ¶¶2, 21–23, 27, 51

[47] Conference of the Parties to the Convention on Biological Diversity. (2016). *Decision XIII/17: Synthetic Biology* (UNEP/CBD/COP/DEC/XIII/17).; Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/21: Synthetic Biology* (CBD/COP/16/13, p. 146).; IUCN Species Survival Commission (SSC). (2016). *IUCN SSC Guiding Principles on Creating Proxies of Extinct Species for Conservation Benefit* (Version 1.0), pp. 1, 10, 14.; UN Economic and Social Council. (2020). *General Comment No. 25 on Science and Economic, Social and Cultural Rights* (E/C.12/GC/25), paras. 56–57.; United Nations. (1992). *Rio Declaration on Environment and Development*, Principle 15.

[48] Intellectual Property Office of the Philippines. (2025). *Examination Guidelines of Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence*, pp. 1–2.

[49] Co-leads of the Informal Co-Chairs' Advisory Group. (2022). *Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources* (CBD/WG2020/4/INF/4), pp. 3–10.

[50] Co-leads of the Informal Co-Chairs' Advisory Group. (2022). *Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources* (CBD/WG2020/5/INF/1), pp. 3–11.

practically impossible, reinforcing the need for multilateral mechanisms like the Cali Fund.[51]

The convergence of these three avenues create a technological pincer move against biological sovereignty.[52] In the domestic context, the exposure Philippine natural heritage to the probability of its coversion to a digital asset that can be edited, synthesized, and mined by AI, these technologies finalize the "dematerialization" of biodiversity,[53] making the enactment of a digital-first protective framework imperative.[54]

CHAPTER III

VULNERABILITY OF PHILIPPINE ENDEMIC SPECIES

Utilizing a case-study approach, this chapter focuses on the Waling-Waling (*Vanda sanderiana*) and the Magician's Cone Snail (*Conus magus*). To appreciate the gravity of digital biopiracy, one must distinguish between routine selective breeding and the outright appropriation of unique genetic identities.

Consider, for example, the cross-breeding of a canine breed native to China with one from the United Kingdom to produce a hybrid; such an act rarely, if ever, incites public clamor regarding the dissolution of national heritage. This is largely because

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[51] CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, pp. 2–3.; Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2), pp. 11, 22

[52] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 11, 21–22, 31.; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, pp. 2–3.

[53] Republic Act No. 9147. (2001). *Wildlife Resources Conservation and Protection Act*, §§ 5(i), 14.; Rohden, F., et al. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 41, 61.

[54] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 2, 4(b), 7(e), 14

domestic animals are typically regarded as private property or shared cultural commodities. Why, then, does the calculus shift so dramatically when discussing the Philippine *waling-waling* orchid or the *Conus* snail?

The distinction lies in the concepts of endemism and biochemical uniqueness. The *waling-waling* and the *Conus* are far more than mere aesthetic assets. Rather, they serve as repositories for specfic biochemical sequences that evolved exclusively within the Philippine archipelago. When these sequences are "digitally ghosted," the State of origin is effectively stripped of its sovereign right to the economic and scientific potential of a resource that exists nowhere else on Earth. It is this unique evolutionary signature that transforms a biological specimen into a matter of national sovereignty.

Jurisdictions such as Namibia[55] have already taken the significant step of explicitly prohibiting the unauthorized upload of Digital Sequence Information (DSI) to public repositories like GenBank. This regulatory stance is driven primarily by acute concerns over the "loss of control and unauthorized commercial use" of national biological assets. It is a pragmatic, albeit defensive, posture.[56] Without a robust mechanism to tether DSI back to its country of origin, a State effectively forfeits its capacity to secure the "fair and equitable" monetary and scientfic benefits mandated by international law. This is particularly problematic for resources unique to a specific geography; once the data is decoupled from its territorial source, the State's leverage in negotiating the resulting scientific dividends evaporates.

3.1 Case Study: The Waling-waling and Digital Hybridization

The Waling-Waling (*Vanda sanderiana*) is uniquely vulnerable to digital hybridization due to its extreme endemicity to Mindanao and its immense commercial

[55] Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2), ¶¶ 32, 59(b); M. 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*. Montreal, U.N. Doc. CBD/DSI/AHTEG/2020/1/5 (2020), ¶¶ 16, 190, 3.2.1, 3.2.2.

[56] Ad Hoc Technical Expert Group on Digital Sequence Information on Genetic Resources, *Study on the Concept and Scope of Digital Sequence Information on Genetic Resources and How Digital Sequence Information is Currently Used,* U.N. Doc. CBD/DSI/AHTEG/2020/1/3 (2020), ¶¶ 14, 5.3.; Biological Diversity Act, 2002, § 2(f) (India).

value in the multi-billion dollar global floriculture market.[57] As a species with highly prized traits such as its massive bloom size and distinct tessellated patterns it is a primary target for digital prospecting.[58] Because its genetic sequences are increasingly available in open-access databases, foreign entities can analyze and mine the specific genes responsible for these aesthetic qualities without ever conducting physical bioprospecting on Philippine soil. This dematerialization allows the Waling-Waling's biological value to be extracted as a digital asset, making it the prototypical victim of a system where informational value is separated from the physical organism.[59]

The technical mechanism of digital hybridization exploits a critical materiality gap in current Philippine laws like the Wildlife Act or Republic Act No. 9147,[60] which primarily regulate the movement of tangible biological material.[61] By using Digital Sequence Information (DSI) and technologies like CRISPR, international breeders can paste the *Waling-Waling*'s characteristic genes into other orchid species to create high-value synthetic hybrids in laboratories abroad.[62] This process effectively "ghosts" the Philippines from the value chain, as the utilization occurs entirely in the digital domain, bypassing traditional requirements for Prior Informed Consent (PIC) and Mutually Agreed Terms (MAT).[63] Consequently, the *Waling-Waling* serves as a critical

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[57] Almontero, C. C., et al., Fingerprinting of Philippine Waling-Waling (*Vanda sanderiana* Rchb.f.) Accessions Using Simple Sequence Repeat (SSR) Markers. *Philippine Journal of Crop Science*, 47(2), 1–17

[58] *Ibid.*

[59] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 31, 36.; Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2). Montreal: SCBD, paras. 32, 42, 60.; Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), § 4.

[60] Republic Act No. 9147, "Wildlife Resources Conservation and Protection Act," § 5, 14 (2001) (Phil.).

[61] Almontero, C. C., Lalusin, A. G., Diaz, M. G. Q., Ocampo, E. T. M., & Hernandez, J. E. (2022). Fingerprinting of Philippine Waling-Waling (*Vanda sanderiana* Rchb.f.) Accessions Using Simple Sequence Repeat (SSR) Markers. *Philippine Journal of Crop Science*, 47(2), 1–17

[62] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 14, 21–22, 31

[63] Bagley, M., Karger, E., Ruiz Muller, M., Perron-Welch, F., & Thambisetty, S. (2020). *Fact-finding Study on How Domestic Measures Address Benefit-sharing Arising from Commercial and Non-commercial Use of Digital Sequence Information on Genetic Resources...* (CBD/DSI/AHTEG/2020/1/5). Montreal: Secretariat of the Convention on Biological Diversity, pp. 10, 26, 29.; Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2). Montreal: SCBD, paras. 32, 59

test case for why the legal definition of "genetic resources" must be expanded to include digital blueprints to prevent the sovereign loss of national natural heritage.[64]

3.2 Case Study: The Magician's Cone Snail and Peptide Sequencing

The Magician's Cone Snail (Conus magus) is selected as a secondary case study because it exemplifies the "financalization" of Philippine biochemical derivatives within the global pharmaceutical sector.[65] Its primary vulnerability stems from complex venom, which contains peptides that possess high potential value as functional units for powerful analgesic drugs.[66] This species is a prototypical basis for the dematerialization of genetic resources because its biological value scientifically flows from the physical organism into digital data via peptide sequencing.[67] By transcribing the snail's biochemical composition into Digital Sequence Information (DSI), foreign entities can utilize the resource's "functonal units of heredity" as a digital asset, thereby decoupling the economic value from the physical presence of the snail in Philippine waters.

The utilization of the Conus magus through peptide sequencing also highlights a critical materiality gap in existing Philippine environmental laws which are built on the premise of physical access.[68] Through modern biotechnology, researchers can sequence

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[64] Philippine House of Representatives, 18th Congress, 3rd Regular Session, House Bill No. 9143: *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources* ("PGRABS Act"), § 1, 2, 4(b), 7(e).

[65] Almontero, C. C., Lalusin, A. G., Diaz, M. G. Q., Ocampo, E. T. M., & Hernandez, J. E. (2022). Fingerprinting of Philippine Waling-Waling (*Vanda sanderiana* Rchb.f.) Accessions Using Simple Sequence Repeat (SSR) Markers. *Philippine Journal of Crop Science*, 47(2), 1–17; CBD, UNEP, & UNDP. (2025). *Multilateral Mechanism for the Fair and Equitable Sharing of Benefits from the Use of Digital Sequence Information on Genetic Resources: Frequently Asked Questions*, pp. 2–3

[66] Davis, K., & Borisenko, A. (2017). *Introduction to Access and Benefit-Sharing and the Nagoya Protocol: What DNA Barcoding Researchers Need to Know*. Pensoft Publishers, Sofia, pp. 12–14; Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 10–11, 31, 36

[67] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), § 2, 4(i), 4(j); Ramiro, I. B. L., et al. (2022). Somatostatin venom analogs evolved by fish-hunting cone snails: From prey capture behavior to identifying drug leads. *Science Advances*, 8(12), eabk1410; Rohden, F., et al. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, pp. 13–14, 66–67; World Intellectual Property Organization. (2001). *Matters Concerning Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore – An Overview* (WIPO/GRTKF/IC/1/3), pp. 4, 34.

[68] Republic Act No. 9147. (2001). *Wildlife Resources Conservation and Protection Act*

the snail's venom-peptides and upload resulting DSI to global databases,[69] effectively bypassing the Prior Informed Consent (PIC) requirements mandated by the Nagoya Protocol. This digital transcription allows for the synthetic manufacture of pharmaceutical products abroad without triggerng national Access and Benefit-Sharing (ABS) mechanisms, as the DSI acts as the definitive "technological application" for the synthesis process.[70] Consequently, the Conus magus serves as a benchmark for why the legal definition of genetic resources must be expanded to include digital blueprints to prevent the digital ghosting of the country of origin in the commercialization of its unique biochemical heritage.[71]

CHAPTER IV

INDIGENOUS DATA SOVEREIGNTY

This chapter delves into the rights of Indigenous Peoples over their traditional knowledge and biologcal data. It introduces Biocultural Labels as a machine-readable legal shield, and pushes for a move toawrd the CARE Principles which are Collective Benefit, Authority to Control, Responsibility, and Ethics in management of Philippine DSI.

The contemporary international landscape is defined by a profound technological asymmetry. There is a widening, perhaps even structural, disparity between high-income nations armed with sophisticated genetic engineering and **CRISPR** capabilities and biodiversity-rich, low-income countries that lack the requisite infrastructure to sequence or synthesize their own biological assets. It is a lopsided

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[69] Bagley, M., Karger, E., Ruiz Muller, M., Perron-Welch, F., & Thambisetty, S. (2020). *Fact-finding Study on How Domestic Measures Address Benefit-sharing Arising from Commercial and Non-commercial Use of Digital Sequence Information on Genetic Resources...* (CBD/DSI/AHTEG/2020/1/5). Montreal: Secretariat of the Convention on Biological Diversity; Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity

[70] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*; Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143)

[71] Ramiro, I. B. L., Bjørn-Yoshimoto, W. E., Imperial, J. S., Gajewiak, J., et al. (2022). Somatostatin venom analogs evolved by fish-hunting cone snails: From prey capture behavior to identifying drug leads. *Science Advances*, 8(12), eabk1410; Republic Act No. 9147. (2001). *Wildlife Resources Conservation and Protection Act*; Rohden, F., Huang, S., Dröge, G., & Scholz, A. H. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity.

exchange. While the latter provide the raw genetic data that serves as the primary engine for innovation, the former possess the specialized digital tools necessary to refine that data into high-value commercial products.

Without a robust multilateral mechanism such as the **Cali Fund**, this dynamic risks regressing into a neo-colonial model. In such a scenario, biodiversity-rich nations are relegated to being mere "providers" of information, systematically excluded from the technological and financial rewards of the burgeoning digital bio-economy. It is precisely this risk that necessitates a transition toward more equitable benefit-sharing frameworks. More so, where indigenous peoples directly tied to the resource are involved.

4.1 The Principle of Permanent Sovereignty over Natural Resources

The principle of Permanent Sovereignty over Natural Resources is a cornerstone of international law, affirming that the authority to determine access to genetic resources rests exclusively with national governments.[72] This principle is recognized as a settled rule of customary international law and is explicitly codified in Article 15.1 of the Convention on Biological Diversity (CBD).[73] Sovereignty over natural resources is considered a core component of a State's territorial sovereignty, granting it the substantive right to regulate, manage, or even prohibit access to its biological wealth through national legislation.[74]

In the digital era, this sovereign right remains the foundational legal basis for requiring Prior Informed Consent (PIC) before the utilization of any genetic material or its digital derivatives.[75] As the country of origin, the Philippines maintains exclusive authority to grant or refuse access to genetic resources recovered from *in-situ* conditions within its territory, regardless of whether the resource is accessed in its

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[72] Sands, P., Peel, J., Fabra, A., & MacKenzie, R. (2018). *Principles of International Environmental Law* (4th ed.). Cambridge: Cambridge University Press, pp. 12, 201–203.

[73] Convention on Biological Diversity. (1992). *Convention on Biological Diversity: Text and Annexes*, Art. 3, 15(1). Montreal: Secretariat of the Convention on Biological Diversity; Davis, K., & Borisenko, A. (2017). *Introduction to Access and Benefit-Sharing and the Nagoya Protocol: What DNA Barcoding Researchers Need to Know*. Pensoft Publishers, Sofia, p. 11

[74] Greiber, T., Peña Moreno, S., Åhrén, M., Nieto Carrasco, J., Chege Kamau, E., Cabrera Medaglia, J., Oliva, M. J., & Perron-Welch, F. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN, pp. 3–5, 31, 93–95; *Supra* 66.

[75] Convention on Biological Diversity. (1992). *Convention on Biological Diversity: Text and Annexes*. Montreal: Secretariat of the Convention on Biological Diversity, Art. 3, 15.1, 15.5.; Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. (2010). Art. 6.1.

physical form or as Digital Sequence Information (DSI).[76] This sovereignty empowers the State to ensure that all biological and genetic assets are utilized in a manner consistent with the common good, thereby protecting the nation's natural heritage from unauthorized digital exploitation.[77]

4.2 Traditional Knowledge as the "Metadata" of Biodiversity

Traditional Knowledge is conceptually framed as the "metadata" of biodiversity, providing the cultural and informational context that renders biological resources scientifically and commercially legible.[78] Rather than being mere secondary information, TK acts as an informational roadmap that guides researchers toward the specific biochemical or genetic traits of an organism, such the medicinal properties or unique venom-peptides found in endemic species.[79] This informational flow from the physical genetic resource to digital data signifies that TK is an integral component of the biotechnology process, as it often identifies the potential value of genetic material long before it is transcribed into Digital Sequence Information (DSI).[80] Consequently, TK constitutes the indispensable narrative that transforms raw biological matter into a high-value biotechnological asset.[81]

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[76] Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2), Preamble, Annex para. 1, 26.; Greiber, T., Peña Moreno, S., Åhrén, M., Nieto Carrasco, J., Chege Kamau, E., Cabrera Medaglia, J., Oliva, M. J., & Perron-Welch, F. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN, pp. 31, 93–95.

[77] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), § 2, 4, 7(e).; Republic Act No. 9147. (2001). *Wildlife Resources Conservation and Protection Act*, § 2.

[78] Greiber, T., Peña Moreno, S., Åhrén, M., Nieto Carrasco, J., Chege Kamau, E., Cabrera Medaglia, J., Oliva, M. J., & Perron-Welch, F. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN, p. 31

[79] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 31, 44; Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, p. 12

[80] Ramiro, I. B. L., et al. (2022). Somatostatin venom analogs evolved by fish-hunting cone snails: From prey capture behavior to identifying drug leads. *Science Advances*, 8(12), eabk1410

[81] Secretariat of the Convention on Biological Diversity. (2020). *Report of the Ad Hoc Technical Expert Group on Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/7). Montreal: SCBD, pp. 8–9.

In the digital era, the preservation of TK is severely threatened by "digital ghosting," a phenomenon where indigenous communities are left out from the utilization of the biological data they helped identify and preserve for generations.[82] When genetic sequences are uploaded to global databases without acknowledging or tagging the associated TK, the sovereign decision space of indigenous peoples is effectively erased, leading to a violation of the right to Prior Informed Consent (PIC) under the Nagoya Protocol.[83] Because DSI scientifically flows from the genetic resource through DNA, RNA, and proteins, any commercialization of these digital blueprints without honoring the underlying cultural metadata constitutes an internationally wrongful act that undermines the fair and equitable sharing of benefits.[84] Therefore, protecting TK as a form of "Indigenous Data" is essential to ensuring that the monetization of biotechnological products results in meaningful returns to the communities of origin under mechanisms like the Cali Fund.[85]

4.3 Biocultural Labels: A Machine-Readable Defensive Mechanism

Biocultural Labels are machine-readable metadata tags designed to permanently link Digital Sequence Information (DSI) to the sovereign authority and traditional knowledge (TK) of its community of origin.[86] This system addresses the materiality gap by ensuring that as biological value scientifically flows from physical specimen into digital string of "A, C, G, T" codes, the associated legal and ethical protocols travel with it.[87] Unlike static copyright symbols, these labels are embedded in the digital metadata of the sequence file itself, serving as a persistent digital paper trail that

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[82] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 11, 21–22, 31

[83] Rohden, F., et al. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 41, 66–67

[84] Greiber, T., et al. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN, pp. 31, 93–95, 109, 137;Secretariat of the Convention on Biological Diversity. (2020). *Synthesis of Views and Information Related to Digital Sequence Information on Genetic Resources* (CBD/DSI/AHTEG/2020/1/2). Montreal: SCBD, paras. 32, 42, 59

[85] Co-leads of the Informal Co-Chairs' Advisory Group. (2022). *Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources* (CBD/WG2020/4/INF/4). Montreal: SCBD, pp. 3, 5, 8.; Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2).; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, pp. 2–3.; International Law Commission. (2001). *Draft Articles on Responsibility of States for Internationally Wrongful Acts*, Art. 1, 31.

[86] Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2)

[87] Co-leads of the Informal Co-Chairs' Advisory Group. (2022). *CO-LEADS' REPORT ON THE WORK OF THE INFORMAL CO-CHAIRS' ADVISORY GROUP ON DIGITAL SEQUENCE INFORMATION ON GENETIC RESOURCES SINCE THE THIRD MEETING...* (CBD/WG2020/4/INF/4).

informs users of the specific terms of utilization, such as non-commercial use or the requirement for a new Access and Benefit-Sharing (ABS) agreement.[88] By digitizing the informed component of Prior Informed Consent (PIC), Biocultural Labels transform the intangible rights of indigenous communities into functional, technological shields within global databases.[89]

To preserve the essence of TK within the ABS framework, the incorporation of Biocultural Labels must follow a structured tripartite procedure. First, the Philippines must establish a National Digital Registry of Traditional Knowledge, where communities can assign specific "BC Labels" to their resources before any sequencing occurs, effectively creating a capital lock on their genetic heritage.[90] Second, these labels must be integrated into the submission protocols of the Intellectual Property Office of the Philippines (IPOPHL) and the National Commission on Indigenous Peoples (NCIP), requiring any DSI-related patent applicant to disclose the digital biological origin and prove compliance with the community's labeled protocols.[91] Finally, this system must be synchronized with the global Cali Fund under CBD Decision 16/2, ensuring that the machine-readable tags trigger automatic benefit-sharing obligations when commercial entities "mine" tagged Philippine data for high-value biotechnological products.[92]

CHAPTER V

[88] Secretariat of the Convention on Biological Diversity. (2022). *CO-LEADS' REPORT ON THE WORK OF THE INFORMAL CO-CHAIRS' ADVISORY GROUP ON DIGITAL SEQUENCE INFORMATION ON GENETIC RESOURCES SINCE THE FOURTH MEETING...* (CBD/WG2020/5/INF/1)

[89] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity.

[90] Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2).; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Question;United Nations. (2017). Satellite Account on Non-profit and Related Institutions and Volunteer Work*

[91] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*.; Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources* (House Bill No. 9143)

[92] Bagley, M., et al. (2020). *Fact-finding Study on How Domestic Measures Address Benefit-sharing Arising from Commercial and Non-commercial Use of Digital Sequence Information on Genetic Resources...* (CBD/DSI/AHTEG/2020/1/5).; Co-leads of the Informal Co-Chairs' Advisory Group. (2022). *Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources* (CBD/WG2020/4/INF/4)

THE PHILIPPINE LEGAL POLICY AND FRAMEWORK

This chapter provides a critical analysis of current and pending laws, including the Intellectual Property Code or Republic Act No. 8293, the PGRABS Bill or House Bill No. 8649, and the 2025 IPOPHL AI Examination Guidelines. It evaluates the consistency of these instruments with the 2024 WIPO Treaty and the constitutional mandate of the common good.

5.1 Analysis of the PGRABS Bill or House Bill No. 9143

The Philippine Genetic Resources Access and Benefit-Sharing (PGRABS) Act,[93] currently docketed as House Bill No. 8649, represents the most comprehensive legislative attempt to modernize the Philippine regulatory landscape in response to the "dematerialization" of biological assets.[94] As the country moves toward full implementation of the 2024 WIPO Treaty, this Bill serves as the primary domestic instrument to institutionalize the Nagoya Protocol and address the burgeoning "digital biopiracy" loophole.[95]

The fundamental purpose of the PGRABS Bill is to transition from a regulatory model that is centered on physical access to a data-inclusive framework.[96] Under existing statutes like the Wildlife Act or Republic Act No. 9147, the State's authority is triggered by the physical movement of specimens.[97] The PGRABS Bill, however, expands this scope by recognizing that the potential value of Philippine natural heritage scientifically flows from the physical resource into Digital Sequence Information (DSI).[98] A salient feature of the PGRABS Bill is its reinforcement of the Prior Informed

[93] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 1, 2, 4(b), 5, 7(e), 7(g), 8, 14

[94] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 30

[95] Secretariat of the Convention on Biological Diversity. (2021). *Co-leads' Report on the Work of the Informal Co-Chairs' Advisory Group on digital sequence information on genetic resources* (CBD/WG2020/3/INF/8), p. 13.; World Intellectual Property Organization. (2024). *WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge*, Art. 1, 3.1.

[96] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 5, 7(a), 7(e), 7(g)

[97] Republic Act No. 9147. (2001). *Wildlife Resources Conservation and Protection Act*, §§ 4, 7

[98] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 31

Consent (PIC) and Mutually Agreed Terms (MAT) regime as non-derogable conditions for access.[99] The Bill clarifies the temporal mandate of "prior," insisting that authorization must precede any Research and Development (R&D) activity, thereby preventing researchers from seeking "post-facto" consent after a digital sequence has already been utilized.[100] Consistent with the "informed" standard, the Bill requires applicants to provide full disclosure regarding the purpose, scope, and foreseeable commercial applications of the research.[101] This prevents the unilateral "repurposing" of simple academic loans into high-stakes commercial or pharmaceutical projects.[102]

Additionally, the most significant difference from earlier environmental laws introduced in the PGRABS Bill's is the shift toward the criminalization of biopiracy.[103] Unlike the administrative fines found in the IP Code or Republic Act No. 8293, the Bill proposes prison sentences and substantial penalties for the unauthorized utilization of Philippine DSI.[104] This move is a valid exercise of the State's police power, justified by the constitutional mandate to protect and utilize natural resources for the common good and to regulate monopolies that cease to serve the public interest.[105] By criminalizing unauthorized digital access, the Bill provides the legal basis for the Philippines to invoke international responsibility under the ARSIWA when foreign entities fail to ensure that resources utilized in their jurisdiction were accessed according to Philippine domestic law.[106]

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[99] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. (2010), Art. 5.1, 6.1, 6.3.; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, p. 2

[100] World Intellectual Property Organization. (2024). *WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge*, Art. 3.1

[101] *Supra* 93.

[102] CITES. (1985). *Resolution Conf. 5.10 (Rev. CoP19): Definition of 'primarily commercial purposes'*, Annex b.

[103] 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. (2010), Art. 15.1.; Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 2, 4(b), 14.; UN Economic and Social Council. (2020). *General Comment No. 25 on Science and Economic, Social and Cultural Rights* (E/C.12/GC/25), para. 62.

[104] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*

[105] Phil. Const. art. XII, §§ 1, 11, 19 (1987); Greiber, T., S. Peña Moreno, M. Åhrén, J. Nieto Carrasco, E. Chege Kamau, J. Cabrera Medaglia, M. J. Oliva, & F. Perron-Welch. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN, pp. 159–160

[106] International Law Commission. (2001). *Draft Articles on Responsibility of States for Internationally Wrongful Acts*. (A/56/10)

Finally, the PGRABS Bill recognizes the symbiotic relationship between biodiversity and Traditional Knowledge.[107] It seeks to formalize the role of the National Commission on Indigenous Peoples (NCIP) in the ABS process, ensuring that the ”metadata” of biodiversity which is the knowledge that identifies the potential value of a resource is protected as a sovereign digital asset.[108] This alignment is critical for the implementation of Biocultural Labels, providing a machine-readable mechanism to track benefit-sharing obligations from the lab to the global Cali Fund.[109]

5.2 The 2024 WIPO Treaty and Mandatory Disclosure Requirements

The WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge, adopted on May 24, 2024, marks a historic shift in the global intellectual property architecture by establishing a formal bridge between patent law and the Access and Benefit-Sharing (ABS) regime.[110] This treaty is the first international IP instrument to recognize the rights of Indigenous Peoples and local communities over their genetic resources and associated traditional knowledge within the patent system.[111] For the Philippines, as a megadiverse nation and a signatory, the treaty provides a powerful multilateral mandate to enforce transparency at the point of patent application, serving as a critical defensive tool against the “digital ghosting” of its biological heritage.[112]

The meat of the treaty is the Mandatory Disclosure Requirement (MDR), which compels patent applicants to disclose the country of origin or the source of genetic

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[107] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 1, 4, 6, 7, 8, 12, 14

[108] Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2), paras. 2, 21, 25, Annex para. 10(c); CBD, UNEP, & UNDP. (2025). *Multilateral Mechanism for the Fair and Equitable Sharing of Benefits from the Use of Digital Sequence Information on Genetic Resources: Frequently Asked Questions*, pp. 2–3

[109] Co-leads of the Informal Co-Chairs’ Advisory Group. (2022). *Report on the Work of the Informal Co-Chairs’ Advisory Group on Digital Sequence Information on Genetic Resources since the Third Meeting...* (CBD/WG2020/4/INF/4), pp. 3–5, 8; Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 31–33.

[110] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, p. 1

[111] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 4(b), 7(e), 7(g)

[112] World Intellectual Property Organization (WIPO). (2024). *WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge*. Geneva: WIPO, Art. 1, 3.1, 3.2.

resources if the claimed invention is based on those resources.[113] This requirement is intended to operationalize the "informed" component of Prior Informed Consent (PIC) by ensuring that the patent office, and by extension the provider State, is made aware of the utilization of its natural assets.[114] Within the Philippine legal setting, the MDR acts as a transparency filter that prevents researchers from repurposing genetic data without authorization, effectively forcing a digital paper trail for inventions derived from endemic species.[115]

In the context of Digital Sequence Information (DSI), the MDR is interpreted as an essential mechanism to close the dematerialization loophole.[116] If an invention, such as a synthetic peptide or a genetically modified proxy, is developed using the digital blueprints of a Philippine resource, the source of the information must be disclosed under the treaty's disclosure mandate.[117] This requirement aligns with the constitutional principle of the Common Good,[118] as it ensures that the privatization of biological innovation through patents does not occur at the expense of national sovereignty or the equitable sharing of benefits. By harmonizing the Intellectual Property Code or Republic Act No. 8293 with this WIPO standard, the Philippines can effectively transform the patent system from a potential venue for biopiracy into a robust mechanism for biological accountability.[119]

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[113] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, pp. 1, 3, 5, 7–8, 12

[114] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. (2010), Art. 6.3, 17; Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), § 4(b), 7(a), 7(e), 14

[115] Almontero, C. C., et. al., Fingerprinting of Philippine Waling-Waling (*Vanda sanderiana* Rchb.f.) Accessions Using Simple Sequence Repeat (SSR) Markers. *Philippine Journal of Crop Science*, 47(2), 1–17; Ramiro, I. B. L., et al. (2022). Somatostatin venom analogs evolved by fish-hunting cone snails: From prey capture behavior to identifying drug leads. *Science Advances*, 8(12), eabk1410; World Intellectual Property Organization (WIPO). (2024). *WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge*, Art. 1, 2, 3.1.

[116] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, pp. 1, 3, 5, 7–8

[117] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 2, 4(b), 7(e)

[118] World Intellectual Property Organization. (2024). *WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge*, Art. 1, 2, 3.1, 8.; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, p. 2.

[119] Houssen, W., et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 11, 31.; Greiber, T., et al. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN, pp. 31, 93–95.

5.3 The 2025 IPOPHL AI Examination Guidelines

In late 2025, the Intellectual Property Office of the Philippines (IPOPHL) issued Memorandum Circular No. 2025-022, titled the Examination Guidelines for Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence.[120] These guidelines were established to keep up with the 800% increase in generative AI-related filings and to provide a clear technical framework for patent examiners.[121] While the guidelines successfully clarify the boundaries of patentable subject matter and the exclusion of AI as an inventor, they present a significant "grey zone" regarding the novelty of the data used to train these language learning machine models especially when such data is derived from the Philippines' unique genetic resources.[122]

A salient feature of the said guidelines is the explicit requirement that an inventor must be a natural person. The guidelines state that AI systems lack civil personality and juridical capacity.[123] Hence, the individual who directs the creative input or provides the technical solution remains the proper inventor. In the context of digital biopiracy, this rule allows a human researcher in a foreign jurisdiction to be named as the sole inventor of a thing derived from Digital Sequence Information (DSI) even if the critical inventive step was achieved by an AI model trained exclusively on the use of Digital Sequence Information (DSI).[124]

Moreover, the guidelines categorize AI-related inventions into "Core AI" and "Applied AI," focusing heavily on the enablement and disclosure of the model's

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[120] Intellectual Property Office of the Philippines. (2025). *Examination Guidelines of Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence*, pp. 1–3, 14–15, 18–20, 29–30

[121] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, pp. 1, 12.

[122] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources* (House Bill No. 9143), §§ 4(b), 7(e).; Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 31.

[123] Intellectual Property Office of the Philippines. (2025). *Examination Guidelines of Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence*, pp. 1, 3, 14–15, 17, 19

[124] Secretariat of the Convention on Biological Diversity, *CO-LEADS' REPORT ON THE WORK OF THE INFORMAL CO-CHAIRS' ADVISORY GROUP ON DIGITAL SEQUENCE INFORMATION ON GENETIC RESOURCES SINCE THE THIRD MEETING...* U.N. Doc. CBD/WG2020/4/INF/4 (2020), pp. 3–4, 7–8.

function.[125] Applicants must provide sufficient detail to enable a skilled person to reproduce the AI's technical effect or technical solution. However, the guidelines currently focus on the structure of the neural network and the algorithm rather than the legal origin of the training datasets. For a biotechnological AI application, the training data is often DSI which are the digital blueprints of genetic resources.[126] Without an explicit link to the Mandatory Disclosure Requirement (MDO) of 2024 WIPO Treaty, an applicant can disclose the "how" of the AI model while completely "ghosting" the "where" of the genetic data that made the invention possible.[127]

To bridge this gap, the IPOPHL guidelines must be harmonized with the PGRABS Bill. Specifically, the disclosure of training data[128] required for AI patents should be expanded to include a mandatory check against the NCIP's Indigenous Knowledge Systems and Practices (IKSP) Registry. If an AI-trained invention is based on Philippine biodiversity, the examiner should be empowered to require proof of Prior Informed Consent (PIC) for the DSI used, ensuring that endemic species are not effectively privatized through a digital backdoor.[129]

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[125] Intellectual Property Office of the Philippines. (2025). *Examination Guidelines of Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence*, pp. 1, 3, 9–11, 29–31

[126] CBD, UNEP, & UNDP. (2025). *Multilateral Mechanism for the Fair and Equitable Sharing of Benefits from the Use of Digital Sequence Information on Genetic Resources: Frequently Asked Questions*, p. 2.; Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 28, 31, 35

[127] World Intellectual Property Organization. (2024). *WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge*, Art. 1, 3.1.

[128] Intellectual Property Office of the Philippines. (2025). *Examination Guidelines of Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence*, pp. 1, 19, 29–31; Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 4(b), 7(e), 7(g), 8, 12, 14; Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, pp. 1, 8, 12

[129] Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 31; CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, p. 2; Co-leads of the Informal Co-Chairs' Advisory Group. (2022). *Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources since the Third Meeting...* (CBD/WG2020/4/INF/4), pp. 3–4, 7–8.

CHAPTER VI

BRIDGING THE REGULATORY GAP

This chapter synthesizes the findings to propose a harmonized regulatory path for the NCIP, DENR, and IPOPHL. It assesses whether the criminalization of biopiracy under the PGRABS Act is not constitutionally infirm on the exercise of Police Power to deter international digital theft.

6.1 Harmonizing IPOPHL Patent Doctrines with the NCIP Protective Mandates

The harmonization of the Intellectual Property Office of the Philippines (IPOPHL) patent doctrines with the protective mandates of the National Commission on Indigenous Peoples (NCIP) is a constitutional necessity grounded in the principle of the Common Good.[130] Currently, a structural tension exists where IPOPHL's mission to promote innovation through the patent system operates independently of the NCIP's duty to safeguard Indigenous Knowledge Systems and Practices (IKSP) and ensure Free and Prior Informed Consent (FPIC).[131] This study argues that a legislative franchise or a patent grant is not an absolute property right but a privilege burdened with public interest conditions subject to the State's Police Power.[132] Hence, the IPOPHL must shift from a purely technical examination of patentability involving novelty, inventive step, and industrial applicability, into a holistic review that includes the verification of the legal source of biological and digital assets.

To effectively bridge this gap, the Mandatory Disclosure Requirement (MDR) established by the 2024 WIPO Treaty must be integrated into the Joint Administrative Orders governing IPOPHL and NCIP.[133] By mandating that any patent application based on Philippine genetic resources or associated traditional knowledge must include a certificate of FPIC from the NCIP, the State then creates a transparency filter against

[130] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, pp. 1, 8, 12.

[131] Intellectual Property Office of the Philippines. (2025). *Examination Guidelines of Inventions, Utility Model, and Industrial Design Applications Relating to Artificial Intelligence*, pp. 14–15, 18.

[132] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 2, 4(b), 6, 7(a), 7(e), 7(g), 7(h), 12.

[133] World Intellectual Property Organization. (2024). *WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge*.

digital biopiracy.[134] This procedural integration ensures that as biological value scientifically flows from a physical resource into Digital Sequence Information (DSI), the sovereign rights of indigenous communities accompany the data Ultimately, this harmonization transforms the patent system into a defensive mechanism that prevents "digital ghosting," ensuring that the privatization of innovation does not occur at the expense of the nation's natural and cultural heritage.[135]

6.2 The Cali Fund and the Future of Benefit-Sharing in the Philippines

The establishment of the Cali Fund under CBD Decision 16/2 represents a transformative shift in the global governance of Digital Sequence Information (DSI), moving from a fragmented bilateral system to a centralized multilateral mechanism for benefit-sharing.[136] For the Philippines, this fund serves as the primary international vehicle to ensure that high-revenue commercial entities especially in the biotechnology, pharmaceutical, and agricultural sectors contribute to the conservation of the very biodiversity they utilize digitally.[137] The fund is designed to compel those "profiting from nature" to provide fair and equitable returns, thereby addressing the "digital ghosting" of provider countries in the global value chain. By establishing clear financial thresholds, the Cali Fund creates a predictable benchmark for identifying liable users whose revenue generation from DSI triggers mandatory contributions.[138]

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[134] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*; National Commission on Indigenous Peoples. (1998). *Rules and Regulations Implementing Republic Act No. 8371, Otherwise Known as "The Indigenous Peoples' Rights Act of 1997"* (NCIP Administrative Order No. 1, s. 1998); Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143)

[135] Houssen, W., et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity

[136] Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2), paras. 1–3, Annex paras. 3, 17–20, 23, Enclosure I, II

[137] CBD, UNEP, & UNDP. (2025). *Multilateral Mechanism for the Fair and Equitable Sharing of Benefits from the Use of Digital Sequence Information on Genetic Resources: Frequently Asked Questions*, pp. 2–3; Conference of the Parties to the Convention on Biological Diversity. (2025). *Report of the Conference of the Parties on its Sixteenth Meeting* (CBD/COP/16/13), Decision 16/28, Table 4, 7.

[138] Secretariat of the Convention on Biological Diversity. (2025). *Terms of Reference of the Cali Fund* (MMDSI/SC/2025/1/2), Annex paras. I, II, III.; Co-leads of the Informal Co-Chairs' Advisory Group. (2022). *Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources since the Third Meeting...* (CBD/WG2020/4/INF/4), para. 20, 26.; Co-leads of the Informal Co-Chairs' Advisory Group. (2022). *Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources since the Fourth Meeting...* (CBD/WG2020/5/INF/1), paras. 16, 39, 41, 44

In the Philippine context, the future of digital benefit-sharing depends on the state's ability to assert its status as a "provider of genetic resources" within this multilateral framework.[139] This assertion is grounded in the constitutional mandate of the Common Good, which dictates that the privatization of biological innovation must not occur at the expense of national sovereignty or social justice.[140] To operationalize this, the proposed PGRABS Act must interface directly with the Cali Fund's terms of reference, ensuring that a significant portion of the allocated benefits is directed toward the National Commission on Indigenous Peoples (NCIP) and local conservation projects. Furthermore, the Philippines should leverage its Police Power to require that any commercial entity operating within its jurisdiction can demonstrate compliance with these global benefit-sharing obligations.[141] Ultimately, the Cali Fund offers a path to reconcile the natural monopoly of high-tech innovation with the equitable distribution of opportunities, ensuring that the digital blueprints of species endemic to the State contribute to the sustained growth of the nation.

6.3 Criminalization vs. Administrative Regulation of Digital Biopiracy

The debate between the criminalization and administrative regulation of biopiracy centers on the adequacy of the State's mechanism to deter high-value digital exploitation. Currently, the Philippine legal system relies heavily on administrative fines under the Wildlife Act or Republic Act No. 9147 and civil remedies within the Intellectual Property Code or Republic Act No. 8293 to penalize the unauthorized utilization of genetic resources.[142] However, this study argues that for digital biopiracy,

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[139] Almontero, C. C., et al. (2022). Fingerprinting of Philippine Waling-Waling (*Vanda sanderiana* Rchb.f.) Accessions Using Simple Sequence Repeat (SSR) Markers. *Philippine Journal of Crop Science*, 47(2), 2, 5, 43.; Ramiro, I. B. L., et al. (2022). Somatostatin venom analogs evolved by fish-hunting cone snails: From prey capture behavior to identifying drug leads. *Science Advances*, 8(12), 6803-6804; Conference of the Parties to the Convention on Biological Diversity. (2024). *Decision 16/2: Digital Sequence Information on Genetic Resources* (CBD/COP/DEC/16/2), Annex para. 21, 518, 1584.

[140] CBD, UNEP, & UNDP. (2025). *The Cali Fund: Frequently Asked Questions*, 02, 03, 3798, 5644, 5682.; Convention on Biological Diversity. (1992). *Convention on Biological Diversity: Text and Annexes*, Art. 2, 15.1, 3813, 3836.; Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. (2010). Art. 5.1, 4443

[141] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), § 2, 4, 7(e), 12, 14, 5378-5382, 5394, 5400, 5406

[142] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, pp. 1, 12, 14; Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds*

especially where the potential profit from a single DNA sequence can reach millions of dollars, administrative fines often become a mere "cost of doing business" for multinational entities.[143] The proposed PGRABS Act represents a strategic shift toward the criminalization of biopiracy, treating the unauthorized utilization of Digital Sequence Information (DSI) as a serious transnational crime.[144]

Enforcement, however, presents a more complex problem: namely, how can State responsibility for biopiracy be meaningfully realized within a digital landscape? Viewed through the lens of the Articles on State Responsibility for Internationally Wrongful Acts (ARSIWA), the appropriation of Digital Sequence Information (DSI) constitutes a clear breach of treaty obligations established under the Convention on Biological Diversity.[145] Yet, the practicalities of enforcement will almost certainly hinge upon the enactment of mutually supportive domestic legislation. This requires user States to adopt internal regulations that mandate proof of legal DSI acquisition as a prerequisite for the granting of patent rights or marketing authorizations.[146] By instituting such compliance checkpoints, the international community can effectively bypass the limitations of physical border controls, ensuring that legal accountability follows the data regardless of its dematerialized state.[147]

The next question to be asked is, how, precisely, will attribution be established in a landscape defined by "digital ghosting"? Furthermore, what specific conduct must a State or non-state actor undertake to avoid legal liability? The resolution resides in the twin pillars of transparency and traceability. To achieve such transparency within a genetically modified organism or synthetic derivative, users must implement Digital

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Therefor (House Bill No. 9143), §§ 4, 14; Republic Act No. 9147. (2001). *Wildlife Resources Conservation and Protection Act*, §§ 27, 28

[143] Houssen, W., et al., *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, p. 2

[144] Sands, P., et al., *Principles of International Environmental Law* (4th ed.). Cambridge University Press, pp. 394, 725; UN Economic and Social Council. (2020). *General Comment No. 25 on Science and Economic, Social and Cultural Rights* (E/C.12/GC/25), para. 81.

[145] Draft Articles on Responsibility of States for Internationally Wrongful Acts, in Report of the International Law Commission on the Work of Its Fifty-Third Session, U.N. GAOR, 56th Sess., Supp. No. 10, at 43, U.N. Doc. A/56/10 (2001); Convention on Biological Diversity art. 15(7), June 5, 1992, 1760 U.N.T.S. 79

[146] 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 art. 4(3), Oct. 29, 2010, U.N. Doc. UNEP/CBD/COP/DEC/X/1

[147] Sands, P., Peel, J., Fabra, A., & MacKenzie, R. (2018). *Principles of International Environmental Law* (4th ed.). Cambridge: Cambridge University Press, pp. 726, 788, 924.

Object Identifiers (DOIs)[148] or blockchain-backed ledgers capable of tethering Digital Sequence Information (DSI) to its "country of origin" metadata.[149]

For an actor to escape liability, it is incumbent upon them to demonstrate a "Chain of Legal Acquisition." This requires affirmative proof that the DSI utilized was either accessed through a recognized multilateral mechanism which is the Cali Fund, for instance, or that the resulting benefits have been shared in strict accordance with Mutually Agreed Terms (MAT).[150] In the absence of this digital paper trail, the utilization of information derived from a foreign resource is rendered an unattributable, and therefore illicit, appropriation. It is the documentation, rather than the physical specimen, that now serves as the primary arbiter of legality.[151]

Administrative regulation on the other hand is traditionally favored for its speediness and reduced litigation costs, but it lacks the severity required to deter intentional and organized digital theft. Because DSI comes from from a genetic resource into a digital asset, it can be replicated and commercialized globally with minimal physical overhead. A standard administrative fine is often negligible compared to the revenue generated by a patented digital derivative like synthetic drug or a genetically modified proxy.[152] Civil remedies require an identified defendant within the jurisdiction, whereas criminalization allows the State to invoke international responsibility and legal assistance treaties to pursue actors who "ghost" the country of orgin.[153] Much like legislative franchise under the EPIRA Law, the right to conduct research on Philippine biodiversity is a conditional regulatory privilege, not a vested

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[148] IUCN, BBNJ Brief: Marine Genetic Resources for PrepCom II 8 (2025); Convention on Biological Diversity art. 1, June 5, 1992, 1760 U.N.T.S. 79; 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 art. 5(1), Oct. 29, 2010, UN Doc. UNEP/CBD/COP/DEC/X/1

[149] 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 art. 5(1), Oct. 29, 2010, UN Doc. UNEP/CBD/COP/DEC/X/1

[150] Sands, P., Peel, J., Fabra, A., & MacKenzie, R. (2018). *Principles of International Environmental Law* (4th ed.). Cambridge: Cambridge University Press, p. 403; 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 art. 17(1)-(3), Oct. 29, 2010, UN Doc. UNEP/CBD/COP/DEC/X/1; IUCN, BBNJ Brief: Marine Genetic Resources for PrepCom II 8 (2025) at 9.

[151] 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 art. 17(2)-(3).

[152] Greiber, T., et al. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN, pp. 76, 81, 159–160.; Houssen, W., Sara, R., & Jaspars, M. (2020). *Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use* (CBD/DSI/AHTEG/2020/1/3). Montreal: Secretariat of the Convention on Biological Diversity, pp. 2, 11, 31

[153] Intellectual Property Office of the Philippines. (2024). *Examination Guidelines on Patents, Utility Models, and Industrial Designs Involving Biodiversity, Genetic Resources, Traditional Knowledge, and Indigenous Knowledge Systems and Practices*, pp. 1, 12.; International Law Commission. (2001). *Draft Articles on Responsibility of States for Internationally Wrongful Acts*, Art. 1

property right.[154] When the natural monopoly of genetic data is abused for private enrichment without benefit-sharing, the State is contitutionally compelled to intervene with the full force of its penal authority. Criminal sanctions, including imprisonment and substantial capital lock penalties, ensure that the unauthorized monetization of species carries a cost that outweighs the potential commercial gain.[155]

Under the economic reality principle, an actvity is deemed commercial if its primary purpose is to obtain an economic benefit.[156] Criminalization addresses this reality by targeting the leading positions within jurdical persons who knowingly authorize digital biopiracy for profit.[157] By institutionalizing that incdental violations remain administrative, but commercially-driven digital theft triggers criminal prosecution, the Philippines can create a robust "safe harbor" for ethical science while effectively thwarting the financialization of its biological natural heritage.[158]

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[154] Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143), §§ 2, 14.; Rohden, F., et al. (2020). *Combined Study on Digital Sequence Information in Public and Private Databases and Traceability* (CBD/DSI/AHTEG/2020/1/4). Montreal: Secretariat of the Convention on Biological Diversity, pp. 48, 66–67.; Secretariat of the Convention on Biological Diversity. (2022). *Co-leads' Report on the Work of the Informal Co-Chairs' Advisory Group on Digital Sequence Information on Genetic Resources since the Third Meeting...* (CBD/WG2020/5/INF/1), p. 4

[155] UN Economic and Social Council. (2020). *General Comment No. 25 on Science and Economic, Social and Cultural Rights* (E/C.12/GC/25), para. 62.; United Nations. (2017). *Satellite Account on Non-profit and Related Institutions and Volunteer Work*, pp. 2, 16.

[156] CITES. (1985). *Resolution Conf. 5.10 (Rev. CoP19): Definition of 'primarily commercial purposes'*.; Philippine House of Representatives. (2021). *An Act Institutionalizing the National Policy on Access, and Benefit-Sharing from the Utilization of Philippine Genetic Resources and Appropriating Funds Therefor* (House Bill No. 9143)

[157] Davis, K., & Borisenko, A. (2017). *Introduction to Access and Benefit-Sharing and the Nagoya Protocol: What DNA Barcoding Researchers Need to Know*.; UN Economic and Social Council. (2020). *General Comment No. 25 on Science and Economic, Social and Cultural Rights* (E/C.12/GC/25)

[158] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. (2010).; International Law Commission. (2001). *Draft Articles on Responsibility of States for Internationally Wrongful Acts*.; Greiber, T., et al. (2012). *An Explanatory Guide to the Nagoya Protocol on Access and Benefit-sharing*. Gland, Switzerland: IUCN.

CHAPTER VII

CONCLUSION AND RECOMMENDATIONS

The final chapter concludes the study forwarding a normative constitutional position. Concrete policy recommendations shall be offered, including specific amendments to the IP Code to mandate the Disclosure of Digital Origin, ensuring that Philippine biodiversity remains a sovereign national asset in the digital age.

7.1 Summary of Findings

This research has systematically deconstructed the legal crisis precipitated by the "dematerialization" of biological assets. By examining the shift from physical specimens to Digital Sequence Information (DSI), the following key findings have been established:

The Regulatory Loophole of Materiality

Current Philippine statutes, specifically the Wildlife Act or Republic Act No. 9147 and the IPRA or Republic Act No. 8371, are fundamentally materiality-bound or highly dependent on the phsyical aspect of access. They rely on physical triggers for Prior Informed Consent (PIC), which effectively excludes the digital blueprints of genetic resources from sovereign oversight. This allows for digital biopiracy, where the informational value of a species is utilized without triggering national Access and Benefit-Sharing (ABS) protocols.

The "Digital Ghosting" of Endemic Species

Case studies of the Waling-Waling (*Vanda sanderiana*) and the Magician's Cone Snail (*Conus magus*) confirm that high-value Philippine biodiversity is already being "digitally ghosted." The genetic sequences of these species are accessible in global databases, enabling foreign entities to conduct AI-driven research and synthetic hybridization without acknowledging the Philippines as the country of origin.

Legislative Insufficiency of AI Guidelines

While the 2025 IPOPHL AI Examination Guidelines provide a robust technical framework for assessing inventorship, they remain legally incomplete regarding data origin. The guidelines focus on the human creative input but fail to mandate the disclosure of the biological origin of the DSI used to train biotechnological AI models, creating a transparency gap in the patent system.

The Defensive Potential of the PGRABS Act and WIPO Treaty

The proposed PGRABS Act (HB 8649) and the 2024 WIPO Treaty provide the necessary legal bite to secure biological sovereignty. The integration of a Mandatory Disclosure Requirement (MDO) within the Intellectual Property Code or Republic Act No. 8293 is the most viable path to linking digital innovation back to its sovereign source.

Technological Shields for Indigenous Sovereignty

Biocultural Labels and Indigenous Data Sovereignty (ID-S) are not merely theoretical concepts but practical, machine-readable mechanisms. When integrated with the Cali Fund an the NCIP's IKSP Registry, these tools can ensure that the "metadata" of biodiversity remains legally attached to its digital derivatives throughout the global value chain.

7.2 Proposed Amendments to the Intellectual Property Code or R.A. No. 8293

To effectively bridge the gap between innovation and biological sovereignty, the following legislative amendments to R.A. No. 8293 are proposed. These amendments are designed to internalize the mandates of the 2024 WIPO Treaty, the PGRABS Bill, and the 2025 IPOPHL AI Guidelines into the core of Philippine patent law.

I. Amendment to Section 2: Declaration of State Policies

Current: "The State recognizes that an effective intellectual property system is vital to the development of domestic and creative activity xxxxx …"

Proposed Amendment: "The State further recognizes that the use of intellectual property bears a social function and must promote the common good. To this end, the State shall ensure that the protection of intellectual property rights does not prejudice biological sovereignty over genetic resources and their digital derivatives. The IP system shall serve as a mechanism for transparency, ensuring that the privatization of innovation through patents is balanced by the equitable sharing of benefits with the country of origin and its indigenous communities."

II. Amendment to Section 22: Non-Patentable Inventions

Current: "22.1. Discoveries, scientific theories and mathematical methods xxxxx ..."

Proposed Amendment: "22.1. Discoveries, scientific theories, and mathematical methods, including Digital Sequence Information (DSI) in its raw, unmodified form as found in nature. However, biotechnological inventions utilizing DSI shall be patentable provided they demonstrate a concrete technical contribution by a natural person, as distinguished from the mere automated mining of genetic data by artificial intelligence."

III. Insertion of Section 32.1-A: Mandatory Disclosure of Origin (MDO)

Proposed New Section: "SEC. 32.1-A. Mandatory Disclosure Requirement. — In addition to the requirements of Section 32, if a claimed invention is based on, derived from, or developed using genetic resources, Digital Sequence Information (DSI), or Associated Traditional Knowledge (ATK), the applicant shall be required to:

- (a) Disclose the country of origin or the source of the genetic resource or DSI;
- (b) Disclose the Indigenous Cultural Community that provided the ATK, where applicable; and

- (c) Provide a certificate of Free and Prior Informed Consent (FPIC) or a copy of the Access and Benefit-Sharing (ABS) agreement, consistent with the PGRABS Act and the Wildlife Act (RA 9147).”

IV. Amendment to Section 51: Examination of the Application

Proposed Amendment: “SEC. 51.1. Substantive Examination. — In conducting the substantive examination, the Bureau shall verify the legal provenance of any biological or digital assets disclosed. For AI-related inventions, the examiner shall ensure compliance with the 2025 IPOPHL AI Examination Guidelines, particularly regarding the disclosure of training datasets to prevent the 'digital ghosting' of Philippine endemic resources.”

V. Amendment to Section 217: Penalties

Proposed Amendment: “SEC. 217.4. Biopiracy and Fraudulent Disclosure. — Any person who knowingly provides false or misleading information regarding the source of genetic resources or DSI in a patent application, or who willfully bypasses the disclosure requirements of Section 32.1-A, shall be liable for Digital Biopiracy and subject to the penal provisions of the PGRABS Act, in addition to the cancellation of the patent grant.”

7.3 Conclusion

The transition from a world of physical biological specimens to one of Digital Sequence Information (DSI) represents more than just a technological shift; it is a fundamental challenge to the Regalian Doctrine and the constitutional identity of the Philippines as a megadiverse nation. This research has demonstrated that when the “functional units of heredity” are decoupled from their material carriers, the traditional legal triggers for Prior Informed Consent (PIC) and Access and Benefit-Sharing (ABS) fail. This creates a state of “digital biopiracy” where the informational value of Philippine endemic species, as seen in the Waling-Waling and the Magician’s Cone Snail, is privatized through global digital commons without providing any benefit to the Filipino people, particularly its indigenous communities, who served as their original stewards.

To bridge this regulatory gap, the law must evolve from a materiality-bound framework to a sovereignty-centered one. The findings of this study conclude that the Common Good, as enshrined in Section 11, Article XII of the 1987 Constitution, remains the ultimate regulatory North Star. The Supreme Court has echoed the importance of promoting development for the greater good of the people time and again in several of its decisions[159], more recently in the reiteration that social insurance funds must remain pooled for their specific public purpose, so too must the nation's genetic wealth be protected from digital misappropriation.[160] The proposed amendments to R.A. No. 8293 and the passage of the PGRABS Act are not mere legislative options; they are constitutional imperatives. By institutionalizing Mandatory Disclosure of Origin (MDO) and adopting Biocultural Labels, the Philippines can ensure that every string of DNA data mined by an AI model remains legally anchored to its sovereign source.

Ultimately, the goal of this legal framework is not to hinder biotechnological innovation but to democratize it. By aligning domestic patent doctrines with the 2024 WIPO Treaty and the global Cali Fund, the Philippines can transform itself from a passive victim of digital ghosting into a proactive leader in Indigenous Data Sovereignty (ID-S). In this day and age, biological sovereignty must be asserted at the point of transcription, not just at the point of extraction. Only then can we ensure that the endemic species such as the "Queen of Philippine Orchids" and the biochemical treasures of our seas such as the Magician's Cone Snail continue to serve the common good of the Filipino people be it physically or digitally.

[159] *Republic v. Coconut Industry Investment Fund Oil Mills Group,* G.R. No. 147062-64 (Supreme Court of the Philippines Dec. 14, 2001); *Tañada v. Angara,* G.R. No. 118295 (Supreme Court of the Philippines May 2, 1997)

[160] *Pimentel III v. House of Representatives*, G.R. No. 274778 (Supreme Court of the Philippines Dec. 3, 2025).

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