



Department of Law

Master of Science in Law, Digital Innovation and Sustainability

Chair: Governance of Digital Innovation and Sustainability

Biodiversity Financing: How Benefit-Sharing Mechanisms Can Complement Market-Based Financing Tools to Ensure Biodiversity Protection

Supervisor: Prof. Christian Fernando Iaione Co-Supervisor: Prof. Elisabetta Tatì

Candidate: Erica Galanti ID Number: 630573 Academic Year 2022/2023

Table of Contents

CHAPTER ONE	7
1. INTRODUCTION	7
1.1 Background Of The Study/Problem Statement	7
1.2 Justification Of The Study	8
1.3 Research Objectives	9
1.4 Organization of the Study	10
1.5 Clarification of Terms	11
Biodiversity	11
Biodiversity financing	13
Policymakers	13
Governance	14
CHAPTER TWO	17
2.1 SECTION I	17
2.1.1 Economic trends of biodiversity financing	17
2.1.2 The Convention on Biological Diversity	19
2.1.3 The Nature Restoration Regulation	22
2.2 SECTION 2	24
2.2.1 Biodiversity Financing Tools	25
Market-Based Tools: the Benefits and the Pitfalls	25
Payment for Ecosystems Services (PES)	
Green Bonds	28
Carbon offsets and credits	31
Non-market-based tools	34
CHAPTER THREE	39
3.1 SECTION 1	
3.1.1 Benefit-Sharing mechanisms as a Type of Non-Market-Based Mechanism	39
3.1.2 Defining Types of Benefit-sharing Mechanisms	42
Definitions of Benefit-Sharing Mechanisms	42

The Nagoya Protocol and Benefit-Sharing Mechanisms	44
Inter-State and State-to-Community Benefit-Sharing Mechanisms	46
3.2 SECTION 2	50
3.2.1 Creating a Framework for Benefit-Sharing Mechanisms	50
Public-Private Partnerships (PPPs)	. 52
Innovation Helices Model: from the Triple to Quintuple Helix Model	53
The Sustainable Development Innovation Partnerships model (SDIP)	57
Social-Ecological Systems Framework (SES)	59
The Theory of the Commons	. 62

CHAPTER FOUR	70
4.1. SECTION 1	70
4.1.1 Methodology description	70
4.2. SECTION 2	73
4.2.1 The Luangwa Community Forests Project	
Overview of Zambia	73
Overview of the Luangwa Community Forest Project	74
4.2.2 Ankeniheny–Zahamena Corridor Biodiversity Conservation Project	84
Overview of Madagascar	
Overview of the REDD+ CAZ project	87
4.3 SECTION 3	94
4.3.1. Variables Evaluation Method	94
Design Principles and codification applied to BSMs	95
Coding of the Luangwa Community Forest Project	98
Coding of the CAZ Project	99
CHAPTER FIVE	100
5.1 DISCUSSION	100
5.1.1 Findings	100
5.1.2 Limitations	

6. CONCLUSIONS	3
----------------	---

Table of Figures

Figure 1: Global biodiversity conservation financing compared to global	
biodiversity conservation needs	. 19
Figure 2. The Core Subsystems of Social-Ecological Models	.61
Figure 3. Ostrom second level variables	. 63
Figure 4. The Five Guiding Principles	. 70
Figure 5. The Five Guiding Principles for BSMs	73
Figure 6. Map of the Area of the Luangwa Community Forest Project	.77
Figure 7. Table of LCFP Goals and Practices	. 79
Figure 8: Satellite data shows deforestation surge in 2020 in the CAZ area	88
Figure 9: Satellite imagery shows rapid deforestation in CAZ in late 2020	. 91

Abbreviations and acronyms

- 1. BSMs: benefit-sharing mechanisms
- 2. CAZ: Ankeniheny-Zahamena Corridor
- 3. CBD: Convention on Biological Diversity
- 4. IPLC Indigenous People and Local Communities
- 5. LCFP: Luangwa Community Forest Project
- 6. QHM: Quintuple Helix Model
- 7. PAs: Protected Areas
- 8. PES: Payments for Ecosystem Services
- 9. PPP: Public-Private Partnerships
- 10. SDIP: Sustainable Development Innovation Partnerships

Abstract

This thesis explores the complex topic of biodiversity financing, examining in particular how Benefit-Sharing Mechanisms (BSMs) can synergize with market-based financial tools to improve biodiversity protection efforts in, for example, nature conservation projects. This study is motivated by the urgency of the biodiversity crisis and its major financing challenges, and therefore seeks to answer the central question: How can alternative or supplementary financial solutions, specifically non-market-based BSMs, complement traditional market-based approaches to better promote the safeguarding of biodiversity? The primary aim is to demonstrate that non-market-based tools, such as BSMs, play a pivotal role in biodiversity conservation. Particularly, they can help offsetting the limitations and risks associated with market-based mechanisms. Additionally, this study strives to develop a practical model, a framework for policymakers, to help them structure and analyze BSMs and assess their efficacy, encompassing financial and non-financial dimensions. This research, which adopts a qualitative approach, applies theoretical frameworks and variables drawn from multistakeholder collaboration models and ecological systems to analyze two case studies: the Luangwa Community Forests Project and the Ankeniheny-Zahamena Corridor Biodiversity Conservation Project. The analysis suggests that BSMs, when integrated into biodiversity financing, can enhance conservation outcomes and equitable benefit distribution. Both case studies, incorporating market-based and non-market-based mechanisms, serve as exemplars of innovative biodiversity financing approaches. Not only that, but they also demonstrate that current BSMs are often neglected or subject to a top-down structure that does not truly help address biodiversity concerns nor promote local development of sustainable solutions. This study underscores the importance of BSMs in augmenting biodiversity conservation efforts and contributing to sustainable development goals. It offers valuable insights for policymakers and stakeholders, highlighting the variables and a possible model to create more inclusive and locally oriented collaborations and BSMs. The study's focus is, however, on two case studies only, limiting the generalizability of findings. Its aim, in fact, is to offer a suggestion of how the discussion on BSMs can be treated with further research involving multiple cases and quantitative assessments. This thesis overall underscores the critical role of BSMs in complementing market-based tools for biodiversity financing, offering a pathway to more effective and sustainable conservation initiatives.

CHAPTER ONE

1. INTRODUCTION

1.1 Background Of The Study/Problem Statement

The focus of most actors working to mitigate and adapt to the effects of climate change, including international organizations and governments, has primarily been put on fighting the rise of greenhouse gas emissions. This priority is legitimated because of the urgent action that remaining within a 1.5C to 2C degrees increase requires, and mainly being addressed in the energy sector and the use of fossil fuels. However, the attention that has been put on this matter overshadows other crucial environmental topics, such as safeguarding biodiversity for a sustainable world.

Studies show that biodiversity loss can impact the ability of ecosystems to provide essential services that help mitigate climate change, such as carbon sequestration, water regulation, or soil stabilization. A study by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services found that 14 of the 18 services that ecosystems provide are declining, which could exacerbate climate change (**IPBES**, **2019**).¹ Furthermore, the recovery of biodiversity can also mitigate global warming and be an ally in the fight against temperature increases. Restoring and protecting forests, wetlands, and other ecosystems can increase their ability to sequester carbon from the atmosphere, helping to mitigate climate change. A study by the World Resources Institute found that natural climate solutions, such as reforestation and forest protection, could provide up to one-third of the emissions reductions needed by 2030 to meet the Paris Agreement goals (World Resources Institute, **2017**).²

The difference of attention brought to climate change intended as the rise of greenhouse gas emissions compared to other relevant environmental issues, such as biodiversity, is powerfully portrayed by the gap in the financing of biodiversity and climate

¹ IPBES (2019) Global Assessment Report on Biodiversity and Ecosystem Services

² World Resources Institute (2017)

change. The UNFCCC, within the context of the Kyoto Protocol and the Paris Agreement, promotes the utilization of climate financing to help countries and parties with different levels of development mitigate and adapt to the effects of climate change. However, not only are investments and other forms of financing in this area still significantly inferior to environmentally harmful funding worldwide, but they also need to consider highly relevant matters that must be addressed to fight climate change, aside from the energy sector. For instance, the industries that received the most finance in 2019–2020 were renewable energy (US\$336 billion per year on average) and sustainable transport (US\$169 billion). By contrast, tracked flows to agriculture, forestry, and other land usages closer to biodiversity were only US\$16.5 billion, representing less than 2.5% of total climate finance. These figures show us that financing oriented toward safeguarding biodiversity is minimal when the protection and restoration of biodiversity are crucial for ensuring the success of climate change mitigation.

1.2 Justification Of The Study

While the shift of focus toward biodiversity protection is still in process, there are some positive indications that the awareness of its importance - and funding - has been increasing in recent years, and new frameworks for policy and action are being outlined in relevant institutions.

In the context of the 2022 UN Biodiversity Conference, the Kunming-Montreal Global Biodiversity Framework was established. The Convention on Biodiversity (CBD) outlined during the COP15 has set a list of four long-term goals regarding biodiversity, and 23 section-oriented global targets for urgent action to complete within 2030. Among these targets, Target 19 specifically addresses the need to "*Substantially and progressively increase the level of financial resources from all sources, in an effective, timely and easily accessible manner, including domestic, international, public and private resources*" (CBD, 2022).³

Target 19 lists innovative financial tools that promote the safekeeping of biodiversity, mostly market-based instruments such as payment for ecosystem services, green bonds, biodiversity offsets, and credits. These innovative financial instruments have only recently started entering the market. While they certainly play a crucial role in reorienting the financial sector

³ CBD (2022) Official CBD Press Release - 22 December 2022, Montreal

toward biodiversity protection, they present many pitfalls and limitations. Many disadvantages of market-based tools can be driven from sectors where they are utilized for long time periods as green financial resources. Strong of this awareness, it is important to build appropriately, since the very beginning, instruments that are dedicated specifically to the protection of biodiversity and that can balance market based tools and non-market-based solutions and approaches.

This study is motivated by the urgent need to solve the biodiversity crisis and its financing issues, for which it is important to consider alternative or additional financial solutions beyond simple market-based ones. Benefit-sharing mechanisms (BSMs) are an important non-market-based instrument - the only one cited in Target 19 - that can play a great role in improving the effects of biodiversity financing.

1.3 Research Objectives

The Study's main objective is to demonstrate that non-market-based tools, particularly benefit-sharing mechanisms, have a significant role in the safekeeping of biodiversity, which can counterweight the risk and the pitfalls of market-based mechanisms if effectively applied. Additionally, the study aims to find a model that can help policymakers structure benefit-sharing mechanisms and assess their efficiency, not solely relying on financial measures but considering other important aspects that non-market-based mechanisms promote. The ultimate goal is to identify the values, variables, and models to observe and utilize to reconcile biodiversity finance with the importance of sustainable development concretely.

To achieve this, the following specific objectives of this study are to:

- Observe the current state of biodiversity financing and international frameworks for its promotion, especially of the CBD, and how the concept of biodiversity financing has evolved through time.
- 2. Group and define the financial instruments suggested by the CBD: payments for ecosystem services, green bonds, carbon credits and offsets, and benefit-sharing

mechanisms. In this sense, the Study also aims to create categorizations between the different market-based and non-market-based instruments that can help distinguish their advantages and disadvantages.

- **3.** Create an overview of BSMs by observing the literature to outline this instrument's existing definitions, types, and classifications.
- 4. Group and analyze relevant co-governance models and theories, specifically the multi-stakeholder partnerships model, such as the PPPs or SDIP models, as well as the Helices Models, the Socio-Ecological System Framework, and the Theory of the Commons, that can help structure a model for analyzing BSMs.

1.4 Organization of the Study

The Study is organized into six chapters.

- **1.** The first chapter explains the reasons that have motivated this study, how it is structured, and clarifies some of the terms that play an essential role.
- 2. The second chapter observes the economic and political trends that concern biodiversity and its financing. Firstly, it underlines the issues of the biodiversity financing gap and defines and explains the role of the Convention on Biological Diversity and the recent Nature Restoration Regulation in creating frameworks for protecting biodiversity. The chapter lists the different and innovative financing tools used for financing biodiversity, both market and non-market-based.
- **3.** Chapter three focuses on the tool of benefit-sharing mechanisms, providing an overview of the scattered literature on this instrument and providing definitions and different categorizations to analyze it. The chapter presents relevant literature on multi-stakeholder partnerships and co-governance mechanisms that can help draw a new analysis framework for BSMs.

- 4. The fourth chapter concerns the methodology of the study. It explains how the qualitative assessment will be led, creating tables to apply the identified relevant variables for developing a BSMs-analysis model to the two case studies identified for this study, which are also presented in this chapter.
- 5. Chapter five concerns the discussion of the results observed in the previous one, as well as general observations and extended discourse that can be made based on the analysis of the two case studies, the literature, and the presentation of the BSMs-analysis model. The last chapter also concludes the study and opens suggestions for further investigations.

1.5 Clarification of Terms

Some of the terms that are used in this study need clarification and a more thorough definition to avoid confusion, mixing them with interrelated concepts or simply channeling the analysis more effectively.

Biodiversity

It is challenging to underpin one definition of biodiversity from the literature. In the Convention of Biological Diversity's report "Sustaining Life on Earth", the following definition is provided: "Biological diversity – or biodiversity – is the term given to the variety of life on Earth and the natural patterns it forms (**CBD**, 2000).⁴ The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes and, increasingly, by the influence of humans. It forms the web of life of which we are an integral part and upon which we so fully depend." The report adds that biodiversity comprehends the whole variety of plants, animals, and microorganisms, classified into different species, of which about 1.7 million have been identified so far, despite estimates of total existing species ranging from 3 to 100 million. Biodiversity concerns living beings and various ecosystems, such as "deserts, forests, wetlands, mountains, lakes, rivers, and agricultural landscapes." Including the notion of ecosystems in biological diversity is fundamental because of the interconnection between the species of each ecosystem. Generally speaking, each component of an ecosystem provides

⁴ CBD (2000) Sustaining life on Earth - How the CBD Promotes Nature and Human Well-being, UNEP

a form of interaction with the other living creatures and the habitat, allowing it to thrive and regenerate itself. According to the report, "It is the combination of life forms and their interactions with each other and the rest of the environment that has made Earth a uniquely habitable place for humans."

The concept of biodiversity seems to be distanced or sometimes even opposite to land shaped by humans, such as urban or agricultural areas. However, in the era of the Anthropocene, human action and nature cannot be considered separate entities, considering the influence that human action has on the use of land (Pellegrino and Di Paola, 2018).⁵ No Nature is completely independent of humans, as even a natural reserve is preserved by human decision-making, and there is no human creation without the use of natural resources and the support of biodiversity. A fascinating take on the subject is, for example, the types of ecosystems and biodiversity that can be found in cities or agricultural areas. In this study, however, the focus will be put on traditionally natural biodiverse areas, such as natural reserves. However, this idea of biodiversity being "useful" for human ecosystems also shows that biodiversity provides many goods and services that sustain our lives and, in economic terms, can therefore be considered as a resource. Indeed, the same report proceeds by underlying its important role for economic purposes and defines it as a "[...] resource upon which families, communities, nations, and future generations depend. It is the link between organisms, binding each into an interdependent community or ecosystem where all living creatures have their place and role. It is the very web of life. The latter is an interesting explanation of biodiversity, as the term "resource" implies its relation to the economy, to its ability to provide services and goods. However, such a term can be subject to critics, as it is quite an anthropocentric definition of biodiversity, subjecting it to the exploitation and interest of human purposes. Critics claim that one of the reasons for which the biodiversity crisis is so rampant is indeed the very conception of nature as a "resource," as something to dispose of as wanted, and therefore promote a more holistic view of biodiversity.

When defining biodiversity, it is fundamental to mention the biological diversity crisis that has been caused by human action (Karolyi, 2023).⁶ It is estimated that the presence of mammals, birds, fish, reptiles, and amphibians has declined by over 60% in the last four decades and that even species that are not currently going extinct are subject to fast

⁵ Pellegrino G., Di Paola M (2018) Nell'Antropocene. Etica e Politica alla Fine di un Mondo, Derive Approdi

⁶ Karolyi A. (2023) Biodiversity finance: A Call for Research into Financing Nature, Financial Management Journal, Wiley Online Library

ecosystem degradation that is impoverishing their genetic diversity. The UN's Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has warned that "humans are damaging nature far more rapidly than it can renew itself." The preservation of biodiversity is fundamental because it is a "resource" and because life on earth depends on it. For this reason, a global framework is necessary to change the trend of biodiversity loss and start preserving it for current and future generations. During the 1992 Earth Summit in Rio de Janeiro, the Convention on Biological Diversity was adopted to help meet the sustainable development strategy goals. This international agreement, as we will see in the following chapter, ensured that the majority of the world's governments committed to pursuing economic development while preserving the environment. It is composed of three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

Biodiversity financing

During the creation of the CBD in 1992, it was agreed that to protect and restore biodiversity, it was fundamental for the economic reasons justifying biodiversity conservation to be broadcasted and for the private financial sector to largely contribute with financial, managerial, and technical resources. Signatory countries agreed to seek to attract new financial resources for biodiversity to implement the objectives of the Convention in collaboration with the private sector. Biodiversity financing, therefore, encompasses all types of finances, ranging from public or private, national or financial flows, compensation, or charities that consider or promote biodiversity conservation. Biodiversity finance is a part of the same financial world as ESG investing practices, hence all types of investing that consider environmental and social governance in funding and investment placement. The finance of biodiversity uses a whole series of new financial practices and tools which are observed in this study, such as payments for ecosystem services, green bonds, biodiversity offsets, credits, and particularly benefit-sharing mechanisms.

Policymakers

The scope of the thesis is to provide a model that can help policymakers assess the efficiency of non-market-based tools for biodiversity financing. However, who are the

policymakers? Which are the entities that are concerned by this model? Generally speaking, the idea of developing biodiversity financing, since the creation of the CBD and increased activism for environmental protection, has increased the importance of protecting biodiversity in the private financial sector and increasing the flows of capital and investments dedicated to this issue. For this reason, the concepts of "greening finance" and "financing green," which will be observed more in-depth later on in this study, have paved their way in the narrative on biodiversity financing. Financing green initiatives involves investing in specific projects or activities that directly address environmental issues, such as protecting endangered species or preserving habitats. On the other hand, greening finance does not involve financing sustainable projects but making the financial system itself more focused on sustainability, mainstreaming environmental factors into the financial system, and improving the management of climate-related financial risks. Despite these two goals, making the financial market greener and mobilizing private funds for green activities has shown paradoxes that have recently been criticized. Particularly, the idea that return-seeking capital can be a solution to biodiversity loss through the private market shows some fallacies: if the costs of losing biodiversity are hard to calculate monetarily and its effects weigh on society first and on private economic agents second, biodiversity should be viewed as a public good, in which the public sector has to play the leading role and display effective governance mechanisms. The "biodiversity financing gap" that will be presented in the next chapter poses a serious issue: it is not expectable for governments to be able to fulfill it anytime soon when actually the biodiversity crisis requires fast and effective solutions - but neither does the speed at which the private sector is embracing biodiversity spark much hope for it to be the only solution. The actors that play an important role in preserving biodiversity are many, among which investors, private certification systems, local communities, businesses, etc., and they are not to be dismissed, as will be discussed in the following chapters. However, this study will consider policymakers as the entities responsible for the governance of biodiversity protection and restoration projects, which can involve other actors but are organized by entities such as financial institutions, as well as specific or local administrations that can intervene in the influence that all the different actors can have on biodiversity.

Governance

There are multiple definitions of governance, as it can be applied to different fields and contexts. In broad terms, governance can be intended as the process and system through which decisions are made, authority is exercised, and actions are taken to regulate and manage the affairs of an organization, community, or society as a whole. It includes the mechanisms, structures, and processes that guide and direct the behavior of individuals and institutions in achieving collective goals and ensuring the process takes solace with order, stability, and effectiveness. When viewed in the context of managing common goods, governance refers to the collective and collaborative efforts of multiple stakeholders to oversee, regulate, and manage shared resources and assets that are crucial for the well-being and prosperity of a community or society in a sustainable manner. It involves the establishment of rules, norms, and institutions that balance the interests of different stakeholders, promote equitable access to resources, and prevent overexploitation or degradation of the common goods for the benefit of present and future generations (**Ostrom, 1990**)⁷.

The principles and structures of the governance of common resources have evolved through time, with new types of governance being developed. Self, shared, collaborative, and polycentric governance have gained interest in this field (Foster and Iaione, 2022). ⁸ Shared governance encompasses the idea of self-governance, of actors taking care of themselves without necessary government intervention. However, the role of the government is not erased, as 'shared' implies that governance is distributed between public and civic actors, creating bilateral interactions in the management of small-scale, local resources that also produce goods and services for local livelihoods. Including self-governance in governance schemes helps drift away from a Leviathan role of public goods, which instead can be handled by other actors, private and civic, that can bring local knowledge, technology, and operativity to the management of common resources. In shared governance, some competencies remain under public control, but local communities tied to the resource in question play a proactive role in its management and control.

⁷ Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.

⁸ Foster S. , Iaione C. (2022) Urban Co-Cities, Innovative Transitions Towards Just and Self Sustaining Communities , the MIT Press

Collaborative governance, the 'second step' to collective governance, can be linked to other models that have been previously mentioned, such as the Quintuple Helix Model. It adds a layer of complexity to the shared governance idea, going beyond bilateral relations between government and civic entities and including broader partnership models. The new multi-stakeholder relationships that are developed in collaborative governance are interdependent, cooperative, and can include from three to five of the very different actors of the Quintuple Helix Model in the different common resource management areas, surpassing simple collaboration agreements and concretely building collaborative governance structures and legal entities for cooperation. This additional layer of complexity can make interactions more structured and complex but also allows to manage resources that are not strictly small-scaled and consider greater dimensions, types, or areas of common resources, embracing the use of public utilities for producing local public services that are co-managed and co-owned by multiple stakeholders.

Polycentric governance, originally proposed by Vincent Ostrom, Charles Tiebout, and Robert Warren, adds another layer to collaborative governance, resulting in the most advanced form of collective governance. The previous governance structure includes multi-stakeholder partnerships, but polycentric governance envisions multiple decision-making centers and collaborative but formally independent decision-making centers. The interactions within a polycentric governance model are well defined, following 'consistent and predictable patterns of interacting behavior' within an understood model of multiple, autonomous decision-making centers consisting of lots of different actors - such as businesses, civic society, public authorities, academia institutions - that co-decide the management of common resources. When studying different governance systems to evaluate the efficiency of different actors involved in managing public services in urban areas, Elinor Ostrom found that a polycentric approach promotes more satisfaction in small communities when locally organized centers are rendering services rather than centralized governmental ones. They are also more likely to promote experimentation practices, incentivizing the development of innovative public promising provision approaches and creating adaptable, dynamic governance solutions.

CHAPTER TWO

2.1 SECTION I

This section of the study presents the current trends of biodiversity financing from a strictly financial point of view as well as a governance one. It will observe the political framework and set of actions undertaken at an international level to protect biodiversity, as well as the current obstacles and limitations of governmental agencies in the monitoring and promotion of finance for biodiversity.

2.1.1 Economic trends of biodiversity financing

The financing of biodiversity today presents a huge gap between the amount of financing currently being utilized and the amounts of investments truly needed to preserve and promote biodiversity - and the ecosystem services it provides. The fact that most human needs, such as food, air, water, and raw materials, as well as most economic sectors, often rely on services provided by healthy and diverse ecosystems has not, to this day, incentivized a sufficiently significant increase in financial flows towards their safekeeping - despite their relevance. The reasons for such scarce results are multiple.

Firstly, the value of ecosystem services and resources provided by biodiversity is hard to estimate. The indicators are extremely varied, as the KPIs that can be used for biodiversity are numerous - such as the number of specific species present on a territory, an extension of natural land - and not standardized. Secondly, ecosystem services and benefits deriving from biodiversity are often considered as given capital; aspects like the regeneration of the capital provided, or the bad effects that economic production has on them, are often not considered. That is, despite the data being quite clear; according to the World Economic Forum, more than half of the world's GDP is more or less heavily dependent on ecosystem services. Additionally, more than a quarter of the collective balance sheet of the Development Finance Institutions worldwide is considered highly dependent on ecosystem services contributing according to specific estimates to up to 125 trillion US dollars per year (**BMZ**, **2020**).⁹



Note: Using midpoints of the current estimates and future needs, current global biodiversity conservation financing (upper graph) may need to increase by a factor of 5–7X to meet the estimated global need for biodiversity conservation (lower graph).

Figure 1:Global biodiversity conservation financing compared to global biodiversity conservation needs (US\$ billions)¹⁰

However, political, economic, and financial decisions systematically underestimate or simply do not take into account the benefits derived from ecosystem services, or the costs that have to be endured because of their detriment. As mentioned, there is a great, unfulfilled gap between the financing needed to protect, ensure the restoration, and prevent further loss of biodiversity, compared to any other type of finance, or even compared with other climate finance sectors. Biodiversity finance currently amounts to about US\$ 124-143 billion per year, comprising national, and international flows, such as official development assistance (ODA), compensation, or charities. The three most important sources of finance are the national budgets of developed countries, official development assistance bodies, and the private sector. However, this sum accounts for less than a seventh of the total finances needed for the real conservation and sustainable use of ecosystems and natural resources, estimated

⁹ BMZ (2020): Investing in Biodiversity - A Matter of Survival

¹⁰ Deutz A. et al, Financing Nature: Closing the Global Biodiversity Financing Gap, Paulson Institute Report, 2020

to be of about US\$ 722-967 billion a year (**Deutz et al, 2020**).¹¹ In recent decades, attention to climate change has been increasing, and while biodiversity is still very underlooked compared to climate change as a whole in the finance sector, relevant finance institutions are more insistently calling for regulation that promotes the integration of biodiversity in the financial sector.

The attitude towards investing has also evolved in recent years due to the increasing awareness and effects of climate change and its threats. ESG investing has been gaining ground as a new investment standard system to help the development of new financial instruments and mechanisms to increase the number of investments oriented toward sustainable project funding. Sustainable funds have also proven to be an interesting addition to portfolio diversification, being more resilient and less prone to risk than normal assets (Lodh, 2023).¹² Investors are therefore motivated to align with the international increasing attention to sustainability and the needs of the real economy. However, ESG investing strategies and the new financial tools that it proposes are not simple to implement in the financial market. ESG investing strategies strongly promote collaborative approaches that supposedly lead to stakeholders' co-management of resources and benefit-sharing. Nevertheless, limitations such as the hard scalability of fundings, the scarce returns on investments, and immature financial markets are not allowing sustainable financingparticularly biodiversity financing - to flourish, considering biodiversity is more complex and often more overlooked than climate change. ESG investing strategies strongly promote collaborative approaches that, in line with the resource mobilization draft indications, lead to stakeholders' co-management of resources and benefit-sharing.

2.1.2 The Convention on Biological Diversity

The political framework that is guiding the topic of biodiversity on a global scale is the Convention on Biological Diversity, that is also the first global legally binding agreement to cover all aspects of biological diversity. During the Earth Summit in Rio de Janeiro in 1992, the Convention was opened for signatures, and it entered into force the following year.

¹¹ Deutz A. et al, Financing Nature: Closing the Global Biodiversity Financing Gap, Paulson Institute Report, 2020

¹² Lodh A. (2020) "ESG and the cost of capital", MSCI

Many States use it to shape national guidelines for biodiversity-related policies - with the notable absence of the US, the only UN member that has not ratified the Convention. By signing and ratifying the CBD, signatories agree to support its goals and aims, of which the most important three are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from the utilization of genetic resources. The new strategic plan that has been adopted during the Conference Of the Parties in December 2022 during the Kunming-Montreal Summit has established a new set of goals and targets to reach in order to improve biodiversity conservation and restoration. Some of the long-term goals concern closing the biodiversity financing gap, shifting the current financial trends that disregard the role of ecosystems in the economy, and aligning financial flows and activities with the true value of biodiversity. To better understand the importance of the Convention, understanding the juridic framework that it operates under is of notable relevance. International conventions, similarly to treaties, are legally binding agreements between two or more countries or international organizations. Their scope is generally the one of establishing rules, regulations, and standards to govern specific aspects of international relations, such as biodiversity and the environment in this case. Once involved parties agree upon the aspects that are negotiated, each participating country's government ratifies the treaty or convention, indicating its agreement to be bound by its terms and the commitment to implementing them in its own legal systems. In many cases, the terms "treaty" and "convention" are used interchangeably to refer to international agreements between countries. Either way, one of the major issues of international treaties and conventions is that they are often challenging to enforce. While international law can provide mechanisms to enforce treaty obligations, such as international courts and tribunals, these mechanisms have often proved to be quite limited in their effectiveness or area of application. States may be reluctant to submit to the jurisdiction of international courts or may simply ignore their obligations under the treaty, making it difficult to hold them accountable for any violations.

The CBD was complemented by two supplementary agreements: the Cartagena Protocol and the Nagoya Protocol. The first one was adopted in the early 2000s and concerns the movements of living modified organisms that derive from modern biotechnology and how they are exchanged and moved from one country to another. The Nagoya Protocol, which will be studied more in-depth in Chapter Three, was adopted in 2010 and came into force in 2014. It concerns access to genetic resources and the fair and equitable sharing of benefits arising

from their utilization. It aims to support the implementation of one of the three main goals of the CBD, which is the one of promoting a fair and equitable sharing of benefits, and to do so by providing a more transparent framework and set of guidelines.

The financing of biodiversity has played an important and challenging role in the evolution of the CBD. In its early stages - and to this day - economics are considered a fundamental pillar of biodiversity conservation, with most of the objectives depending on onerous funding for implementation and success. The crucial part that economics plays is underlined by the assumption that unless there are tangible economic and financial benefits associated with biodiversity conservation, it is improbable that individuals, households, industries, companies, or governments will take active measures to protect and preserve biodiversity (IUCN, 2000).¹³ Without compelling incentives, people and private agents tend to prioritize activities that provide immediate profitability and economic advantages, often leading to the degradation and depletion of biodiversity. According to the narratives in the CBD drafts, the fact that biodiversity conservation is perceived as an abstract and intangible concept without clear economic value poses a significant barrier to its effective preservation. When individuals and entities perceive no direct returns from investing time, resources, and effort into biodiversity conservation, they are less inclined to prioritize investing in conservation projects. This mindset derives from the notion that conserving biodiversity lacks economic viability compared to alternative uses of natural resources. Industries may exploit natural resources for profit, households may engage in activities that contribute to biodiversity loss for their convenience, and governments may prioritize economic development over conservation measures because of the perception that economic profitability outweighs the inherent value of biodiversity. When natural areas are undervalued or priced too low, for example, the cost of converting them for purposes such as agriculture, forestry, or other land uses becomes more affordable compared to the expense of protecting and preserving the natural habitats (Barbier, 2022).¹⁴ The CBD has therefore increasingly and repeatedly, through the years, insisted on the importance of economic incentives in promoting biodiversity conservation. Indeed, new innovative financial instruments have been mentioned in recent drafts, such as payments for ecosystem services, benefit-sharing

¹³IUCN (2000) Economics And The Convention On Biological Diversity, The World Conservation Union

¹⁴ Barbier E (2022) The Policy Implications of the Dasgupta Review: Land Use Change and Biodiversity, Environmental and Resource Economics

mechanisms, or carbon credits, can all be considered incentives to make different actors engage more in biodiversity conservation.

However, recent literature has been quite critical of the effects that this narrative has had on biodiversity protection in the decades that followed the creation of the CBD (Corson, 2012).¹⁵ According to many scholars, the constant privatization and commodification of Nature to make it more appealing to private investments has, rather than helping fund it, often contributed to its degradation, in the form of land-grabbing practices, and uncontrolled use of biodiversity resources. The lack of governance structures in monitoring and regulating the behavior of private actors in the handling of biodiversity has also resulted in a deepening of the North-South divide. Northern private actors and big corporations - under the excuse of participating in sustainable activities in developing countries - exploit land and resources, often at the expense of indigenous people, local communities, and nature. These private actors gain benefits in terms of reputation, credit, and economic interests. This market failure calls for non-market derived intervention that brings the focus not on creating economic returns and commodifying Nature, but creating sustainable benefit creation and distribution systems instead, that can help the global South gain its independence from the North (Chausson et al., 2023).¹⁶ Interestingly enough, new drafts of the CBD have also given increasing importance to other aspects of biodiversity conservation. The Kunming-Montréal summit extensively insisted on the role that Indigenous people and local communities (IPLCs) have to play in biodiversity protection.

The Convention being an international, high-profile document, is an important step in ensuring greater sustainable development and protection of biodiversity. However, like many international treaties, it lacks strong enforcement and monitoring mechanisms, as enforcement is reserved for national governments, in the name of their sovereignty. Hence, the difficulties of enforcing CBD compliance across borders with local legislation translates into slower action for biodiversity protection and worrying low results, especially when considering that the United States, along with a few others, have not ratified the CBD. There have been prolonged efforts that have been made in the attempt to create an indirect enforcement mechanism for the CBD, for example by linking it to the World Trade

¹⁵ Corson C. (2012) Enclosing the global Commons: the Convention on biological diversity and green grabbing, Taylor and Francis Online

¹⁶ Chausson A. et al (2023), Going beyond market-based mechanisms to finance nature-based solutions and foster sustainable futures, Department of Biology, University of Oxford

Organisation's Trade-related Intellectual Property Rights agreement, and other national efforts and suggestions. However, the issue remains unresolved and no indirect enforcement mechanisms have been successfully designed (Schroeder, 2007).¹⁷

2.1.3 The Nature Restoration Regulation

The sustainable goals that were shaped within the CBD can struggle to find real-life application and to be implemented because of the juridic nature of the Convention and the natural limitations of international law. The ratification of the Convention implies that national implementation is to be pursued, but the lack of a controlling and sanctionatory structure works as a disincentive for countries to adhere to the Convention. From a juridic point of view, it is a risk to expect national harmonization in an international context. However, the growing attention to biodiversity protection has taken an additional step forward for countries within the European UNion, In July 2023, a key law on the regulation of nature restoration passed as part of the new EU biodiversity strategy. During the COP15 Convention on Biological Diversity in 2020, the European Parliament requested a legally binding target including all European Member States to restore degraded habitats by 2030, by restoring all types of ecosystems, ranging from natural forests to floodplains, peatlands, wetlands, grasslands, coastal zones, and marine areas. The Commission was called upon to adopt a more ambitious strategy for 2030, in order to avoid repeating the failure that the previous EU biodiversity strategy incurred into, which aimed at restoring 15% of degraded ecosystems through voluntary commitments. The targets set in this new regulation are more specific than previous ones. They include monitoring and assessment methods and increase Member States' liability in attaining the objectives by 2030. The latter are much stronger than previous ones, aiming to reach at least 30% of protected terrestrial and marine areas and restore at least 30% of degraded ecosystems in less than a decade.

The scope of this new regulation is indeed to protect existing natural areas - including different ecosystems such as forest, agricultural land, marine, and aquatic habitats, as well as urban areas - and cover at least 20% of the Union's land and sea areas by 2030, as well as all ecosystems that require restoration by 2050. Being legally binding, Member States have to reach the targets envisioned by the EU by developing nature restoration plans that the

¹⁷ Schroeder D (2007) Benefit-Sharing: it's Time for a Definition, J Med Ethics

Commission assesses. The current framework for European biodiversity protection consists of two main nature directives. The first is the Birds Directive, which aims to maintain the wild bird populations living in European ecosystems. Preserving these species entails applying special conservation measures for threatened and migratory species while allowing for others to be sustainably exploited (Birds Directive, 2009).¹⁸ The Habitats Directive, on the other hand, concerns measures that aim at maintaining or restoring natural habitats and species of wild fauna and flora of Community interest at favorable conservation status, with particular attention given to pollinator species (Habitat Directive, 1992).¹⁹ Instead, the conservation of freshwater and marine ecosystems is covered by specific directives, such as the Water Framework Directive or the Marine Strategy Framework Directive. They generally aim at maintaining or increasing the 'good environmental status' of freshwater or areas within a selected time range. Another relevant directive concerning biodiversity is the Environmental Liability Directive, which uses the polluter pays principle as a basis for its framework to avoid environmental damage. However, the assessments evaluating Member States' performances are not giving positive results, with objectives set by the directives being quite far from current realities. The European Environment Agency's 2020 has assessed that up to 81% of the habitats protected under the Habitats Directive have a poor or bad conservation status, with many of the conditions of these territories degrading in time. Many ecosystems evaluated by the Joint Research Center for the EU-wide assessment of terrestrial, freshwater, and marine ecosystems were found to have largely unfavorable ecosystem conditions, with severe gaps in the legal protection of ecosystems. Cropland and forests, for example, have been found to be the least protected, when their protection alone could significantly contribute to the biodiversity conservation efforts of the EU. The new nature restoration regulation has been welcomed positively by the public. However, many stakeholders are skeptical concerning the realistic possibilities of achieving the goals that are set and for Member States to adhere to the regulation, given the poor results obtained with previous biodiversity-related regulations. The scope of this regulation is to make ecosystems not only more biodiverse but also resilient and create more synergies with the services provided by ecosystems. The Commission has calculated that between 8 and 38 euros will be returned for every euro invested in restoration in the form of ecosystem services.

¹⁸ Directive 2009/147/EC of the European Parliament and of the Council (2009) On the conservation of Wild Birds, European Union

¹⁹Council Directive 92/43/EEC (1992) On the Conservation of Natural Habitats and of Wild Fauna and Flora.., European Union

The law faced important opposition inside the European Parliament, particularly from the center-right European People's Party and the Conservatives and Reformists far-right Party, which almost stopped the proposal from passing. The two parties argued that such regulation would negatively affect the agriculture and energy sectors, which just started recovering from the heavy shocks created by the Covid-19 crisis, by subtracting land that could be used for ensuring food security and energy sufficiency without truly benefitting nature. However, the claims of the opposition have been strongly criticized by the scientific community, which stated in an open letter signed by more than 6,000 scientists that these claims 'contradict' scientific evidence and result from strong lobbying activities exercised in the European Parliament. The implementation of this regulation at the state level presents severe challenges and threats of non-compliance. Nevertheless, the creation of the regulation itself represents a milestone in the promotion of biodiversity protection and restoration, forcing policymakers to take concrete action. In order to do so, innovative tools for financing, governance, and implementation of biodiversity-promoting tools need to be better known and utilized, such as those suggested by the Convention on Biological Diversity.

2.2 SECTION 2

In this section, the tools used for biodiversity suggested by target 19 of the CBD are observed and classified. A distinction is made between market-based tools and non-market-based tools. All of the instruments are defined and observations on their strengths and limitations are underlined. Particularly, the pitfalls of often praised market-based instruments, such as the risk of greenwashing, the inexorable link to market rules and principles, and disregard for non-economic fundamental aspects of biodiversity protection, will be given attention.

2.2.1 Biodiversity Financing Tools

Market-Based Tools: the Benefits and the Pitfalls

The financing of biodiversity is gaining ground in terms of objectives, as well as innovative tools implemented in the financial sector, and the amount of their utilization. Most of these instruments, as mentioned, are based on the market. The Convention on Biological Diversity, Target 19 mentions payments for ecosystem services, green bonds, carbon offsets, and credits.

Payment for Ecosystems Services (PES)

According to the European Commission, Payments for Ecosystem Services are "a variety of arrangements through which financial incentives are offered to actors to encourage them not to cause environmental harm" (European Commission, 2021)²⁰ These incentives can be provided to communities, as well as individuals or companies operating in specific environments whose biodiversity is to be protected. For this reason, payments for ecosystem services are sometimes also intended as a sort of benefit-sharing mechanism, which will be discussed later on. The payments aim at promoting conservation efforts made by the recipient actors, which can include ecosystem restoration projects or promote the provision of services that benefit society, such as increased green areas, protection of fauna and flora, or preservation of clean water. The payments can not only be given to various types of entities but also come from different parties, such as governments, financial organizations, private or public bodies, individuals - through philanthropism or donations - or NGOs. As for the structure of it, it can vary based on the type of service that is being provided and the payer's needs. Several models structure the payments: they can, for example, take place as direct payments given to landowners or other recipients through specific certification programs or through other market-based mechanisms.

PES are considered voluntary instruments, as they offer incentives to landowners or users of a specific resource for conservation activities on a voluntary basis. The participation of both the service provider and the service user in the payment scheme is not mandatory. Unlike traditional regulatory approaches, which rely on laws and regulations to protect and conserve ecosystems, PES relies on voluntary agreements between parties. Of course, they still require a legal and regulatory framework to ensure their fairness and effectiveness, despite being voluntary. For this reason, governments and other stakeholders should play an important role in establishing and enforcing the rules and regulations governing payments for ecosystems, especially to ensure their sustainability and the equitable distribution of the benefits that arise.

²⁰ European Commission (2021) Ensuring that Polluters Pay: Payments for Ecosystem Services, General Publications of the European Union

PES essentially presents an intrinsic risk of potential market failures, in which costs and benefits of these schemes can be unfairly distributed or not equitably involve all stakeholders. The lack of control and enforcement of regulation can translate into incorrect reporting of the payments as well as their unfair distribution. Another defining element of PES is that they are result-based, meaning that they depend on the outcome of the conservation actions that are to be taken through the provision of the payments. Usually, PES are not provided until results of some kind can be assessed, measured, and create a positive outcome. The latter can be of different nature and measured with different indexes. For instance, as long as a payment for ecosystem services regards biodiversity, indexes used can be the number of animals or plants of a specific set of species, amounts of deforestation, the number of different species, the extension of a natural area, or other indicators that are used for assessing biodiversity. In other words, the payment or compensation received by the service provider depends on achieving measurable and verifiable results that can be monitored, measured, and verified. PES schemes focus on incentivizing service providers to deliver specific ecosystem services and achieve defined and measurable conservation results rather than simply paying for inputs or activities. The result-based approach is a key part of PES schemes, and it also provides a way for service users to ensure that their investments are generating the desired outcomes and, therefore, be able to assess if the investment is being proficuous. This, too, can be a problematic trait for many reasons. Firstly, evaluating the effects of a project on biodiversity is a complex task, not only because of the number of indexes that can create biased results through their omission or glorification but also because it can be practically difficult to measure these indexes. As mentioned, it is hard to assess the impact of biodiversity conservation actions, on the one hand, because of the multitude of indicators that can be used. On the other, biodiversity outcomes generally require long-term monitoring, as results are not immediate. Therefore, ensuring that the payments are being proficuous through the reporting of results can be a troublesome task. The monitoring not only has to be consistent and consider extended land areas that can be hard to track in detail. Additionally, as will be discussed more in-depth through case studies analysis, the monitoring and assessment of outcomes are often privately led, and there are no guarantees that the certified, published results reflect real ones, if not through public investigations, which are rare.

PES can overall be considered a market-based instrument, as they involve the creation of a specific market in which prices for conservation activities are negotiated between buyers and sellers. If correctly applied, PES certainly incentivize conservation, restoration, and protection of natural habitats and resources, and they can also promote the development of environmental values and respect for biodiversity among landowners and resource users who adhere to the schemes. Another strength of this instrument is that it is a flexible and adaptable tool that can be modified to meet the specific needs of different local communities, projects, and ecosystems. Overall, the main strengths of these schemes are that they are not a fixed system, making them an adaptable tool suited for different kinds of projects and desired biodiversity outcomes.

However, PES also pose multiple challenges, for example, establishing a truly effective market where the service being paid for is hard to quantify and evaluate. PES may also raise issues of equity or fairness, notably if the payments are based on market rates, which do not necessarily reflect the real value of the provided ecosystem service. Consequently, some service providers might receive less compensation than their service deserves, and inversely, other providers might receive more than the biodiversity output their actions create. Another issue that regards equity in PES is that providers who are most likely to participate are large-scale landowners or wealthier communities, which poses an issue not only because this marginalizes smaller, poorer communities and smaller-scale landowners but also because it contradicts multiple of the points raised during the CBD on fair access to benefits and equity. The CBD strongly focuses, for example, on the role that more developed members have to play in ensuring that developing members are being supported and that minorities are not only included but also active parts of biodiversity conservation processes and indigenous groups. Supposing benefits of these payments are concentrated on wealthier, larger providers; in that case, these schemes can result in social inequities in which communities that most need ecosystem services cannot access them as much. To address this issue, these payments need to consider using alternative schemes that can design forms of payments that are more inclusive and equitable or find alternative funding systems to support those who cannot take part in them. In the case that PES are integrated into public policies or regulations, such as conservation or land use policies, a more stable and predictable demand for ecosystem services can be created, helping address the aforementioned issues. If, alternatively, PES are created as a way to diversify the streams of income for ecosystem services providers, they help them become less reliant on simple market mechanisms and

develop a more secure net of income, with PES becoming an efficient alternative source - although not unique- of funding.

Green Bonds

Green bonds have been getting much attention as a promising tool in the sector of sustainable financing. The World Banks' report "What Are Green Bonds?" defines a green bond as a " debt security that is issued to raise capital specifically to support climate-related or environmental projects." (World Bank, 2015)²¹ Therefore, investors take into account the environmental purposes of the projects that the bond intends to support in addition to the standard financial characteristics that are usually evaluated for investing in bonds, such as maturity, coupon, price, or credit quality of the issuer. Green bonds started being issued in the early 2000s-2010s by multiple international organizations, such as the World Bank, the International Finance Corporation, and the European Investment Bank. Green bonds differ from regular bonds not only because of the focus on environmental impacts and the kind of projects funded but also because of the different, more sustainable, and responsible investors they allow issuers to attract. The market of green bonds has been growing exponentially, going from about US\$4 billion in 2010 to over US\$37 billion in 2014 and reaching a value of US\$ 500 billion in 2021.

Green bonds require funds raised through their issuance to finance biodiversity-friendly projects, which vary a lot both in scope and scale. Supporting projects that promote biodiversity and sustainable development can be attractive for investors who seek to align their investment practices with their values or are looking for green opportunities in the financial market. Proceeds from green bonds allow greater transparency and accountability for investors, as they help ensure that the funds provided are used for their intended purpose. Trustworthiness and accountability are also increased by the fact that green bonds are usually certified by independent third parties to verify that the projects that they fund meet specific environmental standards. The certification process is based on assessing the benefits of biodiversity that the project funded by green bonds generates. These standards include predefined criteria and standards on biodiversity protection, water conservation, and others developed by specific organizations, such as the Climate Bonds Initiative. Therefore,

²¹ World Bank (2015) What Are Green Bonds?

once a project obtains the certification that confirms it respects the selected standards, it can be included among the projects of a portfolio financed by a green bond. Portfolios are usually shown to investors in public documents or, when they are interested in one, in the bond prospectus to help them make informed decisions about the bond's environmental impact.

Green bonds have gained much attention in the field of biodiversity and, generally speaking, sustainable finance because their potential environmental benefits are not indifferent. They allow investors to support environmentally friendly projects by providing a new source of funding for projects that may not have had access to other more traditional funding sources, for example, and accelerate the transition to a more sustainable economy this way. Additionally, since each project in a green bond can focus on a different environmental issue - for what concerns biodiversity, they can include fauna or flora restoration projects, marine or terrestrial habitats protection, for example - and help simultaneously address multiple pressing environmental challenges. Moreover, green bonds are a part of the transition towards sustainability, in which values and principles play an important role. They act as a new avenue for investors to align with their values and environmental concerns.

Diversification is a fundamental principle of investing that green bonds promote. It helps investors reduce their exposure to any specific asset and diminishes the risks investors run into. Investing specifically in green bonds helps decrease risks because they are issued by various issuers, such as corporations, municipalities, and governments, who offer a large range of credit ratings, which can provide investors with a range of risk and return profiles to choose from, and maturities, which can provide investors with the flexibility to tailor their investments to their preferred investment horizon. The projects funded by green bonds are very different, allowing investors to diversify their portfolios further. However, regulatory support is fundamental for the success of green bonds; governments and other institutions can create favorable policy environments for the development of green bonds, for example, by providing tax incentives, such as exemptions or reductions, as well as subsidies to encourage investing in them. The European Union, for example, has established a regulatory framework for green bonds, which includes requirements for transparency, disclosure, and verification of the environmental benefits of the projects being financed. Regulatory support also helps the process become more transparent, accessible, and trustworthy by requiring issuers of the green bonds to disclose information on the projects being funded and their environmental impact or provide standards for certification processes. The regulatory support provided to green bonds can help create a more robust market that benefits issuers, investors, and the environment.

Green bonds also present a series of weaknesses, which essentially revolve around the lack of standardization, limited supply, and pricing issues. There is not currently a standardized definition of what constitutes a green bond exactly, which leads to different issuers being able to use different criteria to assess whether projects qualify as "green" or not, and not all criteria used are necessarily effective. Moreover, such variety means investors can have difficulties comparing the different green bonds and evaluating their real environmental impact. There have been efforts to address this issue, such as the establishment of voluntary standards for green bonds made by the International Capital Market Association (ICMA) of the Green Bond Principles. The aim is to provide guidelines for issuers to follow in order to promote transparency, disclosure, and integrity in the market for green bonds, but harmonization of criteria is still not ensured in the market of green bonds.

Another issue is related to the smaller size of the green bond market compared to traditional bonds, which limits the opportunities for investors and overall supply. This issue is due to green bonds being a relatively new financial instrument, on the one hand, and also to the fact that some issuers may be hesitant to enter this market. Despite this, the market of green bonds has been rapidly growing in recent years, and limited supply can also have its upsides in the sense that they can create opportunities for higher yields and returns. As for pricing issues, green bonds might make investors more hesitant if the pricing is not competitive with other fixed-income securities. If issuers find themselves in this challenging situation, they might have to offer higher yields to attract investors. This weakness is often counterweighted by certification processes, especially if made by third-party bodies with strong environmental credentials, and by the fact that investors who look into green bonds might be willing to accept lower yields in exchange for investing in bonds that align with their values. The rate of return on the projects funded through green bonds also poses issues concerning the possible reach that these projects can have. As previously mentioned, biodiversity-related markets are very recent and still "immature." The subset of projects that can be attractive for investors is restricted to commercially mature sectors when in reality,

many of the opportunities for biodiversity-related projects are not financially viable in terms of return on investment (Chausson et al., 2023). Overall, green bonds offer a way for investors to support environmentally friendly projects while also receiving fixed income. Nevertheless, they do not come without their limitations, and investors have to carefully evaluate the risks and benefits before investing, which can limit the effects and extent that green bonds can reach.

Carbon offsets and credits

Carbon offsets and credits are mechanisms that support projects that remove GHG emissions from the atmosphere (Trouwloon et al, 2023).²² Essentially, they are based on the idea of "offsetting" emissions on a global scale rather than local, meaning that activities that reduce emissions in a specific place can mitigate the emissions produced elsewhere. The mechanisms establish a carbon market, in which carbon credits can be bought by an entity, usually private companies, to compensate for the emissions that they produce by reducing or removing GHG emissions elsewhere. So, while carbon offsets are the achievement of the goal of projects that aim at reducing emissions, carbon credits are the financial instrument that represents the reduction or removal of precise carbon dioxide units. Credits can be sold and bought in an attempt to produce economic incentives for companies to fund sustainable projects that decrease GHG emissions or reduce their emissions to sell their own carbon credits. Carbon offsets can operate in both voluntary or regulated markets, meaning that the actors of the market can either voluntarily sell and purchase offsets - to improve their reputation, for example - or be subject to the governmental imposition of emission reduction targets. In this sense, purchasing credits can help reach the objectives set by the governments. The ways and the types of projects that carbon offsetting involves are quite varied. They can take place in the form of reforestation, energy efficiency initiatives, GHG emissions capture projects, and other initiatives. These projects are usually certified according to sector-specific standards to ensure the credibility and additionality of the emissions reductions. However, the certification process, as will be discussed throughout the study, can present multiple greenwashing risks. Indeed, the certification entities are usually privately led, and these entities depend on the companies they certify as a source of economic returns, which can alter

²² Trouwloon D et al. (2023) Understanding the Use of Carbon Credits by Companies: A Review of the Defining Elements of Corporate Claims, Wiley Online Library

the outcomes of the certification processes. Additionally, certifications only produce positive image outcomes, in the sense that if a company is certified, its positive traits are highlighted, while its weaknesses can be overshadowed.

Carbon offsets and credits can be helpful for biodiversity financing, as they present multiple incentives, but the risks are non-negligible. According to Trouwloon D. et al., "the major risk is that offsetting offers a "cheap" license for governments, companies, and individuals to continue polluting and delaying their own GHG reductions, far beyond the time frame that climate science suggests is advisable for reaching climate goals."²³ Carbon offsets potentially play a significant role in climate change mitigation, especially when adopting a global approach to emissions management, where the emissions are considered in their totality and not as local outputs. Regarding biodiversity, projects that offset emissions usually concern practices like reforestation programs, protection of natural areas, and other biodiversity-promoting activities. Carbon offsets can help promote sustainable development because removing emissions from the atmosphere implies developing projects related to clean energy, biodiversity conservation, and community development initiatives. However, carbon offsets have been criticized because of the ease with which they can serve as greenwashing tools. Companies can trade carbon credits and claim to offset emissions, but it can be hard to verify whether that is actually the case. Carbon offsets and credits need extensive monitoring and verification processes to prove they support the environment and offset emissions.

However, this results-tracing does not necessarily happen as often or as rigorously as it should. The control is often delegated to private agencies that could misreport the results in the interests of the offsetting company. Also, measuring offsetting results can be challenging: indicators used vary from project to project, and the data can be hard to collect. The risks of carbon offsets and credits extend to the concept of additionality, which refers to whether the emissions reduction would have happened independently from the carbon offsets working as an incentive. The whole credibility of these tools relies on the concept that they play a determining role in emission reduction. Lastly, the very foundational concept of carbon offsets - that emissions produced in one place can be compensated by emissions produced elsewhere - can be problematic. The mathematical sum and subtraction of emissions on a

²³ Trouwloon D et al. (2023) Understanding the Use of Carbon Credits by Companies: A Review of the Defining Elements of Corporate Climate Claims, section 2.1, Wiley Online Library

global scale and the possibility of just buying carbon credits can disincentivize polluting companies to improve their impact at a local scale because emissions are compensated, in theory. This compensation is not granted, considering that the permanence of carbon removal projects can be uncertain because of the other natural disturbances or land use changes to which the projects can be subject to. Lastly, the carbon offset and credit market can be complex and subject to fluctuating prices, varying standards, and regulatory frameworks. These complexities can create challenges for market participants, making it important to have transparent and consistent regulations to ensure the market's integrity.

As mentioned, there are more than one type of carbon markets. The first one is called the mandatory 'cap and trade" program, in which governments limit the emissions that can be produced in a specific industry. If a company produces more emissions than allowed, it can buy more carbon credits to continue producing at that rate or be penalized for a violation. If companies, on the other hand, reduce their emissions, they can sell their credits to other companies. Thus, the system provides a double incentive to decrease emissions. The other type of carbon market is the voluntary offset program, allowing businesses, individuals, and non-profits to offset their emissions by choice. These offsets can be created by participating in projects that reduce, capture, and store emissions by investing in renewable energy, improving energy efficiency, capturing greenhouse gasses, handling forestation, or switching to biofuels. The voluntary adhesion to carbon offsetting helps companies improve their reputation among customers, increasing the sense of corporate social responsibility. The carbon credit market was created within the Kyoto Protocol framework in 1997, which required only developed nations to cut their CO2 emissions. However, since the creation of this legally binding treaty was created, overall emissions drastically increased instead of decreasing from 1990 levels, particularly because of Russian and Ukrainian oil and gas companies that exploited loopholes in the system, adding a staggering 600 million tonnes of CO2 into the atmosphere. Additionally, over 75% of the carbon credits created lacked environmental integrity. The explosion of fraudulent projects led to the fall of the Kyoto Protocol, which the 2015 Paris Agreement then replaced. Although scandals and episodes of the sort have often challenged the credibility of carbon credits, they remain an important financial tool to implement in the fight against climate change, if used within proper regulation and control mechanisms.

Non-market-based tools

The idea behind increasing the private involvement in the financing of biodiversity relies on using new market-based instruments, such as the ones that have been described above. Nonetheless, these tools alone might not be sufficient to bridge the financing gap and ensure that biodiversity receives all the financing needed or that the latter is used efficiently. For this reason, non-market-based tools are just as important in the fight against biodiversity loss. Most of them concern the way funds are used, organized, and distributed and imply for government action to take place. An interesting study by Chausson et al.²⁴ suggests ways to go beyond market-based mechanisms to foster sustainable futures and nature-based solutions, in particular, a list of non-market-based tools, such as repurposing harmful government subsidies, taxing environmentally harmful activities, directly funding nature and decolonizing finance mechanisms.

In this section, these methods are briefly discussed to introduce the concept of non-market-based mechanisms, allowing the Study to discuss BSMs - which is the non-market-based mechanism that this study will focus on - more in-depth in the next chapter.

As mentioned, the role of governmental bodies is central in the management of non-market-based mechanisms. The repurposing of harmful subsidies or taxing environmentally harmful activities, for example, must be managed publicly. To this day, the amount of investments related to environmentally harmful activities in the form of investments, bonds, as well as subsidies is much greater than those in activities that result in positive environmental outputs. Target 18 of the Global Biodiversity framework adopted during the Kunming-Montréal summit explicitly mentions the need to "*Identify by 2025, and eliminate, phase out or reform incentives, including subsidies harmful for biodiversity, in a proportionate, just, fair, effective and equitable way, while substantially and progressively reducing them by at least 500 billion United States dollars per year by 2030, starting with the most harmful incentives, and scale up positive incentives for the conservation and sustainable*

²⁴ Chausson A. et al. (2023), Going beyond market-based mechanisms to finance nature-based solutions and foster sustainable futures, Department of Biology, University of Oxford

use of biodiversity"(**CBD**, 2022).²⁵ Many products and activities that are harmful to the environment are largely subsidized, such as oil production or animal products deriving from livestock (**Chandel et al., 2019**).²⁶ Indeed, harmful sectors most often subsidized are agriculture, forestry, fisheries, and fossil fuels. It is estimated that repurposing harmful subsidies in the agricultural sector alone could double funding for nature on a global scale. (**Barbier, 2022**)²⁷. Taxing environmentally harmful subsidies works as an alternative method to reduce the amount of harmful activities and nocive products. Both of these non-market-based techniques can however be challenged by lobbying practices and the power that private companies and industries can exert on governmental action and decisions (**Hertog, 2010**)²⁸. Following private interest theorists of regulation, the phenomenon of regulatory capture indicates that close relationships can form between policymakers and privates, leading to political action favoring private interests rather than the public ones . Yet, governments need to challenge these obstacles in the name of biodiversity preservation, perhaps by considering the relevance of biodiversity and ecosystem services conservation for the economic sector in the long term.

Investing in environmental conservation and biodiversity can be a resource to boost the economy, create jobs, multiply economic outputs, and improve the population's well-being. It is, therefore, important for the government to directly fund investments in nature. Increasing financial spending on environmental protection and nature can help reduce the risk of investments, as environmentally friendly investments rate better on risk assessment procedures and are therefore safer (Lodh, 2020).²⁹ They can serve the purpose of tackling inflation and utilizing in an efficient way the funds allocated for the post covid recovery. Financial mechanisms also ought to be decolonized: the North-South divide can also be seen through the flows of finance, and for what concerns biodiversity protection flows, the current divide is being reinforced. Instead, according to Chausson et al., *"unconditional cash transfers or debt relief schemes could substantially relieve the burden of*

²⁵ Convention on Biological Diversity (2022) Cop15: Final Text Of Kunming-Montreal Global Biodiversity Framework, Official CBD Press Release

²⁶ Chandel BS et al (2019) Livestock production systems, subsidies and its implications: An investigation through review of literature, Indian Dairy Association

²⁷ Barbier EB. (2022) The Policy Implications of the Dasgupta Review: Land Use Change and Biodiversity: Invited Paper for the Special Issue on "The Economics of Biodiversity: Building on the Dasgupta Review," Environmental and Resource Economics

²⁸ Hertog, J.A. (2010) Review of Economic Theories of Regulation, Discussion Paper Series / Tjalling C. Koopmans Research Institute

²⁹ Lodh A. (2020) "ESG and the cost of capital", MSCI
debt on poor countries' national budgets, towards allocating resources for addressing environmental and social challenges." The study also adds a fifth important element to consider, which is more a principle shift rather than a real non-market-based tool, which is to shift away from the imperative of economic growth. Indeed, optimistic visions of sustainable development and green growth have recently been questioned among scholars and the general public, considering that the history of economic growth and its parallel with increased production suggest that growing without increasing pollution, for as much as an economy can become circular, is not a realistic expectation. Degrowth, circular practices, and alternatives to monetary solutions should be considered as ways to manage the economy and improve society and nature's well-being truly and effectively.

Non-market-based tools are fundamental to leveraging the effects of market-based mechanisms and their outcomes. As mentioned, funds for biodiversity are still insufficient in number, and the market-based mechanisms that are being promoted are innovative, which can be good but also imply that they are new on the financial market. They also create new markets that are often too "immature" and subject to multiple limitations and constraints. (Chausson et al., 2022). Market-based mechanisms such as green bonds or payments for ecosystem services generally require a positive return on investment, which is not a given for many biodiversity issues that need to be tackled. Private investors are generally attracted by projects and investment opportunities that are circumscribed to commercially mature sectors, while great amounts of biodiversity protection projects that require funding are not financially viable - considering the different costs of implementation, management and monitoring - and are therefore underfunded. Also, the tools suggested in the GBF are environment-promoting tools that do not necessarily apply to biodiversity. While carbon credits, for example, can be calculated, it is harder to estimate biodiversity credits, and the fact that carbon offsets and credits promote biodiversity conservation is generally more an assumption than a certified fact. Many ecosystem services are characterized as non-rival and non-excludable (Chausson, 2022)³⁰. This means that relying solely on private property regimes and markets is ineffective and unsuitable for their sustainable management. The emerging and innovative natural capital markets that are being created, such as bio credits or carbon credits, are still far from being fully developed. While the potential of the carbon market is often highlighted to attract investors, this alone cannot sufficiently promote

³⁰ Chausson A. et al (2023), Going beyond market-based mechanisms to finance nature-based solutions and foster sustainable futures, Department of Biology, University of Oxford

biodiversity protection. The immaturity of these markets also makes it difficult to establish adequate prices that meet the needs of indigenous people and local communities and biodiversity conservation.

The financing green and greening finance narratives often mentioned in the effort to promote sustainability in the financial sector actually demonstrate the limitations and obstacles that the sector faces (World Bank Group, 2020).³¹

Greening finance initiatives aim to make the financial sector greener rather than only financing green projects. The practical ways to do so are by reforming financial resource flows that cause harm, prioritize portfolios and practices of development cooperation agencies and banks, MDBs, international financial institutions and charities, to align financial flows with the objectives of the CBD. Other actions can involve strengthening risk assessment and transparent reporting requirements of international private finance and business actors, as well as reporting on actions taken and efforts made to decrease harmful incentives. However, rethinking financial structures and mechanisms will require years of transformation, and the concept of creating a more sustainable financial sector is a long-term, all-encompassing project. It goes beyond the case-by-case promotion of environmentally positive projects and takes a broader solution-oriented approach that probably needs to be faster to respond to the climate emergency and the biodiversity crisis that are currently taking place. Yes, it is a fundamental part of creating a more sustainable economy and rebalancing financial activities in favor of Nature. However, it cannot be expected to be efficient enough to solve the crises, and it needs to be anticipated by non-market-related mechanisms that help halt the biodiversity crisis and adapt to change.

Financing green initiatives, on the other hand, aim at increasing biodiversity protection by, for example, increasing domestic public biodiversity-related expenditures, or leveraging between public and private domestic biodiversity related finances. Using financing green as a framework for financial policy can promote the design and implementation of positive sustainability measures that align domestic policies with international environmental obligations, as well as using more innovative financial tools and enhancing the role of collective actions, which include indigenous peoples and local

³¹ World Bank Group (2020) Mobilizing Private Finance for Nature

communities. Financing green comprehends the financing of non-market-based approaches, which do not aim at using natural resources and biodiversity for creating an economic output as much as developing Mother Earth centric actions or nature based solutions to ecosystem specific issues. Financing green practices do not require the same enormous structural changes as greening finance ones do, and are therefore faster and more at reach. Nevertheless, the financing of green projects and activities has to become more efficient, traceable, transparent and effective. Market-based mechanisms that help finance green need to be paired with non-market-based mechanisms that help structure the distribution of the benefits, scale the effects at different levels, and make sure that they reach a sustainable status. Indeed, the importance of funding or market-based tools is not to be dismissed. Without initial investments, projects cannot take place, and it is therefore important to persist in developing and increasing their share in the financial market. However, initial investments need governance methods and systems to make sure that their effects are real, long term, and fairly distributed.

CHAPTER THREE

3.1 SECTION 1

Having looked at the different non-market-based mechanisms, in this section, the focus is put on a specific type of non-market-based tools, the one of benefit-sharing mechanisms (BSMs). BSMs are described here, and their relation to market-based mechanisms is analyzed. Successively, the study identifies a theoretical framework, the one of the Theory of the Commons, that can help assess the efficiency of BSMs. Other relevant models, such as the Quintuple Helix Model, the Public-private Partnerships model - considering also the evolutions of it - and the Sustainable Development Innovation Partnership model, are also described and considered for the setting on a new framework of analysis for BSMs.

3.1.1 Benefit-Sharing mechanisms as a Type of Non-Market-Based Mechanism

The new Global Biodiversity Framework, when addressing the financial tools to develop in Target 19, mentions benefit-sharing mechanisms as the only non-market-based tool. BSMs are multiple and it is hard to identify a single definition. The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization in 2011, as the title shows, mentions BSMs for what concerns the access to genetic resources and their use (Nagoya Protocol, 2011).³² In general terms, BSMs were introduced in international law in 1992 through the Convention on Biological Diversity. They were formalized with the particular intent to address issues of governance of socio-ecological systems in developing countries (Nkhata et al., 2012).³³ However, through time and particularly in recent years, the concept of BSMs has evolved. While it was originally related to the distribution of financial benefits, the conception of the latter has broadened and now

³² Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, (2011)Secretariat of the Convention on Biological Diversity, United Nations

³³ Nkhata et al. (2012) A Typology of benefit-sharing Arrangements for the Governance of Social-Ecological Systems in Developing Countries, JSTOR

embraces other forms of responsibility and accountability. BSMs refer to a range of different approaches used to equitably share the positive outcomes that derive from the utilization of natural resources. BSMs are often cited in large, multi-stakeholder initiatives, in which the interests of different groups have to be balanced at different levels, including local, international, public and private actors. In the Convention on Biological Diversity, Indigenous Peoples and Local Communities (IPLCs) are often cited as actors who have to actively be involved in multiple phases of biodiversity conservation, particularly in the phase regarding the sharing and the distribution of the benefits. Indeed, BSMs can be organized on a vertical axis that incorporates benefit-sharing from national to local scales, and a horizontal axis that includes the distribution of benefits across communities, households, and local stakeholders within the national and local scales (Thu Thuy et al., 2013).³⁴ They are very adjustable tools that can change and adapt to the scale and diversity of each project whose benefits must be distributed. BSMs, as mentioned, can be quite diverse and include various schemes. PES, for example, which has previously been described as one of the market-based mechanisms, can be considered a benefit-sharing mechanism as well, for example. Indeed, people working on sustainable and biodiversity-promoting projects often receive compensation and benefits in the forms of payments, as a compensation for the role they have played in the project development. It is a market-based BSMs, and it essentially belongs to a broader category that can comprise both non-market and market-based benefits. The advantage that BSMs bring by being such a broad category is that they can include very diverse types of benefits: from access to goods to technology and transportation, to education, healthcare services, better organization or financial remunerations.

Overall, BSMs can be described in the following way: they are inclusive, equitable, and very flexible instruments. BSMs aims to include several diverse stakeholders, such as local communities, indigenous groups, government agencies, NGOs, and private sector actors, as their scope is not to serve private or public interests but to ensure that all parties involved receive adequate benefits. In order to distribute benefits among all participants who are impacted by the use of natural resources, all parties are generally included in the decision-making processes. Furthermore, the backbone principle of benefit-sharing mechanisms ensures equity: the use of natural resources is thought in a way to fairly benefit

³⁴ Thu Thuy P. et al. (2013) Approaches to benefit-sharing, A preliminary comparative analysis of 13 REDD+ countries, CIFOR

all actors involved, taking into account the different roles, needs, and positions that are taken by each participant., in order to promote long term sustainable use of said resources. Similarly to other innovative green financial tools, BSMs can be adjusted to fit specific contexts. However, they are a tool that offers a broader range of approaches, which for example, can be both monetary and non-monetary. In both cases, the distribution mechanisms can be quite diverse depending on the structure of the specific case.

Benefit-sharing mechanisms present some powerful potentialities. Firstly, the horizontal dimension of benefit-sharing mechanisms guarantees that the benefits derived from the use and conservation of ecosystems and natural resources are equitably shared among different stakeholders that are involved in the benefits. They are a great tool to promote conservation and sustainable use, as the financial incentives that they can provide are able to encourage the participation of local communities, indigenous people, and all relevant groups that, historically, have been excluded from decision-making and access to the benefits derived from the utilization of natural resources. Providing benefits to these groups and communities means that BSMs also supports local livelihoods, their resilience ,and adaptability to climate change's effects. Moreover, the collaboration between stakeholders such as governmental agencies, civil society organizations, and actors from the private sector is a driver of trust-building and collaborative practices that bolster transparency, communication, and efficient coordination between actors in achieving long-term sustainable goals. BSMs is also a tool that can deeply strengthen governance frameworks through the advancement of inclusive and participatory decision-making processes that arrange the interests of all stakeholders while considering the management and conservation of resources.

Benefit-sharing mechanisms also present some difficult aspects, especially for what concerns their implementation. The latter, indeed, can be quite complex, particularly when multiple stakeholders are involved, coordinating all interests, establishing the proportionate repartition of benefits and the type of benefit that is to be shared as well. There is a risk that power dynamics between different stakeholders may lead to inequitable distribution of benefits. The way benefits are distributed can ultimately be opaque, in some cases being subject to unequal divisions depending on who is managing the resources and the type of benefit that is being shared, creating issues of accountability as well in a multi-stakeholder environment in which decision making processes can become problematic. Also, BSMs

require for social and organizational issues regarding the lack of distribution of benefits to be addressed as well in order to work, such as discrimination, inequality or poverty, as these matters can shorten the impact of the mechanisms of benefit-sharing.

In summary, BSMs are an important tool for promoting the equitable and sustainable use of natural resources, fostering collaboration, equity and sustainability. It goes without saying that the benefits of a project can only be distributed if the project itself works, is properly funded and structured. For this reason, benefit-sharing mechanisms are particularly useful when considered as enablers of the long term sustainability of projects. Initial investments based on market-based tools and other fund collection practices are necessary to kick start projects, especially during the development and the creation of the project. What BSMs add is the possibility to create self resilient, self-managed projects, with systems of distribution, stakeholder involvement and local governance practices. BSMs, in this sense, can serve as a way to rethink the return on investment approach, by providing it in the first place but then shifting to the development of organized, independent structures that can detach themselves from the market and create their own reality. BSMs are a sort of mutual benefit system in which the participants can, over time, become independent from the market after some time. However, these mechanisms are not without their challenges, and their success depends on careful design and a very solid governance.

3.1.2 Defining Types of Benefit-sharing mechanisms

Benefit-sharing mechanisms have long been cited in international debates, particularly when concerning biodiversity-promoting topics and environmental action. However, there is not a coordinated understanding of what BSMs truly are, and the literature on the topic is quite scattered. One of the aims of this study is to create a common framework of analysis for BSMs, to help policymakers evaluate their efficiency in the context of biodiversity financing. For this reason, this section will focus on collecting the different types and explanations of BSMs found in the relevant literature.

Definitions of Benefit-Sharing Mechanisms

Back in 2007, Schroeder embraced the challenge of finding a clear definition for BSMs (Schroeder, 2007).³⁵ In his work, he analyzes international ethics and ethics facets. In the first one, the author distinguishes non-human genetic resources from human genetic resources. The term, in both cases, describes "an exchange between those who grant access to a particular resource and those who provide compensation or rewards for its use". The concept of non-human genetic resources comes from the CBD Earth Summit that took place in Rio de Janeiro in 1992, when the Convention set the international goals, for its members, to conserve biological diversity, ensure the sustainable use of its components, and the fair and equitable sharing of the benefits derived from the use of genetic resources (CBD, 1995).³⁶ Human genetic resources, instead, refer to the unique genetic material found within humans, including DNA, genes, and genetic variations. The parties of the Convention on Biological Diversity in 1995 decided that this second category would not be included in its scope, and national definitions of benefit-sharing were to be given, with some definitions being more limited than others. Overall, definitions converged on the idea that benefit-sharing is the sharing of whatever derives from using biological resources, community knowledge, technologies, innovations, or practices. Schroeder adds to this definition that, when talking about BSMs, it should be specified that two parties participate in legal benefit-sharing processes, for it to be distinguished from charitable giving. The CBD remains the strongest normative justification for benefit-sharing of non-human resources, identifying the conservation of biological diversity as a "common concern for humankind" and increasingly agreeing on the importance that the recognition of the importance of custodians of biodiversity play and the fair distribution of benefits to them. Local communities and Indigenous People are being progressively included in the conversation for a matter of fairness and fundamental rights, but also because without developing a fair system of recognition of their work, the use of non-human resources cannot be sustainable. For this reason, the CBD justifies BSMs through a mutually beneficial instrumental approach, in

³⁵ Schroeder D (2007) benefit-sharing: it's Time for a Definition, J Med Ethics

³⁶ CBD (1995) Decision II/11 access to genetic resources

which each party gives and receives in equivalent shares, in both monetary and non-monetary terms.

In fact, the difference between monetary and non-monetary BSMs is important to note, when defining and categorizing BSMs. Monetary benefit-sharing refers to mechanisms that involve transferring financial resources, royalties, fees, or payments from the user of a genetic resource - or traditional knowledge associated with it - to the provider country or community. It is a form of compensation for the use of these resources. This type of BSMs can take place in various forms: it can serve as payments for ecosystem services, a specific financial tool in which compensations are based on specific services provided. It can also be provided as royalties for commercialization, offering percentages of profits derived from using a genetic resource to the providers of said resource. Additionally, monetary BSMs can develop as access fees, where the users of genetic resources pay fees to access and use resources, as well as technology transfer agreements, involving monetary compensation in exchange for the transfer of technology or know-how related to genetic resources, or trust funds managed for the benefit of the providers.

Non-monetary benefit-sharing methods focus on the transfer of non-financial benefits of different origins. Some examples include technology transfers, meaning the exchange of knowledge, expertise, and methods between parties, as well as capacity building, research collaboration, training, access to data and information, sharing of research results, and contributions to local development projects in various manners. This last form of non-monetary BSMs can often be seen in development projects. This mechanism involves investing financial, technical resources, or other forms of support for local communities' development through supporting education, healthcare, infrastructure, or environmental conservation. The goal of non-monetary BSMs, overall, is to promote sustainable development while endorsing scientific knowledge and fostering equitable partnerships (Visser et al., 2004).³⁷

Schroeder concludes that, when including ethics in the discourse, it is possible to draw a definition for benefit-sharing. Indeed, "benefit-sharing is the action of giving a portion of advantages/profits derived from the use of non-human genetic resources or

³⁷ Visser B et al. (2004) Options for Non-Monetary Benefit-Sharing: an Inventory, Centre for Genetic Resources, the Netherlands Wageningen University and Research Centre

traditional knowledge to the resource providers, in order to achieve justice in exchange." Essentially, BSMs allows people to differentiate the use of genetic resources from charitable giving because it establishes a just compensation system in exchange for using said resources.

The Nagoya Protocol and Benefit-Sharing Mechanisms

The matter of distributing benefits equitably in the context of biodiversity led to the creation of the Nagoya Protocol, one of the two supplementary agreements to the CBD. The Protocol concerns the access to genetic resources and the fair and equitable sharing of benefits arising from their utilization, narrowing the focus on the third of the three main goals of the CBD, which is indeed the one of "*Fair and Equitable Sharing of Benefits Created Through the Utilization of Genetic Resources*" (CBD, 2011). ³⁸

The scope of the Protocol is to create greater legal certainty and transparency for the two parties involved in the use of genetic resources: providers and users. Increasing these aspects can help ease the predictability of conditions of access to genetic resources and ensure that the benefits are shared even when the resources leave the providers' sites. Setting a protocol of this kind is meant to serve as an incentive to conserve genetic resources and create a more sustainable relationship between the use of genetic resources for human well-being and the protection of biodiversity. The genetic resources included in the Nagoya Protocol are those covered by the CBD, as well as traditional knowledge that is associated with genetic resources. Including this traditional knowledge increases the importance of indigenous and local expertise, in alignment with the greater attention that these categories have been getting in recent years.

The contracting parties of the Nagoya Protocol encounter a series of obligated measures to take that ensure their compliance in ways of managing BSMs in order to access genetic resources. Specific obligations are expected from countries at domestic level and listed as follows:

Contracting Parties are to:

1) Take all necessary measures to create legal certainty, clarity and transparency

³⁸ CBD (2011) 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, United Nations

- 2) Provide fair and non arbitrary rules and procedures
- Establish clear rules and procedures for prior informed consent and mutually agreed terms
- 4) Provide for issuance of a permit or equivalent when access is granted
- 5) Create conditions to promote and encourage research contributing to biodiversity conservation and sustainable use
- Pay due regard to cases of present or imminent emergencies that threaten human, animal or plant health
- 7) Consider the importance of genetic resources for food, agriculture and food security

These domestic measures are meant to guarantee that the benefits are fairly and equitably distributed with the contracting party that provides the resources used, be it for research and development, biochemical composition or subsequent applications and commercialization of the resources. In particular, the protocol explains that the "*sharing is subject to mutually agreed terms*", rather than an imposition of one party on the other, and that benefits can be both of monetary or non-monetary nature. A relevant innovation of the Nagoya Protocol is to have envisioned a series of specific compliance supporting obligations, in domestic legislation and regulation, for the contracting party providing the resources in mutually agreed terms. Some of these obligations include taking measures to ensure that access is granted following prior consent and mutually agreed terms with interested parties, that they cooperate in case of alleged violation of the other contracting party's requirements. There are also other measures regarding the settlement of disputes between parties. The Protocol addresses genetic resources where "indigenous and local communities have the established right to grant access to them", for which contracting parties need to ensure prior consent, and fair benefit-sharing in line with community laws and procedures.

Inter-State and State-to-Community Benefit-Sharing Mechanisms

Overall, benefit-sharing mechanisms can be very diverse in origin, structure, and scope. While different analyses and categorizations have been made, the BSMs literature remains scattered. Particularly, BSMs concerning biodiversity can take different forms. Morgera and Tsioumani have offered a good analysis of BSMs through their study of the evolution of BSMs within the CBD framework and the link drawn between biodiversity and

community livelihoods. Their study divides this tool in two categories: inter-State and State-to-community BSMs. According to Morgera and Tsioumani (2010), the concept of BSMs has been evolving within the Convention on Biological Diversity framework. What used to be considered, originally, as a tool to manage genetic resources, has broadened its reach and started covering conservation and sustainable use of biodiversity, using completely different legal connotations (**Morgera and Tsiounami, 2010**).³⁹ This evolution led to creating a distinction between inter-State BSMs and State-to-Community ones. This distinction interestingly reflects a typical evolution of international law, namely, from a type of relationship primarily based on interactions between states to a legal framework suitable for a globalized world. In this context, direct relations between individuals from different countries are strengthened, not only through states but also through international organizations/entities of public or private nature. As a result, international legal sources, in order to make fundamental rights effective, can have direct domestic implications for the relationship between the State/other similar entities and individuals/communities (State-to-community or Private Sector-to-Community ones).

The first category of BSMs is usually linked to the access to genetic resources. Before the entry into force of the CBD, natural resources were conceived under an application of the 'common heritage concept', with 'in situ' resource access being considered legitimately free and unconditional, with the expectation that research was to benefit future generations too. The common heritage principle, however, sparked reluctance among certain countries, because of the lack of intellectual property regulation and the asymmetries that were then created by following interventions for property protection. Under the CBD, the national sovereignty principle has replaced the common knowledge one on the topic of genetic resources. It provided for the first time a clear legal basis for inter-State benefit-sharing, which was included in the CBD and obliged developed countries to share the benefits coming from genetic resources to correct inequities arising in this context. Three main means of benefit-sharing have been pointed out in the CBD in this sense, which can all be reconducted to different articles of the Convention: appropriate access to genetic resources, appropriate transfer of relevant technologies, and appropriate funding. Ensuring access to genetic resources has generally been conceived as an unavoidable condition to continue research and create shareable benefits. The authority to determine it is held by national governments and

³⁹ Morgera E., Tsiounami E. (2010) The Evolution of benefit-sharing: Linking Biodiversity and Community Livelihoods, RECIEL

countries and is subject to national legislation. Countries need to adopt adequate legislative, administrative, or policy measures to possess benefit-sharing requirements. This inter-State approach to benefit-sharing is not limited to governmental action, but actually reaches the community level, as it includes traditional knowledge associated with genetic resources implied in the 'in situ' conservation mentioned in Article 8 of the CBD. The utilization of this knowledge, often derived from indigenous people and local communities, is to be followed by the equitable distribution of the benefits derived from its utilization. Traditional knowledge is at the root of the usefulness of genetic resources, and it has therefore been argued that it cannot be separated from genetic resources. This situation creates a crossroad between genetic resources whose property is held by States, and traditional knowledge that belongs to particular cultures or peoples. The Bonn Guidelines, adopted to assist governments in establishing measures on access to benefit-sharing, underline that benefits "have to be shared fairly and equitably with all those who have been identified and have contributed to the resource management, scientific or commercial process, including indigenous ald local communities, [...] in such a way as to promote conservation and sustainable use of biological diversity".

The second category of BSMs, the State-to-Community one, is related to the conservation and sustainable use of biodiversity. It is born from the contribution of indigenous and local communities' knowledge, innovation, and general practices to the sustainable use of 'biodiversity components'. The difference with the inter-State typology is that it is not used in the context of access to benefit-sharing of different states, as much as in the one of how benefits are to be immediately distributed to communities to improve their livelihoods within one State. The CBD in 2010, at the time in which this study was led, only mentioned that benefits derived from using traditional knowledge are encouraged to be equitably shared. Such vision has strongly changed in the following decade, with the COP15 version of 2022 strongly insisting on prioritizing the role of indigenous people and local communities in both the deliveries they can provide to the protection of biodiversity and the benefits they are entitled to. The State-to-community vision has been reinforced through programs that promote the involvement of the public in environmental decision-making. This type of BSMs does not only play a role in distributing the positive outcomes created by the utilization of traditional knowledge. However, it has also developed into a 'compensation' mechanism, in which indigenous and local communities are provided benefits to compensate

for the negative impacts of policies that harm their environment. State-to-Community BSMs seem to be seen with reluctance by CBD parties, according to the authors, considering the minimal implementation of policies of this kind of BSMs at a national level.

Because of the limited enactment of State-to-Community BSMs, the paper also mentions a third category that can be considered: Private Sector-to-Community. In alignment with the previously mentioned international trend of "privatizing nature," the management of BSMs can indeed be handled by private parties and non-State actors. Private entities benefitting from access to ecosystem services, goods, and resources, as well as traditional knowledge, can and shall distribute benefits gained from their activities to local and indigenous communities involved in or influenced by their specific activities. Managing benefit-sharing mechanisms allows the private to align themselves with compliance regulations and adhere to corporate social responsibility duties. However, this type of benefit-sharing is hard to monitor, and the lack of external verification of operations can lead privates to not respect the fair distribution of benefits.

Essentially, according to the authors, Inter-State and State-to-Community benefit-sharing represent different types of BSMs and can have different impacts on communities' livelihoods and influence global processes related to biodiversity, and benefit-sharing - as well as its correct implementation - play a fundamental role in supporting sustainable development and equitable utilization of biodiversity resources. To promote these mechanisms, it is crucial to include more concrete enactment of national legislation, establish an international access to benefit-sharing regimes, amending intellectual property rights, and creating compliance and enforcement systems. Efforts have to be made to ensure benefits reach indigenous and local communities and reward them for their stewardship of biodiversity, by systematically reflecting the procedural requirements outlined in various decisions of the CBD's Conference of the Parties (COP) in national legislation. The fragmentation of CBD processes and overlapping COP decisions have increased implementation challenges for BSMs at the national level and coherence with other international processes. For this reason, an integrative interpretation and application of the CBD's text and COP decisions are needed to achieve the convention's objectives. Morgera and Tsiounami conclude that the failure to respect the objective of reducing biodiversity loss by 2010 underscores the importance of equitably sharing benefits from the use of genetic

resources and traditional knowledge, and emphasizes the need to empower indigenous peoples and local communities to contribute to CBD implementation.

3.2 SECTION 2

3.2.1 Creating a Framework for BSMs

Benefit-sharing mechanisms require a very solid governance framework in order to be efficient. Also, as seen in the previous sections, there are a multitude of different BSMs, that differ in their scope, definition, and structure. Therefore, it is fundamental to develop a methodological approach to help governmental bodies, policymakers, and local communities navigate BSMs, leveraging their advantages and challenges and selecting the most suitable ones. To establish such a method, it is important to select a model that can reconcile the need to rely on the market to finance biodiversity conservation with the values of sustainable development that concern equity, harmony, and local well-being. Outlining this method is the focus of this section.

The World Bank has emphasized the need to converge the efforts of the real sector and the financial sector in order to promote the way forward for sustainable development truly (World Bank Group, 2020).⁴⁰ The financial sector's responsibilities for promoting this improvement essentially rely on respecting policy frameworks, promoting efficient data and accounting as well as regulation, supervision, and reporting. All of these elements require strong collaboration between all stakeholders and actors involved, not only in the financial sector itself, but also in the real one. In this sense, co-governance and management of biodiversity finance seems to be an important element to ensure its success in promoting biodiversity conservation and restoration.

Cooperation and shared governance are elements that are quite recurrent in the literature concerning innovative policy frameworks for sustainability. On the Draft Decision submitted by the President on Resource Mobilization of the CBD (**CBD**, **2022**)⁴¹, some of the

⁴⁰World Bank Group (2020) Mobilizing Private Finance for Nature

⁴¹ CBD (2022) Conference of The Parties to the CBD, Fifteenth meeting – Part II Montreal, Canada, Agenda item 12A

most recurring elements regard, for example, the collaboration of different actors and the creation of partnerships and innovative schemes for the promotion of biodiversity safekeeping. The following articles demonstrate it, as the Convention states that it is: "Recognizing the need for effective partnerships and collaboration among all relevant actors, and for strengthening partnerships with businesses and the financial sector for mobilizing resources and to align financial flows with the mission of the post-2020 global biodiversity framework" and that it "Invites relevant international organizations and initiatives as well as multi-stakeholder partnerships to support the implementation of the strategy for resource mobilization". These points are also in alignment with Goal 17 of the 2030 Agenda for Sustainable Development of the United Nations, a subset of Sustainable Development Goals, which highlights the need to "enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries" and additionally calls to "encourage and promote effective public, public private and civil society partnerships, building on the experience and resourcing strategies of partnerships".

Benefit-sharing mechanisms are extremely relevant in determining the success, the sustainability and the efficiency of biodiversity-related projects. Their success, as they are non-market-based mechanisms, heavily relies on having a strong governance model being built behind it. For this reason, this part of the study explores the literature on governance models that can help shape a framework for the governance of BSMs. The scope is to understand what are the important principles, actors, and characteristics that can ensure the sustainability, fairness, and efficiency of BSMs. Five models are presented as reference models, as their structures and concepts, as well as the way they have evolved in the literature, can help promote the aforementioned objectives of finding an analysis model for structuring BSMs. Firstly, Private Public Partnerships (PPPs) and derivative Partnerships models are observed, particularly for what concerns the development of the second relevant partnership model that is described, the Sustainable Development Innovation Partnership Model (SDIP). Thirdly, the evolution of the Triple to Quintuple Helix Model (QHM) is explained, allowing the study to introduce the Social and Ecological Systems framework (SES), and the Theory of the Commons. The latter, which is the final model that is

considered, is seen through the work on the management of co-cities pursued by Sheila Foster and Christian Iaione (Foster and Iaione, 2022).⁴² This part of the study is merely descriptive, intending to introduce notions that can be useful for identifying the relevant elements that can help create, manage and evaluate the performance of BSMs for biodiversity.

Public-Private Partnerships (PPPs)

The need of developing innovative collaboration and partnership schemes has been receiving growing attention, and it has been gaining relevance in the culture and practice of public administrations in the last years, particularly through the form of Public-Private Partnerships (PPPs) (Foster and Iaione, 2022).43 PPPs can be defined as a series of arrangements between the public and private sectors that aim at delivering public services, infrastructure, goods or projects in a collaborative way. These partnerships can take multiple forms, such as joint ventures, specific services delivered from the private sector, or governmental infrastructure projects built as joint ventures, in which responsibility and ownership are shared. PPPs are a valid resource, particularly in cases in which the government does not have sufficient resources, know-how, and technology to pursue projects autonomously, and in which the contribution of innovative solutions coming from the private sector can strongly benefit public infrastructure or service development. PPPs can lead to better quality infrastructure, improved service delivery, and more efficient use of public resources. However, despite PPPs having many positive aspects, it also presents some contraindications and complications due to the interests of the parties, which sometimes can be divergent, and the difficulties in ensuring transparency or accountability for management processes and general outcomes.

In recent literature, the PPPs model that was promoted in the 90s is required to meet new needs and processes and, therefore, in order to succeed, partnerships need to be adopt a more complex and often hybrid form, involving more stakeholders rather than simple private and public ones, aiming at greater openness, encompassing new actors and aiming at more elaborate development goals. According to Foster and Iaione, however, the literature on the

⁴² Foster S. , Iaione C. (2022) Urban Co-Cities, Innovative Transitions Towards Just and Self Sustaining Communities , the MIT Press

⁴³ Iaione C. (2022) Urban Sustainable Development & Innovation Partnerships, Italian Journal of Public Law

topic of partnerships is not correctly considering multiple fundamental elements: the need for multi-stakeholdership, the importance of conceiving the common interest as a way to reach an equitable benefit-sharing outcome, and the outcome oriented evaluation approach. These features are determining for the success of new PPPs, and are resulting in the development of a series of alternative models to PPPs, such as Public-Community Partnerships (PCPs), Public-Private-Community Partnerships (PPCPs), or Community Benefits Agreements (CBAs). These other models are interesting because they integrate the community into the partnership, and in multiple forms that concern different aspects of the community itself. These broadened versions of PPPs are aligned with a growing need for multi-stakeholder approaches that, in fact, can be identified in the literature under the umbrella of the Quintuple Helix Model. In the following section, the evolution of the helices models and how they align with the changes that PPPs have been undergoing is observed.

Innovation Helices Model: from the Triple to Quintuple Helix Model

Innovation Helices Models essentially serve as tools for policymakers to draw synergies from different societal parts that are considered relevant enough for their relationship and interactions, such as academia, government, and society. Although the Helix Model has not received a general definition, its evolution, which went from including three main elements, then four, and ultimately five, shows how different parts of society enter the scene, as the relevance and the accountability of different stakeholders evolve through time.

In the Triple Helix Model designed by Etzkowitz and Leydesdorf, the relationship between the different parties is essentially constituted by the State, the industry, and universities (Etzkowirz and Leydesdorf, 1995).⁴⁴ The helix of the State represents the political system, the will that stands behind the formulation of policies for the present as well as the future and the administration of general state circumstances. The State helix is a source of innovation because of public funding mechanisms, as well as its function in product creation, including political and cultural capital. The development of innovative technologies can be boosted by governmental incentives, such as lowering market risks or correcting market failures through regulation to increase certainty for businesses. The government can encourage investment by, for example, delivering compensations for risks of technical or

⁴⁴Etzkowitz H., Leydesdorf L. (1995) The Triple Helix -- University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development, SSRN

financial nature, or allocating funds to university or research organizations to increase knowledge and innovation opportunities. The industrial helix represents the whole economic system, including firms, banks, services, and industries that turn research and innovation into goods and services. It often serves a similar function to the public state helix, being at the root of innovation-promoting processes and at the source of most funding. The knowledge helix itself is essentially constituted by universities, general academia, and research institutions, which manage the production and transfer of knowledge within societal parts. In an innovation-oriented perspective, the institutions that produce knowledge aim at recombining outdated schemes, models, and ideas to develop new, better-performing ones and put them into practice (Etzkowitz, 2003).⁴⁵Additionally, the process of innovation creation is moving from being exclusively originated in closed internal processes within enterprises to a multi-actor process that also involves the government and previously cited knowledge-producing institutions. Universities, particularly, serve a new role of knowledge development, whose link to private industrial production and governance has grown, forming a new "entrepreneurial-university" model, much more integrated into society and its development. The Triple Helix Model was birthed from academic research on the collaboration of different societal parts, such as private, public, and academic ones. Its origin can be traced back to 1967, when the director of the Dutch Central Organisation for Applied Scientific Research proposed to use the concept of a triangle. The model was born as a knowledge one, establishing the three subsystems that jointly result in a national innovation system - state, industry, and academia. Etzkowitz and Leydesdorff decided in 1995 to focus on the intersections of the three helices that result in "trilateral networks and hybrid organizations" (White, Razak et al., 2015).⁴⁶ The overlapping of these three helices would, according to their observations, create a positive effect on the world of policy. The Triple Helix Model has different structures: there are the statist model, the laissez-faire model, and the hybrid model. The statist model represents societies in which the government controls both universities and industry, and is therefore the figure leading the innovation processes, such as in the USSR or authoritative regimes in Latin America. In the laissez-faire model, the three entities are distinct and autonomous, where communication between the parts is almost

⁴⁵ Etzkowitz, H. (2003) Innovation in Innovation: The Triple Helix of University-Industry- Government Relations. Social Science Information

⁴⁶ White G, Razak A. et al. (2015) The Triple Helix Model for innovation: A Holistic Exploration of Barriers and Enablers. International Journal of Business Performance and Supply Chain Modelling

irrelevant. The USA is an example of this model. The hybrid one instead includes traits from both the statist and laissez-faire models.

The other two Helix Models, namely the Quadruple and Quintuple Helix Models, add two other dimensions. Respectively, the Quadruple model adds the civic society helix, which includes NGOs and citizens, and assembles the notions of media and culture-based public systems. The first one includes communication channels - TV, social media, newspapers - and the overall information capital, while the second one represents traditions, values and other cultural aspects. This helix includes labor unions, and citizens seen in different functions, as consumers and users for example. Their role is crucial in driving innovation through demand. The quintuple helix instead adds the environmental helix as the fifth subsystem, whose role is to provide natural capital, which works as a basis for all the other subsystems. Natural capital natural resources and includes fauna and flora, other elements that drive environmental-oriented innovation, making the new model problem-oriented, and a promoter of socio-ecological transformations that include circular or bio-economy and overall sustainability.

The Quadruple Helix that followed the Triple model is based on the same tripartite relationship, but it adds the dimension of a media and culture-based public. It essentially constitutes civic society (**Carayannis and Campbell, 2009**).⁴⁷ Adding this helix implies that civic society plays a non-negligible role in the generation and use of innovation. The role that citizens play in the production system as consumers and users of information and knowledge stimulates innovation processes this way.

The Quintuple Helix Model, adds environmental knowledge and innovation to the model (Carayannis and Campbell, 2012)⁴⁸ The aim is to transform the interactions between the parties and contextualize them in a framework of sustainable development and the environment. The goal is to design a model that brings the focus of the elements included in the two previous models on elements like innovation, knowledge, and ecology. And while interactions are included the Triple and Quadruple dimensions, these additional characteristics are still lacking from them. For this reason, rethinking different sectors, such

⁴⁷Carayannis E., Campbell D. (2009) 'Mode 3' and 'Quadruple Helix': Toward a 21st Century Fractal Innovation Ecosystem, International Journal of Technology Management

⁴⁸ Carayannis E., Campbell D. (2012) The Quintuple Helix innovation model: global warming as a challenge and driver for innovation, Minerva

as the financial one, with the Quintuple Helix Model in mind, could be a great advancement in creating a model of governance that includes more actors and takes concrete, sustainable action. According to authors Carayannis and Campbell, this quintuple helix demonstrates that society must put innovation and knowledge in the context of the natural environment to produce and use them in the most effectively. As mentioned, the Helix Model has not been truly defined by the creators of each version of it, reason for which Foster and Iaione have provided the concept of a polycentric system as a definition for it (Foster and Iaione, 2016)⁴⁹ A polycentric system is intended by the two authors as a system in which governmental entities have a multi-level relationship, which includes both competition and cooperation, learning and interacting, as well as different duties according to the amount of public services that they provide. The Quintuple Helix Model essentially helps develop a theoretical and practical understanding in which sustainable development is supported by both knowledge and innovation. The fifth helix, indeed, represents the "natural environment of society" subsystem as a new addition to the political, educational, economic, and social helices. Each of these helices is connected to the other. They are all characterized by a national, regional, and global reach. The addition of the quintuple helix, however, differs from the previous ones, as it serves as a framework for the linkages between the other systems, working as a tool to help build instruments and indicators that help assess sustainability, as its relevance keeps growing in all sectors. The five helices are, in this way, linked to the SDGs promoted by the United Nations, and to impactfully promote sustainable development principles. The differences between the previous helices and the quintuple helix are not limited to its different, encompassing function. The newer model implies that innovation and development is not only reserved to specific areas of society, but that it actively regards all parts of society. The political agent, for example, can contribute to policy making and securing markets. The private sector creates innovation through competition and trade. The education helix creates knowledge and research for innovation and society demands, purchases, and stimulates the creation of innovative solutions. However, the environmental helix plays a greater role because bringing sustainable development into the equation poses greater attention to the "natural capital" which all the other types of capital - social, political, economic - rely on. Recent streams of environmental economics or new circular economy models do refer, for example, to a new dimension of sustainable development in which the three famous pillars -Society, Economy, and the Environment - are not equal, rather the social and economic pillars

⁴⁹ Foster S. and Iaione C. (2016) The City as a Commons, Yale Law & Policy Review

are a part of the greater environmental sphere, which matters the most because of its ability to provide the "forgotten" natural capital. The latter is the backbone not only of economic activities, but of human and nonhuman life on earth, its ability not only to survive but also to thrive and be preserved through time. The natural environment that the quintuple helix underlines can be defined as the whole of natural resources that innovation and other processes do not only get inspired from, but actually need to exist, making Nature a fundamental actor in the development of innovation and knowledge production with ecological outputs (Konig et al.2020). Conceiving the quintuple helix and hence the role of the environment increases the importance of sustainability and broadens the Triple and Quadruple Helix Models.

The Quintuple Helix Model concerns innovation, hence it also concerns any innovative advancements that can be taken in any sector, such as biodiversity financing and the new tools it promotes in the financial sector. The Quintuple Helix Model underlines the importance of linking and connecting different actors' innovative operations in the context of environmental progress and sustainable development. When considering the evolution of PPPs, it is easy to notice a resemblance between the simpler original structure of partnerships, which only included the public and private sphere, and the Triple Helix Model, which did not frame the relations between the political, economic, and cultural helices within a broader conception. The changes in the PPPs models, with the newer versions including other dimensions of society and economy, reminds the evolution of the Quadruple and then Quintuple Helix Models. Both PPPs and the Quintuple Helix Model touch on the fundamental topic of having to promote collaborative approaches between different parts, which brings the study back to the polycentric definition that we have previously observed, and having to do it in a sustainable frame. In synthesis, the Quintuple Helix Model provides a framework that includes five different actors - government, industry, academia, civil society, and the environment - and emphasizes the importance of collaboration among these actors to achieve sustainable development. This model can be used to analyze the role of different actors in biodiversity finance and identify potential areas for collaboration.

The Sustainable Development Innovation Partnerships model (SDIP)

The traditional government and business practices, such as first-generation PPPs or Helix Models for example, require to be coupled with other innovative approaches in order to truly create sustainable means of development, creating partnerships among the different actors as a fuel for innovative BSMs and practices. Iaione introduces the concept of Urban Sustainable Development and Innovation Partnerships (USDIPs) as a tool to design, at both legal and policy levels, policy experiments that accelerate the ecological and technological transition (Iaione, 2022).⁵⁰ Such acceleration is intended to be developed through a multi-stakeholder approach that reunites different actors, particularly scientific ones and communities, into a collaborative delivery of sustainable-oriented innovation. Iaione proposes the USDIP model as a tool for urban development. However, it can be broadened and serve as a framework for other sectors, such as the financial one, in the form of Sustainable Development Innovation Partnership Model (SDIP), by taking the same fundamental principles and applying them to different contexts. As Iaione mentions, "the theoretical triangulation of literature on inclusive and innovative public-private partnerships [...] can contribute significantly to developing a theory on urban sustainable development and innovation co-governance." Indeed, the author expresses the limitations that traditional Public-Private Partnerships run into and offers this new model as a solution. Its greater complexity and hybrid nature consider elements beyond PPPs such as multi-stakeholdership, co-design processes, adopting a monitoring and outcome-oriented approach, and supporting sustainable development projects by creating legal and institutional frameworks.

Public administration in the last decades has increasingly considered the importance of public-private partnerships. However, the classical structure of PPPs must include greater innovation and reconciliation with sustainable development goals. The previously cited elements of multi-stakeholders, common interest, equitable sharing of benefits, co-design processes, and outcome-oriented approach are often insufficiently considered. As Iaione mentions " [...] there is room for a model of governance of innovation that is based on the application of the triple and Quadruple helix theories to the urban context." He also underlines " the necessity to include in such models another category of actor, the unorganized social actors (i.e. city inhabitants, local communities not organized as NGOs or

⁵⁰ Iaione C. (2022) Urban Sustainable Development And Innovation Partnerships, Italian Journal of Public Law

in other legal forms)." This additional step marks a non-negligible difference with the aforementioned models. The active role of local communities, not only as consumers or subjects of law to eventually consult but rather as active co-decision makers, shifts the narrative of policy making and extends the partnership logic to new entities in an innovative way.

Social-Ecological Systems Framework (SES)

All the aforementioned theoretical models address the idea of multi-stakeholder and shared management governance activities. Elinor Ostrom's studies, and in particular the Social-Ecological Systems (SES) framework she developed in 2009, have signed a fundamental milestone and become a point of reference in developing co-governance systems (Ostrom, 2009).⁵¹ Essentially, the author's framework provides a theoretical approach to understanding and analyzing the interactions of all the elements that constitute social and ecological systems. The objective of this framework is developed in response to the common belief that resource users, generally speaking the local communities that interact with specific resources, are unable and unwilling to organize themselves, and rather end up overexploiting resources and perpetrating the tragedy of the commons. This traditional perception applies to all common-pool natural resources, such as forests, fisheries, or water systems. Instead, Ostrom suggests that collective action and self-governance are possible, allowing resources to be sustainably managed. Her study highlights the importance of understanding the institutional arrangements, governance structures, and collective decision-making processes that shape the management and the use of resources within these strongly interconnected social-ecological systems. To do so, these elements must be understood as second-level variables influencing the interactions of four main subsystems. The SESs are indeed complex systems, but instead of trying to over-simplify, standardize, and find universal solutions for them, Ostrom affirms that "we must learn to dissect and to harness complexity, rather than eliminate it from such systems". For this reason, SES are in her view composed of multiple subsystems and internal variables that differentiate each system and helps study their complexity.

⁵¹Ostrom E. (2009) A General Framework for Analyzing Sustainability of Social-Ecological Systems, JSTOR

Within a SES, there are four main subsystems: users, resource systems, resource units, and governance systems.

- 1) Users are the individuals involved in the utilization of the resource, are affected by the decisions made upon it, and take an active part in influencing the SES.
- 2) Resource systems correspond to the ecosystem that is specifically being looked at and from which resources are drawn.
- 3) Resource units are the single elements being extracted from the resource system, such as animals, materials, or other natural resources. Users are the individuals benefiting from the extraction and utilization of the units of the resource system.
- Government systems are the rules and organization standards that govern activities in the resource system



Figure 2. The Core Subsystems of Social-Ecological Models⁵²

Each subsystem is theoretically separable from the others, but the interactions of these four subsystems are what produce different kinds of SES outcomes. The subsystems are themselves composed of a multitude of second-level variables that can be selected based on how relevant they are to study a specific SES. Ostrom explains that the logic behind this

⁵²Ostrom E. (2009) A General Framework for Analyzing Sustainability of Social-Ecological Systems, The Core Subsystems in a Framework for Analyzing Social-Ecological Systems, JSTOR

multi-level framework is that "without a framework to organize relevant variables identified in theories and empirical research, isolated knowledge acquired from studies of diverse resource systems in different countries by biophysical and social scientists is not likely to cumulate."In fact, one of the main problems causing over-exploitation and weak management of resources, according to Ostrom, is that theoretical methods and analyses that have been developed on resource systems and their utilization tends to be scattered and divided in different fields. The general objective to try to simplify and find "one size fits all" universal solutions does not guarantee success. Failure can be avoided if the resources and the different subsystems are self-organized and managed through effective rules set up by local leaders, communities, and harvesters, making SESs sustainable. This result is not to be obtained through the hyper simplification and standardization of systems but rather, instead, focus on the identification of specific variables and the relations of their components. Approaching the management of SES in this way can help create points of convergence of interest and analysis from different fields. It provides a set of potentially relevant variables for data collection, conducting field studies, and analyzing the findings made on different SESs.

The second-level variables are numerous and adaptable, meaning they can be modified, replaced by others, or excluded depending on the specific SES' structure. Some of the variables that Ostrom identifies are listed in the following table:

Table 1. Examples of second-level variables under first-level core subsystems (S, RS, GS, RU, U, I, O and ECO) in a framework for analyzing social-ecological systems. The framework does not list variables in an order of importance, because their importance varies in different studies. [Adapted from (12)]

Social, economic, and political settings (S)

S1 Economic development. S2 Demographic trends. S3 Political stability. S4 Government resource policies. S5 Market incentives. S6 Media organization.

Resource systems (RS)	Governance systems (GS)
RS1 Sector (e.g., water, forests, pasture, fish)	GS1 Government organizations
RS2 Clarity of system boundaries	GS2 Nongovernment organizations
RS3 Size of resource system*	GS3 Network structure
RS4 Human-constructed facilities	GS4 Property-rights systems
RS5 Productivity of system*	GS5 Operational rules
RS6 Equilibrium properties	GS6 Collective-choice rules*
RS7 Predictability of system dynamics*	GS7 Constitutional rules
RS8 Storage characteristics	GS8 Monitoring and sanctioning processes
RS9 Location	
Resource units (RU)	Users (U)
RU1 Resource unit mobility*	U1 Number of users*
RU2 Growth or replacement rate	U2 Socioeconomic attributes of users
RU3 Interaction among resource units	U3 History of use
RU4 Economic value	U4 Location
RU5 Number of units	U5 Leadership/entrepreneurship*
RU6 Distinctive markings	U6 Norms/social capital*
RU7 Spatial and temporal distribution	U7 Knowledge of SES/mental models*
	U8 Importance of resource*
	U9 Technology used
Interactions (I)	$\rightarrow outcomes$ (O)
11 Harvesting levels of diverse users	O1 Social performance measures
12 Information sharing among users	(e.g., efficiency, equity,
13 Deliberation processes	accountability, sustainability)
14 Conflicts among users	O2 Ecological performance measures
15 Investment activities	(e.g., overharvested, resilience,
16 Lobbying activities	bio-diversity, sustainability)
17 Self-organizing activities	O3 Externalities to other SESs
18 Networking activities	
Related eco	osystems (ECO)
ECO1 Climate patterns. ECO2 Pollution pa	tterns. ECO3 Flows into and out of focal SES.

*Subset of variables found to be associated with self-organization.

Figure 3. Ostrom second level variables⁵³

The Theory of the Commons

The Theory of the Commons has largely been used in the literature to explain how natural goods should be considered in order to ensure their protection and equal distribution. It is a close, more optimistic derivative of the Tragedy of the Commons developed by Garrett Hardin in an influential essay published in the journal Science in 1968. The tragedy of the Commons, which is also the title of the publication, refers to an economic and social science concept for which common resources are destined to be depleted out of a lack of coordination

⁵³Ostrom E. (2009) A General Framework for Analyzing Sustainability of Social-Ecological Systems, examples of second-level variables under first-level core subsystem, JSTOR

between users. The idea is that common pool resources that are accessible to multiple individuals, driven by personal interest and incentives, end up degrading, depleting, and ruining the access to the shared resource, making it collapse. The latter is very much caused by the inability of these individuals to organize themselves in a cooperative way and, having several individuals looking at personal benefits only, the resource gets destroyed in the long term.

The Commons Theory instead offers a more optimistic perspective on the possibility for common resources to be collectively shared. Instead of focusing on the risk of resource depletion and inability to collaborate, this theory states that common-pool resources can be effectively managed and preserved under the presence of a strong sense of community, cooperation, and collective action among users and stakeholders. Collective decision-making processes, resource stewardship, developing cooperation-promoting norms and trust, institutional arrangements - be they formal or informal - and acknowledging the need for actors to be interconnected and adaptive are all key elements in the success of sustainable common resource management. The Commons Theory can be applied to various fields and scenarios.

Elinor Ostrom's studies and case-based Nobel Prize winning made significant contributions to it and her work marked an important milestone in its understanding. It demonstrated how collective governance of natural resources of water, land, food, and other natural goods can provide very successful results through the creation of "institutions resembling neither the state nor the market". Her findings demonstrated that organized collaboration at a local scale helped co-determine production levels, value extraction, creation of policy and regulation on resource use that would protect the commons from overconsumption, depletion and misuse over time. Through Ostrom's work, the theory of the commons has been applied to not only natural resources, but other types of resources that can receive the attribute of being commons, promoting new ways of designing rules, legal and governance tools for their use. In the case of biodiversity, applying the theory of the commons comes natural, as biodiversity includes illimited ecosystem services and natural resources that are fundamental for human activities. However, the commons in the context of biodiversity isn't limited to considering natural resources as the commons, but the whole spectrum of new commons that have been developed in the literature that can be used to conserve biodiversity. Indeed, the new

categories of commons that have been conceptualized by scholars, such as knowledge commons, cultural commons, infrastructure commons, and digital commons, among others (Hess, 2008).⁵⁴

The Theory of the Commons applied to biodiversity offers an alternative narrative to the one of commodification and privatization of nature, in which the focus is brought on indigenous people, local communities and their ability to co-manage and handle the protection of natural biodiverse resources in a self-resilient way, using all types of commons to help biodiversity thrive. Indeed, all of the different categories of commons, ranging from natural assets to cultural knowledge on how to promote biodiversity are based on "communities working together in self-governing ways to protect resources from enclosure or to build newly open-shared resources".

According to Ostrom, it isn't possible to identify one single model of managing resources to apply to all common shared resources. More traditional forms including public or private governance might be more efficient in cases in which community collective action would have limited impact or excessively complex requirements for realization, for example. Ostrom studied successful common pool resource institutions and observed that specific conditions dictate whether collective governance can be used efficiently. Particularly, communities that have explicit access and exclusion lines drawn, in close-knit communities that share similar culture and are expected to keep reciprocal continued interaction through time. These characteristics allow communities to create and exercise rules and procedures that help govern the commons in an effective way, tailored to local needs and particularities. The fact that communities participate in the governance process in a very active and central manner doesn't imply that they are the only actors. The very idea of the commons is the one of shared handling of resources, such as biodiversity financing for example. The right of the communities to self-manage, create and enforce policies rests on the requirement for outside central authorities to recognize and respect their existence, which can also be useful in monitoring and enforcement practices. Dispute resolution and tools for recourse are also a fundamental aspect that is strengthened by governmental involvement, considering even the most united communities can incur in conflicts and disagreements both among its very members and with third actors. The help of external bodies with governance power can help

⁵⁴ Hess C. (2008) Mapping the New Commons, SSRN

form "nested enterprises", intended as the sum of the "rules, procedures, monitoring, and sanctions put in place along with other governance activities are organized in a nested institutional structure with layers of activity by different actors" (Foster and Iaione, 2022).⁵⁵ Nesting includes both relations and interactions within the members of a community and the latter's interactions with central governmental entities. These authorities are especially relevant in the management of important and large-scale resources, which could correspond to greater biodiversity areas to protect, more important flows of capital for biodiversity conservation or numerous communities and stakeholders among which to distribute benefits. In smaller communities, disputes can generally be solved through informal practices that can be more or less systemized. Generally, the nesting practices as well as other traits of commons management that have been mentioned have been driving the study of resources that are considered "scarce, congestible, renewable natural resources such as rivers, lakes, fisheries, and forests." (Potetee, Janssen and Ostrom, 2010)⁵⁶

Foster and Iaione in 2022 promote the idea of extending the use of the commons theory, which is often limited to natural resources management, to the management of cities and urban spaces. Conceiving the city as a common origins a whole set of new practices of cooperation and co-management that involve citizens in proactively using common resources. The authors illustrate five basic principles that are implied in the well-functioning of co-cities. Interestingly enough, these principles can be transposed to the co-management of biodiversity financing.

1) The first principle is the one of collective governance. The term "collective" refers to a multitude of stakeholders taking part in the governance processes built around the management of a local community and the other actors involved. The ways in which they cooperate are sharing, collaborating, coordinating, and cooperating on the projects that are set for the area. The actors that participate in co-governance can be of public nature, such as public authorities, or private ones, like private commercial entities, knowledge institutions, particularly universities, libraries, schools and cultural institutions, and civil society organizations. Co-governance implies the collective management and ownership of all the resources that are relevant for the

⁵⁵ Foster S., Iaione C. (2022) Urban Co-Cities, Innovative Transitions Towards Just and Self Sustaining Communities, the MIT Press

⁵⁶ Poteete, A., M. Janssen, and E. Ostrom (2010) Working Together: Collective Action, the Commons, and Multiple Methods in Practice, Princeton University Press

well-being of communities, creating various types of relationships among social actors that are not limited to the one between public authorities and the civic sector but, similarly to what the Quintuple Helix suggests, involve very different actors in pursuing the common good in an ever-evolving manner. Co-governance can present different levels, which are identified by Foster and Iaione as shared, collaborative, and polycentric governance. The definition of these three types of governance has already been defined in Chapter One.

- 2) The second principle corresponds to being in the context of an enabling state. Public authorities and other state representatives play a crucial role in easing the creation, management, and monitoring of shared resources and helping the governance arrangements needed to manage the commons. Additionally, they provide regulation, monitoring, and framing activities within specific measures. They represent an imprescriptible part of the success of co-governance projects. Central authorities must recognize and respect a community's collective governance of a common pool resource and its right to manage and regulate it. The role of the government, in this sense, is to help ensure better monitoring and enforcement by recognizing the community's governance legitimacy and supporting it. Multistakholder partnerships are in this sense understood within a framework that still acknowledges the government's role and powers on shared resources. An enabling state promotes the Quintuple Helix Model and other relevant principles, such as the one of experimentalism, as it facilitates the collaboration between all parts of society businesses, knowledge institutions, NGOs, and civic society - to co-develop projects of management of common resources. In this sense, the collaboration also helps the government improve decision-making and planning, especially if the state is here considered as a platform in which the state does not impose itself through a bottom-up approach and rather adopts a horizontal position, in which it supports the co-governance processes "from a distance", letting other actors play an important part in local decision making.
- 3) The third principle revolves around social and economic pooling. The idea is to involve or create institutions, be they of a civic, financial, or social nature, that are

"transparent, collaborative, and accountable to local communities". These institutions are intended to help create new opportunities by pooling resources and stakeholders toward underserved areas. Pooling the know-how, the capacities and resources in a shared effort among different actors and sectors enable not only a better management of the collectively handled resources but also of economic ventures for a collaborative, circular, and solidal community as a whole. Social and economic pooling essentially upscale co-governance schemes by including pools of common resources, going from simple co-management and sharing of resources to co-governance that transforms collectivities into enabling platforms that help govern and produce goods and services. They do not substitute other actors, such as public entities or private producers, but rather expand their capacity through collaborative economic practices, shifting from competition to reciprocity. It is important to note that many pooling economies are digital, closely linking this type of functioning to platform cooperativism which is characterized by distributed ownership and collaboration. Sharing economy and pooling economies, although similar, differ in the root idea that the first one revolves around profit and often creates unfair working conditions for gig-based workers. In contrast, the second one focuses on peer-to-peer collaboration that transforms users into producers or owners of the delivery of goods and services. Pooling economies promote innovative solutions, and allow for platforms and initiatives that they promote to be cross sectorial, independent but collaborative, all while offering a cascade of benefits, such as increasing attention to the public good, providing sustainable and climate-friendly solutions, increasing social cohesion, and moving the use of resources from public and private entities to communities.

4) The fourth principle concerns experimentalism: it is fundamental, when following a collaborative approach with multiple parties, to be adaptive, have an open approach to planning, creating innovative policies and reforms to manage the common resources in a cooperative and effective way. Experimentalism is part of the innovative principles that legal and policy tools can follow to design adaptive, custom-made, and flexible solutions. According to scholars such as Silke Helfrich and David Bollier, Iaione explains, the commons are not to be considered as mere co-managed resources, but rather understood as "an organic fabric of social structures and processes", often

experimentally led by local realities. Experimentalism becomes, in this sense, an approach to policy implementation and creation that is based on evidence, trial and error and creative design, in which monitoring, assessing, and reporting play a crucial part. This approach allows all stakeholders, particularly policy makers, not to fear intervention because the 'trial-and-error' procedure helps structure well-fitting local solutions, exploring the right policies and improving them through time.

5) Lastly, the fifth principle regards tech justice, ensuring access, participation, and co-management or ownership of technological and digital infrastructure and data. That is, in light of the fact that technology plays a central role in optimizing the management of resources: pooling, sharing, monitoring, and creating data, as well as utilizing new technologies on the ground, can help improve both the management and the actual use of shared resources. Technology can ameliorate the use and performance of multiple areas of governance, such as communication, which is the essential element in a co-governance scheme that sees multiple parties collaborating, construction, funding, digital services, resource pooling, and education among others. It facilitates the interconnection of relevant actors, speeds processes, and helps ease monitoring practices. Digital infrastructure can create a 'virtuous cycle of openness, innovation, more investment that brings needed benefits to vulnerable groups.' Making technological resources "commons" through the development of mesh networks or community-based networks makes technology an integral part of collective governance.

These principles can be used as variables to identify whether a project concerning joint resource management is practical. In Co-Cities, they are applied to numerous case studies to highlight the performance and relevant aspects that could be found in different cities and build a classification criterion.

Principles	Summarized explanation
Collective Governance	Multi-stakeholder collaboration for the management of common resources that includes self, shared, collaborative, and polycentric governance principles.
Enabling State	The government plays the role of facilitating the management of a project and creating adequate regulations and policies to support it.
Social and Economic Pooling	Diverse institutions promote the creation of new, sustainable economic ventures and structures by collaborating, cooperating, and using innovative digital means.
Experimentalism	A principle for the method stakeholders shall follow to manage projects will be flexible, effective, and an open approach to innovation.
Tech Justice	Recognize and utilize the advantages that technology can bring in sharing, pooling, and monitoring activities that are crucial for the resilience of projects.

Figure 4. The Five Guiding Principles

Foster and Iaione's work in Co-Cities helps develop a framework that reimagines the city as a nest for polycentric cooperation between different actors in the co-governance of cities, handling all common resources of a city - environmental, digital, and cultural - through contractual or institutionalized particular multi stakeholder partnerships, involving multiple stakeholders and promoting civic engagement. In this scheme, "*common resources occupy a middle ground between public and private goods and between the state and the market. They represent new and innovative urban goods and services geared toward supporting the most disadvantaged, marginal populations and communities.*" This co-city model is based on the five listed design principles - collective governance, enabling state, pooling economies, experimentalism, and tech justice - which resonate with some of Ostrom's preexisting design principles.

BSMs requires strong collaboration of all stakeholders involved in a conservation effort. For this reason, exploring these different co-governance and innovation models and partnership schemes and considering different aspects of all of these theories can help design an analysis model to assess the efficiency of BSMs. For example, the variables identified in Foster and Iaione's study can be considered part of the second-level variables Elinor Ostrom mentions in her publication on SES systems and can be extended to other common resource contexts apart from cities. For instance, they can be applied to BSMs to assess their efficiency in distributing the expected benefits derived from a biodiversity-promoting project. The principles and variables that have been presented in this section are therefore re-addressed in the following Methodology Chapter.

CHAPTER FOUR

4.1. SECTION 1

4.1.1 Methodology description

In the following chapter, the theoretical observations that have been made on the financing of biodiversity, the different models observed - particularly the importance of multi stakeholder collaboration of partnerships models, the variables of the SES framework by Elinor Ostrom and the interpretation of the Theory of the Commons by Sheila Foster and Christian Iaione for co-cities management - will be applied to the analysis of two case studies: the Luangwa Community Forests Project and the Ankeniheny–Zahamena Corridor Biodiversity Conservation Project.

The analysis will follow a qualitative approach. The models and variables that have been defined in the previous chapter will be adapted to these two reference cases and serve as a way to identify whether the way the financing of biodiversity is organized in these case studies is indeed effective in biodiverse terms, fair to the people and in line with sustainable development principles.

These case studies were selected because they allow the Study to compare two similar scenarios and observe how they perform. The Study is limited to two single case studies; therefore, the description of these two projects and the analysis of the results only serves a

theoretical purpose and is intended as a way to demonstrate how the models and variables that have been identified can be applied to these kinds of systems. Further studies, including several study cases, a comparative approach, and quantitative assessments, should be conducted in order to draw conclusions in addition to observations and hypotheses.

These two case studies have been selected based on specific criterions. The first two are self-explanatory:

- Firstly, they both had to consist of conservation projects that promoted, more or less directly, the conservation and protection of biodiversity. Both projects needed to result in the creation or reinforcement of protected areas, and although both projects mainly aim at carbon capture, this activity intrinsically includes the protection of biodiversity.
- 2. Secondly, financing these biodiversity-protecting projects had to include innovative instruments of those listed by the CBD. Remarkably, both case studies, in this case, include a market-based mechanism, which is carbon credits, and a non-market-based one, as in the BSMs used in these projects. The idea is to consider projects that can help evaluate BSMs's impact on projects that aim to protect biodiversity as well as how they can help complement market-based financial tools, if needed.
- 3. Thirdly, the countries had to be from the same economic region. For this reason, the two case studies are located in Zambia and Madagascar, both included in the Southern African Economic Region (SADC). The idea is that, in this way, further studies could extensively compare regional differences in the management and success of BSMs implementation, comparing nations within the same geographic area and the differences found within similar contexts, rather than considering the North-South divide scheme only.

After having described the general features and challenges of the two case studies, the Study applies the five guiding principles taken from Co-Cities - co-governance, enabling state, pooling economies, experimentalism, and tech justice - as analytical tools to observe the efficiency of the projects in creating positive biodiversity outcomes and a fair distribution of
benefits. Indeed, the variables applied to cities will instead be applied to the projects' way of managing BSMs through the guiding principles.

For this reason, the five principles adopt a slightly different meaning from the one explained in Co-Cities.

Principles	Summarized explanation
Co-governance of BSMs	Co-governance applied to BSMs refers to the collaborative approaches that can be adopted to develop the distribution of benefits.
Enabling State	The Enabling State is to be understood as a promoter of justice, promoting the interests of its citizens and participating actively to ensure that the distribution of the benefits is fair and sustainably managed.
Poolism	Poolism concerns the commoning of economic resources and the collaboration between different stakeholders in ensuring that the financial resources are fairly distributed, used, and co-managed.
BSMs Experimentalism	BSMs Experimentalism regards the innovativeness of the structure of BSMs if they follow standard schemes or instead develop according to the territory and local people's peculiar traits.
Tech justice in BSMs	Tech Justice can be a great tool in the promotion of equitable distribution of benefits, with the services the utilization of technological tools can render in monitoring, managing data, or offering access to benefits in innovative manners.

Figure 5. The Five Guiding Principles for BSMs

4.2. SECTION 2

4.2.1 The Luangwa Community Forests Project

Overview of Zambia

The first case study is located in Zambia, which is a member state of the regional economic consortium of the Southern African Development Community (SADC). Zambia is confronted with multifaceted developmental challenges: it occupies the 145th rank globally on the Human Development Index, indicating its low developmental status. A substantial 61% of Zambia's population lives below the poverty line, underlying the depth of its economic struggles (World Bank Zambia).⁵⁷ Its economy strongly relies on mining, particularly copper, although attempts at economic diversification have been promoted in recent years. Zambia is a presidential republic, marked by discernible political dynamics. Unlike most of its neighbors, it has managed to avoid the war and internal conflicts that have characterized much of Africa's post-colonial history, earning itself a reputation for political stability. Especially after political turmoil and attempted coups in the 1990s, Zambia has experienced periods of relative stability in the new millenia (BBC, 2023).⁵⁸ However, it is not free of political uncertainty and frequent allegations of corruption. These factors contribute to an intricate political landscape that impacts the nation's developmental trajectory. Environmental concerns intersect with Zambia's socio-political panorama, particularly within the Luangwa area. Famous for its Victoria Falls and other renowned natural wonders, Zambia's natural richness makes it a great biodiversity hotspot, playing host to numerous species, many of which are endemic and endangered, in different types of ecosystems. The Luangwa area, in particular, is renowned for its ecological richness, encompassing diverse habitats, from forests to savannah. Yet, anthropogenic activities such as deforestation, expansion of agricultural land, and wildlife poaching pose significant threats to this delicate area. In the fight against climate change, Zambia's circumstances assume considerable significance, with the challenge of promoting its development while preserving its unique natural resources and ecosystems.

⁵⁷The World Bank in Zambia

⁵⁸ BBC (2023) Zambia country profile

Overview of the Luangwa Community Forest Project

The Luangwa Community Forest Project is a part of the many projects under the REDD+ initiative (Reducing Emissions from Deforestation and Forest Degradation) in developing countries. REDD+ is a framework created by the UNFCCC Conference of the Parties (COP) to guide forest sector activities that reduce emissions from deforestation. Its goal is to create a scheme in which multinational companies can compensate for their emissions by investing in projects that decrease emissions, such as forest conservation projects, through carbon credit acquisitions. On its website, it can be read that through REDD+, "We prioritize community engagement and create incentives to preserve forest through long-term performance and REDD+ conservation methods." (BioCarbon Partners, 2023) ⁵⁹ The website strongly insists on two main characteristics of its projects: investing in communities by creating partnerships and using a market-based approach to protect the climate through the use of carbon offsets and credits. The latter play a central role in these conservation projects; similarly to equities representing company shares, they represent defined amounts of greenhouse gas emission rights that companies can purchase or sell. Purchasing carbon credits from REDD+ projects allows businesses to claim the ability to produce "net zero" emissions because the ones that their activities effectively produce are theoretically being compensated through projects that protect forests and similar activities. Many companies have entered the carbon credit market in order to keep producing greenhouse gasses while offsetting their emissions through these projects, gaining points in reputation and credibility.

The Luangwa Project is led by BioCarbon Partners (BCP), which states that their way to combat climate change is based on using prevention to fight deforestation. While other carbon offset projects work through reforestation mechanisms, REDD+ in this case focuses on protecting already existing trees in natural areas. The amount of carbon dioxide emissions that would be released if these trees were to be cut down without the protection of REDD+ initiatives is calculated and sold in the form of Forest Carbon Offsets. The revenue from the sale of these credits, the website states, is meant to fund conservation and development projects to "provide an alternative source of income for local communities that depend on the forest". On the website, it delivers numbers stating that more than a million hectares of forest

⁵⁹ BioCarbon Partners (2023) Website: What We Do, REDD+

are being protected, two thousand jobs have been created in local communities and more than nine million USD have been invested into community development projects since 2013.⁶⁰ It also mentions its alignment with high international standards, independent auditors, and awards, such as the Best for the World Workers Award in 2022, the Verified Carbon Standard, the Climate, Community, and Biodiversity Standards by Verra, and the Voluntary Carbon Market Rankings 2022 Winner Award. In the section explaining the REDD+ approach, its "holistic" trait is underlined, and how it links poverty, environmental degradation, and climate change in their effort to reduce emissions. The step-by-step explanation of their procedure illustrates how local communities are involved in the decision-making processes of the projects. Firstly, according to BCP, internationally recognized standards are used in order to obtain "free, prior and informed consent" of the communities involved in protecting the forests. This consent is provided by engaging the representatives of the communities in mapping, "ground truthing" activities, such as flying over the forests, that allow them to participate in decision making. The agreements that are established with the representatives are long term, averaging a total of thirty years long binding agreements. The "ground truthing" activities also include making investments into local livelihoods, such as building infrastructure, education and other benefits that can generate positive outcomes for the communities.

The Luangwa forest is situated in Zambia, in its oriental province. It occupies an area of about 940 thousand hectares and is currently the biggest emissions compensation project in Africa. It is considered one of the most successful projects within the REDD+ initiative. Indeed, as mentioned, it has received multiple awards and is also certified as a B corporation. On the website, BCP provides a series of numbers related to the results derived from the projects, in terms of households supported, hectares protected, secondary projects managed and so on. For instance, it states that the Luangwa project protects an estimated half a million trees, that more than 200.000 community members benefit from their projects and more than 47.000 households "benefit directly from Forest Carbon Revenue". The way these numbers are estimated is not traceable on their website. The project relies on partnerships with the representative chiefs of local communities, creating a network of 17 Chiefdoms that collaborate with BCP and grant access to the forest. According to their 2022 Impact Report, these collaborations with local communities are also valuable for preventing overpopulation,

⁶⁰ BioCarbon partners (2023) Website: Driving a new form of conservation finance that unites the community, wildlife, and climate positivity under the REDD+ project Model, REDD+

which is one of the project's objectives to preserve the natural area. On BCP 2022's Impact Report, the Luangwa project is presented as a highly successful example of how to collaborate with local communities to provide numerous benefits, protect nature against threats of deforestation and biodiversity loss, and use innovative market tools such as carbon offsets and credits.⁶¹



Figure 6. Map of the Area of the Luangwa Community Forest Project⁶²

In the 2022 Impact Report, BCP lists a series of local goals that are being pursued to improve local livelihoods and nature. It explains that most of their initiatives have been pursued in collaboration with the Ministry of Agriculture and Livestock, in order to help the farmers of the area address the food security risks promoting Conservation Farming Practices that also include Smart practices and technologies, considering that the protection of the natural area can clash with traditional farming methods. The country of Zambia is strongly affected by climate change's negative effects, and the hardest hit individuals are often smallholders and subsistence farmers. The LCFP supports them by developing innovative programs of

⁶¹ BCP (2022) BCP Impact Report

⁶² Mulungu K. (2021) The Luangwa Community Forests Project (LCFP) in Zambia: A review of the biggest REDD+ project in Africa financed by the Italian oil and gas company ENI, Greenpeace

horticulture, bee-keeping, poultry and goat rearing and village banking, while promoting the role of women in all of these activities. Village banking is an interesting part of the project's financing mechanisms. It serves the purpose of extending financial services to village economies, to permit the development of circular economies in rural communities through village loans and savings groups. This initiative has helped communities instaure structures to pool their financial resources, use loans to start businesses, support family activities and make home improvements, and overall empower rural communities's access to formal revenue streams.

The Impact Report also explains the Project's approach to biodiversity. It explains that the REDD+ initiatives have set an objective to scale biodiversity conservation up to an estimated 5 million hectares in Zambia only by the end of 2025. The project explains that its joint effort with the Zambian government, the Forestry Department, and the Chiefdom partners helps ensure that the protected area remains untouched, allowing biodiversity to prosper without being damaged by human activities. It also explains that it has partnered with multiple conservation organizations, including Birdwatch Zambia, Lion Landscapes and Panthera, and Community Scouts. This private-public multi-stakeholder partnership helps surveil the park and perform biodiversity protection activities and monitoring. The three goals concerning biodiversity that the LCFP pursues are to preserve ecosystems and species, to verify the sustainable management of biodiversity resources, and to implement the Kunming-Montréal biodiversity framework by securing adequate means of implementation for all parties. The ways in which BCP plans to promote each of these goals is by respectively promoting more vigorous law enforcement and the creation of wildlife corridors, organizing the provision of natural goods to local communities, and utilizing carbon fees to fund conservation measures.



Figure 7. Table of LCFP Goals and Practices ⁶³

The project is intended to reduce emissions by avoiding deforestation, using a series of mitigation activities. Among these, direct conservation support, engagement, and capacity building with key Government and community stakeholders, performance-based payments to community stakeholders delivered through local institutions, promotion of alternative livelihood activities including conservation agriculture, non-timber forest product livelihoods, and sustainable enterprise development are all solutions that are envisaged and promoted by the program.

While the multinational companies adhering to offsetting initiatives are generally from the Global North, the forests that are used for offsetting emissions are primarily located in the Global South and developing countries. Indeed, REDD+ is a program through which high-income countries provide financial incentives to low-income tropical countries to keep their forests standing and thereby reduce deforestation-related carbon emissions. For example, all REDD+ projects dedicated to offsetting purposes are located in the Global South, particularly Asian and African countries. Greenpeace, which often denounces projects of this kind because of the lack of transparency of data and results, explains that this choice could be motivated by the greater lack of regulation and governmental control in the Global South, which allows companies to exercise land grabbing practices and operate without

⁶³BCP Impact Report (2022) BCP Impact Report: Making Conservation of Wildlife Habitat Valuable to People

public control and intervention protecting the land access rights of local communities.⁶⁴ Land grabbing of this kind has actually been eased by restrictions on indigenous population and local communities' access to land to allow big, polluting industries to claim greenhouse gas emissions compensations, it claims.⁶⁵ The risks of these kind of projects therefore lay in the possibility for companies to start claiming that they compensate their emissions, when they truly keep producing if not increasing them, and the increase of land grabbing practices that menace local communities in the Global South, who receive impositions and limitations on how to use forest resources that have to be used to claim carbon offsetting.

Numerous investigations have been conducted on the Luangwa Community Forest Project to assess whether the impacts that were being claimed in terms of forest protection and benefit creation were effectively taking place. The results were controversial. This study additionally focuses on the italian company Eni's involvement in the Luangwa Project, based on the findings of Greenpeace, Recommon. Findings on this case were published on a report that denounced the whole programme as well as Eni's involvement in it. This study will also consider the claims made by an investigation that was led by Rai Report, an Italian television program that leads investigations and inquiries on controversial topics, which dedicated an episode to the Luangwa Community Forests Project and Eni's involvement in it.⁶⁶

Eni is an Italian multinational energy company, and is part of the seven major oil companies in the world. It takes part in multiple offsetting projects and is aiming to reach "net-zero" emissions by 2050 through offsetting practices. In 2020 it bought multiple carbon credits in the Luangwa National Park in Zambia, defining it a perfect low-cost opportunity for emission compensation that cost less than 10 dollars per ton of carbon dioxide. Companies such as Eni are largely relying on innovative tools, such as carbon credits, to improve their reputation and impact on the environment. Aiming at "net zero" emissions is in line with sustainable goals such as Agenda 2030 and the SDGs of the UN. However, the term "net zero" has quickly started being criticized by environmental activists and organizations, who have coined the term "neot- zero", criticizing the greenwashing effect that purchasing carbon credits can have on a company. Indeed, compensating emissions through the carbon market can lead to companies like Eni, according to the organizations accusing it, to keep producing - if not

⁶⁴ Greenpeace (2021) Cosa si nasconde dietro all'interesse di Eni per le foreste? Recommon & Greenpeace

⁶⁵ Lang C. (2023) Carbon Colonialism: Four Corners investigates NIHT Inc's REDD+ project in Papua New Guinea, REDD Monitor

⁶⁶ Chianca L. (2023) Luangwa Project, Report, Rai3

increasing - greenhouse gas emissions, and simply buying off compensation titles without, however, guaranteeing that the amount of emissions that they produce is truly compensated. The very idea of calculating emissions through a 'total global emissions' calculus is heavily criticized by environmental organizations, as emissions are still being produced by the company, who actually grow disincentivized to diminish emissions because they can compensate them for low-cost carbon credits .

The Italian news TV program called 'Report' of the Rai3 channel has led an on ground investigation of the Luangwa Project, highlighting many contradictions that seem to arise from its activities. Eni was invited by Report to answer a list of questions to get the company's point of view before the launching of the episode on broadcast TV. However, Eni's response was delivered too late and was not therefore included in the episode, only to be published on Report's website in written form. The episode opens by denouncing the trophy hunting activities that take place in the park, which are included in the Luangwa program. BCP's website highlights how the Luangwa National Park is one of the last ten strongholds on earth for lions, yet Report's findings suggest that 'white hunters' can pay to access the park and hunt protected species, including lions. According to locals, it is "foreseen by the program" of the Luangwa Community Forest Project and therefore goes unquestioned. When asked about the hunting activities in view of the episode launching on TV, Eni provided an unclear answer. Eni answers by affirming that illegal logging and poaching are prohibited by law, and the project does not impose restrictions on access or use of non-timber forest products (NTFPs) in the project area. It also adds that the project contributes significantly to combating climate change and contributing to the development and resilience of the country's most vulnerable communities and the protection of ecosystems, associated ecosystem services, and biodiversity. Eni continues explaining that the project preserves essential ecological corridors for numerous species, including the African wild dog, Temminck's pangolin, leopard, and lion, some of which are listed in the IUCN Red List, in complementary areas to parks and reserves. Lastly, it states that according to the report from CCB Standards, the project has improved the ecological integrity and biodiversity of the area. Surveys conducted by local stakeholders show that biodiversity in the wildlife corridor connecting the five national parks, which the initiative aims to preserve, has remained stable. Furthermore, in the Munyamadzi area, wildlife has increased based on regular monitoring since the beginning of the project. However, All of the above information

does not specifically answer Report's questions about poaching safari activities going on in the park.

Other issues underlined by Report's inquiry concern deforestation prevention claims, the effective distribution of benefits to local communities and the hampering of data on population growth of the Luangwa Project. Chianca, the leader of the Report investigation, interviews Thales West, an assistant professor at the Department of Environmental Geography at the Vrije Universiteit Amsterdam, who has studied carbon credits projects and started doubting their efficiency at creating tangible results.⁶⁷ West claims that it is hard to determine the real amount of deforestation that would occur without the project's protection. If overestimated, the carbon credits end up being based on false data that erases the effects of credits. It explains that if it's not really reducing the threat of deforestation in the area, the Luangwa project risks not having any concrete impact on emissions and on the preservation of biodiversity. Therefore, the project shouldn't emit any carbon credits because it isn't really reducing deforestation or balancing emissions towards a 'net zero' goal.

The on-the-ground investigations that the reporters lead in the Luanga allow them to engage with local communities. They interview one of the chiefs of the seventeen chiefdoms taking part in the project, along with some local farmers and project managers. In the interview, chief Luembe affirms that his community receives a part of the projects' funds obtained through the selling of carbon credits - about 50.000 dollars that year - but that they are not informed on how much the total profit that is being made off the selling of carbon credits is, and if the share they receive corresponds to the amount they were promised. According to Eni, not less than 70% of the profits coming from the selling of carbon credits is being returned to the territory but didn't specify the amount in numbers due to privacy and confidentiality reasons. Luembe and other locals also claim that the deforestation rates weren't particularly significant in the area before the creation of the programme. This information is also stated by BeZero, an independent ratings agency for the Voluntary carbon Market that makes assessments and ratings on numerous carbon credits and other sustainability promoting projects.⁶⁸ Each project is classified, ranging from an AAA to a CCC grade, certifying the likelihood with which each project is actually creating a positive environmental impact. The Luangwa project was recently downgraded from an A grade to a

⁶⁷ West T. et al. (2023) Credit credibility threatens forests, Science

⁶⁸ BeZero (2023) Luangwa Community Forests Project (B)

B grade, indicating a low likelihood for the project to concretely achieve 1 tonne of CO2 avoidance or removal per carbon credit. This downgrade took place after BeZero received new information on the project regarding the protected status of the area and its effectiveness, the reference region and leakage belt, and the methods used for accounting the carbon offsetting of the project. The research was also led by analyzing satellite imagery of the area. BeZero reached the conclusion that all the risk factors observed indicated a strong likelihood for the deforestation risks of the area to not be as great as stated, creating concerns on the project's additionality. Dissimilarities between the project area and the reference region increase the risk of overestimated deforestation and therefore of over crediting, considering that a great share of the are controlled by the project was already protected by the relatively effective International Union for Conservation of Nature (IUCN) category VI protected areas. This information renders the deforestation policies led by the project much less likely to create any effective emissions compensations, and to be a determinant player in the decrease of deforestation risks. If the latter aren't as high as predicted, also the biodiversity protection ensured by the project is lower.

Additional issues come from the fact that carbon credits are only one of the aspects of the project, as there are also impacts on biodiversity and socio economic impacts on local livelihoods to be considered as a portfolio made of different investments that are relevant for the project's sustainable effectiveness. Report's investigators also lead on-the-ground research to check the distribution of non monetary benefits, such as the promotion of education and infrastructure building. In one of the Chiefdoms of the Luangwa park, the schools are very old and cannot be used for safety reasons: they lack windows, floors, the walls are frail and the roof isn't suited for hot weather, making the classrooms too hot to study in. A new structure has been built next to the old school where the kids can take classes thanks to the profits made by the project. There isn't enough room for all the students, forcing them to take short classes in turns. Because of these issues, REDD+ has financed the construction of a new school building. However, although one year has passed since the end of construction activities, the structure is still not being used because of bureaucratic and material obstacles. Firstly, the structure still hasn't been formally entrusted to the community's school. Secondly, REDD+ built the structure without taking into consideration the furniture needed for actual use, such as desks, chairs or boards. The funds allocated for the building, according to the chief, are mostly used for transport of materials, and are insufficient for completing livelihood projects such as the new school building. generally, small farmers and other locals complain to the reporters about being left out from the decision making processes. The project was "imposed" on the communities, who don't get explanations about what is being done in the area, or about the science behind the carbon credits system.

As previously mentioned, one of the many initiatives promoted in the Luangwa Community Forest Project is the one of disincentivizing population growth, which would theoretically decrease threats posed to deforestation in the area. However, similarly to the hampered data on deforestation, some organizations are stating concerns on the data regarding the local population. Recommon and Greenpeace have found out that during the presentation of the project, greater population density was inserted than the one that can be estimated to truly live in the area, creating important inconsistencies. If the real risk of over population is lower than the one estimated by the promoters of the Luangwa project, then so are the merits taken for preventing it higher than they should be.

When interrogated by Report, Eni - as one of the most important co-managers of the project - has stated multiple arguments in its defense. Particularly, it claims that the Luangwa project is certified by renowned and trustworthy certification agencies, who lead impartial research and assessments. One of the two leading agencies for the certification project is Verra, an american certification society who is known to be the biggest certifier for the voluntary carbon credits market. Nevertheless, the latter itself stands at the root of environmental associations' critiques. The voluntary carbon market isn't subject to any type of regulation, the rules are essentially made by private entities who certify and co-manage all carbon credits that are generated, and Verra certifies up to 75% of carbon credits companies. Additionally, its committees are largely composed of representatives of oil, gas and electricity producing companies who might exercise non negligible amounts of pressure on the certification outputs, as they participate in the standards regarding decisions. The voluntary commitment of companies to keep deforestation and population growth under control in an area that maybe didn't present either of these risks poses credibility issues to the whole project.

The total of 12 questions asked by Report to Eni in view of the broadcasting of their episode on the Luangwa park raised concerns on different aspects of the project. Particularly, they revolved around the legitimacy of the carbon credits purchased through this project and the role they play in Eni's sustainability strategy, the due diligence processes followed by Eni to ensure the legitimacy of the project, the distribution of benefits to local communities, and the assessment of the positive impacts on fauna and flora it created. For what concerns the risk of CO2 capture and overestimation, Eni answered that the projects are thoroughly evaluated by comparing the deforestation rate's evolution to that of a reference area - the "baseline" - that is established through field sampling and considering various other local factors. it explained that the project designs are controlled by independent verifiers and subsequently validated by the Registry Entity. Among the certified elements is the benefit-sharing mechanism with local communities, the consultation process with the communities, and their informed consent (Free, Prior, and Informed Consent - FPIC). Additionally, Eni explains that to ensure impartiality and transparency, periodic verifications of each project's compliance with quality and certification criteria, as well as the calculation of credits to be issued, are carried out by auditors different from those who initially validated the project.

In conclusion, the Luangwa Community Forest Project is one of the most important emissions offsetting programs in Africa - and in the world. It promotes a series of development initiatives for local communities that involve agriculture, financing, education and healthcare. However, the project seems to raise multiple perplexities concerning the transparency of emissions calculations processes, the distribution of benefits derived from the selling of carbon credits and the effectiveness of the project in truly decreasing and preventing deforestation and overpopulation.

4.2.2 Ankeniheny–Zahamena Corridor Biodiversity Conservation Project

Overview of Madagascar

The second case study treated in this study is located in Madagascar, more specifically in the Ankeniheny Zahamena Corridor (CAZ), which is a designated protected area in the eastern region of the country. Madagascar, like Zambia, is a member of the Regional Economic Zone

called Southern African Development Community (SADC). its is one of the poorest countries on earth, ranking 135th globally under the Human Development Indicator⁶⁹ and with more than 77% of the population living below the poverty threshold.⁷⁰ Its economy is quite fragile, strongly relying on agriculture, which constitutes almost 30% of the GDP, and is crucial for the livelihood of its inhabitants, with many living in rural areas. Madagascar is characterized by a semi-presidential representative democratic republic, but even more by high levels of political instability, characterized by corruption and internal conflict. These political difficulties and the national economic structure hamper the country's possibilities for development, and constrain it to rely on official external aid which constitutes a staggering 75% of public investment programs and 40% of government budget.

In the light of the fight against climate change, this political and economical panorama becomes quite problematic, particularly when considering how important Madagascar's natural ecosystems are. The country is considered a 'mega-diversity hotspot", hosting thousands of endangered and endemic species and granting a fair amount of carbon storage through its tropical forests. It is also one of the most threatened ones in the world, according to Conservation International, particularly because of deforestation, population growth and other anthropogenic activities.⁷¹

The Ankeniheny-Zahamena Corridor (CAZ) includes very diverse habitats, such as wetland, rivers, and forests, hosting thousands of animal and plant species, of which many are endemic to the region and endangered. About 350.000 people live in the area, and base their livelihoods on agriculture and cash crop production, particularly the ones of rice, coffee, bananas, manioc, lychee and charcoal. However, the production of these goods strongly affects the natural panorama, threatening the local ecosystems with deforestation and over-exploitation of resources. Deforestation threats are clearly illustrated by satellite images, which demonstrate that between 1950 and 2000 almost half of the total forest cover was destroyed, shrinking the forest area from 27% to 15%.⁷² This great reduction has been mostly caused by human activities, such as cutting wood for high value fuel creation in the form of charcoal, mining for gemstones - which often includes illegal mining practices and has

⁶⁹ Human Development Index (2023) World Population Review

⁷⁰ Portela R. et al (2012) Assessing and Valuing Ecosystem Services in the Ankeniheny-Zahamena Corridor (Caz), Madagascar, WAVES

⁷¹ Conservation international (2012)

⁷² Harper et al. (2007) Fifty Years of Deforestation and Forest Fragmentation in Madagascar, Foundation for Environmental Conservation

attracted thousands of migrant workers to the area - and "slash and burn" agriculture, a traditional farming method particularly practiced in tropical regions, that involves clearing a piece of forested land by cutting down and burning vegetation. The ashes from the burned vegetation provide some nutrients to the soil. Farmers then cultivate crops on this cleared land for a few years until the soil's fertility diminishes, at which point they move on to a new plot of land and repeat the process. In spite of being a protected area, the CAZ has strongly been affected by the deforestation threats and trends of the past decades, as can be seen in Figure X. The areas at risk are not only the borders of the forest, but its central parts too, as the different wood cutting, mining and agriculture activities also take place in the interior of the CAZ, where it is theoretically prohibited to pursue them. Estimates of Conservation International, a Virginia based NGO, calculated back in 2010 that one hectare of deforestation in the CAZ results in an average of 270 tons of CO2 released into the atmosphere.⁷³ Efforts to prevent the cutting down of trees and preserve the storage of carbon are therefore strongly recommended in the area.



Figure 8: Satellite data shows deforestation surge in 2020 in the CAZ area⁷⁴

⁷³ Carver E. (2021) Slash-and-burn farming eats away at a Madagascar haven for endangered lemurs, frogs, Mongabay

⁷⁴ Carver E. (2021) Slash-and-burn farming eats away at a Madagascar haven for endangered lemurs, frogs -Satellite data show the area comprising the former province of Toamasina experienced a surge in deforestation in 2020, Mongabay

From the early 2000s onwards, there has been a notable decrease in annual deforestation rates, which can be attributed to the increased attention to the importance of this natural area and the instoration of a series of conservation projects. At the moment, there are multiple forest carbon initiative projects operating or being developed in Madagascar, considering the attention that the Malagasy governement is putting on this resource as well (Vyawahare, 2021).⁷⁵ The projects are a mixture of publicly and privately managed initiatives, with both national and international agencies cooperating for their development, and also include other actors such as non-profit organizations and local communities. The threat of deforestation and great forest coverage has particularly attracted investors and project managers who intend to create conservation outputs by focusing on the forests' carbon resources.

Overview of the REDD+ CAZ project

The pilot CAZ REDD+ project developed by REDD+ in 2012 is a carbon credit creation project, aiming at protecting the natural area against deforestation and using the innovative means of carbon credits to support its efforts. It also aims at protecting biodiversity and ecosystem services by improving the capacity of local communities to manage the resources in an efficient and non erosive manner. The Ankeniheny-Zahamena-Mantadia Biodiversity Conservation Corridor Project is one of the first officially recognized REDD+ projects in the African continent and is the main reason that led the CAZ area to be recognized as an officially protected area. CAZ REDD+ covers a rainforest area of more than 425.000 he, in the effort of protecting CAZ's greatly biodiverse environments and keeping carbon stored in its forests. This project is one of many REDD+ pilot projects in Madagascar, and the country's government has recently committed to the next stage of implementation of the project. The latter, similarly to the Zambian REDD+ one in the Luangwa park, is certified by multiple certification standards, such as the Voluntary Carbon Standard (VCS) and the Climate, Community & Biodiversity Standards (CCBA). The CAZ safeguarded zone comprises three previously established natural areas managed by Madagascar National Parks: Zahamena National Park, Mantadia National Park, and the Mangerivola Reserve (refer to Table 1). Prior to the establishment of CAZ, endeavors aimed at preserving the region's natural resources were limited in scope and lacked a comprehensive overarching plan. The introduction of the new protected zone has furnished a structured approach to formulate a

⁷⁵ Vyawahare M (2021) Even as the government bets big on carbon, REDD+ flounders in Madagascar, Mongabay

distinct roadmap for conserving the entire corridor and expanding effective initial projects. The CAZ safeguarded zone comprises three previously established natural areas managed by Madagascar National Parks: Zahamena National Park, Mantadia National Park, and the Mangerivola Reserve. Prior to the establishment of CAZ, activities that aimed at preserving the region's natural resources were limited in scope and also lacked a comprehensive overarching plan. The introduction of the new protected zone has structured a new approach to formulate a distinct roadmap for conserving the entire corridor and expanding effective initial projects.

In an interesting study published by Nature Communications that evaluates the role of protected areas (PA) and their effectiveness in mitigating climate change, it has been noted by the authors that PA play in fact a major role in preventing emissions release, and therefore in stabilizing the planet's climate. It underlines the lack of accurate carbon stock maps at a global level, and how that has not enabled the quantification of the impact of PAs on climate change mitigation. The study used ASA's GEDI mission samples to estimate total above ground carbon stocks of all mapped terrestrial woody areas. Carbon stocks in this sense were to avoid emissions from deforestation and degradation in PASs compared to forests that aren't protected and surveilled. The results of the study, which included CAZ among its case studies used for assessment, concluded that PAs do play a major difference, underlying the importance that protecting natural areas play in the capturing of carbon for present and future sequestration.⁷⁶

However, in spite of the role it played in making the CAZ a protected area, and the importance of the latter, the management of CAZ REDD+ has been put under serious accusations and criticism by both academics and third party verification agencies. In 2018, a study found that the restrictions that were put on the access to the natural ecosystem resources were greatly weighing on local communities, who saw their access to fundamental resources for their livelihoods be halted without receiving sufficient compensation. Indeed, the CAZ REDD+ program does envision a series of benefit-sharing mechanisms in the form of economic compensations and one-off payments for local people affected by the creation of protected areas, but the authors concluded that these were strongly insufficient and

⁷⁶ Duncanson L. et al. (2023) The Effectiveness Of Global Protected Areas For Climate Change Mitigation, Nature Communications

concretely reduced the protection activities to land grabbing practices.⁷⁷ "[...] The local people, some of the poorest in the world, have lost out as a result of the protected area establishment, and that compensation provided to mitigate these costs has been inadequate. Too little has been received by too few and it has not reached those most in need." is written by the authors of the study. CAZ inhabitants, with the addition of the great number of immigrants coming to work in mining or agriculture, need resources provided by nature and the land to survive, be it for harvest, house building, or fuel creation. 90% of local habitants practice swidden agriculture, making conservation efforts difficult to coincide with the protection of these people's right to support their own subsistence methods. Forest communities are strongly and negatively affected by the restrictions that are imposed on them for conservation, with a significant cost representing 2-84% of annual income across households of median-income. The compensations that are programmed are not received by all households, with more than an estimated 50%, about 3000 households, not receiving any. Additionally, even compensated households are arguably granted a payment of sufficient magnitude when related to the costs they endure, considering that the compensation is based on the amount spent and the valuation by recipients two years after the compensation was received. A truly impactful compensation should envision a different order of magnitude, considering that despite policies that intend to create real positive impact and promote conservation, poor local communities still bear the costs of forest conservation. Donors' social safeguarding risks not being met unless major extra funding is given by global beneficiaries of conservation, to ensure that the efforts made to protect natural ecosystems, biodiversity and fight climate change do not compromise the ability of poorer populations to provide for themselves and develop in a sustainable manner.

The director of community resources support at Conservation International Madagascar, Bruno Rajaspera, told in an interview released to Mongabay News that CI adopted a multi functional "landscape approach" in CAZ.⁷⁸ The idea is to include different spheres of initiative of economic, social and governance nature, to include the protection of CAZ in a sustainable agenda that promotes development rather than halting it. The increases in deforestation seen in 2020, according to him, were due to the struggles endured during the pandemic and the big economic pressures it created.

⁷⁷ Poudyal M. et al (2018) Who bears the cost of forest conservation? PeerJ

⁷⁸ Carver E. (2021) Slash-and-burn farming eats away at a Madagascar haven for endangered lemurs, frogs, Mongabay



MONGABAY Basemap by Planet,

Figure 9: Satellite imagery shows rapid deforestation in CAZ in late 2020⁷⁹

From 2005 to 2015, CAZ only held the title of a temporary protected area, becoming a fully fledged one only after a full decade, in spite of parts of the area having been protected from much earlier, in the 1960s. In order to face the struggles of local communities, it uses a mixed-use model, like many other projects in similar cases, which combines allowing some usage of resources to answer the needs of local populations while promoting conservation. It divides CAZ in different zones. There are the "hard core" zones, on which any activity that involves the ecosystems is prohibited, mostly in the inside of CAZ. Then there are outer zones, strictly regulated and enforced but with the inclusion of permits for some resource usages. As mentioned, Conservation International co-manages the project with other agencies, having obtained an agreement with Madagascar's government for management responsibility of CAZ. In particular, its work revolves around supporting the local community groups called Vondron'Olona Ifotany (VOI) in the effort of monitoring, controlling and surveilling the use of ecosystem resources and wellbeing of CAZ, by patrolling and monitoring the forest. This collaboration with the local groups helps in building a multi structured authority system that involves local people and is used in different parts of the country's protected areas.

⁷⁹Carver E. (2021) Slash-and-burn farming eats away at a Madagascar haven for endangered lemurs, frogs - Satellite imagery shows rapid deforestation in CAZ in late 2020, Mongabay

REDD+ CAZ is a carbon credit emitting project, like the LCFP one in Zambia. As of 2015, according to the World Bank, the project had generated about 3,915,496 carbon credits.⁸⁰ The funds obtained through the selling of these credits on the voluntary carbon markets serves the purpose of promoting the protection of the park and developing benefits on the ground for both local communities and natural ecosystems. Among these services, there are multiple activities that aim at directly supporting the livelihoods of the people in CAZ by developing more sustainable fish farming, better crop cultivation and irrigation practices for rice, brans and fruits, creating a whole set of circular and greener agricultural alternatives to slash-and-burn practices. Additionally, the income generated from carbon credits is redistributed in the form of payments for ecosystem services, a way of distributing benefits and, to some extent, compensations to local people - as well as an incentive- to take part in the conservation of the area's forests.⁸¹

The challenges posed by the political profile of the country, however, have affected the confidence in the management of CAZ, with increasing rumors of corruption, according to Ravaloharimanitra of the Aspinall Foundation in an interview released to Mongabay. Local people see governmental officials, such as representatives of the environment ministry, district and regional officials, as corrupt and distant from the protection of their needs. This mistrust in institutions, aside from the political instability that characterizes the country, is also due to practical transparency issues, synch as the language barriers. Logging permits and other relevant documentation issued by officials are often in French, the official national language, but that is not understood by all locals, with many VOI members not being able to read it and therefore to implement and enforce conservation rules, with loggers exploiting this opportunity to pursue prohibited activities in locations where logging is not permitted. Additionally, lawbreakers are rarely kept accountable for their infractions, both because it is hard to monitor the whole area with insufficient control methods and because legal repercussions are often not pursued. As a consequence of all of these struggles, local communities are disillusioned and distrust grows against inactive institutions that prohibit the use of natural resources but do not punish those who don't respect the rules.

⁸⁰ BioCF (2015) Madagascar: Ankeniheny–Zahamena Corridor Biodiversity Conservation (REDD+) Project, World Bank Group - Climate Change

⁸¹ BioCF (2015) Madagascar: Ankeniheny–Zahamena Corridor Biodiversity Conservation (Redd+) Project, World Bank Group - Climate Change

The protection of biodiversity is one of the goals pursued by the REDD+ CAZ project, which however mostly relies on its carbon credit production and deforestation prevention, of which biodiversity protection is a byproduct. However, the tracking of carbon offsetting is, also in this case, presenting several problems and raising doubts on the project's alleged merits. BeZero has led an investigation on this project too and reaffirmed its 'BB' Be Zero carbon rating for this project.⁸² The 'BB' rating for carbon credits mark a moderately low likelihood of achieving 1 tonne of CO2 removal or avoidance, and it has been confirmed in a second investigation led by BeZero in recent years. The credits issued by the project, according to its findings, show strong additionality because of "persistent drivers of high deforestation in Madagascar and the project's strong reliance on carbon finance." In addition to these problematic elements, evidence tied to the risks of little policy implementation for forest management governance and its high risk of being ineffective influence and support the attributed rating. BeZero considers that, similarly to the Zambian case, the rating is affected by "notable over-crediting risk" as well as highly overestimated carbon stocks and "significant non-permanence risk related to the increased forest loss in recent years."

In conclusion, CAZ is of extreme importance for preserving one of the most biodiverse hotspots on earth, and the establishment a protected area in 2015 through the development of the REDD+ project in the area played a crucial role in diminishing the threats and establishing rules for protecting nature in the corridor. However, implementation of the efforts and monitoring of the results isn't a simple task, and the deforestation trends are far from being tamed in spite of the establishment of PAs and carbon credit system. In fact, the latter might be hampered by the inability to completely halt deforestation in protected zones, participating in the already plausible over-crediting of emissions.

⁸² Be Zero (2023) Carbon Emissions Reduction Project in the Corridor Ankeniheny-Zahamena (CAZ) Protected Area, Madagascar (BB)

4.3 SECTION 3

4.3.1. Variables Evaluation Method

After having presented the two case studies, the goal of this section is to apply the variables that have been identified through the observation of the Co-Cities model and apply the commons methodology that has been used for cities to BSMs used for biodiversity protection.

In Co-Cities, the performance of the variables in each case study is evaluated through the collection of information from secondary sources and/or interviews with representatives of each case. It allowed the researchers to summarize the results of their empirical analysis on projects and public policies in the 140 cities examined. This structure serves as a basis for this research on the efficiency of BSMs. The scope of the application of these variables is not the one of drawing conclusions and final assessments or recommendations on how to improve the utilization of BSMs, rather outline a methodology that can be used to assess the efficiency of BSMs in biodiversity conservation projects that utilize them, identify common trends and, with further research, solutions. The following analysis is therefore only descriptive and only intends to suggest an example of how BSMs can be observed to develop a common framework of analysis and improve the utilization of this tool as a complementary financial solution for biodiversity financing instruments, such as carbon credits for example.

The aim of the following table is to highlight the relevant aspects of each conservation project and create a classification criterion for the five relevant variables that were identified through the Co-Cities model. The table below is directly modeled after the one used in Co-Cities Guidance Codebook. In the latter, the authors operationalized every one of the design principles (co-governance, enabling state, pooling economies, experimentalism and tech justice) and defined the main features of each one of them. These definitions, along with a series of guiding questions, allow coders to assign values of performance of each principle within a designed case study. The value is incremental, in the sense that the more the design principle features in a case study, the higher the numeric value assigned is.

In the original method, values ranging from 1 to 3, respectively demonstrating weak, moderate and strong performance of a guiding principle, are applied to cities. Focusing instead on BSMs, the definitions of the different sub-categories defining each guiding principle have been slightly modified to suit the different context. The results of the coding allows, in this study's case, to evaluate the two conservation projects that have been presented - the Luangwa Community Forest Project and the Ankeniheny–Zahamena Corridor Biodiversity Conservation Project - and assign evaluations to the performance of BSMs of these projects according to the guiding principles.

The units of measure range from 0 to 3, with 0 being absent, 1 meaning weak; 2 reflecting a moderate presence of the variable and 3 a strong one.

Design principle	Main category and sub category	Coding
Co-governance	a) Public governance: exercise of public authority by state or local governments for generating rules and regulations, and for delivering services to communities.	Weak (1)
	b) Public-Private governance: multi-stakeholder governance with only the public sector and the private sector for specific programs.	
	a) Co-governance: community emerges as an actor and partners up with at least one of the other four actors.	Moderate (2)
	b) Shared governance: care of commons concerns bilateral partnership/pacts between the government and communities that voluntarily activate themselves to take care of, regenerate or manage, single biodiversity resources through a single intervention, in order to improve the quality of natural spaces and protect the area. Phenomena are small scale.	
	a) Collaborative governance: is based on multilateral partnerships between several actors on a common-pooled resource, that creates a relationship of interdependence among stakeholders. The shift between shared and collaborative governance relies on the openness of the partnership (at least three actors of the quintuple model) and on the transition from single small-scale assets to the management of larger scale resources.	Strong (3)
	b) Cooperative governance: is institutionalized and represents the	

Design Principles and codification applied to BSMs

	 evolution from the pacts that foster collaboration among stakeholders to governance structures or legal entities that are cooperatively owned by or linked to the actors of the quintuple helix. Public utilities become NPU (Non-Profit Utilities), involving all stakeholders in collective property ownership or management of the public service management, and not allowing the distribution of dividends to its members. Public utilities are owned by users/community/workers and led cooperatives. c) Polycentric governance: the government and the other actors of the quintuple helix are simultaneously interdependent and autonomous, at all levels. Importance is placed on informal/civic uses. The actors are autonomous centers of decision-making, and responsibilities at different levels are tailored for their specific needs and capabilities. Everyday environmentalism is part of this. Co-design of public policies would make it more robust. 	
Enabling State	Co-design: The State uses co-design as a tool for decision making and planning and hires service designers or design thinkers.	Weak (1)
	Collaborative: The State embraces a horizontal approach, without giving up with his role and duties. It supports the commons by investing on or funding them or providing technical support rather than contracting out some services. It shares political and strategic decisions rather than administrative ones.	Moderate (2)
	 Experimental: The State adopts a public policy cycle rooted in informal gatherings, mapping and above all practices and evaluations of those practices and prototypes. Informal: The enabling state uses informal structures and procedures. 	Strong (3)
Poolism	 a) Sharing: Sharing Economy (SE) in the strict sense, on-demand economy or crowd-based capitalism. Access economy: SE initiatives whose business model implies that goods and services are traded on the basis of access rather than ownership. It refers to renting things temporarily rather than selling them permanently Gig economy: SE initiatives based on contingent work that is transacted on a digital marketplace 	Weak (1)

	 Pooling: Based on co-production and solidarity/social justice. Collaborative economy: or SE initiatives that foster a peer-to-peer approach involve users in the design of the productive process or transform clients into a community. 	Moderate (2)
	 Commoning economy: for SE initiatives that are 1) collectively owned or managed 2) multi-actor, cross sectorial 3) autonomous but interdependent 4) involves a transfer of resources from the private or public actor to the collective group 5) aimed at realizing the goals of the right to the community 	Strong (3)
Experimentalism	Iterative: The process is replicable following the same steps.	Weak (1)
	 Adaptive: The project relies on a methodology or on a structure/process that is exportable and adaptable to different contexts. Experimentalist methodology: For its internal organization, for the governance of the common resource, for the provision of the service of public utility or for the production of goods and services. 	Moderate (2)
	Replicable/scalable/connectivity: The process is replicable in other contexts, scalable (from micro to macro) and has a view at different levels in order to learn best practice and share experiences.	Strong (3)
Tech Justice	 Tech Equality: Based on a concept of formal equality. It brings together people of diverse walks of life in communities around the world to self-organize around natural common goods. Connectivity: access to a medium/high quality broadband. Use: Effective use of the Internet by community members. Device property: digital devices (smartphones, laptops, notebooks) owned by citizens. Digitalization: of local public services. 	
	 Tech Justice: Represents the shift to formal equality to substantial equality. It is rooted in the idea of human capacity and the recognition of structural inequalities. It targets populations that are "left behind", especially from the digital divide, and identifies inclusive solutions. Public recognition: local public policies/programs addressed 	

 on the overcoming of (ethnic/cultural/) minorities' digital divide. NGO: specific local NGO projects focused on the overcoming of (ethnic/cultural/) minorities' digital divide. Self-organization: of communities around those projects/initiatives. Defined roles and responsibilities: for actors/community by the public policy/program/NGO project. 	
Tech Sovereignty: A result of full access and digitalization, and the overcoming of the digital divide. The communities involved are able to collectively participate in and form their own cooperative platforms, or the skills and tools they acquired are directly used in an entrepreneurial way.	Strong (3)

In the following tables, the guiding principles have been applied to the two case studies of the LCFP and CAZ, with a brief commentary explaining the considerations that were made for the attribution of the numeric value. Ideally, these numeric values are to be supported through thorough on-the-ground research, interviews and monitoring.

Coding of the Luangwa Community Forest Project

Design principle	Commentary	Coding
Co-governance of BSMs	Authorities are involved in the project and a multi-stakeholder approach is adopted, presenting aspects of co-governance and shared governance too. Communities are represented by Chiefs and participate in the program's evolution. However, it is unclear to what extent communities are involved in decision making and aware of the conditions that are imposed, meaning that the interdependence of stakeholders is not equilibrated, and rather risks forming top-down approaches to the BSMs distribution, although some autonomy is being developed at local level for some initiatives. Representatives of Chiefdoms, women and local communities are involved in development programs and management of benefits.	2
Enabling State	The State works as an enabler, as it allows for the project to be present on the territory, involves national protected areas, and works as one of the partners of the project. It is unclear to what extent the State plays a leading role in the development of the program, in monitoring activities and supporting the project BSMs with political, strategic decisions and technical support. The State does not seem to play an experimental role in the distribution of benefits.	1

Poolism	One of the aims of the program is to incentivise the development of pooling economies in Luangwa, by empowering local communities and developing their ability to manage parts of their own funding, with initiatives such as the banking one. It doesn't particularly promote access nor gig economy mechanisms to distribute benefits, but fosters a collaborative economy with peer-to-peer approaches, and the design of processes that transform clients into communities.	2
Experimentalism	The project presents numerous experimental initiatives, including those regarding BSMs, that aside from being iterative are also replicable, scalable, and connective. It follows an adaptive and experimentalist approach.	3
Tech Justice	Technological benefits and BSMs are not predominantly present in the program. Communities benefit from provision of technological goods, such as infrastructure for agriculture, education or healthcare. The research didn't collect information on internet connectivity, digitalization and cooperative digital platforms of the program.	1

Coding of the CAZ Project

Design principle	Commentary	Coding
Co-governance of BSMs	Authorities are involved in the project and a multi-stakeholder approach is adopted, presenting aspects of co-governance and shared governance too. Communities are provided ecosystem services payments and compensations for the occupation of land and lack of access to resources, which however has been deemed insufficient by researchers and local communities. There is a top-down approach to BSMs distribution, with little involvement of local communities in decision making.	1
Enabling State	The State works as an enabler, as it allows for the project to be present on the territory, involves national protected areas, and works as one of the partners of the project. However, pursued deforestation, lack of monitoring and sanctions for transgressors leaves doubt on the efficiency of State monitoring and involvement. It is unclear to what extent communities are involved in decision making, regarding the distribution of benefits, and if they are aware of the conditions that are imposed by the project. There is relevant distrust in institutions and lack of transparency. The State doesn't seem to have a leading role in the development of the program, in monitoring activities and supporting the project BSMs with political, strategic decisions and technical support. The State does not seem to play an experimental role in the distribution of benefits.	1
Poolism	No significant pooling activities for the distribution of benefits have	0

	emerged through the research on CAZ.	
Experimentalism	The project does not seem to present particularly innovative methods of benefit distribution. The use of satellite view of first density is an important tool, yet there is little tracking and monitoring of other biodiversity measures	1
Tech Justice	Technological benefits and BSMs are not predominantly present in the program. The research didn't collect information on internet connectivity, digitalization and cooperative digital platforms of the program.	0

CHAPTER FIVE

5.1 DISCUSSION

This chapter will discuss the observations that have been made in the previous one. As the study follows a qualitative approach, the selection of the case studies isn't intended to prove the validity of the Study's thesis, but rather demonstrate how the methodologies that have been identified in the literature can be applied to real-life scenarios of benefit-sharing mechanisms to study them and their effects. The intention of the discussion is not to draw conclusions on the efficiency of this model or to express judgments on the case studies, but to suggest a new approach that, with further studies and case selections, could eventually support the identification of patterns and solutions in which BSMs - and the way in which they are structured - can provide a valid support system for biodiversity conservation.

5.1.2 Findings

The discussion is supported by two interviews with experts in the field of biodiversity conservation and sustainable finance. The first interview was with a member of the UN non-profit organization Regions20 - now called Catalytic - who has previously worked for the UNDP. The second interviewee is from the UNDP - Secretariat of Central African Forest

Initiative - and has previously worked for REDD+ initiatives. As the discussion unfolds, their comments and answers to the questions of the interviews are presented.

The discussion starts through the commentary of the results of the tables on the two case studies observed.

Firstly, it can be noted how both case studies generally present pretty low scores, particularly in the case of the Malagasy project. These poor results coincide with the scarce projects' effectiveness at truly protecting the concerned areas against deforestation, considering the latter hasn't been stopped in CAZ and might not have even been a real threat in Luangwa. Perhaps, better and more nature-oriented mechanisms to distribute benefits, rather than only compensations for use, could provide stronger incentives for preserving nature and fostering collaboration. The local challenges that are found regarding deforestation are clearly very different, and in spite of both projects being REDD+ initiatives, a unique, one-size-fits-all approach to deforestation prevention clearly does not seem to work. For this reason, among many others, creating multi-stakeholder partnerships in which local communities play a relevant role can help better understand local challenges, and support policy makers in figuring out which solutions can work and which can't. Both examples demonstrate, in different ways, how, in spite of the proven importance of protected areas to fight climate change and safeguard ecosystems, the mere establishment of a PA is not sufficient in ensuring results. Indeed, the Study's interviewee from UNDP confirmed that REDD+ projects incur into inevitable limitations, due to the nature of the projects itself. According to them: "There has to be a difference made between the State and REDD+ projects. They [REDD+] are an interesting initiative to test methodologies, but are not the solution the international community had in mind when it created REDD+. In practice, they are national-level mechanisms in which governments create greenhouse gases inventories, show their emission levels and can then present action based on defined baselines. However, when considering the national scale, REDD+ initiatives are clearly restricted to small areas and borders, selected in a very arbitrary way. This type of solution can't add up to a planetary effort for biodiversity protection without strong governmental action. REDD+ projects are interesting, but I don't consider them able to solve a planetary issue and change the trajectory of how forests are preserved. When we witness major changes in biodiversity

protection, it is not because of these projects, but because of the decisions that governments make in reducing or increasing conservation".

In Madagascar, for example, having established a protected area without considering that a big part of the population lives off of slash agriculture creates a major clash between local communities' interests and the need to safeguard Nature. In light of a pretty inactive governmental effort, this issue is most likely to be resolved through extensive collaboration with multiple stakeholders and proactive communities, to understand how to best serve the people's interests without compromising biodiversity protection. For what concerns the Luangwa project, many of the issues that affect it can be identified in the accusations that have been made on its efficiency at protecting nature, promoting private interests rather than local ones, and actually having a positive environmental impact. Many of these issues - in particular, the concerns regarding whether the LCFP actually protects animals and plants, also considering the hunting activities that are permitted and the low deforestation prevention efforts, whether they are only accusations or actual problems to be addressed - can be resolved with greater transparency on the equitable distribution of benefits, and the development of stronger co-governance mechanisms. For example, policy makers and project managers should invest more in what concerns reforestation activities and wilderness protection, providing incentives for preserving and leading these types of activities. The benefits created from these activities, through safari or sustainable agriculture, can help create new sustainable sources of income for local communities while creating positive synergies with the natural ecosystems. It is important for communities to be involved in an integral way, and not only for Chiefs of chiefdoms to provide approval and agree to the implementation of programs that the rest of the local population doesn't know much about.

In both cases, the scores for what concerns tech Justice are very low. Surely, ensuring the use of technology, and even more in a fair and equitable way, requires an initial investment that can burden the stakeholders. However, smart systems could help resolve the issues of monitoring the activities that are promoted by the project and those pursued by local communities, ensuring better results in both protecting biodiversity, involving all stakeholders and increasing transparency overall. technology, in these projects, is being used in innovative ways. The satellite imagery observations used for covering the forest areas, for example, demonstrate strong potentialities for the space industry and the role that technology is already playing in monitoring activities. Other technologies or innovations, such as means of transport or agricultural structures, are being scatteredly implemented. However, the accessibility of these technologies is in fact not in line with the equitable trait of Tech Justice: they aren't being distributed to the whole population as a way to promote collaborative platforms, behaviors and Internet access.

The role of the State as an enabler, in both CAZ and the LGFP, is limited. Zambia and Madagascar are both developing States, in which it is likely for the State to be more of an enabler through its absence - and hence letting projects unfold - rather than being a guarantee and a proactive partner in the effort to create PA and safeguard biodiversity. When asked about the importance of stakeholders involved in conservation activities, the interviewee from UNDP said that: "every stakeholder is important, in the sense that without any of the actors, the solutions would fail. But since we are talking about commons, common natural goods that are shared between a broad population and that cannot be owned by anyone, but damaged by anyone, the role of government is crucial. Without it, there is not enough incentive to conserve these natural assets. Without government intervention, these common goods are tweaked in favor of unsustainable interventions, so there is a strong need to use governmental tools or those of any kind of joined power-structure. The latter can also be at community level, if the community is able to withstand pressure from other groups. However, we often see that it is not the case, communities are often helpless in front of bigger companies. So yes, multi stakeholder partnerships are very important, but its primarily the responsibility of the government that has been entrusted by the people to manage the common goods." The absence of a truly enabling State, in both case studies, is a root issue of the lack of funding, regulation, and control that could allow these projects to truly provide positive outcomes. If the State was to play a more transparent and collaborative role, it could also increase the sense of trust in institutions and guarantee greater compliance of all stakeholders involved including local communities who currently don't respect the rules because of the absence of sanctioning systems ensured by the State. In the effort to compensate for such absent State figures, it could be a strategic solution to increase the role of multilateral partnerships, where all parties play a relevant role with effective weight in decision making processes, making it transparent and shared.

An important note has to be made on the role that local communities have to and can play in these types of projects. Collaboration with IPLCs is therefore fundamental, but as already mentioned, it doesn't present a one-size-fits-all solution, and it is not a holy grail. "The participation of local communities is crucial, they are at the forefront of land use changes, but in some cases, for example when you have slash and burn agriculture, they are also responsible for the land use changes", the UNDP interviewee agreed on. Working with local communities can be extremely demanding, and there are serious limits to be considered in relation to the lack of structured interactive means, suited equipment, communication abilities and the very important role of local culture. An agreement and collaboration method that might work with a community might not work with the one next to it based on its beliefs, challenges, structures and other differences. For this reason, it is crucial to include IPLC - as well as other stakeholders that can facilitate communication - and proceed with implementing biodiversity protection without compromising their interests. At the same time, local communities shouldn't be expected to resolve the issues and obstacles that can be found. They have to be part of the process to find solutions, but also have to be considered among the problems to be solved - for example, their need to use natural resources that needs to be protected, or the pursuit of environmentally harmful practices. In this sense, the importance of multistakeholder partnerships resurfaces. The private actors involved, for example, can play a very strong and effective role, under the supervision of enabling public ones - to make sure that their activities do not promote greenwashing and rather that all actors work together as joint creators of opportunities.

For what concerns the distribution of benefits, it can be seen in the LCFP that the distribution of benefits derived from the selling of carbon credits follows a clear top-down approach, with economic benefits being distributed from the project management agencies without them being directly handled by the communities. The project delivers performance-based payments to community stakeholders through local institutions, and promotes alternative livelihood activities including conservation agriculture, non-timber forest product livelihoods, and sustainable enterprise development. In fact, the project focuses on developing new streams of income and direct funding management, such as through the creation of the village banking system, the promotion of village loans, savings groups and pooling of financial resources, which is an interesting experimentalist approach to BSMs that could create promising outputs. However, the concerns that the project has raised on its

carbon credit calculations and the transparency of its activities is not to be dismissed. In the CAZ case, the compensations received for the prohibitions made on the utilization of land and resources have been deemed insufficient and a burden on the already poor local communities. Catalytic's senior advisor, when answering a question on the difficulties of creating fair and well functioning BSMs, answered that, based on his experience with BSMs, it can be complicated to outline perfect sharing systems, considering all of the complex structures and variables that have to be taken into consideration when creating projects of the kind. According to the interviewee: "It's possible to make mistakes. For example, when we [as Regions20] took part in the financing of a project in the Northern part of Senegal to produce solar energy, we began our project, plugged our system and started distributing energy on the grid. However, at the end of the project, we naively noticed that we produced solar energy without ensuring that the citizens that gave their land to allow us to build solar panels and facilities, could access the electricity we produced. We didn't create a benefit for local communities, although we were acting in good faith by developing a project to produce sustainable green energy. At the start, we didn't reflect enough about it. We corrected it and equipped all the public infrastructure of the area with solar panels, so that they could access electricity. Therefore sometimes, even when we try to work for the good, we forget proprietary things, such as this one." They proceeded to explain that there are two types of BSMs structures that can be utilized: one is the voluntary one, in which the promoters of projects have to ensure that the multi-stakeholder engagement is considered from the start. The other approach to BSMs relies on the management of benefits ensured directly by the local communities. For this reason, one the most important aspects of BSMs is creating a multi-stakeholder engagement, in alignment with a business model that includes an adequate remuneration for local producers and participants. It is crucial to involve the government and collectivities in these processes, to create regulation and respect of the rules. The second big topic, they explained, is ensuring local distribution of benefits, especially when other innovative financial tools are being used to raise funds for a conservation project. Carbon credits that are produced in the Global South, for example, are often quickly bought from companies of the Global North that also speculate on them. The capital created by the carbon credits isn't capitalized in the South, and ends up not serving the development of local businesses, actors and cooperations. There are systems that can be put in place to avoid for credits to be immediately sold and for them to be used, for example, as a collateral bank guarantee. In case of non payment of a loan, carbon credits can, in this way, be used as a form

of reimbursement. This sort of mechanism for local development promotion is at the center of the attention of certification agencies, such as the Gold Standard, in the effort to put in place a juridical framework for this type of guarantee and allow for this second type of local benefit-sharing to be effectively put to the service of the communities.

In both cases, BSMs play a marginal role that mainly serves as a compensation or, to a smaller extent, as an incentive for the local people's participation in the project, for the utilization of their land or the reduction of their access to natural resources. The main financial tool used in both initiatives is the one of carbon credits. Carbon credits are a valid source of funding and a great way envisioned by sustainability promoting agencies to ensure conservation of natural spaces. However, the ease with which carbon credits have historically fallen under accusation of overestimation of the emissions retained sheds a veil of skepticism on their efficiency. Additionally, creating conservation projects based on carbon retention systems creates assumed effects on the protection of biodiversity, but real case scenarios such as the hunting and poaching in the LCFP or the perseverance of deforestation in CAZ suggest that these systems aren't sufficient in protecting natural areas from activities that harm ecosystems. Catalytic's expert, similarly to how Eni responded to Report's Press Office questionnaire, explains that working with certifying agencies serves the very purpose of making sure that these projects are effective, and adds that there are logistical complications that can raise problematic results. Because of operation costs, certifying agencies do not systematically verify all projects on a continued basis. They adopt a scientifically designed systematic approach to create statistics that imply that verifying 1/3 sites or 1/5 sites can suffice to draw general assessments. For this reason, rather than thinking that non-compliance or misalignment is intentional, the difficulty and high costs of implementing adequate monitoring and certification need to be considered. The tools that are put in place are limited, but they have to be trusted and improved, rather than be solely accused, according to the Study's first interviewee. Statistics help make reasonable assessments, but they are still subject to real world challenges.

The limits that monitoring activities incur into when tracking carbon emissions are quite important, however, and raise questions on whether the protection of biodiversity should be tied to these parameters. Perhaps including more biodiversity indicators to assess projects' efficiency would be an interesting alternative strategy rather than focusing on emissions only. Indeed, monitoring activities and checking parameters related to fauna and flora prosperity is likely to raise costs. As the UNDP interviewee explained, there is an inherent problem with the fact that "Measuring biodiversity is a complex challenge, because there is not an agreement, a standardized way on how to compare the value of different species." Different measures can be considered, such as interactions with humans, species richness or composition of ecosystems, but it still remains very difficult to compare values as opposed to other measures, such as CO2. Carbon emissions are very easy to capture, understand, and compare, as CO2 is the same through countries, while biodiversity lacks this kind of equivalence. However, the fact that CO2 is easier to measure doesn't make it a reliable instrument to conserve biodiversity. Firstly, the interviewee explained, because carbon credits do not work for marine ecosystems, or have so far been applied to terrestrial ecosystems, leaving out marine biodiversity conservation issues, when it is actually a crucial habitat to preserve. Additionally, CO2 is easier to use as a value, but can still be subject to manipulation or miscalculations. Carbon credits are generally only applied to one specific ecosystem, generally tropical forests, which are surely key ecosystems to conserve but also insufficient to address all biodiversity concerns.

However, local management systems, with incentives for local participation in these undertakings in the form of BSMs, could perhaps be a solution. For example, every increase in biodiversity monitored through local agencies, with indicators and baselines suited to that specific area, could result in different compensation levels and redistribution of access to ecosystem services. The REDD+ jurisdiction is "not without fault", according to the UNDP interviewee, for what concerns setting a valid baseline. Several issues have been listed during the interview, and one key problem is that REDD+ conservation projects are a system based on an artificially created reference level. They do not utilize absolute values, and essentially compare results on arbitrarily selected year averages. "Anybody can set them, and because everybody can have a different reference level, not everyone is compared according to the same baseline, and it makes it very difficult to compare. If the reference level is high, with lots of initiative being pursued in the past, it will provide different results and modify information based on their reference-level approach. It would be much more logical to use - especially for land use - absolute values at national level, such as how much a nation emits and absorbs

yearly. It would be more transparent." Emissions produced and conserved are simpler parameters to check compared to the multitude of indicators that can define biodiversity, but they can also very easily be misinterpreted and miscalculated. Collecting data on fauna and flora prosperity and ecosystem diversity at local level could greatly complement the assessment of projects' real impact, shifting the perspective completely. The protection of biodiversity, in this sense, would not be a secondary effect of the climate change mitigation activities against emissions, but instead become the primary objective, and by focusing on biodiversity protection end up increasing carbon retention.

For what concerns the crucial aspect of collaboration between different stakeholders that is promoted in models like SDIP, Quintuple Helix and Theory of the Commons, both case studies do indeed present multiple public-private partnerships and collaborations. However, questions can be raised on the effective role that the State plays in these collaborations. Does it play the part of an enabler, facilitating the development of the projects and their monitoring, or does it just grant the possibility to develop projects without much control, monitoring and intervention? The absence of the State or, more correctly, the absence of its enabling role, also works against the involvement and promoting of interests of local communities and indigenous people, which in certain cases can find their positions to be disregarded by decision making processes regarding their areas.⁸³ The UNDP interviewee explained that they didn't believe that REDD+ and conservation of the sort can be considered long term and efficient solutions without strong State involvement. They mentioned that can REDD+ projects naturally incur strong limitations. Firstly, due to the fact that incentives are established in an arbitrary way. Emissions reduction and conservation efforts can only be claimed within a small area, but that doesn't guarantee that "just two meters away from the selected site, there are not plenty of emissions taking place." In the case of the LCFP and CAZ projects, the programs that have been agreed on with the government are long term, for a time period that can range up to 30 years. Rather than become a burden for IPLC and an obstacle to their autonomy, this long duration of programs could enable them to not only develop banking strategies, but also the funds collected through market-based mechanisms to develop autonomous systems of income creation, such as tourism, the circular use of resources or other income creating activities. These activities would make IPLC interact with the environment in a sustainable and gradually independent manner, that utilizes funds from

⁸³ Corson C. (2012) Enclosing the global commons: the Convention on biological diversity and green grabbing, Taylor and Francis Online
market-based tools as a "kick-off" financial instrument, to then develop autonomous and self-sustaining systems. It is a complicated task to eliminate the global North-South divide if these projects do not set an ultimate goal to enable the emancipation of IPLC. The latter aligns with how the concept of biodiversity financing has been evolving in recent times within the CBD framework. The importance of the role of IPLC has firmly been reiterated, and set as a foundation for biodiversity promoting action. Indeed, Catalytic's senior advisor confirms that the concept of biodiversity financing has greatly evolved through time, firstly by acknowledging the need to give a capitalistic interest to nature to attract private capital, and then by increasing the attention given to enhancing and valorising the efforts that can be made by IPLC in conserving nature. Of course, States can struggle to serve an enabling function when considering that many of them, especially in the Global South, are affected by political turmoil, economic difficulties and overall instability. It becomes hard to protect biodiversity rich hotspots when they are found in unstable surroundings. For this reason, strong cooperation between other stakeholders can serve as a solution to 'bypass' the absence of a strong State figure and still promote biodiversity. Certainly, that increases the difficulty in monitoring and assessing projects' efficiency objectively, for which finding ways to develop trustworthy certification mechanisms are even more fundamental.

The privatization of nature comes with many risks, which have been increasingly portrayed in recent literature. In particular, the pitfalls of using a market-based approach for biodiversity conservation can lead to greenwashing, insufficient action in areas that need it, too much dependence on market mechanisms and the perpetration of a negative narrative of the human-to-nature relation, where nature gets excessively commodified. According to our first interviewee, the inclusion and protagonism of the private sector in the fight against biodiversity loss is crucial. He explains that, when working for the UNDP in 2009, he was a part of a series of departments that affirmed, through a series of studies, that local communities, intended as regions, cities and citizens, are able to answer up to 70% of the demand for member states to put their financial contributions to the service of local communities, but that this initiative didn't work, because governments were not interested in taking an active involvement. The idea evolved into a collaboration with the World Bank, with the goal of creating a trust fund dedicated to local communities, but this project sank as well because of political and financial regulations issues that didn't allow local communities,

even with state support, to receive money directly. In order to pursue this idea, a drift from public institutions towards the private sector was necessary. Catalytic's senior advisor explained that this switch was greatly impacted by the work done with former governor of California Arnold Schwarzenegger, who was one of the first ones in the world to base his environmental policy making on the Kyoto protocol and show that it was possible to regulate at local level and have direct relations with public and private investors without passing from the State. They built the R20 foundation as a transactional body between the political domain of the UN and States on one side, and the financial and private sector on the other, which is the one that has technical solutions to adequate the offer of finance and technology with the demand of finance and technology of territorial communities and citizens. Essentially, the "privatization" of nature is taking place to some extent, although it remains largely of public domain, but it is provided a monetary, a financial value through the means of different financial tools - be it green bonds or carbon markets - and mainly by equipping local communities of farmers, citizens and eco tourists to make sure that the efforts of nature conservation can be enhanced. The role of the private sector is therefore crucial in these collaborations, and not to be demonized. Tools such as BSMs, when correctly employed and with further development, can help make sure that the partnerships and the efforts that are put into protecting biodiversity create fairer distribution of benefits and more concrete results.

Projects for biodiversity conservation present a significant economic burden for local people, and it is a threat not to be taken lightly. The well intended objective of preserving natural ecosystems to favor natural regeneration of ecosystems can clash with local populations' interests, taking away their access and possibility to use resources that could actually be fundamental to their livelihoods. This clash is even more relevant when these practices hinder the ability of the projects to actually succeed in protecting biodiversity, preventing deforestation and environmental degradation. A good example of it is the slash agriculture practices in Madagascar, which grant a form of nutrition and basic income for numerous households. market-based financial mechanisms for biodiversity, such as carbon credits or green bonds, only concern the funding of sustainable projects, and do not ensure that the projects prevent environment-degrading activities to be pursued. However, these issues need to be confronted and eradicated at their source, not by instoring protected areas and expecting natural compliance in spite of the issues that such imposition can create, but by collaborating with local communities to find alternatives and solutions to utilize resources

sustainably to naturally lead towards conformity to rules. For this reason, well designed BSMs offer precious solutions that other financial instruments structurally cannot, as they can help compensate for the losses that are endured by the instoration of protected areas and alse increase the collaboration between all stakeholders and local communities to drift them from harmful practices and replace them with sustainable ones that foster biodiversity.

Another interesting aspect to consider is how the Global North-South divide significantly influences development patterns and strongly affects the likelihood of success of biodiversity conservation projects. Indeed, many conservation projects that utilize the innovative tool of carbon credits and offsets, for example, are set in the Global South, and it is mostly Northern organizations and privates that take the lead in conservation projects situated in the Global South. However, delving into the differences in conservation initiatives across distinct states that are part of the same economic region, such as Zambia and Madagascar, offers an important perspective to be adopted, alternatively to the Global North and South divide analysis. By transcending the conventional juxtaposition of the Global North and South, this approach offers a different examination of the dissimilarities, the parallels, and the challenges that characterize states in a horizontal manner, that can be applied to both North-North or South-South cases. This study's analytical framework adopts a lateral South-South perspective, which can be useful in drawing out solutions. For example, it could be interesting to extend the study to countries that are in the same area but with different development levels, or to include a North-to-North analysis of, for example, two European countries' conservation projects. This would allow us to observe how the variables perform in each scenario. This can mark a shift in the identification of different trends, pooling some and opposing others to better understand how policy makers of different areas can promote biodiversity conservation at best.

The distribution of benefits, which has not been appointed as the third main goal of the CBD by hazard, but because of its relevance in ensuring that biodiversity can truly be protected, risks being bantered as a conceptual lead for action without much concrete structure being built around it, and with very few direct effects on biodiversity. Even in the two case studies observed, BSMs are often mentioned, yet are hardly ever tied to biodiversity. The benefits mentioned generally regard payments for ecosystem services, compensations for land occupation, or benefits concerning infrastructure building, as well as education or agriculture promotion. None of these help local communities develop a self sustaining and sustainable relationship with ecosystem resources. The BSMs model that is pursued, in both cases, follows a top-down model, where benefits are distributed from private entities managing the projects, and the beneficiaries, be it the government entities participating to the project or local communities, only receive them in a passive manner. This model of BSMs distribution poses multiple issues and threats for what concerns land grabbing practices, and inefficiency of conservation results. Perhaps, having looked at the different types and categories of BSMs, it could be interesting to use the analysis model to identify and develop more horizontal BSMs, where the management of the benefits is directly conceived, handled and distributed at a local, active level. Of course, this dimension still comprehends multi stakeholder collaboration, but rather than making BSMs a secondary element of conservation projects, they structure their very governance. It would be interesting, in this sense, to explore whether there are examples of this kind of horizontal BSMs in other conservation projects.

Developing more BSMs in direct relation to biodiversity can truly boost the conservation efforts and the fostering of biodiversity.

5.1.2 Limitations

The BSMs analysis model that has been suggested in this study can help draw comparisons, underline the elements to work on and, with further studies, identify both positive and negative patterns to better structure sustainable biodiversity promoting projects. The limits of this study consist indeed of only having observed two case studies. As many biodiversity conservation projects that use innovative financial tools are set in developing countries, the case studies were selected in two South African countries, Zambia and Madagascar. The REDD+ anti deforestation projects pursued in both countries presented promising aspects, but also severe challenges. With further investigations, extensive case studies collection and model application, it could be possible to create a structured observation of the role that BSMs play in biodiversity promoting projects and how effective these projects are depending on how well BSMs performs. It could also help divert from a narrow North-South divide analysis and help observe how different issues can be found in the same world regions, depending on single countries' development levels and characteristics.

Additionally, the model that was suggested in this study only modeled the variables that were used in the Co-Cities model. Considering that, for development projects, a "one-sixe-fits-all" approach is unlikely to work in every scenario, it could be necessary to go beyond the variables suggested in this thesis and, depending on specific needs and characteristics of each case, include other variables that can help assess the efficiency of BSMs.

CONCLUSIONS

The goals of this study were multiple. Generally speaking, the main aim was to illustrate how urgent solving the biodiversity crisis is - and the one of its funding - and underline the important role that benefit-sharing mechanisms play in the sustainable promotion of biodiversity conservation and restoration, as a fundamental complement to correct the structure of market-based tools. The limits of market-based mechanisms were discussed, and the creation of a model for BSMs was suggested, based on literature on co-governance mechanisms, that can help structure them and assess BSMs effectiveness for policy design and implementation.

Additionally, one of the aims of this paper was, in fact, to research how biodiversity financing and, in particular, BSMs are treated in the literature, how the conceptualization of BSMs has evolved in the international biodiversity promoting panorama, and to cover, to some extent, the definitions, the types, and the trends that characterize BSMs. The study observed important international agreements on biodiversity protection, mainly considering the evolution of the Convention on Biological Diversity, but also the Nature Restoration Regulation and the Nagoya Protocol. The study also noted the narratives that affect biodiversity conservation regarding the role of Nature, of local communities, the private and public sector, which led to suggesting that converging towards multi-stakeholder partnerships and co-governance mechanisms that valorize all stakeholders involved - and in particular, indigenous people and local communities - is a fundamental step in aligning biodiversity promoting action with fair and concrete sustainability practices.

This study, in spite of its limitations, can suggest a series of practical solutions that can be adopted to improve the systems of BSMs for biodiversity conservation. Firstly, setting up a BSMs analysis model can help compare projects and identify which structural elements guarantee greater success, and how to scale them from one project to the other. Secondly, it underlines the importance that strict monitoring and regulation play to avoid greenwashing, actors acting on bad faith and free riding effects. Sustainable BSMs, in this sense, can help fight land grabbing practices and dubious biodiversity results if, rather than providing mere economic compensations to IPLC for land occupation, are instead set up to create fair and self-sustaining systems of both monetary and non monetary benefit distribution. For this reason, a third observation to be made is that a major involvement of local communities, in order to establish this type of BSMs, is fundamental. Involving local communities does not only grant access to more knowledge on how to protect local biodiversity, but actually offers a unique and crucial way to truly mitigate the bad effects that local stakeholders can produce on biodiversity. Collaborating with local communities and actors and setting up co-governance mechanisms can help understand local challenges, behaviors and trends that affect biodiversity, and develop collaborative systems - especially with the support of a BSMs analysis model - to face them in the most efficient way. In this sense, imagining a more horizontal distribution of BSMs, where multi-stakeholder partnerships and co-governance mechanisms help local communities be the very managers of biodiversity and of its benefits, creating synergies with their surrounding ecosystems rather than exploiting them in an uncontrolled manner or only receiving benefits from denied access to biodiversity resources. A new model of BSMs that is structured around co-governance and that follows the model we have designed can succeed in creating horizontal governance schemes and a sustainable use of biodiversity, where the incentive not to destroy it does not come from prohibition and derived compensations but from actual benefits created from a responsible use of resources.

The protection of biodiversity has to come to the first line of both climate issues and solutions, as its preservation can truly mitigate the negative effects of climate change or, on the contrary, severely aggravate world conditions and the rise of global temperatures. It is not to be treated as a second class problem but as one of the central solutions to be promoted. Strongly incorporating BSMs is a reliable and efficient manner to complement the market-based tools that are being used for financing biodiversity, and also guarantee that projects start working on the ground in spite of the global biodiversity financing gap still being very far from being fulfilled. The co-governance structures that BSMs help put in place

at a local level can significantly contribute to creating projects that truly protect biodiversity while promoting fair and equitable sustainable development.

REFERENCES

- 1. Barbier E. (2022) The Policy Implications of the Dasgupta Review: Land Use Change and Biodiversity, Environmental and Resource Economics
- 2. BBC (2023) Zambia country profile
- BCP Impact Report (2022) BCP Impact Report: Making Conservation of Wildlife Habitat Valuable to People
- 4. BeZero (2023) Luangwa Community Forests Project (B)
- 5. Be Zero (2023) Carbon Emissions Reduction Project in the Corridor Ankeniheny-Zahamena (CAZ) Protected Area, Madagascar (BB)
- 6. BioCarbon Partners (2023) Website: What We Do, REDD+
- BioCarbon Partners (2023) Website: Driving a new form of conservation finance that unites the community, wildlife, and climate positivity under the REDD+ project Model, REDD+
- 8. BioCF (2015) Madagascar: Ankeniheny–Zahamena Corridor Biodiversity Conservation (REDD+) Project, World Bank Group - Climate Change
- 9. BMZ (2020): Investing in Biodiversity A Matter of Survival
- Carayannis E., Campbell D. (2009) 'Mode 3' and 'Quadruple Helix': Toward a 21st Century Fractal Innovation Ecosystem, International Journal of Technology Management
- 11. Carayannis E., Campbell D. (2012) The Quintuple Helix innovation model: global warming as a challenge and driver for innovation, Minerva
- 12. Carver E. (2021) Slash-and-burn farming eats away at a Madagascar haven for endangered lemurs, frogs, Mongabay
- 13. CBD (1995) Decision II/11 access to genetic resources
- 14. CBD (2000) Sustaining life on Earth How the CBD Promotes Nature and Human Well-being, UNEP
- 15. CBD (2011) 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, United Nations
- 16. CBD (2022) Official CBD Press Release 22 December 2022, Montreal
- CBD (2022) Conference of The Parties to the CBD, Fifteenth meeting Part II Montreal, Canada, Agenda item 12A

- Chandel BS et al (2019) Livestock production systems, subsidies and its implications:
 An investigation through review of literature, Indian Dairy Association
- Chausson A. et al (2023), Going beyond market-based mechanisms to finance nature-based solutions and foster sustainable futures, Department of Biology, University of Oxford
- 20. Corson C. (2012) Enclosing the global Commons: the Convention on biological diversity and green grabbing, Taylor and Francis Online
- Convention on Biological Diversity (2022) Cop15: Final Text Of Kunming-Montreal Global Biodiversity Framework, Official CBD Press Release
- 22. Conservation international (2012)
- Deutz A. et al, Financing Nature: Closing the Global Biodiversity Financing Gap, Paulson Institute Report, 2020
- 24. Etzkowitz H., Leydesdorf L. (1995) The Triple Helix --University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development, SSRN
- Etzkowitz, H. (2003) Innovation in Innovation: The Triple Helix of University-Industry- Government Relations. Social Science Information
- 26. European Commission (2021) Ensuring that Polluters Pay: Payments for Ecosystem Services, General Publications of the European Union
- European Union of the European Parliament and of the Council (2009) On the conservation of Wild Birds, Directive 2009/147/EC
- 28. European Union of the European Parliament and of the Council (1992) On the Conservation of Natural Habitats and of Wild Fauna and Flora, Council Directive 92/43/EEC
- 29. Foster S. and Iaione C. (2016) The City as a Commons, Yale Law & Policy Review
- 30. Foster S. and Iaione C. (2022) Urban Co-Cities, Innovative Transitions Towards Just and Self Sustaining Communities, the MIT Press
- Greenpeace (2021) Cosa si nasconde dietro all'interesse di Eni per le foreste? Recommon & Greenpeace
- Harper et al. (2007) Fifty Years of Deforestation and Forest Fragmentation in Madagascar, Foundation for Environmental Conservation
- Hertog, J.A. (2010) Review of Economic Theories of Regulation, Discussion Paper Series / Tjalling C. Koopmans Research Institute

- 34. Hess C. (2008) Mapping the New Commons, SSRN
- 35. Human Development Index (2023) World Population Review
- Iaione C. (2022) Urban Sustainable Development & Innovation Partnerships, Italian Journal of Public Law
- 37. IPBES (2019) Global Assessment Report on Biodiversity and Ecosystem Services
- IUCN (2000) Economics And The Convention On Biological Diversity, The World Conservation Union
- Karolyi A. (2023) Biodiversity finance: A Call for Research into Financing Nature, Financial Management Journal, Wiley Online Library
- 40. Lang C. (2023) Carbon Colonialism: Four Corners investigates NIHT Inc's REDD+ project in Papua New Guinea, REDD Monitor
- 41. Lodh A. (2020) "ESG and the cost of capital", MSCI
- 42. Morgera E., Tsiounami E. (2010) The Evolution of benefit-sharing: Linking Biodiversity and Community Livelihoods, RECIEL
- 43. Mulungu K. (2021) The Luangwa Community Forests Project (LCFP) in Zambia: A review of the biggest REDD+ project in Africa financed by the Italian oil and gas company ENI, Greenpeace
- 44. Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (2011) Secretariat of the Convention on Biological Diversity, United NationsNkhata et al. (2012) A Typology of benefit-sharing Arrangements for the Governance of Social-Ecological Systems in Developing Countries, JSTOR
- 45. Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.
- 46. Ostrom E. (2009) A General Framework for Analyzing Sustainability of Social-Ecological Systems, JSTOR
- Pellegrino G., Di Paola M (2018) Nell'Antropocene. Etica e Politica alla Fine di un Mondo, Derive Approdi
- 48. Portela R. et al (2012) Assessing and Valuing Ecosystem Services in the Ankeniheny-Zahamena Corridor (Caz), Madagascar, WAVES
- 49. Poteete, A., M. Janssen, and E. Ostrom (2010) Working Together: Collective Action, the Commons, and Multiple Methods in Practice, Princeton University Press
- 50. Schroeder D (2007) Benefit-Sharing: it's Time for a Definition, J Med Ethics

- Trouwloon D et al. (2023) Understanding the Use of Carbon Credits by Companies: A Review of the Defining Elements of Corporate Climate Claims, Wiley Online Library
- 52. Thu Thuy P. et al. (2013) Approaches to benefit-sharing, A preliminary comparative analysis of 13 REDD+ countries, CIFOR
- 53. Visser B et al. (2004) Options for Non-Monetary Benefit-Sharing: an Inventory, Centre for Genetic Resources, the Netherlands Wageningen University and Research Centre
- 54. Vyawahare M (2021) Even as the government bets big on carbon, REDD+ flounders in Madagascar, Mongabay
- 55. West T. et al. (2023) Credit credibility threatens forests, Science
- 56. White G, Razak A. et al. (2015) The Triple Helix Model for innovation: A Holistic Exploration of Barriers and Enablers. International Journal of Business Performance and Supply Chain Modelling
- 57. World Bank (2015) What Are Green Bonds?
- World Bank Group (2020) Mobilizing Private Finance for Nature, The World Bank in Zambia
- 59. World Resources Institute (2017)