

Louvain School of Management

How to measure socioeconomic impacts of nature-based carbon offsets?

Analysis of current methodologies applied for project validation of reforestation projects and proposal for improvement.

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Glossary

A/R – Afforestation and Reforestation

ACMI – Africa Carbon Markets Initiative

ACR – American Carbon Registry

AFOLU - Agriculture, Forestry and Other Land Use

CA – Corresponding Adjustment

CAR – Climate Action Reserve

CBAM – Carbon Border Adjustment Mechanism

CCB – Climate, Community & Biodiversity

CCP – Core Carbon Principle

CDM – Clean Development Mechanism

COP – Conference of Parties

CRT – Climate Reserve Ton

DVGM – Dynamic Global Vegetation Model

ER – Emissions Reduction

ERT – Emission Reduction Ton

GS – Gold Standard

ETS – Emissions Trading System

GWP – Global Warming Potential

IC VCM – Integrity Council for the VCM

ICAP – International Carbon Action Partnership

IFM – Improved Forest Management

IMF – International Monetary Fund

ITMO – Internationally Transferred Mitigation Outcome

LIC – Low-Income Country

LMIC – Lower-Middle-Income Country

NbS – Nature-Based Solution

NDC – Nationally Determined Contribution

PDD – Project Design Document

PES – Payment for Environmental Service

PFM – Participatory Forest Management

CFM – Community Forest Management

PVC – Plan Vivo Certificate

RCT – Randomized Control Trial

REDD + - Reduction Emissions from Deforestation and forest Degradation in Developing countries (the + stands for additional forest-related activities that protect the environment)

SD VISTa – Sustainable Development Verified Impact Standard

SDG – Sustainable Development Goal

tCER – Temporary Certified Emissions Reduction

TSVCM – Taskforce on Scaling Voluntary Carbon Market

UNCED - United Nations Conference on Environment and Development

UNFCCC - United Nations Framework Convention on Climate Change

VCS – Verified Carbon Standard

VCU – Verified Carbon Unit

VER – Verified Emissions Reduction

VVB – Validation and Verification Bodies

I. Introduction

The recent extreme weather events add to the numerous factors demonstrating society's face urgent need to halt climate change. Notably, July 2023 was the hottest month in recorded human history with no signs of the global rise in temperature dissipating (Copernicus, 2023). In this context, recent debates have been revolving around carbon emission reduction. Countries and corporates now experience increasingly stringent regulations and are striving to achieve the sustainability goals they imposed during the 2015 Paris Agreements. With this backdrop, some countries and regions created enforced carbon reduction mechanisms, such as the European EUTs or the Californian Cap-and-Trade Program (ICAP, 2022). We nevertheless observe latent initiatives originating from the Global South by being initially set aside in terms of sustainability-related legislation due to historical circumstances. Stakeholders located in compliance regimes therefore sought to utilize the available carbon sink capacity existing in Low- and Lower-Middle-Income countries, creating the Voluntary Carbon Market.

Voluntary carbon credits originate from carbon offsets, i.e., projects that reduce or avoid the amount of CO₂ in the atmosphere through various methodologies. Nature-based solutions became the largest project typology, doubling their credit issuance between 2020 and 2021, with Afforestation and Reforestation projects at their core (The Ecosystem Marketplace, 2022). Indeed, 41% of the total amount of credits emitted on the VCM originate from Forestry and Land Use projects (Dugast, C., et al., 2023). Although experiencing rapid growth, this yet unregulated market reveals its drawbacks. Lack of standardization and transparency pushes potential buyers to question the integrity of voluntary credits. In parallel, countries in which these offsets are located have agriculture as their main economic activity, suggesting that a high proportion of the population lives in rural areas. Both their location and cropland activities point to the inevitable impacts these projects have on these communities.

Although an increased number of studies have recently been exploring the topic of carbon claims made on the Voluntary Carbon Market, we noticed scarcity of research targeting socioeconomic impacts generated by carbon offsets located in developing countries. Studies showcase data accessibility issues coupled with low data validity and reliability, inevitably hampering the possibility to depict causal relationships. Additionally, results tend to demonstrate the intrinsic challenges brought by carbon offsets due to inaccurate project design patterns. In this sense, we aimed to explore the current status quo of social impact assessment, intending to outline a potential proposal for improvement. Our research question is therefore **"How to measure socioeconomic impacts of nature-based carbon offsets?"**.

This study will review methodologies used by Gold Standard, Verra, and Plan Vivo for A/R project validation, using publicly available PDDs. We will derive the used social indicators and analyze them based on selected criteria.

This paper is structured as follows. The first section introduces our literature review and presents an extensive overview of current carbon markets. We explain their origin and purpose, outline the respective mechanisms of the Compliance Market and the Voluntary Carbon Market, and highlight key market trends. The second section dives deeper into the specifics of the study. Here, we explore the link between rural communities in the Global South and the current growing trend of Afforestation and Reforestation carbon offsets. In addition, this section presents previous research made on the social impact of these projects. We then discuss the current needs of rural communities located in Low- and Middle-Lower-Income countries experience. The subsequent parts of this paper put emphasis on the empirical aspects of our research. The third section presents a walkthrough of our research design, in which we describe the various steps that led us to this study, as well as our methodology. We here present the selected projects and the selection criteria used to do so. The fourth section lays out our analysis. It regroups both the results, which we will present through Tables, and a discussion, linking our findings to the previously outlined theoretical frameworks. The fifth section contains our proposal for improvement, designed based on the elements discussed in our literature review as well as the outcomes of our analysis. The last section concludes this thesis, closing with the limitations of our study.

Taken together, our results suggest weakly standardized methodologies used by all three of the analyzed standards. While observing large inconsistencies throughout both standards and projects, we also identify lack of clarity in the indicators chosen by projects, revealing predominantly unspecified measures coupled with no use of baselines, formulas, nor targets. Our findings validate the scenery outlined in our literature review, stating issues about clearly understanding research outcomes due to unreliable data. We for instance observe no use of Randomized Control Trials by projects to measure socioeconomic effects. Our proposal therefore lays the foundation for standardization and increased data validity. We suggest the accurate definition of baselines, formulas, and targets in PDDs and the use of control and treatment population samples to enhance transparency, focus means accordingly and allow for more reliable data. Alongside the latter, we formulate a standardized set of indicators that ought to be used by projects. This set regroups project-specific attentions, whilst offering indicators from a larger selection of topics. Finally, we close our proposal by taking a step back and indicate more holistic recommendations to standards to be used in concert with our former indicator-specific suggestions.

PART 1: Literature Review

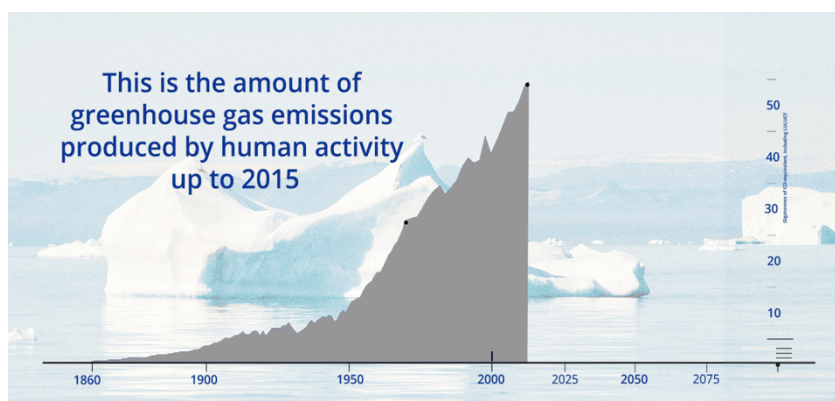
II. The Voluntary Carbon Market

1. Global Warming

Global warming is a worldwide threat that scientists and experts have tried to point out for more than three decades. According to the Intergovernmental Panel on Climate Change (IPCC), the global temperature is now one degree Celsius above the pre-industrial levels and will continue to rise approximately by 0.2 degrees every decade to reach a two-degree increase in 2060 (The European Commission, 2023). Considering the Industrial Revolution as a starting point, anthropogenic activities such as transportation, excessive and intensive agriculture, burning and extraction of fossil fuels, as well as deforestation have impacted climatic conditions - being mostly responsible for global warming through greenhouse gasses (GHG) emissions such as carbon dioxide (CO₂). These modify our atmosphere by absorbing and radiating heat (The European Council, 2021; Abbass, K., et al., 2022).

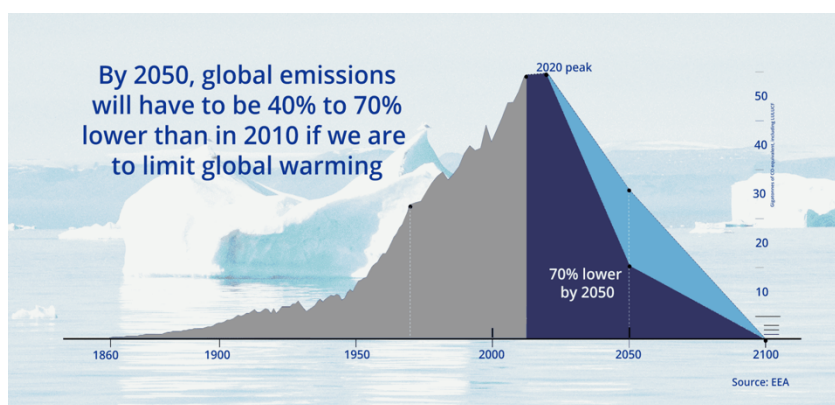
In the context of reducing GHG emissions, carbon is one of the most impactful gasses since it is the largest emission originated by human actions and the most harmful for climate change if no action is undertaken regarding its reduction (EU Climate Action, 2014). Notwithstanding that the latter remains the main focus, it is important to mention that there are other GHGs that also trap heat - such as methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF₃), and sulfur hexafluoride (SF₆). To effectively address climate change, we must reduce emissions of all types of GHGs. For this reason, scientists and policymakers use “Global Warming Potentials” (GWPs) to measure the harmful effects of these gases in terms of CO₂ equivalents. As for now, all major actions taken on the market are denominated in units of CO₂-equivalent emission reductions using 100-year GWPs for ease of comparison (Carbon Offset Guide, n.d.(f)).

Figure 1 - Increase in GHG emissions due to human activity



Source: The European Council (2021).

Figure 2 - Objective of GHG emission reduction by 2050



Source: The European Council (2021).

As climate change is signalized by extreme variations in temperature, it also impacts precipitation, humidity, and other variables. Effects originating from these changes can be perceived around the globe, however some regions or countries are more impacted. Research made by Ridder et al. (2022) shows that future changes in climate conditions - especially the rise of high compound events such as drought, floods, high winds, etc. - are mainly observed in regions regrouping developing countries (Ridder, N.N., Ukkola, A.M., Pitman, A.J. et al., 2022). These are locations where communities rely the most on natural resources for income and food, whilst being the least capable of coping with such climate-related hazards. The impact variation also applies for economic sectors. For instance, agriculture is one of the most vulnerable economic activities when it comes to climate change, being at the same time one of the main roots of GHG emissions. Abbass et al. (2022) highlight this sector being the source of almost 40% of all emissions. Extreme weather conditions might alter agricultural productivity by almost 20% in developing countries, implying major concerns for local populations that are extremely sensitive and vulnerable to these changes (Kollmuss, A. et al., 2008).

Indeed, communities mostly rely on nature for their livelihoods, regrouping 50 million smallholder farmers that produce the region's food and rely on productions for subsistence (Ferdinand, T. & del Ser, J., 2022).

It is important to underline that climate change includes but is not limited to an increase of average temperature or weather disasters. Global biodiversity and ecosystems are acute victims: the possible loss of 99% of coral reefs, sea levels rising, and most importantly the loss of crucial carbon sinks such as tropical forests or mangroves - which are being abated or see their sequestration capacity reduced because of changes in soil and water quality (Abbass et al., 2022).

2. From the Kyoto Protocol to the Paris Agreement

In 1992, the United Nations Conference on Environment and Development (UNCED) - also known as the Rio Earth Summit - adopted the United Nations Framework Convention on Climate Change (UNFCCC) and founded the Conference of Parties (COP). The latter is a yearly event regrouping all UNFCCC's signatory countries as well as civil society actors such as NGOs, territorial governments, labor unions, and businesses.

Discussed and adopted during COP3, the Kyoto Protocol operationalizes the UNFCCC - signed by 41 countries plus the EU to reduce their annual emissions by 5.2% below the 1990 levels before 2012 (which represents 29% of total GHG emissions in the world) while being able to make foreign investments in so-called developing countries to attain their goals (The United Nations, 2023). This agreement is therefore only binding on developed countries and imposes on them a heavier burden under the principle of "common but differentiated responsibility and respective capabilities" - recognizing that they are largely responsible for the current high levels of GHG emissions in the atmosphere. In addition, industrialized countries are required to provide information about their GHG emissions and to commit to meeting their targets, as non-compliance results in sanctions (De Rafael, R., 2016).

This marked the beginning of quantified goals for greenhouse gas reduction (Ajala, I., 2009). However, some inherent problems related to Kyoto's Protocol made it perish in favor of – more recently – the Paris Agreement. Indeed, major countries such as the US or Canada didn't sign the Kyoto protocol, and emerging countries were treated as homogeneous – making countries like China or India free from any obligations. Furthermore, since emerging economies did not have to follow any quantified objectives, they had no incentive to enforce verifiable nor transparent ones.

Some developing countries evoked their right for development as well, refusing to make any efforts to cut down emissions (De Rafael, R., 2016).

The Paris Agreement is a legally binding, international UN treaty under the UNFCCC that was signed during COP21 in 2015. Signed by 194 parties, it aims to reduce carbon emissions to keep global warming under the threshold of a two degrees Celsius increase compared to pre-industrial levels by stipulating the major actions and goals of the convention that countries must apply and do (The United Nations, 2023). The mission of the Paris Agreement was also to reassess national commitments and targets every five years and finally, to provide and support developing countries with financial resources to mitigate climate change, build resilience and increase capacity to adapt to its impacts (Les Nations Unies, 2015).

The Paris Agreement operates on a five-year cycle in which countries take increasingly ambitious climate action. Each country is required to submit a revised national action plan - known as a Nationally Determined Contribution (NDC) - every five years, communicating the steps they will take to diminish greenhouse gas emissions in order to meet the Paris Agreement's targets. They also elaborate on the steps they will take to build resilience and adaptation capacity towards the effects of rising temperatures. Alongside the latter, countries are asked to develop and communicate long-term strategies – considered as the underlying approach for their consecutive five-year-long NDCs (The United Nations, 2023). These are called LT-LEDS, and unlike the NDCs, are not mandatory (see The United Nations, 2015, for the detailed articles of the Paris Agreement).

3. The Carbon Trading System

Given the context we described in our previous sections, we will elaborate on what both the Kyoto Protocol and the Paris Agreement brought in terms of concrete action items. We will start by presenting the current Compliance Carbon Market - explaining its way-of-working and utilizing the European case as an example. We then outline the major components of the Voluntary Carbon Market as well as its main market trends, to then sum up the key criteria of both markets. This section contributes to establish a clearer picture for the reader about the carbon trading system on two very different markets, laying foundations for the following sections of this paper.

The Kyoto Protocol introduced carbon as a commodity by registering carbon emissions for the first time in history and as any commodity, it became tradable on the market (Controverses, 2008). As aforementioned, it was not ratified by important players such as the US or Canada and didn't include China nor India - all currently known as great polluters. This lack of unification within the agreement resulted, by corollary, in a fragmented carbon market for which there is currently no worldwide market and where different schemes appeared (Controverses, 2008). These schemes include Emission Trade Systems (ETS) such as:

- (a) The *cap-and-trade* mechanism - where a maximum amount of carbon emissions has been decided upfront, and stakeholders exchange rights to emit carbon in the future. A right can be sold if the entity owning it abated its emissions and doesn't need that many rights anymore (Leclerc, N.,2020). This right can thus be transferred to another party that might need more rights. In other terms, once the credit allowances have been allocated, two situations may arise. One, the company's GHG emissions are lower than the allocated quota. In this situation, the company can sell its quotas on the carbon market. It can also decide to keep them for later. Two, the company's GHG emissions are higher than the allocated quota. In this case, the company must buy additional quotas on the carbon market. Companies can also use what is called borrowing allowances. In simple terms, enabling them to use part of their allowances for future years in advance (Leclerc, N.,2020). This allows for the halt of carbon emission increase but doesn't permit to reduce it. To induce reduction, the overall cap is diminishing gradually (KPMG, 2023).
- (b) The *baseline-and-credit* mechanism. This system defines baseline emission levels depending on the entity and its sector of activity, an entity that diminished its emissions below the threshold receives credits - equivalent to the amount of reduction compared to its baseline - that it can then sell to other entities (The Oxford Institute for Energy Studies, 2022). It is important to highlight that this mechanism doesn't force companies to maintain their emissions at baseline-level in any way. If their emissions are superior, no penalties are necessarily inflicted.

The second trading system is known as an exchange of credits that are issued from the process of reducing carbon. A standard has been set: one credit equals a ton of CO₂ either removed from the atmosphere or avoided of being emitted. This means that a credit comes from a ton of CO₂ already reduced upfront, its reduction lies in the past (IOSCO, 2022). It is the trade of Emissions Reductions (ERs).

Within this primary distinction, two types of markets are found: *compliance carbon markets* and *voluntary carbon markets*. Both have different approaches to reducing GHG emissions – the former relies on the cap-and-trade or baseline-and-credit systems, whilst the latter functions with credit exchanges originating from carbon compensation or removal projects (The Oxford Institute for Energy Studies, 2022). Nevertheless, compliance markets can also embed exchanges of credits originating from offset projects initiated by governments. We will discuss this mechanism later in our paper.

a. The Compliance Carbon Market

Our previous section mentions major initiatives that have been developed on a global scale. We however thought relevant to take a deeper look at what the Paris Agreement has initiated at a European Union-level. As we introduced, every country or region has to define and communicate long term strategies to attain the globally agreed-upon goals. This section intends to explain the compliance carbon market, using the EU's strategy as our main case. As a main player and one of the biggest ETS markets worldwide, highlighting its key components and mechanisms related to carbon emissions will facilitate understanding of overall market dynamics.

i. A Brief Introduction

Compliance markets are established by governments and regulated by international and national laws. These federalized initiatives are taken so that countries can reach their NDCs in order to meet Paris Agreement targets in time. According to The International Carbon Action Partnership (ICAP) - a forum helping cooperation between governments and countries having established or planning to establish ETS systems - there are 26¹ compliance carbon trade systems in force throughout the globe; the main ones being the EU, California, and China (ICAP, 2022). Appendix 1 shows a map of the current Compliance Markets worldwide.

It is important to highlight that these markets do not embed all sectors², i.e., types of economic activities. Whether an economic activity is included or not depends on the system in which it is considered. For instance, while the EU ETS system covers power, industry and domestic aviation, California's cap-and-trade system covers power, industry, buildings, and transport (ICAP, 2022).

¹ These 26 markets are divided in different levels: 1 supranational (the EU with Iceland, Norway, and Liechtenstein), 8 countries (China, Germany, Kazakhstan, Mexico, New Zealand, Republic of Korea, Switzerland, and the UK), 19 provinces (located in the US, Canada and in China) and 6 cities (located in China and Japan) (ICAP, 2022).

² Sectors include forestry, waste, domestic aviation, transport, buildings, industry, and power (ICAP, 2022).

The industries that are covered by the compliance markets in force can be found in Appendix 2 and 3. Companies and other organizations within these sectors must comply with regulations set by the government (ICAP, 2022).

In terms of pricing, prices can vary depending on the approach used by a country or region. Including emission trading systems, these approaches can be carbon taxes, offset mechanisms³, Results-Based Climate Finance⁴ (RBCF), and internal carbon prices set by organizations⁵ (ICAP, 2022). The choice of a carbon pricing type for governments depends on national circumstances and political realities. Systems such as ETS and carbon taxes are the most common types for compliance carbon pricing initiatives. Companies often use the carbon price they face in mandatory initiatives as a basis for their internal carbon price. Finally, GHG emissions can also be indirectly priced through other policy instruments such as the removal of fossil fuel subsidies and energy taxation (The World Bank, 2023).

Currently not even one third of the total population lives under compliance market regulations, and solely 17% of emissions are taken care of throughout these markets (ICAP, 2022). Nevertheless, we observe a growing compliance market as the ICAP recorded 11 new markets that are currently under consideration - meaning that a proposal has been made but not yet decided - and 9 markets that are under development - i.e., the decision has been approved, but the program is still reviewed and not yet enforced (International Carbon Action Partnership, 2023).

ii. The European Program

The EU ETS market generated \$37 billion revenues in 2021, with a carbon price that reached almost \$100 a ton, whilst California generated \$3.99 billion revenues in 2021, with a carbon price of \$22.43 a ton (International Carbon Action Partnership, 2023). Since prices are defined by supply and demand in both previous cases, and since, as mentioned above, caps are gradually reduced to meet long-term targets, we can deduce that the decrease in the amount of CO₂ allowed to be emitted puts pressure on the price of emission rights (The European Commission, 2021).

³ Carbon credits issuance for GHG emission reductions from project- or program-based activities that can be used for compliance with international agreements, domestic policies, or corporate citizenship objectives (The World Bank, 2023).

⁴ A funding approach where payments are made after pre-defined outputs or outcomes related to managing climate change are delivered and verified (The World Bank, 2023).

⁵ A tool used by organizations to guide their decision-making process related to climate change impacts, risks, and opportunities (The World Bank, 2023).

Indeed, in 2021, the EU entered Phase four⁶ of its ETS system - its cap is 1,572 MtCO₂ (compared to 2,084 MtCO₂ in 2013), with a year-on-year reduction of 43 million allowances (a 12% increase compared to Phase three) (ICAP, 2022).

The European market has gained considerable weight through its strict regulations. First, it implemented the *“European Green Deal”*, regrouping a collection of policies designed to enable its green transition and achieve climate neutrality by 2050. This deal regroups various initiatives such as the *“Fit for 55 package”* - which includes a set of legislative proposals that would improve the current amendments enforced, such as the EU ETS for instance. These proposals aim to trigger a successful reduction of 55% (previously set at 40%) of the EU's GHG emissions for 2030 compared to 1990's levels (The Council for the European Union, 2023). The latter is a regulation the EU imposed under the name of *“The European Climate Law”* used as an intermediate target on the way towards its legally binding target of net zero greenhouse gas emissions by 2050. The European Green Deal encompasses various other initiatives such as biodiversity and industrial strategies. The Green Deal was introduced by the Commission in December 2019 and recognized by the European Council in December of the same year, while the European Climate Law came into force on July 29, 2021 (The European Commission, 2023). We can thus observe that these regulations are still relatively recent, putting pressure on the involved sectors in a fast-paced way.

iii. An Increase of Interest in Credits Generated Through Carbon Offsets

Due to price pressure, stricter regulations, reduction of allowances available on the market, and due to the non-inclusion of certain sectors or countries in the compliance market, companies and organizations are increasing their purchases of credits coming from offset projects that take place outside the mandatory systems in place.

One can ask oneself why companies don't directly offset emissions outside regulated territories. Taking the European Union's case, the international organization created the “CBAM” regulation. Preventing carbon leakage, the CBAM is a measure that was designed to comply with the rules set in the European Green deal, aligned with the World Trade Organization (WTO) as well as with the EU's international obligations. As per this system, EU importers will have to purchase carbon certificates at a price that matches the carbon price they would have paid if the goods were produced following the EU's carbon pricing guidelines.

⁶ A complete overview of the different phases included in the EU ETS can be found in Appendix 4.

However, if a non-EU producer proves that they have already paid for the carbon utilized in producing the imported goods in a third country, the corresponding cost can be completely deducted for the EU importer. This seeks to encourage producers to shift towards greener production methods within countries outside the EU (The European Commission, 2023).

All the reasons mentioned here-above explain the amplified importance of the Voluntary Carbon Market (VCM) in recent years. Accordingly, even if the VCM and the Compliance Market are disparate, their convergence is inevitable. This convergence can be seen as a third market. It is part of the Compliance Carbon Market, but allows a mechanism only seen in the VCM: carbon offsets. To understand the latter, it is relevant to mention that alongside the national initiatives that the Kyoto Protocol and Paris Agreement requested, both agreements created international carbon markets supervised by the UN. The Kyoto Protocol shaped three markets⁷: the Clean Development Mechanism (CDM), the International Exchange System and the Joint Implementation. Due to the underlying reasons why the Kyoto Protocol was replaced by the Paris Agreement and because of flaws in the way they were constructed, these three markets were failures and have been replaced (Carbon Market Watch, 2020). Article 6 of the Paris Agreement has the same purpose as the former three markets: providing some flexibility to governments by allowing countries to cooperate with each other on a voluntary basis. It recognizes the importance of cross-country cooperation to reach NDCs faster and consider higher ambitions (The World Bank, 2022). Article 6 lays the foundations of an international compliance carbon market in different manners.

First, Article 6.2⁸ outlines that through a bottom-up cooperative approach, countries and organizations can engage in the launch of a GHG ER project and trade the mitigation outcomes resulting from this project (The Oxford Institute for Energy Studies, 2022). These outcomes are called Internationally Transferred Mitigation Outcomes (ITMOs) and have to be authorized by both parties before any transfer can occur from the host entity to the receiving entity (Soezer, A., 2022). The impact of an ITMO and its credits can be measured in different metrics, not only in terms of CO₂ (Crook, J., 2022).

⁷ The CDM enabled so-called developed countries to initiate emission-reduction projects in so-called developing countries, creating Certified Emission Reduction credits (CERs) that can be counted towards meeting the objectives set by the Kyoto Protocol. The other markets interacted between each other, while the exchange system enabled trade of quotas in-between developed countries, the joint implementation system works similarly to the CDM, but the transaction doesn't involve developing countries and projects as well as credits originate from developed countries (Carbon Market Watch, 2020; Carbon Offset Guide, n.d.(a)).

⁸ See The United Nations (2015) for the detailed articles of the Paris Agreement.

As it is important to make sure that these credits are only counted once - in favor of the receiving country's NDC - Article 6 uses corresponding adjustments (i.e., an accounting tool assuring that the selling entity has to deduct the credits from its emissions inventory). A diagram of the Corresponding Adjustments Mechanism between two countries can be found in Appendix 5.

The current market mechanisms have yet to be fully decided and implemented, as they have been discussed since 2016. Despite the completion during COP26 in Glasgow, uncertainties can still be experienced (The Oxford Institute for Energy Studies, 2022). Article 6 is still very vague on what an ITMO is and has not defined the amount of international help a country may receive from another to reach its NDCs, compared to the level of its national efforts for mitigation (Forest Carbon Partnership, 2016). The corresponding adjustments (CAs) mechanism also creates some confusion: while countries must ask for a CA from the project's host country to be able to count a credit for their own NDC, private organizations using these credits don't have such an obligation. They can use a credit originating from an offset project in another country without requesting any CA (Favasuli, S., 2022).

Article 6.4⁹ mentions a centralized mechanism that would work as a revised version of the CDM. It states that countries and organizations can trade carbon credits they gained from removing or avoiding emissions through supervised bilateral agreements (The United Nations Development Programme, n.d.). The purpose here is to create a global carbon market overviewed by the United Nations as a Supervisory Body. For instance, a country or company can launch a project in another country, which has to be accepted by the host country and validated by the UN in order to issue valid art. 6.4 carbon credits (Crook, J., 2022). This mechanism will include a centralized accounting framework, rating, and registry. As the risk of double counting¹⁰ is also present, the Corresponding Adjustment Mechanism is also in force for this trade system (The Oxford Institute for Energy Studies, 2022). A diagram of the issue of double counting can be found in Appendix 6. Once the mitigation outcome is acknowledged, an agreement regarding its price has to be settled. The contracts supporting the payment of these deals are called Emission Reductions Payment Agreements (ERPAs). They define all terms related to the purchase of the credits. Note that payments are effectuated after verification of the achieved mitigation outcome (The United Nations Development Programme, n.d.).

⁹ See The United Nations, 2015, for the detailed articles of the Paris Agreement.

¹⁰ Explained further in this study. Double counting is an accounting issue inducing that a carbon credit is counted twice (Carbon Offset Guide, n.d.(b)).

Notwithstanding the methodologies used in Articles 6.2 and 6.4 of the Paris Agreement are trying to embed carbon trade in an international manner, the VCM is a considerable part of the global carbon credit trade - operating with its own rules and stakeholders. A different ecosystem that we currently do not know how to link with the Compliance Market (The Oxford Institute for Energy Studies, 2022).

Table 1 - Summary chart of main existing methodologies (without VCM)

Framework	Credit typology	Target buyer	Governance	Procedures
Compliance Carbon Markets	Right to emit (cap-and-trade) or baseline credits (baseline-and-credit)	Companies within the economic activity covered by legal framework	Country, state, city, supranational level	Legal regulations, laws
Art. 6.2	ITMOs	Receiving country's NDC or international compliance carbon market	Bilateral or multilateral agreements	Corresponding Adjustment
Art. 6.4	Art. 6.4 ERs	Receiving country's NDC or international compliance carbon market	The UN as Supervisory Board	Corresponding Adjustment, administrative fees

Source: The Oxford Institute for Energy Studies (2022).

b. The Voluntary Carbon Market

i. A Brief Introduction

The VCM works separately, although in parallel to the Compliance Market. It consists of carbon credits created by “offset claims”; emission avoidance or removal projects hosted in developing countries. Whilst supply originates in the latter, most of the demand originates from the *Global North* (Ecofys, 2004). Conversely to the Compliance Market, the VCM is not established by governments and participation is voluntary. This market is neither centralized, regulated, nor unique. There is no public policy involved. It is currently mostly embedding private-led projects that provide to a private sector-level (Atkinson, N. et al., 2022). Accreditation (i.e., the computation leading to the number of credits issued by a project) derives from private schemes issued by standard bodies that have been authorized to approve these projects (Atkinson, N. et al., 2022). These characteristics shape this market as agile and flexible whilst being a source of complexity as well; lack of standardization, little alignment with the host country's goals and regulations, questioned respect of all stakeholders and of local policies, unclear governance, etc. (Streck, C., et al., 2021).

By creating the space for privates to remove carbon outside of government actions, the VCM regroups different stakeholders such as corporations or private individuals. The former will use the VCM as a means to attain their corporate social and climate responsibility objectives or to satisfy their compliance obligation, and the latter will invest to create carbon credits available for exchange (IOSCO, 2022). Organizations thus use credits to “cancel out” their operations’ emissions, wanting to limit the impact of a ton of CO₂ they already emitted (Macfarlane, M., 2022). Note that carbon credits from the VCM cannot be used to meet compliance market demand unless its legislation states that it is accepted¹¹ (Carbon Offset Guide, n.d.(e)).

As our previous section mentions, this procedure also enables project-hosting countries to reach their NDCs, as they are receiving additional climate mitigation through Foreign Direct Investments (FDIs). It is important to underline that other stakeholders also take part in the VCM. These stakeholders - including farmers, local communities, or local fauna - are counted as “beneficiaries” of mitigation projects (Streck, C., et al., 2021). The aim is thus to create revenue from producing and selling carbon credits through projects that reduce CO₂ emissions while enhancing the host country’s socioeconomic situation (Ecofys, 2004).

Projects vary in type and size - carbon credits can originate from replanting trees as well as from green energy investment for instance (IOSCO, 2022). Depending on the project type, project managers will use different methodologies to keep track of GHG emission-related issues. These methodologies are issued by carbon standards and initiate how CO₂ emissions, removal or avoidance are measured based on protocols. The aforementioned private standard bodies are responsible for verifying these protocols, determining if the credits are valid, and deciding the amount to be issued (Streck, C., et al., 2021). As we stated earlier, one credit is equivalent to a ton of CO₂ having been removed from the atmosphere or avoided to be emitted. Credits created within these projects can be directly sold to final consumers or displaced on intermediary platforms such as marketplaces or stock exchanges (Ecofys, 2004).

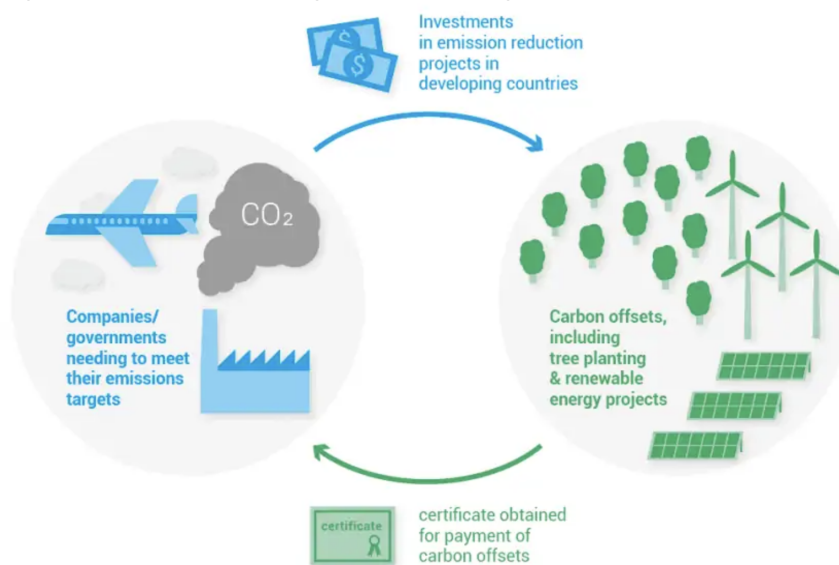
Table 2 - Summary chart of main existing methodologies (with VCM)

Framework	Credit typology	Target buyer	Governance	Procedures
VCM	CO ₂ that has already been avoided or removed from atmosphere	Private companies’ voluntary claims	Independent bodies, standard bodies, international or national initiatives	Standard certification and transparency agreements

Source: The Oxford Institute for Energy Studies (2022).

¹¹ Countries and states like Colombia, Germany, South Africa, Thailand, the UK, or California have established linkage between carbon credits found on the VCM and their Compliance Regime (Streck, C., et al, 2021).

Figure 3 - Illustrative diagram explaining the VCM mechanism



Source: Sullivan, N. (2022).

ii. Returning to the Paris Agreement and Art. 6

Returning to the Paris Agreement, even if VCM projects continue without being mentioned nor included in Art. 6, the London-based rating agency BeZero Carbon suggests that the VCM and the initiated policy of Art. 6 are linked. First, and as mentioned earlier, the market could be a vehicle to decarbonize the hosting country. These projects are FDIs positively tapping into the country's GHG inventory. Second, Art. 6.2 gives the right to countries to trade ITMOs (as long as they are not double counted) - meaning that any mitigation outcome coming from a carbon offset project that generated credits can also be sold by the host country to another country, for the latter to reach its NDC. And third, Art. 6.4 could allow for a sense of structure. As not all aspects are yet clear, their definition could be strongly influenced by the observations made in the VCM, and the latter could benefit from the mechanism's way-of-working to achieve standardization (Atkinson, N., et al. 2022).

Nevertheless, the VCM can also subvert achievement of NDC objectives. This is because it could displace company abatement actions or make governments rely too much on private actions and VCM credits. A country should not become overly dependent on that mechanism to attain its climate mitigation goals. The VCM is ought to work as a *complement*, and not as a means to achieve NDC targets.

Risks can be minimized if VCM activities are authorized and backed by CAs and if these projects are used for sectors that are not covered by NDC objectives, or solely conditional ones, as well as gap-filling systems for areas not covered by public policy (Streck, C., et al., 2021). In that way, governments play a key role in mitigating these risks.

iii. The Role of Governments as Facilitators

In our previous sections we mention that first, the VCM is not regulated nor centralized and that its credits cannot be used in Compliance Markets if no clear agreement is stated, second, that it carries risks regarding local policies and communities, and third, that it might undermine countries' NDC objectives. To this extent, as no rules are currently decided, governments can freely choose their level of involvement. They can decide to have minimal implication, or to engage as lawmakers and supporters. Governments can improve the coupling between respect of local goals, policies, and communities, as well as VCM transactions that could happen on their territories by providing a regulatory framework and stating their support. They can clarify how VCM projects and programs fit with public policies, identify sectors in which VCM investments are welcome, and establish institutions and regulations necessary for operationalizing Art. 6 activities. Governments can also define which types of VCM activities will be authorized and approved under Art. 6, encourage investments in priority sectors, and use carbon finance to meet conditional NDC targets (Streck, C., et al., 2021).

iv. Key Facts and Figures

The VCM finds its origin in the first known offset project operated by AES - a global energy company in the US - in the end of the 80s. The project occurred in Guatemala and credits were created through tree plantation (Streck, C., et al., 2021). The number of projects increased under the Kyoto Protocol's previously mentioned CDM - allowing developed countries to carry out projects which reduce emissions in developing countries to earn credits and to use these credits to achieve their Kyoto targets faster, under the supervision of the CDM Executive Board (The United Nations, 2023). After the implementation of Paris Agreements and Art. 6, the VCM has experienced exponential growth. The increasing demand for credits coming from carbon offsets can be shown through the quantity of credits retired (i.e., credits taken out of the market, as they are being used by the entity that bought them either for participation in climate change mitigation or to reach its own goals), which increased from 36 MtCO₂ in 2016 to 160 MtCO₂ in 2021, whilst having almost doubled between 2020 and 2021 (Climate Focus, 2022). The yearly evolution of VCM carbon credits issuance, combining credits issued by 4 main standards is illustrated in Appendix 7.

According to the Taskforce on Scaling Voluntary Carbon Markets (TSVCM) - a private initiative aimed at finding solutions to scale the Voluntary Carbon Market - the global demand for carbon credits will increase by a factor of up to 100 by 2050 (IOSCO, 2022).

Concerning credit offer, in 2022, carbon credit issuance dropped by 21% to 279 Mt due to global economic uncertainty. Renewable energy surpassed nature-based solutions to become the top category of credit issuances, with these two categories representing two-thirds of issuances. Although nature-based projects still had higher annual issuances, avoided emissions decreased faster than removals. Carbon credit retirements only slightly declined, while non-retired volumes increased, reaching 683 Mt. Some project types such as energy efficiency, industrial gasses, and coal mine methane projects saw increased issuances, up by 30%, 267%, and 212%, respectively (Mikolajczyk, S., & Bravo, F., 2023).

c. Key Differences and Similarities Between the VCM and the Compliance Market

Table 3 - Comparative table between the VCM and the Compliance Market

	Voluntary Carbon Market	Compliance Carbon Market
Purpose	Organizations but also individuals who voluntarily offset their carbon emissions beyond what is required by governments	Reducing GHG emissions from companies in specific sectors by regulating the carbon market
Coverage and compliance	This market is neither centralized nor regulated. Voluntary participation by organizations and individuals, no legal obligation to participate	Mandatory participation by covered entities and governments. Legal obligation to comply with the emissions reduction targets
Types of projects	Renewable energy projects, reforestation efforts, energy efficiency, land use projects, etc.	Projects that reduce emissions in covered sectors or industries such as energy efficiency, transportation projects, etc.
Regulation	Privately led standards, such as Verra, CAR, ACR or Gold Standard.	Established by governments, regulated by international and national laws. Can exist at country-level, continent-level, or city-level
Flexibility	More flexible and accessible approach to carbon offsetting, allowing all organizations and individuals to support projects that reduce GHG emissions	Limited flexibility due to regulatory requirements
Cost and prices	Highly fluctuates depending on the project and market conditions	Prices are determined by market supply and demand and can be influenced by regulatory factors

Sources: The Oxford Institute for Energy Studies. (2022); International Carbon Action Partnership. (2023); Climate Trade. (2021) & Carbon Offset Guide. (n.d.(c))

As aforementioned, the VCM is complementary to the Compliance Market - allowing individuals and organizations to have access to the carbon offsetting market and enabling them to trade carbon credits beyond what is available on compliance markets.

4. Way-of-Working

Our previous sections covered both the origin of carbon markets and an overall explanation of how they work. This section intends to provide a deeper understanding of how a carbon credit is generated, the main stakeholders it involves, and how the market evolves - trying to bypass the current challenges it experiences. We will first define what exactly a carbon credit is, subsequently explain how it is issued and retired, and finally interpret how a set of regulations and regulators try to define rules in a market that currently has none.

a. What is a Carbon Credit?

We already defined a carbon credit in the VCM as a ton of CO₂ ER. They are standardized to be equivalent to GHG reductions on removals in terms of tons of CO₂. Credits are tradable units; they are transferable from one party to another. The buyer of the credit can choose to “retire” the credit – i.e., making the credit no longer obtainable on the market (IOSCO, 2022; Streck, C., et al., 2021).

The entities identifying carbon credits are independent registries, validating a credit in consonance with the rules established by standards. Based on these rules, standard bodies will certify a ton of CO₂ removed or avoided and convert it into a credit. This credit is then incorporated within the registry of the standard body that certified it, enabling tracking of credit issuances, transfers, and retirements (IOSCO, 2022; Streck, C., et al, 2021).

All projects that generate credits share a common purpose: their purpose is to issue credits throughout a specific action in one localization, that will then compensate for emissions within another place. Nevertheless, credits differ depending on the type of project they originate from - which we will discuss later - as these typologies determine how a credit has been generated. This has an impact on credit typology and credit price¹² for example.

¹² For instance, credits originating from projects involving technology have higher prices than credits created through nature-based solutions (ACMI, 2022).

We determine two distinct credit categories:

- (a) Credits originating from *avoidance offsets*. These are the credits on which the VCM has mostly focused on for the past years (Hauman, H. & Shah, M., 2022). They focus on preventing any future possible emissions that have not yet occurred but might occur if the project did not exist (Streck, C., et al., 2021). For example, protecting forests¹³ or using renewable energy as a substitute to fossil fuels.
- (b) Credits originating from *removal offsets*, which have experienced way lower rates of supply due to a considerably long-time frame before projects reach full scale growth or before granting project developers with any ROI (Hauman, H. & Shah, M., 2022). These projects aim to extract carbon that is already present into the atmosphere, through removal or sequestration (Streck, C., et al., 2021). For example, direct air capture (storage through technology) or reforestation (storage through biomass)¹⁴.

b. The Issuance of a Carbon Credit

i. Project Development, Validation, and Certification

These credits originate through projects that can be launched by private individuals and companies, as well as public entities or international organizations. These projects aim at either avoiding certain emissions or removing emissions from the atmosphere. Through the latter, project developers will become suppliers of carbon credits. Anyhow, to reach that point various different steps have to be taken. A key trend is the current shortage in projects in view of the demand observed on the VCM (Santiago L., 2023). Indeed, starting a carbon offset project requires considerable up-front investment. Furthermore, its ROI is relatively variable, even unsure due to market conditions (fragmented market, unstandardized regulations, high reliance on intermediaries), and can often only be perceived after a long period of time. This makes the investment risky and complicated for most project developers (ACMI, 2022). Some succeed however to find funding through public or private investors.

Once the project is designed and has the necessary amount for investment, it needs to be validated by the aforementioned so-called *private standards*. This validation will enable the project developer to have his project registered¹⁵ and capable of generating carbon credits.

¹³ preserving forests which can be considered as carbon sinks as the trees can pull carbon out of the atmosphere through photosynthesis (Climate Seed, 2023).

¹⁴ These credits are marketed at higher price because of their rarity, but also because they require more upfront investment (in time and technology) (Ferdinand, T. & del Ser, J., 2022).

¹⁵ Registries are used by carbon standards to track all generated credits, transfer tradable credits, and trace transactions between buyers and sellers (ACMI, 2022).

These standard bodies are independent entities verifying if the program meets the required criteria in order to generate valid carbon credits. They act as regulators on the VCM, assessing credit credibility and quality. In addition to providing a stamp for validity, they also assure that projects remain acceptable in terms of legislation - such as for human rights - and that it does not create any harm to which it might impact (ACMI, 2022). Verification criteria are thus established and enforced by these carbon standard organizations, which oversee the regulations and prerequisites for VCM initiatives and schemes. Additionally, they validate and grant carbon credits, as well as enable the exchange of such credits. To maintain good governance, standard organizations regularly update their rules and requirements - consulting with stakeholders, implementing environmental and social safeguard measures as well as establishing robust methodologies for determining baselines and project contributions. They additionally require independent third-party auditors - also known as Validation and Verification Bodies (VVBs) - to review projects (Streck, C., et al., 2021).

Overall, VCM projects and programs must comply with the standards' processes, rules, requirements, and safeguards. Additionally, they must use approved methodologies, and provide evidence of compliance to obtain certification of GHG emission reductions or removals and being granted with credits to trade (Ministère de la Transition Écologique, 2022). Table 4 shows the five main carbon standards operating on the market, as of December 2021 (Luik, L., 2022).

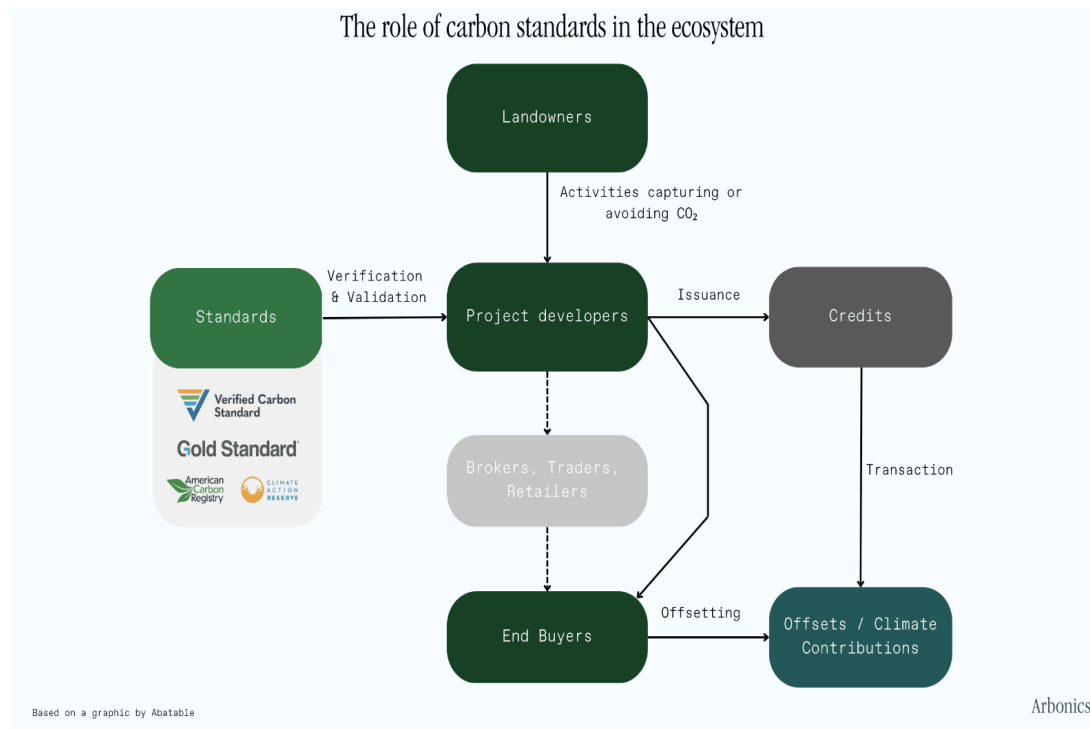
Table 4 - Main carbon standards and respective market shares

Standard body	Credits name	Number of credits issued	Number of projects
VERRA	Verified Carbon Units (VCUs)	1,090,392,689	3,331
Gold Standard	Verified Emissions Reductions (VERs)	238,306,439	2,740
Plan Vivo	Plan Vivo Certificates (PVCs)	6,453,389	221
CAR	Climate Reserve Tons (CRTs)	72,364,984	465
ACR	Emission Reduction Tons (ERTs)	86,765,617	363

Sources: Streck, C., Dyck, M., & Trouwloon, D. (2021); Berkeley. (2023); Carbon Offset Guide. (n.d.(d)).

It is important to highlight that although these entities are called standards, the current market situation is still highly unstandardized as each of them will validate a project based on different criteria and methodologies. In order to be certified by Gold Standard, one would not need the same upfront requirements than for Verra for instance - while the concept stays the same, the requirements and processes might differ.

Figure 4 - Recap of the role of the standard bodies within the VCM



Source: Luik, L. (2022).

ii. Verification for Credit Issuance

A validated project has agreed upon yearly credit issuance. However, every year a project must have the effective credit issuance reviewed based on its current state. This verification structure is outsourced by standard bodies to third-party entities (Streck, C., Dyck, M., & Trouwloon, D., 2021). Project developers must thus submit relevant project data to VVBs, typically including auditing and consulting firms, as well as other specialized organizations. By assessing the project to ensure that all requirements set by the standard body are met, they enable verification and will highlight inconsistencies or errors in the data contained within project reports. During verification, a VVB will confirm whether or not the outcomes set out in the project documentation have been achieved and quantified according to the requirements of the respective standard body (Verra, 2023b). Based on this assessment, the credits issued by a project can vary, being higher or lower than the initial expectations.

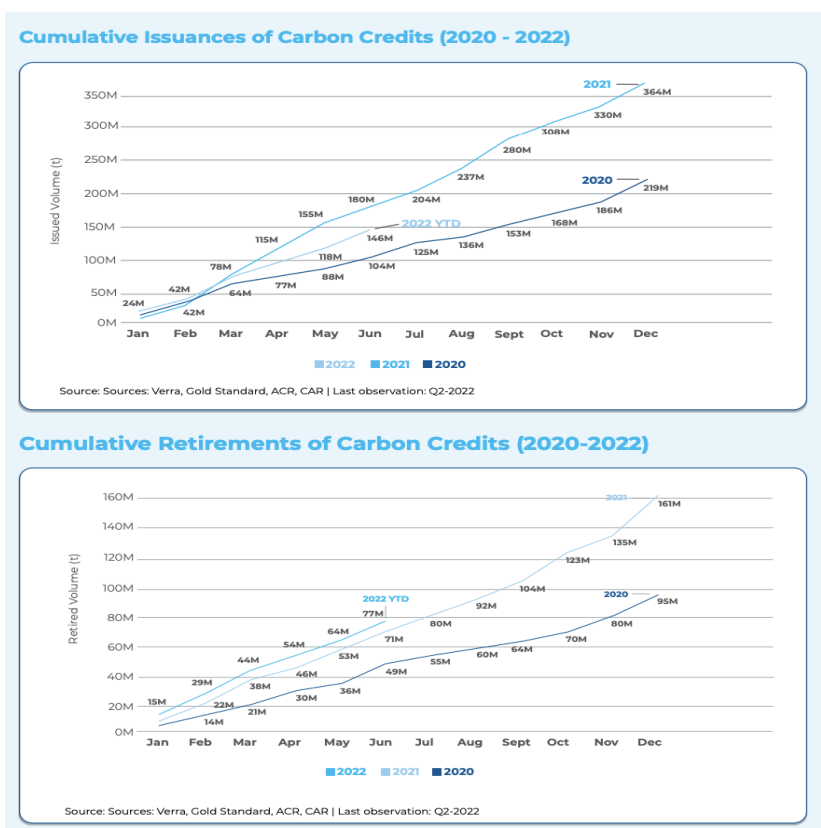
After verification, the project developer may submit the project for registration with the respective standard body and will be able to issue the quantified carbon credits, which can then be traded on the carbon market (Carbon Credits, 2023). Some examples of VVBs include DNV GL, SGS, TÜV NORD, Bureau Veritas, South Pole, First Environment, and Carbon Check (Verra, 2023b).

iii. Credit Retirement

The project developer can then sell the credits its project generated, either through an intermediary - such as a broker or an exchange - or directly to the end-buyer. The latter can be an individual, an organization or even a country (ACMI, 2022). The term retirement refers to a mechanism that has been put into place to avoid double counting – an issue that can occur if the same credits are sold or used by multiple buyers or investors. The latter has already been mentioned within our paper and refers to the risk that the carbon credit would possibly be claimed by two separate entities towards their own mitigation targets. An example could be that both the country hosting the project and the standard body claim the carbon credit, leading to a credit being counted twice: once for the host country, and once for the standard body. Even if only one ton of CO₂ has been effectively avoided or reduced, it seems like two tons are actually on the market (The Integrity Council for the Voluntary Carbon Market, 2023).

To tackle this concern, this mechanism states that a credit can be sold and purchased without being retired, anyhow, once retired it can no longer be used nor traded (ACMI, 2022). When an entity retires a credit, it means that it uses it to compensate for one ton of CO₂ he emitted or will emit, and that it effectively accepts responsibility for the carbon reductions represented by that credit and ensures that it cannot be used by anybody else (Blaufelder, C. et al., 2021). What can be observed is that since 2020, the number of credits issued and retired have been steadily increasing, manifesting the growing interest for VCM-issued credits.

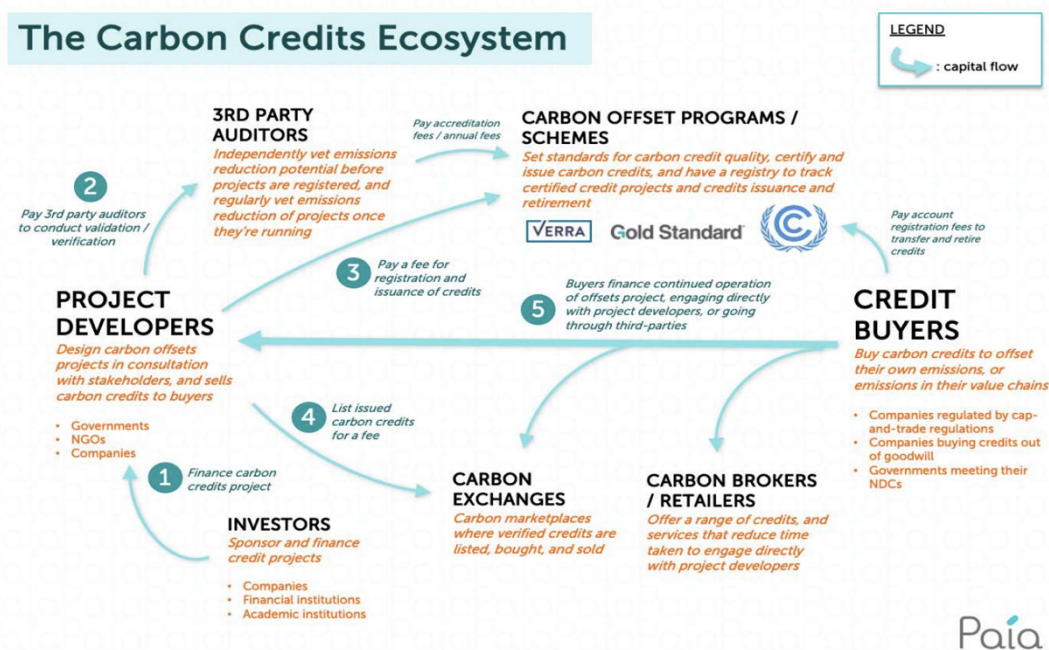
Figure 5 - Cumulative number of credits issued and retired since 2020



Source: South Pole (2022).

iv. Wrap-up of the Carbon Credit Issuance Mechanism

Figure 6 - Recapitulative scheme of the carbon credit ecosystem



Source: IOSCO (2022).

v. *What are Carbon Rights?*

Carbon rights in VCMs are crucial and must be distinguished from a carbon credit. Carbon rights determine who has the right to participate and benefit from a validated VCM project. In other words, it gives the owner of the right the entitlement to profit from a GHG reduction or removal. Individuals or entities who possess carbon rights have the ability to engage in transactions and receive profits from selling carbon credits. In addition, carbon rights may give its holders the opportunity to participate in benefit sharing arrangements. The topic of carbon rights is especially significant and contentious when it comes to nature-based solutions (NbS) as well as carbon projects within the land sector as they both involve a large number of stakeholders - such as local communities for instance. We will outline the concept of different project typologies and more specifically nature-based solutions in the next section of our paper (Streck, C., et al., 2021).

c. **Project Typology**

The VCM regroups multiple different project types, i.e., different ways to generate carbon credits through removal or avoidance. Each typology refers to a methodology that will shape how this project is validated, how credits will be computed and even the price at which credits will be sold. These cluster attempts are still relatively inconsistent on the market; however, we can deduct some general categories such as renewable energy, household devices, energy efficiency, waste, nature-based solutions, methane reduction, fuel switch or chemical, and industrial (Climate Focus, 2023). The Ecosystem Marketplace (2022) categorized eight different project typologies, which themselves are divided in different subcategories. The complete list can be found in Appendix 8.

i. *Nature-Based Solutions*

By doubling its share of total credit issuance, NbS made up 46% of the market share in 2021 (The Ecosystem Marketplace, 2022). Nature-based *removals* credits retirements increased 10% between 2021 and 2022 (South Pole, 2022). Within project types, NbS are market leaders in terms of project launch - being the typology regrouping the most created deals in 2021 and 2022 (Abatable, 2023). This underlines the success of this project type in recent years. The International Union for Conservation of Nature (IUCN) created the term *nature-based solutions* to group means that “leverage nature and the power of healthy ecosystems to protect people, optimize infrastructure and safeguard a stable and biodiverse future” (Ferdinand, T. & del Ser, J., 2022). NbS are therefore solutions that use nature as a means to achieve sustainability goals.

These solutions can be sorted in different subgroups. Once more, inconsistency is noticeable with respect to these subcategories. For example, while some standards treat agriculture as a nature-based activity, others treat it as a separate category (Landholm, D. et al, 2022). It is however possible to outline some groups of projects within this typology such as Improved Forest Management (IFM), Afforestation and Reforestation (A/R), avoided forest conversion, blue carbon, grassland and wetland conservation and restoration, reduced emissions in agriculture, or REDD+ projects (Berkeley, 2023). To enable cross-comparison between the various standards present on the market, Climate Focus (2022) categorized NbS in five different categories, namely “Afforestation and Reforestation”, “Agriculture”, “Avoided deforestation”, “Improved Forest Management” and “Conservation and Restoration of Wetlands”, based on categorizations used by these standards (Landholm, D. et al, 2022). The complete list of NbS project type classification by main standard bodies can be found in Appendix 9.

An additional important feature that will categorize NbS is whether a project is avoidance- or removal-based. As aforementioned, credits issued on the market can originate from carbon not having been released that would have been released without the project occurring, or from carbon extraction from the atmosphere - i.e., carbon that existed and has been removed through a project. If we narrow our focus to NbS, projects such as forest conservation are avoidance offsets, while projects such as reforestation are removal offsets. Some programs - IFM, Wetlands or Soil Carbon - can be included in both groups, diminishing CO₂ levels, and avoiding further emissions (South Pole, 2022).

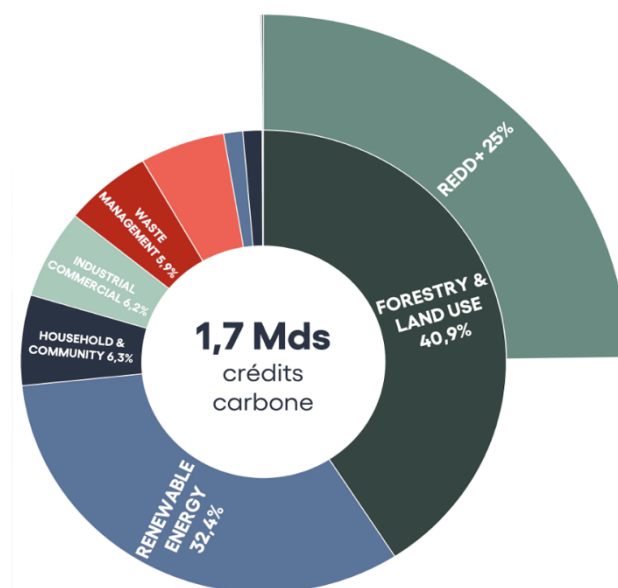
ii. REDD+

The National Strategy for Reducing Emissions from Deforestation and Forest Degradation (REDD+) is an internationally agreed upon framework created by the UNFCCC in 2005 to decrease GHG emissions by reducing deforestation, forest conservation and sustainable management of forests' carbon stocks (EUREDD Facility, 2022). Participation takes place at a country-level and is divided in different phases: the design of national strategies, the implementation of these strategies and the verification of correct progress to grant REDD+ credits to the country involved. The latter leads to monetary based compensations used as incentives for countries to participate (EUREDD Facility, 2022).

REDD+ is financed by a variety of international organizations such as the Forest Carbon Partnership Facility (FCPF), the UN-REDD program or the Green Climate Fund (GCF) (Ministère de la Transition Écologique, 2022).

Overall, this program seeks to increase the use of forests within countries' NDCs by providing large funding. As NbS is the largest category regarding credit issuance, REDD+ is the main driver of NbS projects and accounts for the largest proportion of projects within this category. Therefore, it is also the biggest credit-generator - providing 25% of credits issued for a total of 41% for the NbS category, see below. (Dugast, C., Pivin, A.& Follin-Arbelet G., 2023).

Figure 7 - Proportion of carbon credits based on project typology



Source: Dugast, C., Pivin, A.& Follin-Arbelet G. (2023)

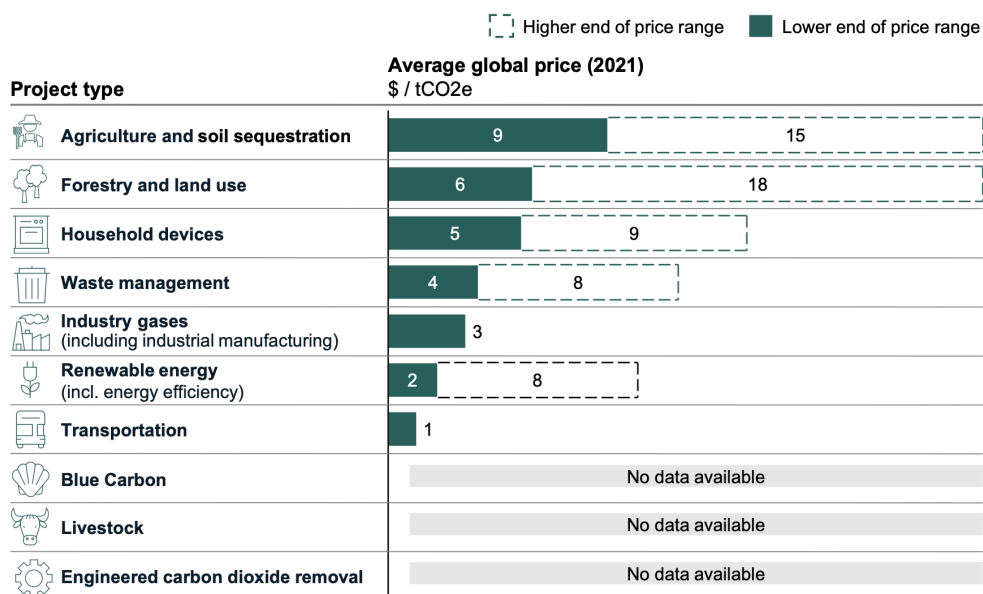
d. Impact on Prices

The pricing mechanism in the VCM is based on variations in supply and demand of carbon credits (Favasuli, S. & Vandana, S., 2021). However, how carbon prices vary and originate remains blurry. Unlike the Compliance Market, price definition is not a straightforward process due to the variety of environmental projects available, their location, and their typology. One thing we can observe is that prices tend to depend on the project type and that this can also be true depending on the various subsections within the same project type. Although relatively nascent research has been made on pricing dynamics on this market, we can acknowledge tendencies for price variations depending on project's size, location, vintage, quality, and co-benefits.

BeZero Carbon highlights that a potential factor for price discovery could indeed be *quality* which is thus verified through ratings. Their analysis based on trading prices of more than 10 million tons of CO₂ shows a correlation between pricing and credit quality. Their correlation coefficient doesn't show unmitigated results, yet a relationship can be noticed, and this relationship seems to strengthen when market liquidity increases (Carr, R., O'Muircheartaigh, F. & Leaver, S., 2023). When it comes to co-benefits, it seems like projects that highlight UN SDGs impact increase the value of the credits they issue, while larger projects without many co-benefits may trade at a discount (Carbon Credits, 2023).

The price of one carbon credit can vary widely - from a few cents per metric ton of CO₂ emissions to \$15/mtCO₂e or even \$20/mtCO₂e for A/R projects (Favasuli, S. & Vandana, S., 2021). Overall, up to half of the credits present on the market have their prices ranged below \$12/tCO₂e. Nevertheless, some credits can see their prices going up to \$119/tCO₂e, or even \$300/tCO₂e for credits originating from tech-oriented projects (ACMI, 2022). Renewable energy projects have the lowest average prices, varying around \$1.4/tCO₂e, while forestry and land-use projects have higher prices, with an average of \$4.3/tCO₂e (Carbon Credits, 2023). The latter - encompassed by NbS - are drivers of the VCM's overall exponential growth because of their rising prices (The Ecosystem Marketplace, 2022).

Figure 8 - Prices vary substantially depending on project type



Source: ACMI. (2022)

5. Integrity: A Major Issue

When overlooking the whole credit-generation process, additionally to the current market trends within the VCM, we could easily recognize the difficulties stakeholders face interacting in a relatively new and uncertain environment. Anyhow, we didn't yet pinpoint the challenging outcomes this unstandardized market might create for its participants. The following section will highlight integrity as being a major issue currently present on the VCM due to its relatively nascent characteristics, lack of transparency and heterogenic regulations. We will begin by outlining the various criticisms that can be observed on the market, to subsequently examine the elements that VCM actors have put in place to circumvent them.

a. Towards High Quality Carbon Credits

Notwithstanding its current state and growth - having transitioned from concerning to viable in the last decade - the VCM is experiencing some roadblocks. In developing countries, the market is not yet stabilized; the question of financing, certifying, and the impact on local communities induce complexities. The first programs were criticized heavily for “their lack of transparency, quality-assurance and third-party standards” (Kollmuss, A., et al., 2008). Indeed, a major concern relates to the transparency of the market and how reliable credits issued from this market can be. The concerns about the integrity of the VCM are threefold:

- (a) the project's reliability regarding tons of CO₂ actually avoided or extracted;
- (b) intermediaries and accessibility to the trade of credits;
- (c) the use made of carbon credits retired (IOSCO, 2022).

William McDonnell, COO of the Integrity Council for the VCM (IC-VCM) - an independent governance entity regrouping stakeholders from various main players on the VCM -, said on the Climate Risk Podcast that credits issued in the VCM perceived a lot of criticism because of their *inconsistency* and high level of fragmentation (Climate Risk Podcasts, 2022). During the McKinsey talks about COP27, Janaina Dallan - Co-CEO of Carbonext - mentioned that information will diminish reluctance to buy these credits, highlighting the importance of *transparency* for this market as a trigger to boost demand (McKinsey & Company, 2022).

With this in mind, it makes sense to define a highly reliable credit as a high-quality credit. This means that establishing the criteria for integrity will enable us to assess quality. In that regard, stakeholders on the market have embarked on a journey towards building trust.

Which criteria would encompass what is needed to be measured for integrity? We can acknowledge some baseline criteria that are needed for validation. In France, The Climate and Resilience Act modifies the Environment Code through Article 147, which defines the “fundamental criteria” for avoidance and removal offsets (Ministère de la Transition Écologique, 2022). In 2021, Article L229-55 outlined a benchmark for acceptance - aligned with what the main standard bodies mostly verify for project validation. First, assuring a correct computing of the number of ER(s) generated would be necessary. Measurement methodologies are currently not standardized. Second, the importance of additionality and accurate baseline settings. This means a correct computation of the amount of CO2 emissions that would have occurred if a project was not implemented, and that the ER(s) would not have taken place without the project - i.e., a project is additional if it allows ER(s) by itself, and that no other already existing activity provides CO2 avoidance or removal. A third criteria would be permanence. Every project should assure a long-term climate benefit and should consider possibilities of reversal due to natural disasters, political climates, or any other events. Lastly, we can highlight the importance of the risk of leakage - a project can't transfer emissions to another area¹⁶ (IOSCO, 2022).

b. The Core Carbon Principles

Research conducted by the TSVCM showed that 45% of potential VCM credit buyers considered the lack of confidence in carbon credits available on the VCM as a major barrier to purchase (TSVCM, 2021). As their goal is to offer “a robust, transparent and liquid market” that would have potential for scale, the TSVCM underlines the importance of creating a benchmark of what high-quality credits stand for.

Our previous section mentions the issues related to credit issuance, which are currently taken care of by standard bodies - however not in a standardized manner as each standard body has its own methodology for validation. Standardization of criteria throughout measurement methodologies and criteria would enable traction on the market. In this way, the IC-VCM introduced its Core Carbon Principles (CCPs) and Assessment Framework in July 2022 (South Pole, 2022). We can see that these principles are aligned with the important issues we mentioned in our previous section. The 10 CCPs are a set of standards that serve as a global reference point for carbon credits of high integrity.

¹⁶ Another issue needing to be addressed would be double counting for which Art. 6 brings considerable answers.

They are divided as follows:

Table 5 - The Core Carbon Principles

Governance	Effective governance	Guarantees transparency, accountability, continuous improvement, and the overall quality of the credit.
	Tracking	Using or operate a registry to identify, record and track the credits issued from the mitigation activities in a unique way.
	Transparency	Provides publicly available information on all credited mitigation activities in a transparent, comprehensive, and accessible way.
	Robust third-party verification	Should have requirements to ensure a strong third-party validation and verification (VVBs).
Emissions Impact	Additionality	The mitigation activity GHG removals/reductions should be extraneous, meaning they would not have occurred without the project's incentive.
	Permanence	The mitigation activity GHG removals/reductions should be permanent, meaning measures are taken to avoid any reversal or compensate for the reversal.
	Robust quantification	The mitigation activity GHG removals/reductions should be quantified according to a scientific and conservative approach.
	No double counting	The mitigation activity GHG removals/reductions should not be issued nor counted nor claimed nor used twice.
Sustainable Development	Sustainable Development benefits and safeguards	Should have clear guidance, tools, and compliance procedures to guarantee the mitigation activities are aligned with the best practices on social & environmental safeguards while at the same time delivering a positive sustainable impact.
	Contribution towards net zero transition	The mitigation activity does not lock-in levels of GHG emissions, technologies nor carbon-intensive practices that are not aligned with the climate objective of reaching a net zero GHG emissions by 2050.

Source: The Integrity Council for the Voluntary Carbon Market (2022).

Each project should have its alignment with the CCPs verified through the Assessment Framework that the IC-VCM developed. This framework describes which are the necessary requirements having to be met by the project to be in accordance with the so-called CCPs (The Integrity Council for the Voluntary Carbon Market, 2023). The operationalization of the various criteria is enforced by the IC-VCM as both the CCPs and the Assessment Framework will pertain to all well-defined carbon-crediting programs (The Integrity Council for the Voluntary Carbon Market, 2022).

c. Rating Agencies

New entities appeared on the market to counter this integrity issue, acting as additional validators, and putting their quality stamp on projects they assess. Rating agencies use their own independent analysis on carbon offsets to assign ratings, typically in the form of letter grades - i.e., a quality score (Streck, C., et al., 2021). Similar to debt ratings, carbon credit ratings help buyers evaluate the risk associated with a credit coming from a specific project. However, it is important to note here that notwithstanding the “double verification” these rating agencies offer, they again lie in a highly fragmented market and do not rely on standardized measures. These agencies have varying approaches to evaluating the quality and risk of carbon projects. Examples of these rating agencies are Sylvera, BeZero, Calyx, Pachama, and Renoster.

6. Conclusion

Our previous sections gave us the opportunity to understand the origin of the main challenges the VCM currently encounters. Due to the high growth of a market that is neither standardized nor regulated, both supply and demand are constrained by intrinsic issues. Our major observation is linked to integrity - a market built without a strong agreed-upon baseline is, by corollary, blurry to its stakeholders and in fine complicates trust and alignment. It is reasonable to say that trust draws on information and data to build itself. Therefore, we believe that granting more project data could leverage integrity on the VCM as it is a major underlying component to transparency. Building on that, we will analyze what the current requirements regarding information and data are necessary for projects to be validated or qualified as high-quality carbon credits providers. Transparency issues the VCM encounters lead us to think that what we might expect to observe on this market is not enough nor consistent data requirements. Based on the current increase of NbS - especially A/R projects - we decided to focus the scope of our study on the latter to construct our analyses on the currently most relevant category found on the VCM.

III. Integrity and Social Impact

1. Increase of Reforestation Carbon Offsets in Low-Income Countries

Global anthropogenic CO₂ emissions increased in 2021, reaching a higher rate than what has been recorded in pre-Covid-19 years. In their data description paper about carbon emissions, Friedlingstein et al. (2022) used both emissions originating from fossil fuels and from land-use change to measure anthropogenic emissions - highlighting that land-use change accounted for 11% of total these emissions ($10.9 \pm 0.9 \text{ GtCyr}^{-1}$ in total). Land-use emissions include deforestation, organic soils, reforestation and wood harvest, and other transitions and are measured through methods such as bookkeeping¹⁷ or DVGMS¹⁸ (Friedlingstein et al., 2022). Even if the bookkeeping method shows a slight decrease in emissions linked with land-use change, DVGMS show an increase over the last years. These divergent results come from the fact that DVGMS take into account the loss of sink capacity over the years, reducing probability for normal rates of carbon sequestration (Friedlingstein et al., 2022). Deforestation accounted for emissions up to $1.8 \pm 0.4 \text{ GtCyr}^{-1}$ in 2021 while reforestation and afforestation accounted for a cut in CO₂ emissions by half ($-0.9 \pm 0.3 \text{ GtCyr}^{-1}$). Deforestation itself counts for more than 15% of anthropogenic emissions (Dugast, C., et al., 2023). It is important to underline that this model does not consider forest degradation nor wood harvesting - alleviating the real impact of deforestation.

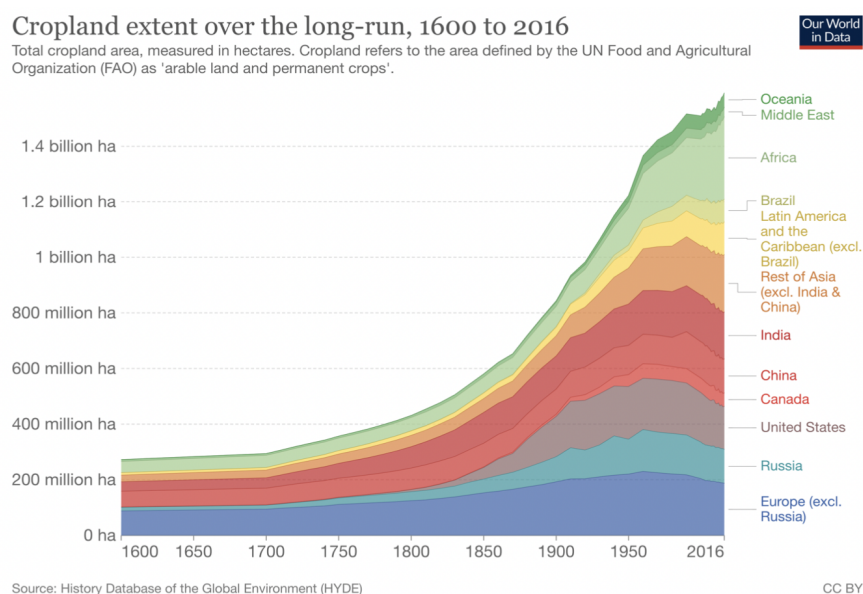
As Friedlingstein et al. (2022) mentioned, it appears that altering deforestation has great potential to decrease anthropogenic emissions and the VCM seems to have noticed that same capacity. As our paper already mentions, recent years have shown an exponential increase in nature-based carbon offsets - especially in reforestation, afforestation, and forest management. The Voluntary Registry Offsets Database - published by the Berkeley Carbon Trading Project (Berkeley, 2023) - shows that forestry and land-use projects account for 16% of the total amount of projects currently held on the VCM. While this doesn't seem like a considerable proportion, it actually represents 41% of the total amount of credits historically emitted on the market (Dugast, C., et al., 2023). And these numbers are rising. A/R offsets have increased by 27% between December 2021 and November 2022 (Abatable, 2023).

¹⁷ The bookkeeping models are specifically designed to evaluate Land Use & Land Cover Changes emissions. They refer to parametric models that combine time series of land use and land cover change (LULCC) with empirical response functions, which describe the alterations in ecosystem carbon stocks resulting from these disturbances (Gasser, T., et al., 2020).

¹⁸ Dynamic Global Vegetation Models (DVGMS) are sophisticated, process-oriented models that incorporate the spatial details of the terrestrial carbon cycle and its associated processes. They provide accurate descriptions of the biogeochemistry of plants and ecosystems, without overemphasizing land use and land cover change (LULCC) (Gasser, T., et al., 2020).

A/R offsets mostly occur in the Global South - with 84% of the total amount of projects located in these regions (Berkeley, 2023). The reason for the latter is twofold. One, Africa, along with Amazonia, has the most forest-based carbon credits access (Kollmuss, A., 2008). Two, the main driver of land-use change emissions is increase in cropland expansion, currently observed in Latin America, Sub-Saharan Africa, and Southeast Asia - regions where deforestation rates are high and steady since the past 30 years (Friedlingstein et al., 2022). Dummett and Blundell (2021) show that in the period of 2013 to 2019, Brazil, Indonesia and Democratic Republic of Congo accounted for 51% of tropical forest coverage loss - 39.27Mha of a total of 77Mha - and that two-thirds of this total loss originates from agriculture, would it be commercial or subsistence (the latter reported to be mainly observed in Africa).

Figure 11 - Cropland extension until 2016, per region



Source: Gottlieb C. (2023).

Focusing on the sub-Saharan region of Africa, more than 60% of the population are smallholder farmers, with 23% of the region's GDP originating from this sector (Goedde, L., Ooko-Ombaka, A. & Pais, G., 2019). By corollary, this suggests that a high proportion of the population is located in rural areas, meaning that a lot of communities are directly affected by local forests and any changes that might occur within them.

The forests of sub-Saharan Africa, for example, are a biodiversity hotspot and communities depend on them to sustain (Asiyanbi, A. P., et al., 2017). With this in mind, the aim of carbon offsets is to create revenue from producing and selling carbon credits through projects that reduce CO₂ emissions while enhancing the host country's socioeconomic situation (Ecofys, 2004).

This indicates that community lands are the main targets for A/R practices and supports the relevance of studying the impact of these types of carbon offsets on local populations and socioeconomic conditions.

2. Involvement of Communities and Socioeconomic Impact

The rise of NbS carbon offsets projects observed in recent years triggered an increase in studies that measure the socioeconomic impact of these projects. Nevertheless, this tendency came with some intrinsic barriers. This includes the fact that studies in development economics require considerable funding if data has to be collected by researchers for the sole purpose of the study. Unfortunately, it seems that due to the lack of consistent and robust data, studies measuring socioeconomic impacts of NbS projects had to rely on national data panels or short-term measurements such as monthly surveys conducted in a one-year time frame. This inevitably undermines the validity of results and diminishes the quantity of studies being made on this topic. We notice that studies measuring socioeconomic impact of NbS projects are more numerous when the project is socially-oriented and isn't located on the VCM, i.e. for Improved Forest Management (IFM) or community-based reforestation programs. Socially-oriented projects involve communities directly as they are the main driver of the designed program. Other project types - such as most of A/R - consider local communities as a factor that has to be taken care of in addition to their nature-driven objective. Yet, even if the field seems relatively nascent, some research related to A/R programs exist. However, these are mostly focused on REDD+ - benefiting from it operating on a large scale. This section will regroup the current knowledge about community involvement in NbS projects and aims to demonstrate the lack of research in terms of quantity and quality around socioeconomic impacts. We will therefore purposely focus on research conducted on this matter.

Ding H., et al., (2023) highlight the scarcity of research regarding socioeconomic impact through land restoration projects, as only few researchers have collected household data before, during and after a project to effectively measure livelihood changes. The authors outline the issue of inconsistent data collection methods in parallel of a lack of sturdy data as the main cause of research scarcity. Additionally, it seems that there is no common agreement on which indicator should be measured for this matter - national household surveys do not provide specific information that allow *isolation* of land restoration effects on socioeconomic values (Ding H., et al., 2023). However, the authors mention that research has demonstrated two main impacts of land restoration on local communities' livelihoods.

Projects tend to increase crop yields as well as the variety of products farmed - *improving food security and income* through the trade of timber and non-timber products or through direct cash payments made by project coordinators. Additionally, land restoration permits *indirect impacts*, such as increased community-level investment in infrastructure through increased income, gender equality, resilience to climate change or even access to better quality water (Ding H., et al., 2023).

Hedge R. and Bull G. Q. (2011) analyzed a Payment-for-Environmental-Services (PES) project that occurred in Mozambique in order to derive its impact on local households. This project started in 2002 and generated agroforestry-based carbon credits by asking farmers to voluntarily plant and take care of trees on their farms for a period of 25 years in return for conditional annual cash payments. In addition, planting trees on land should have positive impacts on crop yields. In 2006, the researchers measured household consumption and income, as well as the potential impact on crop yields, using quarterly surveys to measure the effects in treated and control households - i.e., households not taking part in the project. Results show a significant increase in income and household consumption, but these results aren't observed for poor or women-led households. This might indicate some inclusivity hurdles. However, it also shows a significant loss in crop yields, as the trees were planted for the sole purpose of carbon sequestration instead of being chosen for their own productivity input (Castle, S. E., et al., 2021). Three observations can be drawn from this paper. First, increase in income might originate solely from the direct cash payments farmers received (since no increase in crop yield has been recorded), characterizing this effect as relatively short-term without promoting communities' resilience. Other issues linked with direct payments were revealed through research - such as it not being sufficient to counterbalance what communities could earn through forest resources (Mustalahti, I. & Rakotonarivo, O.-S., 2014). Second, results seem to indicate an unbalanced effect between regular and vulnerable households, revealing an issue regarding inclusivity and equality. And third, the data retrieved only covers a one-year time period with no calculation of pre- or post-project situations. The latter is something that can unfortunately be observed in other papers studying these impacts.

To remediate to the scarce number of impact assessments conducted in this field, Corbera E. et al (2020) measure within a three-year period the impact of Participatory Forest Management (PFM) on rural livelihoods in Tanzania¹⁹.

¹⁹ This study has been conducted through a project initiated by MCDI - a Tanzanian NGO - and a pilot REDD+ program.

By implementing PFM in the Kilwa district to generate carbon credits, the program aims at diversifying local communities' income sources and promoting sustainable forest management. The paper highlights the lack of social cohesion the program showed, given the relatively poor understanding of the project activities - limiting communication and awareness throughout the village. Surveys on 452 households showed a statistically non-significant, yet considerable, increase in income for households located in treated villages. The authors link this result to, first, the difficulty to isolate forest incomes from other sources of income increase. Second, that economic benefits would majorly originate from indirect sources - such as long-term investments to have better access to water or education for instance. And third, that long term data collection consistency remains a main challenge. They also mention the time-consuming and costly characteristics of such data collection and suggest relying on national panel data for further research. Furthermore, we can once again acknowledge the short data collection-period the study relies on, with no data retrieved before and after the project (Corbera, E., et al., 2020).

Research conducted by Ding H. et al. (2023) aims at discovering whether or not farmland restoration has improved socioeconomic conditions in Malawi, using national panel data in 2016 and 2019 to identify restoration, as well as evolution in income and food consumption. Results show an increase in yields - generating more sales and in fine a significant rise in income. Additionally, the study shows food security improvement through an increase of quantity and variety of food consumed. Nevertheless, the authors highlight the various challenges their research encountered that undermine the results we just stated. First, national surveys are incomplete both in answers and questions, short-term focused, and make use of inconsistent indicators. All this, in addition to the data incompatibility they convey, suggest taking action for improvement of these surveys. And second, the researchers performed their analysis solely on a two to three-years' time frame without distinguishing control and treatment groups, complicating the validity of the results.

Studies about projects that aren't socially-oriented show how local populations are considered as externalities - triggering possible negative impacts on communities, creating non-agreed-upon actions and undermining the project outcome because of conflict. Studying the impact of the REDD+ program in Ghana on local agrarian communities, Kansanga M. M., and Luginaah I. (2019), tried to shed light on how a sustainable relationship between food production and carbon forestry can be reached, given how agricultural land has to be reshaped after REDD+ implementation. Through interviews within a five-month time frame, the authors discovered an environment of displacement, corruption, and exploitation.

Capitalization of Ghanaian agrarian forests towards so-called sustainability purposes seems to have been done at the expense of local communities' well-being. The researchers observed three main effects that interact with each other. One, forests landscapes have been privatized for carbon forestry practices, banning farmers from cultivating there, creating landless farmers trying to find - without success - alternative land parcels for subsistence. *This leads to lower food and income security* for these farmers and their families. Two, displaced farmers are left with no choice than negotiating access to forestland to obtain temporary use-rights - leading to illegal “money under the table” practices with influential people, which by corollary favors wealthier farmers that have greater networks, increasing inequalities per se. Three, as REDD+ didn't define its benefit-sharing plan, communities are unsure of what it is they can claim which gives rise to unequal revenue allocation, segregating farmers even more (Mosonsieyiri M. M. & Luginaah, I., 2019). We can thus observe that communities are not considered as part of the project. This argument can be supported through research made about the REDD+ program in Tanzania, where some communities refused to be part of the project - fearing to lose their land. The authors also underline a rise in conflictual discussions in-between community members due to some of them having to relocate themselves (Vatn, A., et al., 2017). As Kansanga M. M. and Luginaah I. (2019) mention, local food production should not be forsaken, and we can back this statement up with our previous section - highlighting the high reliance of these communities on farming practices for survival. Furthermore, the authors recommend the use of Community Forest Management to overcome REDD+ negative impacts. Only local communities have the capacity to lead sustainable forestry management that can be coupled with local livelihood activities - promoting food security and an assured direct benefit from carbon revenue.

Aligned with the previous study's point-of-view, Bond J. et al (2020) promote carbon forestry managed by local communities to not separate farmers from the resources they are dependent on. However, the authors highlight perverse effects arising in Community Forest Management (CFM) schemes such as the increase of inequalities and lack of inclusivity because of the way these programs are designed. Program design has to take into account intrinsic challenges relative to the area to ensure their non-perpetuation or even their non-acceleration. CFM should not discriminate against the poorest households due to the quantity of land they are entitled to use, or their access to funding to plant trees. Additionally, long term viability requires a sense of community and improved governance. This means land rights should be secure, the community should understand and work towards a long-term common objective, the poorer should be granted with the same decision-making positions and the whole community should have the opportunity to diversify income sources through community-fostering activities such as technical and good-governance skills improvement (Bond, J., et al., 2020).

Wittman H. and Caron C. (2015) show that conflict could arise if communities are not in the center of the program, and that the funding is solely used for carbon sequestration purposes. This study is based on a project located in Guatemala that incentivized agroforestry and reforestation both for poverty alleviation and the creation of carbon sinks. The project was successful until the aim shifted towards carbon sinks. Indeed, increasing carbon sequestration capacity requires planting more trees than sustainable land management practices need. Moreover, wealthier farmers had the capacity to plant more trees and became too important for the project as they enabled more carbon sequestration through their farms. This transformed the community-based agroforestry program in a land managed by only a few. Mustalahti I. and Rakotonarivo O. S. (2014), found out through research made within the REDD+ program in Tanzania that the most vulnerable groups (i.e., landless individuals, poorest households, women, elderly or disabled individuals) were underrepresented, especially in decision-making positions. Non-democratic election procedures are already promoting the wealthier groups to access positions of power. In addition, the authors observed that community members didn't receive enough discretionary power to be able to influence decision-makers. The paper concludes by stating that organizing meetings are not enough to represent vulnerable groups - who need to be allowed to influence the program implementation.

Building on the notion of justice and equality research tends to put forward, Fisher J. A. et al. (2017) highlight the concern of communities regarding redistribution schemes and their visible critique towards the underlying reasons of carbon forestry. Perceived as "green colonialism" some participants mentioned not being paid enough for a project that helps the entire world through the sacrifice of their land. These communities' reactions and views of justice have an impact on environmental project outcomes as well. Therefore, the authors emphasize the importance of correct and complete assessments of socioeconomic baselines before the beginning of the project to acknowledge populations' views and values about nature, life, and humanity. Additionally, the paper shows a lack of communities' understanding of the project rationale as most of their training is based on forest management, not on understanding the project and its goal (J.A. Fisher, et al., 2018). Research conducted in Tanzania about the REDD+ program supports this finding by stating that the descriptions community members would give about the program or the rules that it implies were "rather imprecise". The authors highlight the fact that most knowledge transfers were done orally (Vatn, A., et al., 2017). Mustalahti I. and Rakotonarivo O. S. (2014) highlight that villagers didn't know their rights and obligations - leading them to accept smaller amounts of compensation for the loss of their lands.

The previous articles highlight three main problematics. *First*, consistent, and reliable data doesn't seem to be available for researchers wanting to analyze A/R or IFM projects. This leads to costly data retrieval procedures that are not the same from one research to another - which inevitably favors short-term data retrieval, as long-term might require higher funds. Additionally, data issues induce non-causal measurements. These non-significant results are due to high risk of influence from external variables that cannot be dissociated to isolate the effect. Moreover, the complexity to perform Randomized Control Trials (RCTs) because of the difficulty to identify treated and controls tend to bias research outcomes. This is also linked to high reliance on national data panels. Furthermore, it has been shown that national data collection in "developing" countries, especially on the African continent, experience accuracy issues. Jerven Morten (2013) outlines the lack of transparency for both the sources and the methods of these datasets, in addition to the low resources statistical offices have, leading to low data reliability and validity. The author also particularly highlights the complications linked with crop productivity measures (Jerven, M., 2013). *Second*, data and measurement remain the only way to discover if a project correctly respects its claims. Kansanga M. M. and Luginaah I. (2019) demonstrate REDD+'s failure to act in accordance with its goal of improving Ghana's socioeconomic conditions through its program. While stating that reforestation programs will be beneficial for local communities sounds very appealing and true, the fact remains that this effect has to be measured to understand challenges and best practices. In line with that, research seems to highlight the intrinsic issues the project design in itself can carry. Discovering these systemic negative design patterns could help us draw and define what has to be measured to cease what Benjaminsen and Bryceson (2012) qualify as "green grabbing" - i.e., a capitalistic seizure of non-capitalist territories for production and return (Mosonsieyiri M. & Luginaah, I., 2019). Furthermore, third-party verification for social impact through thorough research and valid data should be mandatory given the inseparable nature of socioeconomic and environmental hurdles LIC are currently facing. *Lastly*, research is a valuable way to not reproduce the same mistakes and increase efficiency. The studies discussed previously pinpoint various elements that should be taken into account both to respect communities while truly improving their livelihoods, and to ensure a successful project in terms of climate action. Research outcomes seem thus relevant for next-in-line project developers that would prefer not to fall into pitfalls that could be avoided through knowledge.

These observations - in parallel to the lack of studies based on projects lying on the VCM - stresses the question of what type of data project developers have to submit to standard bodies to be certified. As aforementioned, standard bodies require that specific conditions are met to validate a project.

The same applies for the amount of carbon credits a project can sell, as a third-party validator will proceed with a yearly assessment of the number of credits generated to verify that this number has not changed compared to the intended amount. Nevertheless, the socioeconomic question remains as we have not yet outlined the required data and actions a project has to deliver for its social impact.

3. Needs of Rural Communities in Low- and Lower-Middle-Income Countries

Our previous sections outlined the relevancy of our area of focus, the main issues about current measurements of socioeconomic impacts and their implications. Before defining what ought to be measured, it is important to take a step back and design a holistic overview of what rural communities in Low- and Lower-Middle-Income countries (LICs and LMICs) need. This section will provide a simple rundown of the current challenges these communities encounter and translate them into specific needs. We acknowledge that every country is a particular case in itself, with an initial set of characteristics and a specific history, inevitably bringing up intrinsic differences compared to other countries. Despite the complexity of a country-by-country analysis, we observe a strong connection between the needs of all countries. These needs can ultimately be mapped into a set of systemic issues that increases the effect of just the sum of its parts. Addressing the challenges systematically might provide larger effects. This linkage will easily be grasped through the subsequent roll-out of the various challenges.

The first need we identify is for households to have access to *higher income*. More specifically, the need for *diversification of income sources* to assure consistent earnings. As our paper already mentioned, most of the rural communities in LICs and LMICs are farmers that rely on their yields for subsistence and income generation. Diversifying income sources would be a means for farmers towards being more resistant to shocks. Punctual events, such as droughts or heavy rainfalls, can hamper a whole harvest and being solely dependent on crop yields undeniably leads to lower resilience capacity. Thorlakson T. and Neufeldt H. (2012) state that the probability of extreme weather events is on the rise due to climate change and that it will negatively impact agricultural productivity by 10 to 20% in LICs during the next 40 years. The authors highlight that income diversification was the most effective path towards reduced vulnerability of farmers. However, this situation persists as other economic opportunities are relatively scarce or even non-existent. This also explains the lack of employment opportunities faced by landless community members.

Seasonal food shortages mainly concern farmers, i.e., one of the most privileged segments within the communities as they are able to use their harvest for subsistence. The International Monetary Fund (IMF) states that the poorest among these communities are the ones that don't have access to land, which aggravates food security (Hasan Khan, M., 2000). An interview conducted by Thorlakson T. and Neufeldt H. (2012) in Western Kenya recorded a farmer stating that “there is just no way to earn an income here... No one has money to buy anything from anyone else”.

In some communities, possession of land grants the right to access services or other items - segregating the landless (Miller, C., et al., 2019). The IMF demonstrates how the former challenge is correlated with the need of *building assets*. Indeed, cropland, combined with few livestock and raw labor are most of the assets the rural communities in LICs and LMICs have access to. This inevitably creates a vicious circle in which members are trapped - no other assets can be created through the community due to a lack of means to do so, while the community would need other assets to overcome poverty (Hasan Khan, M., 2000).

Elaborating on the previous statement, we can highlight the importance of *infrastructure* to create more assets. The latter, currently relatively insufficient in LICs and LMICs' rural areas, is needed to generate employment and better economic conditions in addition to providing solutions to cover basic needs (Hasan Khan, M., 2000). For instance, constructing a hospital would create jobs both to construct it and to manage it, while permitting an increased access to healthcare for community members. The same applies regarding access to roads and transport. Besides generating jobs to build roads and managing public transport, it would enable farmers to reach cities. Current limited access to practicable roads hinders their possibilities to reach the market to trade their harvests. Farmers reach cities by traveling by their own means - which often requires them to set up camps along the way - or by very costly transportation - which would eat up all the gains that would possibly have been made through trade (Skandarski, M., 2016). Usable roads and suitable transportation methods are thus essential for income generation. We underline education or access to training as an important vector to foster jobs and empower community members. For instance, training would enable farmers to gain better knowledge - enhancing their bargaining power when selling their harvests. Moreover, they would learn about techniques that could be used to leverage remaining capacity in extreme weather periods (Miller, C., et al., 2019). Thorlakson T. and Neufeldt H. (2012) highlight farmers' will to be independent when choosing these techniques, as some of them mentioned being badly advised by external actors that don't know what is best for their land and their own food security.

Lastly, access to more tangible types of infrastructure - such as clear water and irrigation or modern farming machinery - would increase land productivity during the productive months. This rise in production could generate jobs while improving food security. Building on this matter, LICs encounter a critical need for *an increase in land productivity* due to current demographic trends. Inadequate material, coupled with unsustainable techniques and extreme weather events, thus far reduce overall soil quality. Already lying in a “tragedy of the commons” situation, demographic pressure forces farmers to use up their land until soil erosion - drastically reducing set-aside time (Skandarski, M., 2016; Ding, H., et al., 2017).

Soil erosion is also triggered through other ineffective practices - such as the farmer’s obligation for constant land-use to keep access to the parcel. Some communities’ land tenure systems are so fragile and uncertain that expropriation is a continuous threat for those that don’t make a “proper” use of the land (Gottlieb C., 2023). Property rights are defined depending on the country and the community. Some communities, mostly located in African countries, have communal land ownerships - meaning that allocation of resources is decided through community votes or through the village’s chief’s decision. This can lead to unproductive allocation of the workforce. *Fair and enforceable tenancy contracts* are needed to ensure better efficiency (Hasan Khan, M., 2000). In addition, this system promotes unfair land distribution, marginalizing vulnerable groups such as women, who are often not granted access to any land. Vulnerable groups are thus left with very few options to generate income. As aforementioned, job opportunities are scarce, and this is more acute for women and other vulnerable groups that have less access to the small pool of jobs seasonally available, such as helping farmers in the fields in periods of great harvests (Skandarski, M., 2016). Leaving the power in the hands of only a few, the rural poor are at the mercy of the people of power - being their only way to earn income (Hasan Khan, M., 2000). This dependency and centralization of power amplifies opportunistic behaviors and corrupt practices, underlining the need for *better governance* (Miller, C., et al., 2019). In this sense, the IMF mentions the necessity for all stakeholders of a community to be in the center of the design and implementation of any program targeting them (Hasan Khan, M., 2000). This links perfectly with the findings we highlighted in our previous sections. Community Forest Management practices, when not designed in an inclusive manner, are doomed to promote a rise in inequalities and other perverse effects (Bond, J., et al., 2020).

Linked with soil quality and income diversification, rural communities also need to be assured of *continued access to natural resources*. Natural resources, such as forests, are a considerable source of income and livelihood (Ding, H., et al., 2017).

Access to timber and non-timber forest products enable community members to have other sources of income, while also using these products for their own consumption - making them highly dependent on these resources. Miller D. C. et al (2020) show how a diverse range of trees can improve soil quality whilst offering various types of non-timber products such as coffee, cacao, or other fruits - highlighting their contribution in making communities less vulnerable to shocks. Thorlakson T. and Neufeldt H. (2012) encourage this statement by mentioning how timber forest products can also be sold in extreme weather periods. As we said, these products can also be used by households directly.

For instance, greater access to wood fuel would benefit women by reducing the hours dedicated to cooking, that can be invested in education or in remunerated activities, and consumption of non-wood forest products allows for greater dietary diversity for the household. It is important to note the complexities within each country that were not possible to include here. Nonetheless, this section provides us better clarity on the current needs having to be addressed in rural communities located in LICs, understanding of the challenges these communities experience. We mentioned hindered resilience due to low-income diversification as well as limited infrastructure - both respectively the consequence and the cause of scarce economic opportunities. Unequal land distribution and constrained access to fair tenancy agreements also hampers most vulnerable groups - increasing inequalities and systemic poverty. Mainly, their high reliance on farming, which needs to increase crop productivity due to demographic pressure, while being held back by poor soil quality due to unsustainable practices, such as deforestation. Unsustainable practices inevitably obstruct their access to natural resources, which are essential for their livelihoods, and give community members the opportunity to diversify their income sources.

4. Conclusion

Our literature review sheds light on the scarcity of research conducted on socioeconomic impacts of A/R projects lying on the VCM, mainly due to poor data quality and access. This section also supported the importance of measuring these impacts accurately and consistently, given the intrinsic relationship rural communities in LICs and LMICs have with the natural resources around them. On this point, it is undeniable that local communities will be and have been affected by A/R projects - introduced in a situation where they seem to interfere with a set of systemic challenges facing these rural actors. After discussing the VCM and its functioning, we highlighted the main trends currently shaping this market - i.e., a rising concern regarding integrity issues inevitably affecting its availability for scale.

We then discovered a growth in the quantity of A/R projects, especially through REDD+, which motivated us to understand both the causes for this increase in projects and the consequences it might induce. Recent research shows the considerable responsibility of deforestation in global anthropogenic CO₂ emissions. Altering its occurrence seems to be a valid means for climate change mitigation. A large majority of these projects are located in LICs and LMICs as they regroup most forest-based carbon sinks. Socioeconomic issues in these areas draw considerable pressure on these sinks - mainly through cropland expansion due to high reliance on agriculture. More than half of the local populations are smallholder farmers located in rural areas, being directly impacted by any change occurring within forests.

A relevant question would be, *how* are these local communities impacted? Building on the notion of distrust in the market we initially observed, we mentioned the limited characteristic of current research available on this matter. We stated that studies examining socioeconomic impacts of NbS projects are more prevalent when the communities are the main driving force for the project - such as for IFM. Projects such as A/R consider local communities as internal, however do not design objectives around them. Our main observation is linked with the latter, as we identified the lack of consistent and reliable data available for research, an unreached consensus on the indicators used to assess effects, as well as relatively short time frames used by researchers for measurements. These all lead to biased and inconclusive results, generating roadblocks to gain knowledge and possibly verify if a project effectively aligns with its claims. The few research conducted still extracted valuable information on socioeconomic impacts of A/R projects. Studies indicate inclusivity hurdles, lack of social cohesion due to poor understanding of the project rationale, the unresilient feature of PES, as well as the importance of good governance and secure land tenure systems. We also presented how projects could undermine their own outcomes because of the conflict they created - acting as channels amplifying issues that were already present within communities. This led us to dive deeper into the current socioeconomic conditions rural communities in LICs and LMICs are living by. We thus outlined an interconnected roll out of challenges having to be considered to develop accurate project designs and measure real socioeconomic effects of A/R projects - such as the need for income diversification, infrastructure and increase in crop productivity. This paper focuses on outlining a proposal for an improved methodology to measure socioeconomic impacts of nature-based carbon offsets, and more specifically, reforestation projects. In that sense, the insights the literature review provided will guide our analysis to derive the indicators that will have to be measured to assess these impacts - allowing us to answer our research question in fine.

PART 2: Empirical Framework

IV. Origin and Purpose of the Study

1. Definition of the Research Question

The path taken throughout our preliminary research led us to define our research question as ***"How to measure the socioeconomic impacts of nature-based carbon offsets? Analysis of current methodologies applied for the validation of reforestation projects and proposal for improvement"***. This research question entails us to have a deep understanding of the status quo, as it stems from a crucial finding of our literature review. As aforementioned, we identified the limited quality and accessibility of data inducing the existence of a gap in the proper assessment of the socioeconomic impacts of A/R projects within the VCM. Combined with this, we noticed and shed light on the importance of accurate and consistent measurement of these impacts, particularly given the deep relationship that rural communities in LICs have with their natural resources. Local communities are undeniably directly affected by A/R projects, introduced in the context of the systemic challenges they face. This paper therefore aims to analyze the current methodologies for validating A/R projects and to propose innovative improvements, thereby contributing to a more equitable and verifiable approach to climate change mitigation measures.

Our literature review indicated the fast growth pace of the VCM during recent years, revealing substantial changes in a yet unregulated and unstandardized market. This environment fostered the apparition of a great number of institutions and other actors that sought to develop rules to organize the market. These guidelines intend to build trust and support its growing trend. Aligned with this, we noticed the current integrity issue existing on the VCM. The lack of standardization and transparency hampers the will of buyers to commit to their intended purchase of credits. Although some institutions defined rules to follow for high integrity carbon credits (as the CCPs for instance), our preliminary research revealed persistent issues halting the potential growth of the VCM. This integrity issue led us to review the holistic integrity of projects, outside of carbon impacts solely. We noticed opacity regarding the socioeconomic impacts of projects that do not have a direct social focus. Previous research outlined the scarcity of knowledge about the extent to which these projects are affecting the communities, and this observation is more present for carbon offsets that do not have society at their core.

Therefore, and because of their recent increase in number, we decided to narrow our research scope to A/R projects. These projects intend to protect forest coverage, and do not have direct goals linked with local communities involved. Additionally, recent studies on socioeconomic impacts of A/R projects reveal an important lack of data access, validity, and reliability. The latter induce several issues, such as non-causal results due to the inability to isolate the effect from other external variables, the high reliance to national data that present accuracy problems, as well as the complexity to verify if projects respect their claims.

Upon further investigation based on public information and six interviews, we noted the substantial opacity of the topic and the gap in place between what is measured for tracking the carbon component and tracking socioeconomic effects that the project generates. Correspondingly, this gap motivated us to dive deeper into the methodologies used on the market for project validation. As current project validators are standard bodies, we decided to analyze the current assessment methods used by these entities for socioeconomic impacts. We then encountered a concerning level of inconsistency within the various reports made available by standards. This inconsistency left us with no other solution than to focus on PDDs only and to divide our analysis by standard. Indeed, while standardization is intended to foster trust, the level of implementation seems to fall short in practice.

During our interviews, we observed a considerable disparity between the well-established tracking mechanisms for carbon and the relatively underdeveloped frameworks used to monitor socioeconomic impacts. This disparity raised questions about the overall integrity of these projects, compelling us to extend our focus beyond carbon impact alone and consider a broader perspective. We believe that the same way the market focused on building frameworks to ensure correct computation of avoided and reduced CO₂ emissions, proper frameworks could be developed to guarantee good consideration of socioeconomic effects.

Given that main A/R project locations are in LICs and LMICs, we ensured to meticulously understand socioeconomic challenges specific to these areas. We understood that local contexts differ highly from what we know within the Global North, and that assessment methods should mirror these differences. Similarly, we noticed A/R project-specific challenges that induced the necessity for project-specific measures. Subsistence farming is the main activity of local rural communities. The inherent nature of reforestation in such regions entails a reduction in crop areas, prompting us to explore the transitional processes and implications for the socioeconomic status of these communities. In this sense, some observed assessment methodologies could be labeled as irrelevant.

In conclusion, our research has revealed multifaceted aspects that extend beyond the conventional scope of carbon impact analysis in reforestation projects. The identified gaps in tracking mechanisms, integrity issues, inconsistencies in reporting, and the specificities of rural communities all point towards the pressing need to explore and develop frameworks that encompass comprehensive and reliable assessments of socioeconomic impacts. By addressing these dimensions, we can foster a more inclusive and trustworthy approach to evaluating the true effectiveness and sustainability of A/R initiatives.

2. Characteristics of the Study and Area of Focus

Our literature review guided our research efforts towards focusing solely on A/R projects given their recent substantial increase in number. These projects predominantly occur in regions located in LICs and LMICs - countries that possess the majority of forest coverage whilst simultaneously experiencing the largest increase in forest loss, mainly due to the expansion of land cultivated for subsistence farming. After narrowing down our scope to A/R projects located in LICs and LMICs, we limited our analysis to currently active projects (i.e., projects that are now in their crediting period, therefore issuing carbon credits on the VCM). This decision has been taken for relevancy. We subsequently limited our study to three standards, Gold Standard, Verra and Plan Vivo. The two formers represent more than 80% of the market share of carbon credits issued on the VCM. Plan Vivo, although smaller, has a slightly different structure, which we have deemed relevant for our study. The standard exclusively rates land-use projects and seeks to empower small local landowners by giving them increased access to the VCM. In terms of documentation, we reviewed PDDs of selected projects. We chose to direct our focus solely towards PDDs for both consistency and due to their influence on project validation processes. Furthermore, they include in-depth explanation of the project, inducing that all relevant information would figure in these documents.

V. Methodology

This section explains the methodology used to arrive at a potential proposal for improving the measurement of socioeconomic impacts in A/R carbon offsets. To this end, first, we analyze the current assessment methodologies used by standards to validate and verify projects. For the purpose of this research, we solely focus on the *social aspects* of the requirements a project must meet to issue certified carbon credits, i.e., socioeconomic indicators. Our portfolio of standards includes Verra, Gold Standard and Plan Vivo, with the first two being the largest carbon certifiers present on the market, whilst the latter has a slightly different business model and focuses only on land-use and forestry projects. Altogether, these carbon certifiers represent 89% of the credit issuers on the VCM.

After analyzing the current assessment methodologies, we focus on *selecting distinct cases within each standard*. This allows for greater visibility on how these methodologies are applied in practice. From our literature review, we expect socioeconomic challenges to vary largely depending on the project and country. Similarly, methodologies used by the different standards vary significantly, requiring different measurements in terms of socioeconomic impacts for projects to be validated. Given the complexity of retrieving valuable information without field trips, we decided to dive deeper into each project proposal and development plan.

This empirical approach will de facto bring greater validity to our study, ultimately reinforcing our proposal. In addition, Crowe S. et al. (2011) mention the use of cases for exploratory purposes - usually answering to the questions “how”, “what” and “why” (Crowe, S., et al., 2011). This backs up our methodology choice as our case analysis will outline *how* current evaluation methods are currently measuring social impacts, and *why* a new methodology is ought to be used. Moreover, the case comparison illuminates to *what* degree measurement of socioeconomic impacts in A/R projects can be standardized throughout projects and countries, as well as *which* indicators have to be measured - which encompasses a critical part of our research.

1. Data Collection

As John W. Creswell (2008) mentioned in his book, the qualitative research approach involves the deliberate identification of specific sites, documents, visual material, or individuals for the intended study. Unlike the quantitative research approach, the qualitative approach does not rely on random sampling or does not require a large number of participants.

Instead, the focus is on strategic selection to ensure a deeper understanding of the topic. Therefore, the data for this study is predominantly qualitative in nature and has been gathered using three sources. The first source is related to the preliminary overview of the topic. We conducted several interviews to define the initial scope of our study. The interviews brought us valuable insights, although they were not precise enough to rely entirely on them for this paper. The interviews shed light on the opacity of socioeconomic impacts of carbon offsets. From this first attempt to obtain information, we noted the sensitive nature of the topic by the relevant stakeholders. We contacted several companies and project developers for interviews. While some answered and shared their observations and insights with us, most interviewees required signing a confidential agreement and limiting the public display of this paper before providing additional information. Along with our supervisor, we deemed this as not negotiable since the goal of the thesis is to increase the awareness and improve methodologies in this area.

Overall, our interview questions aimed at grasping a clearer view of current certification processes, while understanding the particularities that are more complicated to comprehend relying on document analysis only. We used semi-structured methods for both rounds. The first round consisted of five interviews. Even if some were not used directly in our analysis, all of them allowed us to move forward with our study in a more precise manner. The list of interviewees is included in Table 6. while the complete set of interviews can be found in Appendices 10 to 13.

Table 6 - List of interviewees from our first interview round

Interviewee	Company	Role
George K. Tarus	Abatable, Plan Vivo, Verra	Member of the Advisory Board
Torrey Sanseverino	BeZero Carbon	Natural Capital Research Manager
Brian Oronoz	Plan Vivo	Carbon Markets Coordinator
Leonardo Santiago	Pachama	Carbon Project Success Manager LATAM
Victor Costenoble	CO2Logic	Climate Projects Advisor

The second source of information is related to field trips and on-field experiences. As mentioned earlier, field trips and on-field experiences are critical to understand the complexity of these projects. Given limitations such as constraints of time, budget, and other logistics challenges, it was not feasible to conduct a field trip for the purpose of this research.

Therefore, we decided to conduct an interview with Olivier Mushiete, a project developer and close friend of our supervisor, to share the on-field experience. Olivier Mushiete is, with his brother Thierry Mushiete, the project developer of an A/R carbon offset currently active in Democratic Republic of Congo - the Ibi Batéké Village. The purpose was to collect information but also to discuss the real on-field challenges. The set of questions was sent to our interviewee before the meeting. The interview transcript is available in Appendix 16.

The third and main source of information is a database of projects and their requested socioeconomic indicators. We constructed the database using information from the Project Design Documents (PDDs) of the chosen projects for each standard. The PDDs are publicly available, but to the best of our knowledge, no database exists that consolidates all the information and summarizes the indicators under use. These documents are found in each of the carbon standard registries. We decided to focus on PDDs as these documents include all the information about projects, while providing a similar format and structure within each standard.

2. Structure of the Analysis

As previously mentioned, we analyze the current assessment methodologies used by three standards - Gold Standard, Verra and Plan Vivo - to understand the status quo and establish a clear picture on the information made available by these entities. To analyze the current assessment methodologies, we dive deeper into the requirements and guidelines publicly available to verify projects. Then, we provide a richer context around the specificities of A/R carbon offsetting projects located in LICs with the help of our interview with the project developer of the Ibi Batéké Village. We describe the project and the particularities the region faces to set up the specific requirements regarding socioeconomic impact and the complexity that comes with it. Our last step encompasses the comparison of distinct cases for each standard we analyzed in step one (i.e., Gold Standard, Verra, and Plan Vivo). The analysis of cases and their cross-comparison will enable us to understand how requirements outlined in step one are put into practice by validated projects.

3. Case Selection

We select cases for each standard to understand how project validation methodologies are applied in practice. Cases weren't picked at random. We used a specific selection method based on the fixed criteria listed below.

- (a) *The cases are A/R projects (reforestation, afforestation, REDD+);*
- (b) *The projects are active - i.e., currently selling carbon credits on the VCM;*
- (c) *The projects are located in LICs or LMICs²⁰;*
- (d) *Selected projects involve and impact local communities directly or indirectly.*

After narrowing down the scope with this preliminary list, we had to fix further criteria per standard given their intrinsic differences.

For Gold Standard, we focus on projects that advocate socially-oriented SDGs, mainly SDG 1 to 11. We do not include in the database projects that focus *only* on environmental indicators since the goal of this research is to investigate social impact indicators and methodologies. Focusing on socially-oriented projects allows us to observe the indicators used by projects championing positive social impacts. Our final scope includes four different projects.

Table 7 - Gold Standard projects analyzed

Project	Description	Social SDGs
ACROSS FOREST AS, <i>Nicaragua</i>	A/R; managed plantations of teak trees on land used for cattle grazing	SDG 4, 8
WithOneSeed Community Forestry Program, <i>Timor-Leste</i>	A/R; community-based forestry program with subsistence farmers	SDG 2
Humbo Ethiopia Assisted Natural Regeneration Project, <i>Ethiopia</i>	A/R; restoration of indigenous tree species in mountainous degraded land	SDG 5, 8
JOil Jatropha plantation, <i>Ghana</i>	A/R; plantation activity in shrubland and bare lands	SDG 8

Source: see PDDs referenced in bibliography, distinct section

²⁰ We first focused on LICs solely, to then discover the relatively restricted case portfolio it gave us access to. Therefore, we chose to include LMICs to our analysis, given the only minimal differences compared to LICs.

For Verra, we divided our case selection according to the three different programs established by the standard²¹.

1. Projects lying in the CCB program have to be currently issuing CCB rated VCUs.

Table 8 - CCB projects analyzed

Project	Description	Social SDGs
Seima Protection Forest REDD+, <i>Cambodia</i>	REDD+; Forest conservation and restoration	Not applicable
Laguna Seca Forest Carbon Project, <i>Belize</i>	A/R; Avoided planned deforestation due to sugarcane culture	Not applicable
Chyulu Hills REDD+, <i>Kenya</i>	REDD+; deforestation and forest degradation halt, grassland conversion	Not applicable

Source: see PDDs referenced in bibliography, distinct section

2. Projects lying in the SD VISTA program have to be currently issuing SD VISTA rated VCUs.

Table 9 - SD VISTA projects analyzed

Project	Description	Social SDGs
Southern Cardamom REDD+, <i>Cambodia</i>	REDD+; Deforestation mitigation, forest conservation	SDG 1, 2, 3, 4, 5, 6, 8, 9, 10, 11

Source: see PDDs referenced in bibliography, distinct section

3. Projects lying in the VCS program are not currently holding any other certification (i.e., SD VISTA and CCB).

Table 10 - VCS projects analyzed

Project	Description	Social SDGs
Agroforestry Batéké Plateau, <i>DRC</i>	A/R; reforestation and alternative source of charcoal for local use	Not applicable
Reforestation of Degraded Forest Reserves, <i>Ghana</i>	A/R; Reforestation and revegetation, halting illegal farming activities	Not applicable
Reforestation of Degraded Land by MTPL, <i>India</i>	A/R; reforestation of degraded land	Not applicable
Afforestation in Eucalyptus and Acacia plantations for Burapha Agroforestry Co., Ltd., <i>Laos</i>	A/R; afforestation and agroforestry on agricultural land crops (rice)	Not applicable

²¹ While they created five different programs, only three encompass A/R projects.

Reforestation and Restoration of degraded mangrove lands, sustainable livelihood and community development, <i>Myanmar</i>	A/R; Mangrove restoration	Not applicable
EcoPlanet Bamboo Central America, <i>Nicaragua</i>	A/R; reforestation and regeneration of degraded pastureland	Not applicable
Reforestation of Degraded Lands, <i>Sierra Leone</i>	A/R; reforestation	Not applicable
Bukaleba Forest Project, <i>Uganda</i>	A/R; indigenous reforestation	Not applicable

Source: see PDDs referenced in bibliography, distinct section

All projects listed on Plan Vivo's website are currently active and issuing carbon credits. We filtered projects to focus solely on A/R and REDD interventions - ending up with thirteen different projects listed hereafter.

Table 11 - Plan Vivo projects analyzed

Project	Description	Social SDG
CommuniTree Carbon Program, <i>Nicaragua</i>	A/R; reforestation and restoration, reduction of deforestation drivers	Not applicable
Rehabilitation and sustainable management by REACH Italia of degraded pastures in the Sahel region, <i>Burkina Faso</i>	A/R; restoration of degraded pastureland, promotion of land-use management practices	Not applicable
EthioTrees, <i>Ethiopia</i>	A/R; community-led woodland restoration	Not applicable
Khasi Hills Community REDD+ Project, <i>India</i>	REDD+; avoided deforestation and improved forest management	Not applicable
Gula Gula Food Forest Program, <i>Indonesia</i>	A/R; degraded forest restoration for agriculturally valuable land	Not applicable
Mikoko Pamoja Project, <i>Kenya</i>	A/R; avoided deforestation and forest degradation, reforestation	Not applicable
Tahiry Honko Project, <i>Madagascar</i>	A/R; mangrove restoration and conservation	Not applicable
Hiniduma Biolink Project, <i>Sri Lanka</i>	A/R; reforestation and participatory agroforestry practices	Not applicable
Emiti Nibwo Bulora Project, <i>Tanzania</i>	A/R; improved land management through reforestation and agroforestry adoption	Not applicable

Halo Verde Timor Community Forest Carbon, <i>Timor-Leste</i>	A/R; community-led reforestation and improved land management	Not applicable
Trees for Global Benefits, <i>Uganda</i>	A/R; improved forest management, reforestation, and conservation	Not applicable
Loru Forest Project, <i>Vanuatu</i>	A/R; avoided deforestation and forest restoration	Not applicable
Hieu Commune Plan Vivo Project, <i>Vietnam</i>	A/R; afforestation, land conservation and land use management improvement	Not applicable

Source: see PDDs referenced in bibliography, distinct section

4. Proposal

The extended knowledge acquired through interviews and meticulous document analysis (including PDDs) - coupled with our previous findings in the literature review - will serve as a solid foundation and help us design an improved methodology to effectively measure socioeconomic impacts of A/R projects within the VCM. Information retrieved from our analysis will serve as essential guidelines for us to design this updated methodology. By critically examining the use of socioeconomic indicators and comparing their characteristics based on specific criteria, this paper will derive a convincing proposal to encompass a set of indicators to ensure an accurate and comprehensive assessment of projects' socioeconomic impacts. With this goal, we intend to encourage a more inclusive and equitable approach to nature-based carbon offsets projects that truly benefit the livelihoods of local communities in LICs.

VI. Analysis

1. Current Assessment Methods for Project Validation

To the best of our knowledge, no standardized baseline studies are conducted in terms of social indicators. This complicates the measurement of socioeconomic changes created by a specific project over time. Notwithstanding these inconsistencies, established standards have shaped specific social requirements that project proponents have to bow to get certified. This section presents a walkthrough of the current assessment methods used by three different standards to validate and verify projects generating carbon credits on the VCM. We will solely direct our focus towards requirements that include social aspects. An example of a complete certification process is available in Appendix 10 – outlining Gold Standard’s validation requirements.

Overall, social considerations are integrated within projects through stakeholder consultations conducted by project developers after carefully identifying and mapping all relevant stakeholders within and surrounding the project area. These public participation processes have to cover multiple topics with the underlying aim of reaching an agreement with all direct and indirect stakeholders. In addition to this procedure, fundamental concepts must be defined and communicated to include a conflict resolution process, methodologies used to foster awareness and recognition, as well as all the possible impacts the project shall have on the community - would they be positive or negative - and how they will be handled (Tarus G. K., 2023). Table 12 presents an overview of the current methodologies and specificities of three standards - Gold Standard, Verra and Plan Vivo. As aforementioned, while inconsistent, the concepts underlying these methodologies remain the same. The use of a comparative lens enables us to support this claim.

a. Table of Results

Table 12 - Current assessment methodologies used by Gold Standard, Verra and Plan Vivo for socioeconomic impacts of a project

	Gold Standard
Introduction Source: Ministère de la Transition Écologique, (2022).	Sector - Energy/Industry - Waste - Land use, land-use change, and forestry

	Actors Buyers and sellers are from all over the world. Projects in Asia (65%), Africa (25%), Latin America (9%) and Europe (1%). Name of carbon credits VERs (verified emission reductions)
Certification Mechanism	
Required baseline(s)	The Project Developer has to deliver the outline of what are called Baseline and Project Scenarios; referring to what would occur without and with the project, respectively. However, these baselines do not cover indicators related to local stakeholders. Regarding the latter, the project developer shall solely identify relevant stakeholders in order to engage with them along the project (Gold Standard, 2019).
Stakeholder consultation	As mentioned above, the Project Developer is responsible for identifying and extending invitations to all pertinent stakeholders (including local individuals, those affected, and those with an interest) for two rounds of consultations. These aim to discuss potential positive and negative impacts (risks) of the project and receive opinions. The first one is a physical meeting where all relevant stakeholders should be present or represented at least, whilst the second is a two-month long feedback gathering process with no obligations for anyone to attend the various meetings occurring. Additionally, the project developer has to define ongoing communication mechanisms, as well as a grievance mechanism. Gold Standard also requires being mindful of gender issues (Gold Standard, 2022). All issues raised by relevant stakeholders should be taken into account and require an explicit outline of how it will be done.
Social criteria to respect	Gold Standard uses an underlying rationale, expressed in principles that have to be respected by all projects. Projects are required to perform an assessment of these principles by answering a set of questions (see pages 41 to 61 in Gold Standard, 2023c). Each principle is linked to a specific target outcome; therefore, the project has to outline how it will meet these requirements, alongside identifying the potential risks or adverse effects that could be created through the project. If a risk is identified, the project shall be redesigned in accordance. Narrowing down these principles to social impacts, we can find (Gold Standard, 2023c): - Respect of Human Rights; - Promotion of gender equality and women's rights; - Insurance of community, health, safety and working conditions; - Protection of cultural heritage; - Respect of indigenous communities; - Avoidance of displacement and resettlement; - Respect for land tenure rights.

Monitoring and reporting	Gold Standard requires Project Developers to design a Monitoring system that will be applied on a yearly basis. Within the system, parameters to compute GHG retirement or avoidance levels have to be defined, in addition to the source of the data, and the measurement type used. The project also has to reassess its performance based on social safeguards, updating the values introduced during certification (i.e., answers to the set of questions previously mentioned). Finally, the project must communicate all comments or other inputs received by local stakeholders and how they were managed (i.e., disputes or other comments). This Monitoring Report has to be sent yearly. Every five year-cycle, this report has to be submitted through a VVB to ensure validity. The baseline scenario has to be reviewed at the end of each cycle (Gold Standard, 2020).
Specificities/ Other	In parallel to what we already described; Gold Standard requires projects to have a minimum impact on two other SDGs in addition to SDG 13 - Climate Action. The project must provide consistent evidence of tangible and beneficial effects on these SDGs. The verification of these impacts is done through the Monitoring report discussed earlier. The project must choose indicators to measure its impact for each targeted SDG. The value computed for each indicator will be compared to the baseline value (i.e., value before the project). Indicators can be chosen through (Gold Standard, 2019): - The list outlined by the United Nations in the Global Indicator Framework for the SDGs, that can be found in Appendix 11; - The Gold Standard SDG Impact Tool, an excel tool regrouping various indicators for the different SDGs, depending on project type. This can be found in Appendix 12; - Any other methodology pre-approved by Gold Standard.

	Verra
Introduction Source: Ministère de la Transition Écologique, (2022).	Sector - Energy - Forestry and land-use - Agriculture - Waste management - Industrial processes and product use - Construction & transport Actors Companies and local authorities are eligible to be funders, while individuals are not allowed to contribute funds. However, project sponsors face no limitations on their status.

	Name of carbon credits VCUs (verified carbon units) through the VCS program.
Certification Mechanism	
Required baseline(s)	The required baseline scenario includes values and assumptions that are GHG-related solely. The project developer is thus not required to hand-in baselines indicators regarding local communities. If a reforestation project impacts local stakeholders, it is required to: - identify and outline the backgrounds of all local stakeholders; - outline all potential risks to local stakeholders' well-being; - describe the economic and cultural differences entrenched in each group, and how their interactions differ; - identify stakeholders' resources to recognize and respect property rights and other resources local stakeholders rely on; - state the current location of local stakeholders outside of the project delimitation; - identify the location of any other resources communities have access to, or own themselves; - highlight the <i>expected</i> changes, as well as the <i>observed</i> changes that have been identified/noticed regarding any of the latter. (Verra, 2023a).
Stakeholder consultation	A local stakeholder consultation must happen to maximize stakeholder engagement for which: - ongoing communication mechanisms should be defined; - the project design shall be updated if stakeholders raise possible issues or negative impacts, or prove the issue to be irrelevant; - grievance mechanisms should be defined. This consultation needs to show that local stakeholders delivered consent. This consent has to be prior project implementation, free and well-informed (Verra, 2023a).
Social criteria to respect	The overarching concept used by the standard forbids project activities to generate negative effects on the local communities. If negative impacts are identified, measures must be taken to mitigate them. This refers to Verra's "No Net Harm" principle. The latter implies a constant communication with local communities, including them in the conversation towards mitigation. This principle requires project developers to recognize and communicate, within every monitoring report, the risks that might impact the local communities' well-being. Specifically, AFOLU projects (A/R, IFM, land management, wetland conservation, grassland and shrubland conservation) need to identify risks that would induce any trade-offs in food security, land loss, yield loss or climate change resilience.

	Entities involved must not be involved in any forms of harassment and shall have past experience managing A/R projects with community involvement. Lastly, the project must respect local property rights - securing them if possible - and reduce any possible negative impact on resources necessary for local communities' livelihoods (see page 10 in Verra, (2023d)) (Verra, 2023a).
Monitoring and reporting	Verra's methodology requires projects to develop a GHG assessment system. The project must identify relevant parameters to quantify and report its GHG removals/ avoidances, communicate the people in charge of measurement and the equipment used. Regarding social matters, the monitoring report must contain updates regarding the "No-Net-Harm" principle aforementioned. Projects also have to mention local stakeholder communication mechanisms in use, describing: - methods to effectively engage local stakeholders; - methods to show outcomes to local stakeholders; - the on-going communication method; - any comment received and how it was managed. AFOLU (Agriculture, Forestry and Other Land Use) projects must answer an additional segment in the monitoring report. This includes showing how communication related to the results of the project, changes to risks to local communities, changes to working rights in the host country or the process of Verra's certification program. Moreover, projects shall: - explain which activities were used to mitigate risks towards locals; - state all updates regarding property rights, showing no negative effects without consent, and compensation if consent has been given; - outline all communication processes used, conflicts and how they were handled (Verra, 2023d). As with Gold Standard, Verra requires project developers to highlight their contribution towards at least three SDGs for every monitoring period. The SDGs' impacts have to be measured according to the UN Global Indicator Framework for SDGs (metadata repository), and the indicators figuring in the United Nations' Global Indicator Framework for SDGs can be found in Appendix 11. Project developers have to state their net impact on the indicator, and explain the effective action taken to obtain the stated result (Verra, 2023a).

Specificities/ Other	<u>CCB</u> This program is specific to land management projects, it provides a CCB “stamp” to projects that want to emphasize their impacts on Climate, Communities and Biodiversity. <i>Requirements (see pages 21 to 23 in Verra, (2023f)):</i> (1) a “without project community scenario”, describing the community at start of the project as well as the expected changes in well-being conditions; (2) a “net positive community impact” for each community group - i.e., impacts identified during project design, as well as unplanned impacts; (3) “other stakeholder impacts” identification, which are linked to the “no net harm” principle (4) a “community impact monitoring” requiring data and explanation of methods used, for sampling, frequency, etc. To define relevant indicators, it is suggested to use the Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects (see pages 42 to 47 in Richards, M. & Panfil, S.N., 2011); (5) (optional), a “exceptional community benefits” section for impact on vulnerable groups, outlining benefit sharing mechanisms, or governance structures (Verra, 2017). <u>SD VISta</u> Program that certifies projects providing sustainable development benefits. Allows them to have a SD VISta label. In addition, the project can claim and issue “SD VISta Assets” (working as VCUs) for the environmental or social benefits accomplished (Verra, 2023c; Verra, 2019). <i>Requirements (see pages 9 to 11 in Verra, (2023e)):</i> (1) a stakeholder consultation as for the VCS program (2) an outline of the impacts on stakeholders (3) a monitoring plan for these impacts, suggesting using the UN SDG metadata repository and if possible, to align metrics and methods with national practices. (4) a Net Positive Stakeholder Impact section, showing positive impact for all groups. For SD VISta assets, the project should measure effects by providing variables and data by using the UN SDG metadata repository. The indicators figuring in the United Nations’ Global Indicator Framework for SDGs can be found in Appendix 11 (Verra, 2023e). <u>REDD+</u> Verra’s REDD+ program has the same requirements as for its VCS program regarding communities - i.e., baseline, stakeholder consultation and “no net harm”. Additionally, it suggests REDD+ projects to use the same measurement techniques as for its CCB program (see pages 42 to 47 in Richards, M. & Panfil, S.N., 2011), but this remains voluntary. All AFOLU projects located in a REDD+ jurisdiction must follow the requirements specific to REDD+ (Richards, M. & Panfil, S.N., 2011).
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	Plan Vivo
Introduction Source: Ministère de la Transition Écologique, (2022).	Sector - Land use, land-use change, and forestry
	Actors Farmers, farming communities, and foresters must originate from rural regions that possess limited resources.
	Name of carbon credits PVCs (Plan Vivo certificates)
Certification Mechanism	
Required baseline(s)	Project Developers have to deliver baseline scenarios to show how project participants would not be able to attain the same results without the project, as well as a so-called carbon baseline to outline current status of GHG emissions. A reassessment of the baseline scenario must be conducted at least once every ten years during the project period. Since Plan Vivo projects consistently include local communities, it is therefore mandatory for the project to: - Identify and categorize all stakeholders who may impact or be impacted by the project as local stakeholders or secondary stakeholders. No consistent indicators relative to local communities are required as a baseline. However since 2008, project developers have to submit a “livelihood baseline”, including - current status of all local stakeholders and how it might be impacted by the project; - description of all different economic/ethnic groups, separated by gender if necessary; - description of access and use of natural surroundings, measure of property rights, income, income sources and other activities. This baseline shall be updated every ten years as well (Plan Vivo, 2021b).
Stakeholder consultation	Projects must: - Inform all stakeholders about the project during the design phase and consult with local stakeholders throughout the project period; - use, if called for, specific mechanisms to engage vulnerable stakeholders as well; - Give local stakeholders annual updates on the project during the project period; - Give all stakeholders opportunities to provide feedback and raise concerns about potential negative impacts throughout the entire project period; - use communication processes that are adapted to local conditions.

	All stakeholders and indigenous communities having property rights on the concerned land have to give free, prior, and informed consent (see page 12 in Plan Vivo, 2021a). The project should also develop an appropriate grievance mechanism (i.e., adapted to local culture and being accessible to local stakeholders) allowing transparent and fair reconciliations between parties (Plan Vivo, 2021a).
Social criteria to respect	Plan Vivo underlines how project developers should be mindful about social safeguards, requesting risk assessments about potential negative social impacts. Followingly, all projects must: - obey the Universal Declaration on Human Rights; - analyze the concerned area and its surroundings for potential negative impacts, implementing specific measures to counter these possible effects; - outline all risks of negative effects on livelihood, income, culture, resources access, equality, human rights, vulnerable groups, tenure rights; - identify mitigation actions that ought to be validated by the impacted stakeholders, with particular care to vulnerable ones; - offer compensation for loss as last resort if no mitigation is possible; - communicate impacts to Plan Vivo directly. All effects should be screened and carefully monitored to show ongoing obedience (Plan Vivo, 2021b; Plan Vivo, 2021c).
Monitoring and reporting	Since 2008, alongside monitoring carbon, Plan Vivo requires projects to have a plan for monitoring livelihood indicators. These indicators should be employed to track livelihood status variations of project participants and other local stakeholders compared to their initial value. If necessary, these should be separated by gender. The monitoring plan has to include specific information about the indicators used, such as: - the sampling technique used; - frequency and duration of assessment; - assessment method; - people in charge; - resource/ capacity necessities. Moreover, project developers are recommended to adopt Livelihood Indicators that pertain to the Sustainable Development Goals set by the United Nations. Plan Vivo advises them to use the indicators developed by the UN, that can be found in Appendix 11. Regarding the livelihood impact assessment: - All project participants should be represented by the sample; - After deciding on goals for each indicator, monitoring shall be conducted a minimum of once every five years throughout the project period;

	- Activities should be adjusted to address any failure to achieve targets; - Changes in indicator values shall be communicated to all stakeholders; - Annual reports should include a summary of results and stakeholder feedback, shared with other stakeholders before being shown to Plan Vivo; - If targets aren't attained, the project should remediate to it. (Plan Vivo, 2021b).
Specificities/ Other	Additionally to the requirements we stated previously, Plan Vivo asks project developers to design and communicate a Benefit Sharing Mechanism. Project participants have to be co-creators of this mechanism. Furthermore, a minimum of 60% of the income derived from carbon credits - after deduction of applicable charges/taxes/fees imposed by the host country - must directly benefit all local stakeholders²². The mechanism specifics have to be detailed and communicated, with regards to: - The proportion of income designated to the various stakeholder groups; - The monetary transfer method adopted, as well as when the payments will occur; - All the necessary prerequisites in order to deliver the effective payments. (Plan Vivo, 2021b).

b. Discussion

This table predominantly highlights the large number of requirements needed to be met by project developers regarding social impacts. Nonetheless, all proof is mainly delivered through textual descriptions - explaining contexts and actions taken. Explanations about how the project respects these requirements have to be “set in stone” through documentation and verified by third parties throughout the project lifetime. Third party verification is done through on-the-field observations transcribed into text-based reports.

In this context, our first concern is that the certification mechanisms can suffer from a lack of integrity due to the written nature of reports and the use of transcriptions. The integrity issue mentioned in our literature review regarding the credits themselves and the transparency in terms of CO2 levels reduced or avoided seem to stretch over to socioeconomic impacts as well. The concern is also driven from the statement of our interviewee Georges K. Tarus - member of the Technical Advisory Committee at Plan Vivo and member of the Forest Carbon Innovation Working Group at Verra in Kenya - about VVB verification.

²² The amount of 60% does not have to be delivered in cash. The community and the project developers have to agree on the desired redistribution mechanism - which can be either cash, kind, or a combination of both (Oronoz B., 2023).

He stated that “*some projects don’t really mirror what they claim they have done on a community level*” (Tarus G. K., 2023) and that due diligence should be improved given that what is being written in reports is not what can be observed on the field. The interview transcript can be found in Appendix 13. This was also observed on the Ghanaian REDD+ project mentioned previously in the literature review. For standards to improve their methodology, we think it is critical to include quantitative measurements, as well as making a stronger emphasis on defining a baseline and methods of calculation. In contrast, text-only reports might create more opportunities to circumvent negative observations compared to quantitative measurements.

Indicators for baseline scenarios are mostly related to carbon dioxide. These are used to compute additionality issues and verify the claims made about extraction and/or avoidance. Table 13 outlines the requirements for the parameters that will be used by project proponents to compare baseline scenarios with project outcomes for all parameters linked with GHG. Conversely, initial social settings are only descriptive in character and, as such, no indicators are used to compare before and after the project implementation. This observation seems in line with the major concern existing on the market currently, i.e., the project’s reliability regarding tons of CO₂ actually avoided or reduced. In that sense, it is legitimate that the transparency lens targets CO₂ and not socioeconomic effects.

Table 13 - Information requirements for indicators used to compare GHG reduction or avoidance outcomes

Data/Parameter
Unit
Description
Source of data
Value(s) applied
Choice of data or measurement methods and procedures
Purpose of data/parameter
Additional comments

Source: PDD Ghana, Gold Standard (2021).

The outlier for this observation is Plan Vivo, which requests since 2008 a “livelihood baseline” from all project developers. In principle, the standard’s initiative enables greater visibility of the effects projects have on local communities.

Upon verification on how it was applied, we found that the lack of specificity of the baseline can underestimate the positive and negative aspects of the project's impact. Our verification was made using the annual report of the "CommuniTree" project, currently taking place in Nicaragua. The project is the widest reforestation plan managed by smallholder farmers currently happening in the country. In its annual report for the year 2022, it outlined as livelihood indicators the number of project participants originating from local communities, the employment created (proportion of women employed, number of permanent/seasonal positions) and the number of project development workshops organized as well as the number of attendees (CommuniTree Carbon Program, PDD, 2014). While this is a good start, our literature review showed the importance of measuring land productivity, access to natural resources, access to infrastructure, or the ability to diversify income to become more resilient to shocks as drivers of socioeconomic improvement in these communities. Computing the number of jobs created does not permit us to fully understand the impact of a project, some positive or negative aspects might be underestimated, leading to potential unforeseen impacts. An extended analysis of the indicators is presented in the next section.

From a general perspective, it seems that project developers are free to use the indicators they prefer to assess their socioeconomic impacts. This leads to conflicting incentives since they are able to choose the ones that suit best their interest and not the ones that benefit the community, creating a moral hazard situation. This generates inconsistent indicators throughout all projects, which ultimately makes comparison between them impossible. As mentioned previously in the literature review, there are issues arising from the use of inconsistent indicators and the inability to rely on national databases. One recommendation to improve current methodologies is to develop a set of standardized indicators throughout projects and countries. In case a project is not suitable for the various indicators, the proportion of indicators used can also be a relevant metric to understand the context of the project. The same way our literature review mentions the importance of standardization as a means to foster trust in the VCM with the development of CCPs, we believe it would be necessary to create this list.

The same applies for the indicators chosen to measure SDG claims. While standards have narrowed down the scope using the indicators defined by the UN repository for SDG claims, freedom of choice in this relatively deterministic list could reduce the social impact of the projects. A/R projects are one-of-a-kind models that have their own organic outcomes, such as improving income diversification through new forest management practices that would enable farmers to sell different types of fruits in addition to their usual crops.

In this regard, two Gold Standard-certified projects analyzed claimed positive impacts on SDG 8. They computed their effect using the number of jobs created and pay range offered (The Nicaforest Forestry Unit (NFU)). While these indicators may be relevant for measurements in high-income countries, the intrinsic challenges currently observed in rural communities located in LICs require the consideration of other variables.

Our analysis points to two main points. First, as established previously, the scarcity of economic opportunities was mainly affecting the landless, suggesting the importance of identifying which stakeholder groups have been given jobs by the project. Second, other indicators should be coupled to employment to assess economic growth in LICs. Sustainable economic growth seems to be fostered by building infrastructure and income diversification, which leads to long term resilience, as opposed to unstable jobs generated by temporary projects, as seen in projects using PES. In line with this claim, our interviewee Leonardo Santiago - Carbon Project Success Manager LATAM at Pachama - mentions how SDGs should be used through a bottom-up approach rather than top down. In that sense, SDGs are simple frameworks that might allow better communication about the project, instead of a deterministic pitfall (Santiago L., 2023). The interview transcript can be found in Appendix 15.

Furthermore, from our analysis, increasing the number of SDGs claims for project validation will not improve the social impact. The main reason behind this is that SDGs claims don't have to be socially-oriented. In this case, a project could have an impact on three different SDGs that do not have a social focus and still be validated. Although it will be explored more thoroughly in the next section, it is relevant to note that only 27% of A/R projects certified by Gold Standard have social SDG claims (Gold Standard, 2023b).

One of the main social requirements is the stakeholder consultation process, in which the project developer identifies all stakeholders and ensures all groups are correctly represented. Nevertheless, our literature review sheds light on the low results obtained for poor and women-led households regarding socioeconomic effects. These groups tend to not be correctly represented in these meetings, and even if well-represented, they are not granted with accurate discretionary power to have a voice over decision makers. We remember the statement made by Bond J. et al (2020), who highlighted the possible adverse effects appearing if a project does not actively ensure non-perpetuation of inequalities or other mechanisms that hinder inclusivity (Bond, J. & Millar, J. & Ramos, J., 2020). Certified projects state that "the village chiefs were there to represent the village", but full representation is not proven.

To account for a part of the problem, Plan Vivo requests the implementation of mechanisms to include vulnerable groups. But the mechanisms do not verify the decision maker and the groups of power influencing the decision. Verra verifies the acknowledgment of intrinsic challenges relative to the area through their stakeholder mapping. Based on our analysis, changes in the methodology to improve the social impact of projects must be directed at pointing out the challenges and mapping inequalities across the community.

Elaborating on stakeholder engagement, our literature review revealed the acute importance of communicating the project rationale, as well as rights and obligations effectively to foster awareness. The lack of communication on this matter affects project outcomes and equality. Every standard we analyzed outlined the importance of clear communication mechanisms between local communities and other project proponents. However, it is relevant to establish which components should be included in the communication processes. Plan Vivo includes an important component by requiring visibility of the benefit sharing mechanisms used by projects. The relevancy of this component can be supported through aforementioned examples, such as the study conducted by Kansanga M. M. and Luginaah I. (2019) about REDD+, showing that the lack of clarity in benefit sharing mechanisms gives rise to unequal revenue allocation and segregation. Our analysis points to inequalities in the social impact of projects rising from the lack of communication. A standardized set of communication mechanisms including the definition of the target audience, message, and channels of communication could profoundly benefit the distribution of funds.

Lastly, standardized certification programs already exist and present a roadmap on how to successfully implement it. CCB programs are considered and developed as upgrades to usual certification processes. In this context, we enter a Fair Trade versus “normal” situation, where the labeling creates a difference in how a project is perceived, for example CCB programs are considered high quality and the rest lower quality. Nevertheless, in comparison to Fair Trade, the labeling for A/R projects can be applied in all instances, meaning that it is not exclusive to geographical areas or specific types of organizations. Setting a goal to create a robust methodology for all standards would benefit all projects, as opposed to having different project tiers with some that do not promote social welfare. It must be stated that we do not intend to promote CCB measurements as the best option. First, CCB measurements are guidelines and not contractually enforced. Second, CCB measurements have not been updated since 2011, even after the introduction of SDGs in 2015.

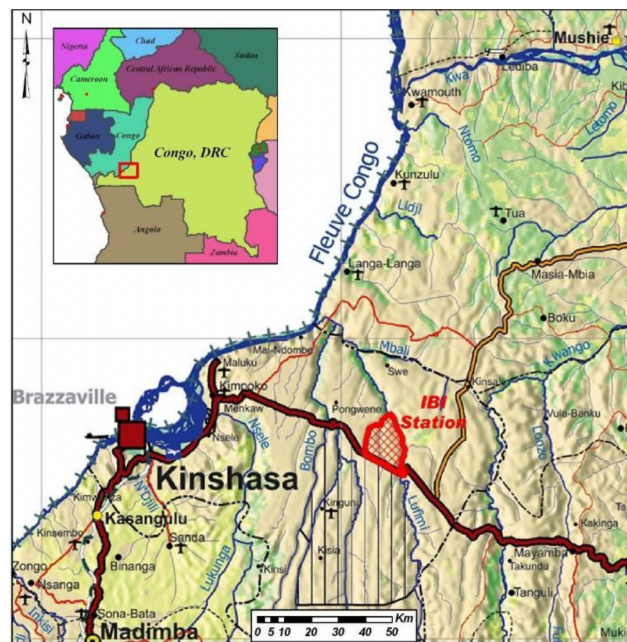
2. Evidence from the Field

To understand and verify how these methodologies are applied in practice, we will analyze multiple A/R projects that are currently operational (i.e., verified and currently issuing carbon credits). As aforementioned, we had the opportunity to observe one project in depth - conducting interviews with the project developer himself. This initial study will enable us to know more about how current project proponents manage and view social impact measurements. We will also be able to grasp a better idea of what was required for the project to be validated and issue credits on the VCM. Having a thorough idea of the specifics brought up by one particular case coupled with the conversations we had with the project developer Mr. Olivier Mushiete, allowed us to distinguish the complexity of the field - which would have been impossible to understand without having interactions with people working locally or visiting the field itself.

a. The project: Ibi Batéké - Novacel South Kwamouth

The Ibi Batéké Village is located in the Batéké plateaux, which covers the area between the Democratic Republic of Congo (DRC) and Gabon's border. This A/R project is mostly known as "Ibi Batéké Degraded Savannah Afforestation for Fuelwood Production" and is located on the Ibi station - which covers 4129 ha. The majority of this land is composed of grassland and shrubby savannah. Villagers located in this area rely heavily on subsistence farming activities, growing mainly maize and cassava. These communities also produce charcoal derived from the wood they find in their forests. Due to these activities, the local flora was often subject to burnings and the 10% forest coverage of the area gradually decreased due to deforestation. In that context, the Mushiete brothers - who traditionally had legal land rights in the area for decades - decided to rent the whole land parcel with a 30-year lease. This lease was signed in 2007 with the family company, NOVACEL sprl (Ibi Batéké, PDD, 2011).

Figure 9 - Project location



Source: CDM. Ibi Batéké, PDD. (2011).

With the development of the Clean Development Mechanism (CDM) and through this new lease, the Mushiete brothers decided to keep on with their father's idea for this land by designing an A/R carbon offset project activity. Since their traditional ownership, the Mushiete family envisioned a sustainable use of land that will empower local communities. In that sense, the current project has five main objectives that pertain to that vision. The first one is to capture and store CO₂ through reforestation activities. The latter will also permit to mitigate soil erosion due to bushfires and prevent water loss caused by runoff, while addressing the issue of degradation and deforestation of the forest coverage remaining. The project also aims to maintain the necessary production of charcoal to meet the fuelwood needs of Kinshasa, the nearby capital city, by offering an alternative biomass for sustainable production. In that sense, the project overall's objective is to improve the economic conditions of local villagers, alleviating poverty through new income generating mechanisms (Ibi Batéké, PDD, 2011).

Tree planting started at the launch of the project in 2008. By February 2011, Ibi Batéké Village became the first privately-owned project in DRC to be registered as a CDM under the UNFCCC. This registration allowed the CO₂ stored in the planted trees to be converted into carbon credits that were to be issued on the VCM. Its crediting period is fixed between 2008 and 2038. The project reduces 54,511 metric tons of CO₂ equivalent per year, issuing a total of 1,635,330 carbon credits throughout its 30-year lifespan (Clean Development Mechanism, 2011). These credits are qualified as Temporary Certified Emissions Reduction (tCERs), meaning that they are aligned with the temporary characteristic of carbon storage.

These credits thus have limited validity. Buyers of tCER will see their credits expire and will have to replace them. If the carbon sink that issued the credits initially still exists, the same credits originating from this sink can be reissued (Dutschke, M., I Schlamadinger, B., 2003). Ibi Batéké Village's tCERs have been purchased around 2021 with a one-time transaction (Mushiete O., 2023).

In terms of activities generated by the project, we can first observe the harvest and process of acacias into charcoal, and the transportation of this charcoal to the capital. Second, due to tree plantation that will have to allow the sustain of subsistence farming practices, the project will promote the adoption of agroforestry methods - stabilizing crop production while maintaining the planted trees in good condition. Third, due to the revamp of the local landscape and the tourist attractions already existing nearby, the project hopes to enhance ecotourism. In parallel with these newly generated activities, Ibi Batéké Village states creating a significant pool of jobs for local communities - with approximately 400 temporary positions and about 60 permanent positions, including 30 executive roles. This staff flow is certainly the biggest socioeconomic effect induced by the project - hired staff will benefit from training, whilst the local economy will be potentially positively influenced by seasonal workers inflow. The project also hopes to contribute to improving livelihoods of the local communities by making new infrastructure available to villagers (i.e., certain machines) during the project lifetime (Clean Development Mechanism, 2011).

b. Discussion: Derived Socioeconomic Assessment Methods

Our analysis of the project's PDD shows that the impact on communities located in the Ibi station area have been taken into account for project validation in two ways. First, through surveys conducted within the project area and in the villages of Mbankana, Mutiene, and Mampu to gain understanding of the current livelihood conditions of the local and surrounding populations. These surveys also allowed to have an overview of the available workforce. These surveys required interviewees to share both their worries and expectations for the project - giving them a short explanation about the Ibi Batéké Village. In parallel to this initial survey, the project conducted a participatory mapping of cultivated land, which provided additional insights into the local agricultural practices (Ibi Batéké, PDD, 2011). This survey allowed the gathering of some interesting findings. For instance, it seems like the population has a specific request of preserving and cultivating medicinal plant species by creating a medicinal plants arboretum. This observation is closely linked with the statement made by Fisher J. A. et al. (2017) about the importance of running correct and complete assessments to recognize communities' values and beliefs (J.A. Fisher, et al, 2018).

Villagers also expressed the importance they allocate to job creation and the maintenance of infrastructure, as well as their desire to participate in and benefit from the project (Clean Development Mechanism, 2011). In that sense, it would be relevant to measure the project's impact on these matters. Second, through an "environmental and social impact assessment". This information is mentioned in the section "socioeconomic impact assessment" of the PDD, stating that no there were no negative socioeconomic impacts identified (Ibi Batéké, PDD, 2011). The document in reference is documented in the footnote but is however not available.

The Ibi Batéké village will not go through other standard verifications as all the project's credits were previously purchased. Our interviewee Mr. Mushiete mentions that they will implement clear social and environmental measurement mechanisms to correctly assess the project's effects. While these surveillance methods haven't been put into place for current activities, the project developers noticed their importance and consider using indicators for their new project, i.e., the extended version of the current Ibi Batéké Village (Mushiete O., 2023). Proper monitoring of socioeconomic impacts seems to be currently absent in this case due to two main factors. One, no requirement has been set from the certifier at the time, and two, costs induced by implementing consistent monitoring are relatively high for project developers to pursue with the idea. This idea is driven by our interviewee's statement, mentioning that monitoring methodologies used are relatively expensive and that revenues it derives are not enough for it to be attractive (Mushiete O., 2023). The latter can be backed up by the statement our interviewee - Mr. Brian Oronoz from Plan Vivo - mentioned, saying that the standard was requesting monitoring in terms of socioeconomic effects every five years only given to the high costs it generates. Since Plan Vivo takes care of projects developed by local communities and smallholders themselves, these often do not have the necessary funds to conduct more surveys (Oronoz B., 2023). The interview transcript is available in Appendix 14.

A final observation we have derived from our interview with Mr. Mushiete are country-level complications hampering the development of appropriate monitoring systems. Stating that if the country's governance and administration mechanisms were strengthened and operational, it would be easier to design the correct mechanisms at a project-level (Mushiete O., 2023). Our literature review mentioned the issue of the current status quo in LICs and LMICs as inadequate data collection and measurements are used in national statistical offices (Jerven, M., 2013). We would then think that having good indicators at a project-level would be beneficial and even more important given that government practices are outdated.

3. Case Comparison

Our previous section enabled us to form a realist idea of the complexities surrounding the implementation of appropriate monitoring methods for A/R projects located in LICs. The Ibi Batéké Village project in DRC showcases the importance of conducting a baseline survey to grasp what communities perceive as valuable. We understand that even if the standard didn't require the measurement of any social indicators, other factors create roadblocks to the use of thorough impact assessments - such as the country-level status quo, and the lack of funds.

Although interesting to detect the aforementioned complexities, we understand the restricted feature of delving into the specifics of one particular case. Therefore, we will in this section analyze a total of 26 different projects that have been validated by Gold Standard, Verra and Plan Vivo. Drawing back on our preliminary analysis of these three standards' assessment methods, we focus on how these methods are applied on currently active A/R projects located in LICs and LMICs. This section will be divided in three parts, each focusing on one standard. Each part includes a table with a list of the social indicators used to measure the impact of all the currently active A/R projects. These indicators are codified and analyzed, which we use to derive our main observations and conclusions. The tables vary slightly due to the intrinsic differences between the methodologies, nevertheless, the most critical elements are included for each standard.

The chosen codification for the following tables has been defined through the SMART goals convention. The latter mentions that clarity of indicators requires specificity, measurability, attainability, relevancy, and time limitation. The aforementioned scarce valid and reliable data access incentivized us to verify if chosen indicators are specific. Therefore, we analyze if projects use baselines, targets, and formulas. The "Method" column outlines the sampling and measurement methods used by projects. This column will allow us to notice if projects use RCTs. All the other criteria have been chosen based on the challenges rural local communities face which we outlined prior, coupled with project-specific issues identified through previous research. In this sense, we seek to perceive which topics are encompassed by the chosen indicators, as well as the measurement level at which they are set – i.e., individual or household. Table 14 regroups de list of abbreviations used within our tables of results.

Table 14 - Caption for tables 15, 16, and 17

Abbreviation	Meaning
HH	The indicator is measured at the household level
Ind	The indicator is measured at the individual level
Training	The indicator is related to training
Unspec	The variable or group under analysis is ambiguous, or the computation method is unspecified
NoBa	The indicator does not use any baseline
NoTarg	The indicator does not use any target
NoFormula	The indicator does not use any formula
Jobs and Payroll	The indicator is related to jobs, income, or salary
Infr	The indicator is related to infrastructure
Women	The indicator is related to gender equality, or is disaggregated by gender
Edu	The indicator is related to education
Method	If applicable, the sampling and measurement method used
Frequency	If applicable, the frequency of measurement of the indicator
Baseline	If applicable, the baseline used
Goals	If applicable, the target used
Formula ²³	If applicable, the formula used

²³ This column has been deleted for projects rated by Verra and Plan Vivo given that no project would specify formulas.

a. Gold Standard

i. Table of Results

Table 15 – Analysis of selected Gold Standard rated projects

Project	SDG	Area	Sub-indicator	Indicator	HH	Ind	Training	Unspec	NoBa	NoTarg	NoFormula	Jobs and payroll	Infr	Women	Edu	Method	Frequency	Baseline	Goals	Formula
Nicaragua	4	Education	# employees, # trainings (year)	# employees participating in trainings per year		x	x	x	x	x	x						annual		(sdg 4.4 goal)	
Nicaragua	8	Work and eco growth	Permanent/part-time; man/woman	# jobs created		x		x	x	x	x	x		By gender			annual		(sdg 8.5)	
Nicaragua	8	Work and eco growth	Monthly payroll	# employees earning above local minimum wage		x			x	x	x	x					annual		(sdg 8.5)	
Ethiopia	5	Gender		% of woman assigned to managerial positions in cooperatives, unions and cooperative-run businesses.		x			x					x		WVE will carry out an annual employment census of the registered cooperatives, unions and cooperative-run businesses. The Ethiopian Government's definition of employment will be used to determine persons employed. The employment census will include age, sex, job type, job level, salary or wage, and years of employment. Data will be validated through attendance sheets and using results of audits undertaken by the district-level	annual		have 20% of all management positions covered by females (revised every 5 years)	% Female Managers = (No.Female employees in management positions)/(Total No.manager employed in Cooperatives,Unions and Cooperative Run Businesses)
Ethiopia	8	Work and eco growth		# jobs created		x		x	x			x		By gender		ibid	annual		have 80 jobs created (revised every 5 years)	
Timor Leste	2	Hunger	Used as to calculate income into community	Annual tree payment made to farmers (USD)		x			x	x	x	x				Project activity + dropbox link gives name and land name of all farmers in the project + allocate number of trees they take care of and the amount transferred as a payment that year. One tree is 0,5\$. (PES inequality problem). Data is drawn from the Tree02 Community Forestry Management Platform. Data is maintained by the Ho Musan Ida Finance team	annual		(sdg 2.3)	
Ghana	8	Work and eco growth		Average monthly salary		x				x		x				Human Resources division of company. The information entered in the human resources databases will be checked for accuracy. Random samples of the contracts/services agreements of the employees will be taken and compared to the information on the database.	annual	0 because without the project there will be no job creation in the area	(sdg 8.5)	$ADE = \frac{\text{Monthly salary} \left(\frac{\text{GH¢}}{\text{month}} \right)}{\text{Monthly working days} \left(\frac{\text{days}}{\text{month}} \right)}$
Ghana	8	Work and eco growth		Monthly working days		x				x		x				ibid	annual	0 because without the project there will be no job creation in the area	(sdg 8.5)	Monthly Working Days = Days/ Month
Ghana	8	Work and eco growth	Divided by permanent/temporary	# of workers (jobs created)		x		x		x		x				ibid	annual	0 because without the project there will be no job creation in the area	(sdg 8.5)	% Permanent Employees = (n/N)*100 ibid for Temporary Employees

Source: see PDDs referenced in bibliography, distinct section

ii. Discussion

The Gold Standard projects are analyzed in Table 15. The first observation is that all projects solely measure indicators relative to the SDGs mentioned. Thus, the projects stay within the chosen SDG framework. Given that our research goal is to improve the measurements of social impact we focus on projects targeting socially-oriented SDGs. Projects that target other SDGs, as in climate, are excluded from the analysis. Nevertheless, the analysis and recommendations that follow could be applied to all projects.

Only four projects focus on SDGs with a social impact. Three of these contribute to SDG 8: “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” (see PDDs of Ethiopia, Ghana, and Nicaragua in distinct section of the bibliography). The project located in Ethiopia also mentions SDG 5: “Achieve gender equality and empower all women and girls” (Humbo Ethiopia Assisted Natural Regeneration Project, PDD, 2009). While the project in Nicaragua promotes SDG 4: “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (ACROSS FOREST AS., PDD, 2016). Finally, Timor-Leste promotes only SDG 2: “Aim to end all forms of hunger and malnutrition” (WithOneSeed Community Forestry Program, PDD, 2016).

The analyzed projects measure a maximum of three social indicators. The least compared to other standards. Nevertheless, it reflects that these indicators seem to be enough to receive a positive SDG impact from Gold Standard. Thus, the project developers have no incentives to measure more indicators to validate the social impact of their projects. We infer that a restricted focus on SDGs lowers the need for additional social indicators.

Furthermore, the measured indicators lack diversity and range. As discussed in the literature review, social and economic wellbeing needs to be approached from different perspectives given the high variety of different needs these rural communities have, but this is not experienced currently. In the case of the projects certified by Gold Standard, most of the indicators target jobs and income changes, as 78% of the indicators in Table 15 are related to jobs and payroll. This uniformity comes from the fact that most projects mention contributions to SDG 8. This generates an information asymmetry problem. Since project developers can choose freely the SDGs, they focus on the ones that they are able to control directly thus making them more likely to achieve and show a positive impact. The problem is that these types of indicators are not linked to the overall wellbeing of the community.

Moreover, the link of the social indicators with SDGs pushes projects to use the targets that have been created and designed for general SDGs. However, as previously mentioned, A/R projects have their own organic outcomes, thus making the use of generic SDG targets relatively restrictive and not specific enough, hindering their relevance.

Subsequently, we observe that only the project in Ghana highlights baselines used for future computations. The use of baselines is necessary to guarantee a correct comparison with future results. For example, before the project starts, the baseline of land ownership sits at 45%, and for the next years the percentage of land ownership can be compared to it. Nevertheless, regarding the project in Ghana, the baseline used for the indicator of “Number of jobs created” is “zero, as without the project there would be no job creation in the area” (JOil Jatropha plantation, PDD, 2021). In addition to creating an almost guaranteed positive impact, this assumption is obvious. Since it is the only project mentioning baselines for social indicators, we can infer that these are not required by Gold Standard in order to be valid, although they are of consequent importance when it comes to comparing appropriate effects. Similarly, only 2 out of the 4 projects (Ethiopia and Ghana) explicit the formulas used to calculate these effects. No information is found regarding sampling methods. Strong inconsistencies included in the PDD lead us to believe that this part of the validation process is not structured nor agreed upon.

Looking more specifically at the indicators used by the various projects, all indicators are measured at an individual level, as opposed to measuring effects at the household or community level²⁴. For instance, the project in Nicaragua mentions the number of employees participating in training. It focuses on the number of individuals that receive a benefit. Nevertheless, an approach towards the group or area can provide more impactful results, such as the number of informative or educational sessions lasting more than 30 minutes in the community. This type of indicator encourages project developers to focus on society-wide programs. Similarly, we believe measuring the wages of employees hired by the project do not show income improvement, nor the improvement in livelihood conditions at a household level. This method hampers validity of results and by corollary does not give any relevant insights on the positive socioeconomic effects of the project on the community. We mentioned data validity issues in our literature review originating from the fact that almost no studies use treatment and control groups for measurement.

²⁴ Individual level data is data associated to one individual of the studied sample, whilst community data is an aggregate measure of all individuals within the sample. Household data is retrieved through questions including effects impacting the entire household such as food consumption levels or amount of capital acquired.

In that sense, solely measuring salaries of people employed will inevitably report increases in income if no comparisons are made at households-levels with individuals that are not employed by the project. Additionally, we believe that measuring the diversity of income sources is more relevant than salary given the needs outlined in our literature review.

A subset of the indicators is specifically disaggregated by gender, allowing for increased visibility on equality of the impact. Nevertheless, the mention of gender tends to be inconsistent throughout projects even though they use the same indicators. Both projects in Ghana and Nicaragua measure the number of jobs created. While the Nicaragua project separates results for women and men, the Ghana project does not. Given that both were certified by Gold Standard, it is surprising that the projects did not share the same characteristic. In this case, as discussed in our literature review, consistency and standardization would bring increased visibility and allow a more thorough comparison of the effects between projects.

Almost 45% of indicators are considered “unspecified”, i.e., that their area/variable of focus is ambiguous. For instance, the project in Nicaragua mentions the number of jobs created but does not include what type of jobs are created (part-time or full-time), when they will be measured (during high season or low season), or the area (in agriculture, services, house chores). As aforementioned multiple times in our paper, specificity allows for greater transparency necessary to foster trust on the market.

Finally, we do not recall the use of indicators relative to A/R projects-specifics. Our literature review showcased through several studies the importance of project-specific points of focus, given their unique organic challenges conveyed through previous research. These specifics are for instance, the measurement of land ownerships, the inclusivity and equality of representation of vulnerable groups within decision making processes, the maintain or increase in crop yields, and the community access to natural resources.

b. Verra

i. *Table of Results*

Table 16 – Analysis of selected CCB rated projects

Project	Area	Indicator	HH	Ind	Training	Unspec	NoBa	NoTarg	NoFormula	Income and assets	Jobs and payroll	Agriculture and food	Infr	Women	Edu	Method	Frequency	Baseline	Goals
Kenya	Community organisation and sensitisation initiatives	Voluntary membership to Community Group	x			x	x	x	x							household survey	annual		
Kenya	Community organisation and sensitisation initiatives	Access to weather and market information	x			x	x	x	x							household survey	annual		
Kenya	Sustainable agriculture intensification	# farmers trained		x	x	x	x	x	x							internal report	quarterly		
Kenya	Sustainable agriculture intensification	# farmers incorporating CA practices or methods		x			x	x	x			x				household survey	quarterly		
Kenya	Sustainable agriculture intensification	Productivity levels coming from CA practices	x				x	x	x			x				internal report	quarterly		
Kenya	Sustainable agriculture intensification	# products derived from farms	x				x	x	x			x				household survey	annual		
Kenya	Sustainable agriculture intensification	# hunger months	x			x	x	x	x			x				household survey	annual		
Kenya	Livelihood diversification enhanced	# training events on IGAs and micro-finance schemes			x		x	x	x				x			internal report	annual		
Kenya	Livelihood diversification enhanced	# of new IGAs established			x		x	x	x				x			internal report	quarterly		
Kenya	Livelihood diversification enhanced	# new local employment created		x		x	x	x	x		x					internal report	quarterly		
Kenya	Livelihood diversification enhanced	# new businesses initiated				x	x	x	x		x					internal report	annual		
Kenya	Livelihood diversification enhanced	Income levels and sources	x				x	x	x	x						household survey	annual		
Kenya	Livelihood diversification enhanced	# physical assets, structures and utilities in household	x			x	x	x	x	x						household survey	annual		
Kenya	Reduced human-wildlife conflicts	# human-wildlife conflicts (crops, livestock, human, property)				x	x	x	x							internal report	seasonally		
Kenya	Reduced human-wildlife conflicts	Amount of compensation paid out for wildlife-related losses				x	x	x	x							internal report	seasonally		
Kenya	Positive attitudes towards education	# education-related awareness raising meetings			x		x	x	x						x	internal report	annual		
Kenya	Positive attitudes towards education	# students and amount spent on bursaries and scholarships		x			x	x	x						x	internal report	annual		
Kenya	Positive attitudes towards education	# of primary and secondary school students not in school		x			x	x	x						x	household survey	annual		
Kenya	Positive attitudes towards education	Highest level of education attained in household		x			x	x	x						x	household survey	annual		
Kenya	Improved education infrastructure	# schools in area				x	x	x	x						x	internal report	annual		
Kenya	Improved education infrastructure	Average distances to nearest Primary and Secondary schools				x	x	x	x						x	household survey	annual		

Source: see PDDs referenced in bibliography, distinct section

Kenya	Improved education infrastructure	# schools built, renovated or supplied with furniture					x	x	x						x	internal report	annual		
Kenya	Better teaching standards	# teachers employed or incentivized		x		x	x	x	x						x	internal report	annual		
Kenya	Better teaching standards	average student/teacher ratio		x			x	x	x						x	internal report	annual		
Kenya	Better teaching standards	school performances				x	x	x	x						x	internal report	annual		
Belize	N/A															"Community data will be collected in the form of records of funds transfers, and records of expenditures for high school scholarships utilized by the community. Community benefits will be monitored through community meetings and records of funds transfers to the Gallon Jug-Chan Chich High School Scholarship Fund at each verification event. Results of monitoring data will be made available publicly through the internet. Monitoring data results will also be made available to participants"			
Cambodia	CCB core standards?	Net positive benefit for social and economic well-being of communities; equitable distribution of costs/benefits					x	x	x	x						"A preliminary community impact monitoring plan (including social HCVs) has been developed (WCS 2012) and testing of the detailed methodologies is underway at the time of submission of the PD. The monitoring plan and results will be made available on the internet and communicated to communities. The program will use a combination of quantitative and qualitative measures for each of the indicators, including an extensive, periodic questionnaire-based household survey and a range of qualitative, participatory approaches".			
Cambodia	Conceptual model target	Increase security and productivity of natural resources to support local livelihoods					x	x	x	x						ibid			
Cambodia	Conceptual model target	Sufficient farmland to support the livelihoods of current residents					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Clearance for land concessions and other projects					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Undefined borders and regulations for the SPF					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Population growth, immigration, better access					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Forest clearance/grabbing by individuals; over-fishing, over-hunting of wildlife; illegal logging and overexploitation of NTFPs					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Land alienation and legal conflict					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Weak traditional institutions and lack of voice					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Limited agricultural productivity					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Scarcity of sustainable dev. livelihood opportunities, on and off farm					x	x	x	x						ibid			
Cambodia	Conceptual model threat	Climate change adaptability					x	x	x	x						ibid			

Source: see PDDs referenced in bibliography, distinct section

Table 17 - Analysis of selected SD ViSta rated projects

Project	SDG	Area	Comment	Indicator	HH	Ind	Training	Unspec	NoBa	NoTarg	NoFormula	Jobs and payroll	Agriculture and food	Infr	Women	Edu	Method	Baseline	Goals
Cambodia	1	No poverty		# of families accessing microfinance loans (have accessed)	x				x		x						scheme's record		Number 1.4 Over the 30-year lifetime of the project 1,890 families will access the project's microfinance scheme.
Cambodia	1	No poverty	(income generating activities, technologies to manage businesses, methods to start businesses, informants about available economic resources)	# of people who have received training		x	x	x	x		x						internal report		Over the 30-year lifetime of the project 20,000 families will receive training on income generating activities.
Cambodia	1	No poverty		# land use planning meetings held with participation and support from local authorities					x		x						internal report		Over the 30-year lifetime of the project 210 land use planning meetings will be held to assist in community members receiving secure land tenure.
Cambodia	1	No poverty		# community members that have undergone agricultural training		x	x	x	x		x		x				internal report		Over the 30-year lifetime of the project 3,000 people will receive agricultural training on improved methods and equipment, helping the farms be more resilient to extreme events, and increasing agricultural yields and income to reduce vulnerability to social and economic shocks.
Cambodia	2	No hunger		ibid		x	x	x	x		x						internal report		Over the 30-year lifetime of the project 3,000 people will receive agricultural training on improved methods, equipment and crop varieties to increase crop yields and sustainability.
Cambodia	2	No hunger		Agricultural demonstration plots established in community areas				x	x		x		x				internal report		Over the 30-year lifetime of the project 25 demonstration gardens will be established in community areas displaying improved methods, equipment and varieties.
Cambodia	2	No hunger		% increase in yields and sales in local and external markets	x			x	x		x		x				household survey		Over the 30-year lifetime of the project 25 demonstration gardens will be established in community areas displaying improved methods, equipment and varieties.
Cambodia	3	Health		# health facilities built or equipped to provide essential health services to project communities					x		x			x			internal report		Over the 30-year lifetime of the project 5 healthcare facilities will be built or equipped to help improve access to quality healthcare services by project community members.
Cambodia	3	Health		# functional health facilities in each commune				x	x		x			x			government record		Over the 30-year lifetime of the project 5 healthcare facilities will be built or equipped to help improve access to quality healthcare services by project community members.
Cambodia	3	Health		% community members benefiting from SCRP-related health schemes		x			x		x			x			household survey		Over the 30-year lifetime of the project 5 healthcare facilities will be built or equipped to help improve access to quality healthcare services by project community members.
Cambodia	3	Health		# health workers employed		x		x	x		x						internal report		Over the 30-year lifetime of the project 20 health workers will be employed by the Project to help improve access to quality healthcare services by project community members.
Cambodia	3	Health		Nurse and doctor/population ratio in project zone		x			x		x						government record		Over the 30-year lifetime of the project 20 health workers will be employed by the Project to help improve access to quality healthcare services by project community members.
Cambodia	4	Education		# of students benefiting from bursary schemes for tertiary education, including university		x		x	x		x					x	internal report		Over the 30-year lifetime of the project 125 students will be provided with a bursary for tertiary education, including university
Cambodia	4	Education		amount of money allocated to bursary schemes					x		x					x	internal report		Over the 30-year lifetime of the project 125 students will be provided with a bursary for tertiary education, including university

Source: see PDDs referenced in bibliography, distinct section

Cambodia	4	Education		% of students not in school due to school fees		x		x	x		x					x	household survey		Over the 30-year lifetime of the project 125 students will be provided with a bursary for tertiary education, including university
Cambodia	4	Education		% of female/male participation in education bursary scheme and project run education events.		x			x		x					x	internal report		The Project will have equal male/female representation for the education bursary scheme and project run education events.
Cambodia	4	Education		# schools constructed, repaired, or equipped					x		x					x	internal report		Over the 30-year lifetime of the project 15 schools will be constructed, repaired or equipped.
Cambodia	4	Education		# functional schools in each commune				x	x		x					x	Government records		Over the 30-year lifetime of the project 15 schools will be constructed, repaired or equipped.
Cambodia	4	Education		# of teachers financially supported		x		x	x		x					x	internal report		Over the 30-year lifetime of the project 20 teachers will be financially supported
Cambodia	4	Education		teacher/student ratio in SCRP supported schools		x			x		x					x	Government records		Over the 30-year lifetime of the project 20 teachers will be financially supported
Cambodia	5	Gender		% attendees in community meetings that are women		x			x		x					x	internal report		The Project will strive to have at least 50% of community meeting attendees be women, and 50% of participants in micro-finance and income generating activities be women.
Cambodia	5	Gender		% of micro-finance participants/ other income generating activities that are women		x		x	x		x					x	internal report		The Project will strive to have at least 50% of community meeting attendees be women, and 50% of participants in micro-finance and income generating activities be women.
Cambodia	5	Gender		% of employees that are women		x		x	x		x					x	internal report		The Project will work to have project employees be at least 50% women.
Cambodia	6	Clean water and sanitation		# of community members who have undergone agricultural training learning methods and improved crop varieties to increase crop water use efficiency		x	x		x		x						internal report		Over the 30-year lifetime of the project 3,000 people will receive agricultural training on improved methods, equipment and crop varieties to increase crop yields and sustainability, which will increase water-use efficiency.
Cambodia	8	Work and economic growth	Disaggregated by gender	# community members who have accessed a microfinance scheme		x			x		x				x		scheme's record		Over the 30-year lifetime of the project 1,890 families will access the project's microfinance scheme, providing access to financial services that will promote productive activities, decent job creation, entrepreneurship, creativity and innovation.
Cambodia	8	Work and economic growth		# of people employed by SCRP		x		x	x		x		x				internal report		By 2027, 10% of community members earning income directly from the SCRP and associated activities
Cambodia	8	Work and economic growth	Disaggregated by gender	# of people who have established an Income Generating Assistance (IGA) from the project		x			x		x		x				internal report		Number 8.3 Over the 30-year lifetime of the project 6,000 people will receive training on income generating activities promoting productive activities, decent job creation, entrepreneurship, creativity and innovation.
Cambodia	8	Work and economic growth		# of families participating and deriving income from eco-tourism activities (CBET)	x				x		x		x				household survey		Over the 30-year lifetime of the project 500 families will participate and derive income from eco-tourism and sustainable tourism.
Cambodia	8	Work and economic growth		# of trained tour guides		x	x		x		x		x				facilities report		Over the 30-year lifetime of the project 500 families will participate and derive income from eco-tourism and sustainable tourism.
Cambodia	8	Work and economic growth		# of tourism service providers		x		x	x		x		x				facilities report		Over the 30-year lifetime of the project 500 families will participate and derive income from eco-tourism and sustainable tourism.
Cambodia	8	Work and economic growth		# of tourism promotion initiatives undertaken				x	x		x						internal report		Over the 30-year lifetime of the project 500 families will participate and derive income from eco-tourism and sustainable tourism.
Cambodia	8	Work and economic growth		# tourists visiting the community eco-tourism facilities (CBET)		x			x		x						facilities report		Over the 30-year lifetime of the project over 100,000 tourists will visit the Project eco-tourism facilities, creating jobs and promoting local culture and products.
Cambodia	8	Work and economic growth		Amount of revenue accruing from eco-tourism activities in the area					x		x						facilities report		Over the 30-year lifetime of the project over 100,000 tourists will visit the Project eco-tourism facilities, creating jobs and promoting local culture and products.

Source: see PDDs referenced in bibliography, distinct section

ii. Discussion

The Verra projects correspond to three different programs: CCB, SD VISTa, and VCS. The social indicators used for the first two programs are included in Tables 16 and 17. The VCS program is not included since they do not measure any socioeconomic indicators. The lack of socioeconomic indicators is surprising given that it is mentioned in the communication materials of Verra that projects entering the VCS program should contribute to at least three SDGs and that this type of impact should be monitored. In that sense, Verra's and SD VISTa programs seem to be more elaborated and require more information related to socioeconomic impact. However, the indicators from the two programs are inconsistent. All CCB and SD VISTa projects under analysis vary largely in terms of the number of indicators used and the quality of the information they aim to measure. Two out of the four projects listed in the tables explicitly mention the indicators that they will keep track of. In the case of the two projects that do not, the project in Belize does not mention any indicators and the project in Cambodia includes a list of administrative statements. It is revealing that no structure is established when it comes to designing a socioeconomic indicator. The same applies for defining in which areas of concern they focus (diversity, equality, employment, among others). Our analysis of Verra, along the same lines as Gold Standard, points to a lack of consistency and standardization. The latter is again perceived as of great importance to build trust, as mentioned in our literature review. However, inconsistencies appear between projects belonging to different programs, and between projects within the same programs as well.

Across the four projects analyzed, we observed 71 measured indicators, 33 of which came from the only SD VISTa project that validated our selection criteria. Overall, most indicators are measured at the individual level (>40%), which is, again, surprising given the ease of measuring impacts at household or community levels. Again, the use of individual level measures blocks the ability to observe real socioeconomic effects, especially when considering the impact that all members of one household have intrinsically with each other. In a similar way to Gold Standard, analyzed Verra projects do not use control and treatment groups to increase validity of their results. Our literature review mentioned the importance of data validity and reliability, for which most studies tried to perform RCTs. Analyzed projects also do not use before project scenarios. Indeed, we observe no use of baselines nor formulas throughout the projects. In the same line as Gold Standard, no requirements regarding baselines, formulas or targets are requested by Verra. However, the SD VISTa project in Cambodia uses targets that are specific to the project.

In addition, even if indicators are linked to SDGs, the project successfully narrowed down their scope to be appropriate according to the specifics of the project.

Around 60% of the indicators are unspecified, with the majority of them featured in the CCB projects. The SD VISta project uses more indicators and focuses on a large set of topics, such as education, infrastructure, jobs, agriculture, or gender equality. Furthermore, high variance in the number of indicators exists between CCB projects. While Kenya takes into account a list of 25 indicators, Belize measures none, and Cambodia mentions some indicators that are not measurable, achievable nor specific. Similarly, it would be interesting to analyze if the same variability appears for SD VISta projects. However, our selection criteria validated only one project. In that sense, the results we got from this project have to be taken with consideration as they could be biased.

Diving deeper into the CCB program, our preliminary analysis outlined that CCB projects are supposed to design a community impact monitoring program based on recommendations built for REDD+ projects. These recommendations mention that indicators should be SMARS, i.e., specific, measurable, achievable, both relevant and reliable, and sensitive. Nevertheless, this is not what can be seen in the field. There is a lack of specificity in most indicators coupled with a lack of measurability, which is surprising given their recommendations. As evidence, the project in Kenya has a high proportion of unspecified socioeconomic indicators. Indeed, the document states that “the first requirement for identifying indicators is clarity of the desired outcomes” (Richards, M. & Panfil, S.N., 2011). Nevertheless, the observations from the field point towards a different direction, featuring mainly a lack of clarity.

Similarly to Gold Standard, we do not observe the use of indicators that are specific to A/R projects. Given their challenges in terms of land ownership, inclusivity, and equality of representation of vulnerable individuals for decision making, increase in crop yields, and assured access to natural resources, we believe it would be relevant to measure these specifics.

c. Plan Vivo

i. *Table of Results*

Table 18 - Analysis of selected Plan Vivo rated projects

Project	Area	Indicator	HH	Ind	Training	Unspec	NoBa	NoTarg	Property	Jobs and Payroll	Agriculture and food	Infr	Women	Education	Frequency	Method	Baseline	Goals
Nicaragua	Local well-being	Percentage of households that have electricity	x			x	x	x				x			N/A			
Nicaragua	Local well-being	Percentage of households that own their house	x			x	x	x	x						N/A			
Nicaragua	Local well-being	Percentage of households that own land	x			x	x	x	x						N/A			
Nicaragua	Local well-being	Illiteracy rate		x		x	x	x						x	N/A			
Nicaragua	Local food production	Percentage of households that have improved pasture	x			x	x	x	x						N/A			
Nicaragua	Local food production	Percentage of households that use irrigation	x			x	x	x				x			N/A			
Nicaragua	Landless families	Percentage of project employees who are landless farmers		x			x	x	x						N/A			
Nicaragua	Gender	Percentage of women employed by the project		x		x	x	x					x		N/A			
Tanzania	Livelihoods	% increase in households with improved diet (Improved diet means at household having least three meals per day of proteins, carbohydrates and fruits/vegetables)	x				x	x							N/A	A socio-economic baseline survey will be carried out in 2017 and it will be repeated for every additional area that is included in the project until its independent verification is scheduled. Information will be accessed through household surveys and project internal database.		
Tanzania	Livelihoods	Per capita income disaggregated into men and women as a result of PVC sales		x			x	x		x					N/A		ibid	
Tanzania	Livelihoods	Number of training sessions on entrepreneurship for farmers			x	x	x	x						x	N/A		ibid	
Tanzania	Gender Equity	Number of women actively participating in the programme		x			x	x					x		N/A		ibid	
Tanzania	Gender Equity	Number of women-owned enterprises		x		x	x	x					x		N/A		ibid	
Tanzania	Tenure security	Number of project households with documented land ownership	x			x	x	x	x						N/A		ibid	
Tanzania	Social capital	% increase in number of farmers who save money regularly		x		x	x	x		x					N/A		ibid	

Source: see PDDs referenced in bibliography, distinct section

Ethiopia	Capacity-building	Number of organized trainings for landless farmers (M/V) per year per enclosure			x	x							x	Every 4-5 years	Quantitative interviews were performed during a systematic survey. The interviewees consisted of two groups: a group with project participants, and a control group of randomly selected farmers in the village near the enclosures. In order to avoid interference, all 49 interviews were held individually by the local project coordinator, who filled in the questionnaire together with the interviewees. Standard statistical tests were applied, as well as non-parametric tests to compare the group of participants with the control group.	1	+15, + 30 per year
Ethiopia	Capacity-building	Participants from more vulnerable groups (women, youth, elderly people)		x		x						x		Every 4-5 years	Ibid	>25%	
Ethiopia	Capacity-building	The mean score by trainees on a comprehensive field test about management of enclosures		x	x		x	x					x	Every 4-5 years	Ibid		
Indonesia	Income	Incomes improve to levels above the official minimum wage of West Sumatra.		x		x		x		x				N/A	CO2Operate BV with partners started collecting data by providing the farmers with a sheet, where they can fill in the kgs harvested, prices they received etc.		
Indonesia	Improved market access for biodiversity-rich forest products	Improved market access for biodiversity-rich forest products				x	x	x				x		N/A			
Indonesia	Gender and employment	Amount and gender of participants.		x		x	x	x				x		N/A	Monitoring of jobs created.		
Indonesia	Capacity building	Number of farmers, and to what extent the produced oil matches the potential production		x			x	x			x			N/A		A maximum of 2.5% oil can be obtained from leaves if leaves are being processed within 2 days of falling to the ground)	
Timor Leste	Socio-economic indicators	Changes in income of HV participants as a result of carbon payments.		x		x	x	x		x				Annually	Interviews with project participants and project database on payments		
Timor Leste	Socio-economic indicators	Participation in the rural micro grant program		x			x	x		x				Annually	Activity register		
Timor Leste	Socio-economic indicators	Payments for compliance with PES agreement		x				x		x				Annually	Plan Vivo participant's database		
Timor Leste	Socio-economic indicators	Increased participation of women in the HV project		x		x	x	x				x		Annually	Project register		
Timor Leste	Socio-economic indicators	Participation of HV Participants in Conservation Agriculture		x		x	x	x			x			Annually	Interviews with project participants		
Timor Leste	Socio-economic indicators	Participation of HV Participants in FMNR		x		x		x						Annually	HV farmers groups meetings and personal communication		
Timor Leste	Socio-economic indicators	Number of scholarships. Number of women receiving training in micro-business development and participation		x	x			x				x	x	Annually	Activities register		

Source: see PDDs referenced in bibliography, distinct section

Sri Lanka	Income generation	Per month income of the farmers		x		x	x	x		x					Annually	The size of dependants, home ownership details and other variables were assessed by RRI.	The average earning capacity of the targeted families is 100 USD per month	
Sri Lanka	Income generation	Average number of income sources (including PES)								x					N/A	Famer interviews and physical observations	All farmers have the ownership of at least 0.405- 0.81 ha of production land of which tea is the main crop noted	
Sri Lanka	Income generation	No of women involved in self employment		x		x	x	x					x		N/A	Interviewing and consulting was done with famer households in the project areas to understand the local farmers/communities' preferences, wishes and concerns, so that the proposed small-scale analog forestry project activity would better respond to their desires for livelihood development by looking at below areas.		
Sri Lanka	Income generation	Number of households with food security	x			x	x	x							N/A			
Sri Lanka	Strengthening social cohesion	Number of women who are economically independent.		x		x	x	x					x		N/A			
Sri Lanka	Strengthening social cohesion	Reduction in number of illnesses due food and water related diseases.		x		x	x	x							N/A			
Sri Lanka	Strengthening social cohesion	Reduction in number of children suffering from malnutrition.		x		x	x	x							N/A			
Sri Lanka	Improve the agro-technical developments	No of farmer enter into the CBO		x			x	x							N/A			
Sri Lanka	Improve the agro-technical developments	Number of people able to grow and produce various cash and food crops		x		x	x	x			x				N/A			
Kenya	Socio-economic indicators	Number of mangrove- related local businesses and relevant income of these businesses				x	x	x		x					Annually	Annual reviews of numbers of businesses and relevant income	Main current project is the mangrove boardwalk which welcomed 1673 visitors in 2010	
Kenya	Socio-economic indicators	Impacts of individual funded projects (supported by community funds)				x		x							Annually	Specific to individual schemes. Each prioritised expenditure will require a specified and measurable output (eg construction of a school building)	Zero	These will be set when the appropriate funded priority is determined by MPCO
Madagascar	Socio-economic indicators	Population divided by gender and age groupings		x		x	x	x							every 5 years	Socioeconomic impacts are measured through a mixed methods approach. The methods drawn upon include: census, focus groups, storytelling, quantitative household and individual surveys	A baseline socioeconomic survey in the Velondriake area was conducted by Blue Ventures in 2015, and will be repeated at 5-year intervals to gauge the socio-economic welfare of community members. Socio-economic indicators will be used to determine whether BV programmes affect the livelihoods of village residents and will have no impact on PES to communities.	Increase in average lifespan
Madagascar	Socio-economic indicators	Number of years of formal schooling attained by each individual		x		x	x	x					x		every 5 years	ibid	ibid	
Madagascar	Socio-economic indicators	Occupation of all individuals over 15 years of age		x		x	x	x							every 5 years	ibid	ibid	Proportion of individuals engaged in fisheries as a primary occupation may decrease
Madagascar	Socio-economic indicators	Literacy rate for all individuals 15 years of age and older		x		x	x	x					x		every 5 years	ibid	ibid	Literacy rate will improve and the number of years of school attended will increase.

Source: see PDDs referenced in bibliography, distinct section

Uganda	Social capital	Number of groups, number of groups as registered CBOs, total number of HH in the groups (male/female applicant)	x				x	x						every 5 years	Every year project technicians, in collaboration with farmer groups, conduct an assessment to establish the socio-economic impacts of the project activities on participating local communities.		
Uganda	Group governance	Number of group meetings held, number of participants, total amount cash held by all groups	x			x	x	x					x	every 5 years	ibid		
Uganda	Project governance	Financial audits, number of meetings				x	x	x						every 5 years	ibid		
Vietnam	Socio-economic	Alternative livelihoods increasingly introduced, Percent of households involved	x			x	x	x		x				every 5 years	A participatory well-being assessment (PWA) will be completed in the 1st year of the crediting period and repeated every 5 years. The result of the assessment is locally defined well-being categories and indicators (Table 2). The number of households belonging to each well-being categories was subsequently assessed. The monitoring will focus on the change in number and percentage of households falling into the most vulnerable category (poor). The result of household surveys will complement the results of PWA to inform overall project design improvement.		
Vietnam	Social	Village meeting attendance and minutes in which forest management is discussed			x		x	x						every 5 years			
Vietnam	Social	Number of violation cases reported by CFMB Number of violation cases resolved by CPC & DPC					x	x						every 5 years			
Vietnam	Socio-economic	Number of Vietnamese Dong (VND) spent for different purposes				x	x	x						every 5 years	PES funds spent as agreed on BSM		
Vietnam	Socio-economic	PES fund and other financial sources mobilized for livelihood improvements				x	x	x		x				every 5 years	Number of hhs who loan from Village Saving Fund (VSF) and the Bank for the Poor, Total sum of loaned money		
Vietnam	Socio-economic	Assets, income and expenditure and participation in activity groups	x		x	x	x	x						every 5 years	Household survey		
Vietnam	Socio-economic	Well-being assessment			x	x	x	x						every 5 years	Based on criteria identified by the communities themselves		
Vietnam	Leakage mitigation	Number of participants with attention to representation from all activity groups and when possible members from adjacent communities and local authorities		x		x	x	x						every 5 years	Awareness raising and capacity building activities		
India	Benefit sharing and participation	Number of villages with Community Development Funds (CDFs)			x					x				Annual	The data is collected from the village leaders and members.		> 70 villages
India	Benefit sharing and participation	Number of families accessing CDFs	x		x									Annual	The data is collected from the village leaders and members.		> 2000 households
India	Institutional capacity	Number of training programs			x	x							x	Annual	The quantitative data is supplemented by case studies and in-depth interviews.		> 10 programs
India	Institutional capacity	Percentage of participants who take up an activity after receiving training (within 1 year)		x	x	x		x					x	Annual	The data is collected from the village leaders and members.		
India	Institutional capacity	Number of families participating in Income Generating Activities	x		x	x	x	x		x				Annual	The data is collected from the village leaders and members.		

Source: see PDDs referenced in bibliography, distinct section

India	Knowledge and awareness	Knowledge of the Federation and project		x	x	x								Annual	Baseline survey and resurvey conducted by the CFs and team members.	75% of households	85% of all households
India	Livelihoods benefits	% of all project households receiving benefits from Community Development Funds	x				x		x					Annual	Baseline survey and resurvey conducted by the CFs and team members		
India	Livelihoods benefits	% of households with livelihoods activities reflecting conservation of forests and natural resources	x		x		x							Annual	Baseline survey and resurvey conducted by the CFs and team members	30% of households	50% of all households
Vanuatu	The landscape provides sufficient quality and quantity of food	How often do you buy food? (days per week)	x				x	x						N/A	Data is collected through interviews with individuals. LLV will use the same respondents where possible (list of respondents below). Interviewers will apply a similar ratio of respondents to match the baseline survey.		
Vanuatu	The landscape provides sufficient quality and quantity of food	How big is your family garden? (hectares)	x				x	x	x					N/A	ibid		
Vanuatu	The landscape provides sufficient quality and quantity of food	How often do you eat free food from your garden? (days per week)	x				x	x						N/A	ibid		
Vanuatu	The landscape provides sufficient quality and quantity of food	How often do you run out of food? (times per month)	x				x	x						N/A	ibid		
Vanuatu	The landscape provides sufficient quality and quantity of food	How often do you eat food from the forest? (times per month)	x				x	x						N/A	ibid		
Vanuatu	The landscape provides sufficient quality and quantity of food	How much do you make selling food? (vatu per month)	x				x	x		x				N/A	ibid		
Vanuatu	Access to clean water occurs all year round	Do you run out of water? (%)	x				x	x			x			N/A	ibid		
Vanuatu	Access to clean water occurs all year round	Are there days when you can use as much as you like? (%)	x				x	x			x			N/A	ibid		
Vanuatu	Household income and assets increase allowing for improved livelihood opportunities and quality of living	Access to Education (qualitative)	x		x	x	x						x	N/A	ibid		More than 2 youth in tertiary education and 100% access to primary and secondary (to year 10)
Vanuatu	Household income and assets increase allowing for improved livelihood opportunities and quality of living	Personal Monthly Income (VUV)	x				x	x		x				N/A	ibid		Expected to increase
Vanuatu	Household income and assets increase allowing for improved livelihood opportunities and quality of living	Travel to town (times per week)	x				x	x			x			N/A	ibid		Expected to increase
Vanuatu	Household income and assets increase allowing for improved livelihood opportunities and quality of living	Hours spent cooking (hours per day)	x				x	x						N/A	ibid		Expected to decrease, focus on female population

Source: see PDDs referenced in bibliography, distinct section

Vanuatu	Household income and assets increase allowing for improved livelihood opportunities and quality of living	Hours spent householder chores (hours per day)	x					x	x							N/A	ibid	Expected to decrease, focus on female population
Vanuatu	Household income and assets increase allowing for improved livelihood opportunities and quality of living	Hours spent Gardening (hours per day)	x					x	x							N/A	ibid	Expected to decrease
Vanuatu	Household income and assets increase allowing for improved livelihood opportunities and quality of living	Hours spent resting	x					x	x							N/A	ibid	Expected to increase, focus on female population
Vanuatu	The Community REDD+ Enterprise contributes to the wellbeing of its members	How many youth do you know that are engaged with the REDD+ Enterprise? (number)		x	x			x	x							N/A	ibid	
Vanuatu	The Community REDD+ Enterprise contributes to the wellbeing of its members	Are you given the opportunity to access information about the REDD+ Enterprise's finances and activities? (% of yes)		x	x			x	x							N/A	ibid	
Vanuatu	The Community REDD+ Enterprise contributes to the wellbeing of its members	Do you trust the REDD+ Enterprise? (% of yes)		x	x			x	x							N/A	ibid	
Burkina Faso	Livelihood	% of girls going to school		x	x	x		x	x				x	x		Every 5 years	Household and asset surveys in each participating village every five years. In the case when lists of households exist, random sampling will be used. In the absence of household lists the sampling strategy will be based on area sampling: (i) the village will be divided into segments of approximately equal population on a sketch of the village; (ii) segments are selected at random; and (iii) every household in the selected segments is invited to participate in the survey. Sample size must be 10% of household quantity	
Burkina Faso	Natural resource management	% of households practicing transhumance	x		x			x	x							Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Natural resource management	% of households purchasing agro-industrial by-products	x		x			x	x		x					Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Family economy	Annual Revenue from the sale of livestock						x	x							Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Family economy	% of households selling milk; average annual amount of milk revenue in FCFA	x					x	x							Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Governance	Number of conflicts related to the management of the rehabilitated pasture sites			x				x							Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Governance	% of households perceiving that all community members have access to the natural resources of the village	x					x	x	x						Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Governance	% of households perceiving that tenure security is guaranteed for all community	x					x	x	x						Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Socio-economic	Number of beneficiaries directly benefiting from the PES payments		x					x							Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Socio-economic	Total amount of community pay-outs to the Plan Vivo fund of the village						x	x		x					Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Socio-economic	Total spent amount of the Plan Vivo fund of the village							x							Every 5 years	Ibid; survey, sample size must be 10% of household quantity	
Burkina Faso	Socio-economic	The number of meetings organized by the CVD, the number of conflicts related to the management of the rehabilitated pasture sites and the perception related to access and tenure security will reflect the governance per Plan Vivo			x	x			x							Every 5 years	Ibid; survey, sample size must be 10% of household quantity	

Source: see PDDs referenced in bibliography, distinct section

ii. Discussion

The projects from Plan Vivo, included in our methodology, are compared, and studied in Table 18. Overall, the projects have more consistency in terms of the number of indicators used compared to Verra. They also seem to use more indicators on average compared to Gold Standard's projects, with an average of 7 compared to 2 for Gold Standard. Furthermore, we can notice a higher degree of diversity in terms of topics. This is true especially if observed project by project. This means that each project has a higher degree of diversity. We notice that their indicators cover on average at least 3 different areas of focus. In this sense, the Verra's CCB and SD VISTA projects we analyzed had a similar level of variety. However, this conclusion is drawn from the observation of 2 projects only, compared to the 13 Plan Vivo rated projects that can be found in Table 18.

Besides education, gender equality, jobs, income, and infrastructure, we codify a new type of indicator: "property". Indicators in this category assess tenure rights in the project area, measuring for instance the number of households owning their land, the number of households with documented ownership, or household land size. This category is relatively important given the fragility of land tenure systems in LICs we mentioned in our literature review. Measuring the number of households owning their land over the years will allow us to perceive if the project worsens property rights conditions, or conversely allows for fair and enforceable tenancy contracts. This observation shows that Plan Vivo rated projects are the first ones using A/R specific indicators. As we know, property rights are an issue in these communities, indicating the relevancy of measuring this matter. The same applies for the indicators such as "how often do you run out of food" – observed in the Vanuatu project - and all questions related to food security and crops (Loru Forest Project, PDD, 2015). Lastly, we can also notice the indicator "average number of income sources (including PES)" used by the Sri Lanka project, highly relevant in terms of socioeconomic effects in LICs and LMICs (Hiniduma Biolink Project, PDD, 2011). Indeed, our literature review highlighted the importance of the diversity of income sources to increase resilience and adaptability to shocks.

Moving back to the indicators used, jobs (including training) and income are the most present areas of measurement, covering respectively 24.47% and 18% of all the indicators used by the analyzed projects. We observe an almost equal distribution between measures done at the individual-level and at the household level, Gold Standard and Verra's projects featured more prominently individual-level measurements. The latter shows, once more, a greater degree of diversity in terms of indicators in Plan Vivo rated projects.

We notice that 46% of indicators are considered unspecified - a better result than for projects rated by the two other standards. While this value hit 60% for Verra, Gold Standard reached 45%, although Gold Standard projects only employed 9 indicators altogether.

With a global picture that shows more consistency and consideration for important criteria to build effective measurement, Plan Vivo rated projects bring us closer to a more holistic and thorough assessment of socioeconomic impacts. However, it is also necessary to pinpoint the almost complete unuse of targets, given that 90% of indicators do not have any designed objective. This makes it difficult to understand why indicators have been chosen as necessary to measure. As Gold Standard and Verra's SD VISta both use SDGs to frame their choice of indicators and to measure their effect on specific goals, Plan Vivo's projects seem to be relatively free in their decision of what to measure or not. We already mentioned the need for standardization, discussed in our literature review extensively, and strongly believe that following a pattern will allow for greater transparency and trust.

Similarly, we observe that 80% of indicators used throughout projects are not linked with any baseline value. This seems to be the case given that we look at the PDD for which standards do not require to outline the results of a baseline assessment. Nonetheless, as aforementioned, Plan Vivo requires that projects conduct a socioeconomic baseline study that will be updated every five years. These results will be made available by the project developer in their monitoring reports. In that sense, some projects mention repeating their socioeconomic assessment every five years. In that case, it would be possible and potentially useful to have baseline values available upfront in the PDD to have a strict guideline for future comparison. Regarding the validity of results, the same comment applies for Plan Vivo as for both Gold Standard and Verra. Results may experience hampered validity and reliability given the inconsistent use of RCTs by projects. This method would enable to measure the effects of the project in an isolated manner.

VII. Proposal and Managerial Implications for Standards

The following section presents the elements for an improved methodology to effectively measure socioeconomic impacts of A/R projects. The current proposal is a collection of the best practices observed in different projects, as well as the recommendations and insights shared throughout the interviews and on-field experience by the project developer of Ibi Batéké, Olivier Mushiete, coupled with the valuable knowledge gained through our literature review. The proposal includes the use of a baseline for all socioeconomic indicators with the goal of properly measuring the effects of the project. Moreover, the application of targets can benefit project developers to focus resources where they are needed. In the case of baseline and targets, the formula of calculation must be established clearly. The three elements in conjunction have the potential to substantially increase the specificity of the chosen socioeconomic indicators. In terms of the type of socioeconomic indicators that should be pursued, we propose a balanced use of individual and household-level indicators. Furthermore, increasing the diversity in the topics of the indicators provides a holistic approach to increase the wellbeing of the community. Lastly, we encourage the use of a standardized set of indicators to reduce the load of project developers and make comparison easier. The final part of the section includes a list of socioeconomic indicators that follow the proposed guidelines. Our objective is two folds. One, these recommendations intend to circumvent the potential negative socioeconomic outcomes that might occur without proper verification, such as seen in our literature review through the REDD+ project located in Ghana. Local communities ended up with lower food and income security, increased corruption, unequal gain redistribution, and higher inequalities (Mosonsieyiri M. & Luginaah, I., 2019). These showcase the opposite of the current needs these communities have. Two, our recommendations seek to shape useful guidelines for standards to revamp their methodologies and attain greater impact through improved governance.

The use of a baseline for all socioeconomic indicators is necessary to properly measure the effects that the project causes in the community. Our analysis highlighted the lack of baseline use for most of the indicators. Furthermore, some projects will mention the value would be set to zero as it would not exist without the project. This type of simplistic and easy to reach indicators are discouraged with the strict requirement of computed baselines. For instance, the indicator of average monthly salary of adults within the household requires a baseline analysis of determining what is the average monthly salary of adults within the household before the project starts.

Continuing the example, if the value is 100 USD, it is recorded, mentioned in project validation documents, and used for future yearly comparisons. The baseline should be set in units, such as number of people, percentage, or currency value. It is important that the baseline can be measured routinely at the longest in a one-year timeframe. In the case of currency, an appropriate method on how to deal with inflation must be established.

The application of targets should guide project developers to use resources more efficiently and systematically. Targets need to be established in the same units as the baseline. Furthermore, targets must not present an ideal situation or the best-case scenario, they need to provide achievable results based on what has been observed in other projects. A strict consideration of the context must be undertaken, as targets are not supposed to change from year to year unless their extreme situations arise. In that sense, the use of appropriate milestones could be a great compromise for intermediary verifications. In the same sense as Key Performance Indicators (KPIs), targets for socioeconomic indicators must be able to be decomposed in smaller time frames (i.e., milestones) allowing project developers to adjust actions towards achieving the target. Lastly, targets should guide the efforts of project developers. The latter stipulates the aforementioned importance of using project specific targets instead of generic mission statements that risk diluting the meaning of action. The use of SMART objectives - as already suggested by previous papers - might be a great means to design appropriate targets, permitting accurate time and resource allocation to effectively attain the desired outcome.

The formula of calculation for the socioeconomic indicator must be established clearly. This is related to the baseline and the target, as both need to follow the same convention. From the review of documents of the different projects, we observed that several monitoring reports change year to year the method of calculation. This needs to be corrected through a clear establishment of the formula in the PDD. For correction purposes, an explicit correction methodology for the formulas must be established. The three elements mentioned so far, baseline, targets, and formula of calculation, used in conjunction, have the potential to substantially increase the specificity of the socioeconomic indicators. The accurate definition of these elements can significantly address the low data transparency issue discussed in our literature review. Both Jerven Morten's book "Poor Numbers" and our interviewee Mr. Olivier Mushiete mentioned the low data *reliability* and *validity* induced by outdated country-level methods used. In addition, it could also remediate to the poor consideration of pre- and post-project situations we observed in a significant amount of research conducted on projects. Coupled with the development of clear baselines, formulas, and targets, we suggest the use of RCTs.

Measuring indicators on two distinct samples of the population - one treatment cluster, representing people that perceive project effects, and one control cluster, representing people that do not engage with the project in any way – will inevitably increase data validity. It is however important to note that these samples must be chosen at random. The use of RCTs will allow projects to isolate project effects from potential endogeneity issues.

Socioeconomic indicators should balance the use of measurements at the individual, household, and community-level. The analysis indicated that most of the indicators currently in use are focused on measuring socioeconomic impact at the individual level, such as the number of jobs created, nevertheless, the use of household and community-level indicators provide an effective tool to check for overall well-being improvements and, at the same time, simplify data collection. In terms of individual-level indicators, the information must be collected per person or use representative surveys, in contrast with household and community-level information that is more easily codified.

Furthermore, increasing the diversity in the topics of the indicators will allow for a broader assessment of the impacts of a project. We noticed the large set of different needs rural communities in LICs and LMICs currently encounter, such as income diversification, asset building, enhanced infrastructure, increase in land productivity, fair and enforceable tenancy rights, better governance, and continued access to natural resources. Given this variance, an increase in topics can promote a more holistic wellbeing of the community. Plan Vivo projects feature more areas of focus than the two other standards analyzed. This generates an overall increase in the number of indicators measured by the project. Indeed, all projects considering a larger set of different topics reveal higher amounts of indicators used. We propose requiring indicators for each topic, including education, gender equality, jobs, income, property, and infrastructure.

We encourage the use of a standardized set of indicators to be applied in all projects with the aim of reducing the load of project developers and making comparison easier between projects. The main concern about this proposal is the applicability of the indicators given the intrinsic characteristics of each project and country. The previous missteps of different NGOs started by setting up a deterministic path that LICs and LMICs must follow. Nevertheless, this time the approach is different. The availability of a standardized set of indicators directly linked to A/R projects and centered around communities provide a tool for project developers to save time by worrying less of creating a socioeconomic indicator from scratch. Furthermore, in the case of several projects using the same indicator, it is possible to compare between the projects to determine the challenges and imitate good principles.

Lastly, we propose a list of 10 socioeconomic indicators that can be used in the context of reforestation projects in LICs and LMICs. The list can be found in Table 19. From these indicators, a baseline, target, and formula of calculation should be used in conjunction to improve the transparency and measurability of the project impact. This set of indicators has been derived from the needs of rural communities in LICs and LMICs, as well as from the risks perceived through conducted research on active projects - both outlined in our literature review. We also assured its compliance with the various best practices mentioned here above. In parallel to the aforementioned needs we identified (see above), the discussed risks include the often not fully understood project rationale due to inappropriate training, the underrepresentation of vulnerable groups in decision-making processes, limited land access or eviction, remuneration schemes that do not allow for resilience, and respect for the community's beliefs and requests (observed through the survey of Ibi Batéké Village, revealing the importance of medicinal plants cultivation for instance).

Table 19 - Proposed set of indicators

Area of interest	Related need/risk	Measurement level and method	Indicator	Formula
Income	Income diversification for resilience	Household, monthly data collection for annual survey	Average number of income sources in a year by participating and non-participating households (including project-related income source)	$\frac{\sum \text{distinct income sources in a year}}{N \text{ of households of interest}}$
Trainings	Understanding project rationale	Individual, internal project data	Number of trainings offered to project participants concerning the project rationale and participants right and obligations which have a participation rate of at least 40%	$\frac{\sum \text{trainings about project rationale and participants' rights and obligations in a year}}{\# \text{ attendees}} \\ \# \text{ of project participants (total)}$
Equality	Segregation of the landless	Individual, annual internal survey	Percentage of employees that are landless (i.e., that do not own land or the right to work on a specific land parcel)	$\frac{\sum \text{employees answering yes to owning land}}{\# \text{ employees (total)}}$
Equality	Vulnerable groups involvement in decision-making	Individual, annual survey	Percentage of individuals from vulnerable groups that state that they have a voice in decision-making processes (vulnerable groups are	$\frac{\sum \text{individuals answering yes to having a voice}}{N \text{ individuals included in survey}}$

			underrepresented groups, or segregated based on local beliefs or values)	
Gender	Representation of vulnerable groups for decision-making	Individual, internal project data	Percentage of decision-making positions filled by women (defined as enrolled in management or supervision positions)	$\frac{\text{Number of women in decision – making positions}}{\text{\# decision – making positions (total)}}$
Property	Fair and enforceable tenancy contracts	Household, annual survey	Percentage of households located within project area that own their land at the end of the year	$\frac{\sum \text{households answering yes to owning land (end of the year)}}{N \text{ of households included in survey}}$
Livelihood	Continuous access to natural resources	Household, annual survey	Percentage of households mentioning that their access to natural resources for livelihood or spiritual beliefs have decreased compared to pre-project situation	$\frac{\sum \text{households stating a decreased access compared to pre – project}}{N \text{ of households included in survey}}$
Food security	Resilience in terms of food access	Household, annual survey at year end	Number of months when the household was compelled to decrease calory intake, or decrease in variety of foods consumed experienced during the previous year	$\sum \text{hunger months the household experienced during the year that preceded}$
Food security	Resilience in terms of food access	Household, monthly data collection for annual survey	Percentage increase (compared to previous year) in dietary intake at the household level (increase in meals, increase in protein/ vitamins/ carbohydrates intake, increase in variety of food)	$\frac{\text{Recorded household dietary intake during current year}}{\text{Recorded household dietary intake during previous year}} * 100$
Agriculture	Increase in crop productivity	Individual, annual survey at year end	Percentage of farmers located in project area mentioning a positive or negative variation in crop productivity (increase of decrease in crop yields with same parcel size). Year-on-year comparison.	$\frac{\sum \text{farmers mentioning an increase in land productivity of their parcel}}{\text{\# respondants that are farmers}}$ Ibid for decrease in land productivity

Aligned with the ideas mentioned here above, we wanted to take a step back and offer more holistic suggestions to standards, that ought to be used in conjunction with the more specific indicator-related recommendations. With a rapidly growing necessity for global warming alleviation, organizations across the globe are compelled to change.

The use of VCM carbon credits presents opportunities, however, this not yet regulated market demonstrates intrinsic challenges due to its functioning – in fine slowing down the adoption pace. Our research pointed out the necessity to palliate current distrust observed on the market, a major roadblock to purchase. We believe that *standardization* and *transparency* are two major components in which trust permeates itself. As CCB and SD VISta labelled projects can be sold at a premium given their assured “high-quality” feature, we suggest the normalization of the requirement sets used to obtain these labels. In that sense, our recommendation would be to use CCB and SD VISta-like methodologies for all projects wanting to be certified. With this suggestion, we acknowledge the specificity of CCB and SD VISta programs to Verra, however using them as use-cases showing “stricter” programs that promote projects that have greater value because of more stringent requirements. Bringing all validated projects to comparable standards will allow for greater visibility to potential customers, whilst pledging for greater impact using sterner methodologies for validation.

Our analysis also highlighted the notable difference between Plan Vivo and the two other standards analyzed. The main differences stem from their purposes and corporate structures, entailing the three standards to vary in their methods. Plan Vivo is a foundation and intends to help small local landowners to access the benefits of the VCM by themselves. Verra and Gold Standard are regular for-profit companies that will favor project developers that have the necessary funds to build carbon offsets. Aligning missions and promoting carbon offsets created by local communities would foster trust – favoring local populations by working collectively with them and for them. This will empower locals and avoid the aforementioned “green grabbing” effect, as it is currently experienced.

We noticed country-level complexities having substantial effects on the way socioeconomic monitoring currently occurs. Outdated methods and scarce policies seem to hamper proper governance at a project-level. We accordingly suggest governments to consider the implementation of Compliance Markets, or to set up more stringent regulations to ensure the respectful use of their territories and populations. In that sense, REDD+ programs tend to empower governments. We nonetheless observed that this empowerment could stagnate at a government-level and be promulgated at the expense of the wellbeing of rural communities. We believe that emancipating their own population through financing and awareness campaigns would offer greater inclusivity. Governments could develop the proper policies needed for projects to not have the opportunity to disrespect the legislation in force within the country in which they are located. For instance, strengthening property rights policies will help with displacement and eviction issues.

VIII. Conclusion

The current climate context gives rise to several macro tailwinds pushing countries and corporates to reduce their emissions. For this matter, two markets appeared. The Compliance Carbon Market, build upon the Paris Agreements and the previous Kyoto Protocol, and the VCM, an intricate market not yet compelled by any regulation. These macro forces have had a compound effect, being buttressed by the rising temperatures recently showcased. We thus observe an exponential growth of the VCM, acting as a new pool of carbon credits through which stakeholders can compensate their emissions. Nevertheless, integrity issues in this fast-paced yet unregulated market are acting as friction to purchase. We therefore observe numerous actors appearing, trying to foster trust. At the heart of this growing trend, nature-based offsets, and more specifically REDD+ and A/R projects. Rural areas of the Global South present an interesting white space for these offsets, marketed as benefitting from new income, whilst offering substantial natural resources. Local communities are then at the center of this new market – being voluntarily or involuntarily involved with carbon offsets located in their regions. Sometimes forced to comply or displaced. Whilst current trust emphasis has been on CO₂, social claims require attention given communities' organic needs.

This paper calls for an improved methodology used by standards to assess socioeconomic effects of these A/R carbon offsets. We recommend addressing the inconsistencies hampering the accurate measurement of how projects impact local communities. In this sense, restructuring the current landscape away from viewing the latter as an external factor to viewing social impact integrity as essential as carbon integrity. We make this recommendation on the premise that only little research has been made on this topic, whilst the few studies conducted about this matter encountered data access, reliability, and validity issues. Additionally, we observe the necessity for context-specific indicators. Studies have shown the importance for communities to understand the project rationale, as well as appropriate project design, to not perpetuate nor accentuate intrinsic negative dynamics existing in these communities, such as inequalities due to land tenure or gender. Altogether, this knowledge allows future projects to not experience the previously discovered drawbacks.

The former observations guided our research design. In this study, we have extensively examined the current assessment methodologies of Gold Standard, Verra, and Plan Vivo. We thoroughly analyzed 26 projects that we selected based on specific criteria. We utilized publicly available guidelines to verify projects, PDDs, and interviews. We noticed integrity issues due to predominant use of qualitative measurements.

It is backed up by the statement of our interviewee, Georges K. Tarus. In terms of quantitative data, projects are free to use any indicator, leaving room for moral hazard and inconsistencies. SDG-related indicator choice prevails, creating a deterministic setting in which intrinsic issues of A/R projects are not properly mirrored. In line with the latter, indicators are relatively undiversified, and their use is restricted. Few topics are touched upon. Many projects chose indicators related to an average of 3 topics (except for Plan Vivo projects) although we outlined the importance of measuring cropland productivity, access to natural resources, vulnerable group representation in decision-making, income diversification. Additionally, we observe the use of ambiguous indicators, combined with a scarce adoption of baselines, targets, and formulas as well as limited of correct sampling methods (RCTs) to avoid endogeneity issues. This unspecific scenario lays footing for poor data reliability and prunes capacity to observe potential adverse outcomes of these projects.

These findings have critical implications for which we believe more stringent methods could be beneficial, ensuring the sustainable integration of local communities within projects whilst verifying that they effectively respect their social claims. We derived a proposal from our results. We suggest revamping current methodologies towards the more stringent methods currently solely used for premium projects tiers (SD VISTa for instance). This robust methodology would allow for accurate effect measurement, promoting the use of baselines, project-specific targets, and formulas, in accordance with proper sampling methods. The combined used will increase data validity. In terms of data access and transparency, we believe that measurement should occur at different levels, and not be limited to the individual. We found a forthright importance of measuring indicators from diverse topics, especially related to project-related issues and the needs of local rural communities. Due to integrity concerns, we suggest the use of a designed standardized set of indicators, creating a comparable ground for projects. This proposal intends to alleviate friction towards data accessibility, permitting the correct mapping of socioeconomic effects induced by A/R carbon offsets.

We are cognizant of the challenges our proposal will induce – increasing the barriers to access the VCM, especially for small local landowners, compelled due to limited funds access for proper monitoring. This issue has been raised by two of our interviewees, Brian Oronoz and Olivier Mushiete. That notwithstanding, we believe this suggestion could be used as an important starting point to dissociate from the current “green grabbing” perception. It is also important to note that Plan Vivo projects had the most complete monitoring designs, although developed by the local communities themselves. One would then think that proper assessment is not really constrained by funding.

IX. Limitations and Ideas for Further Research

1. Limitations

This study analyzed the current methodologies applied for the validation of reforestation projects with the goal of understanding how socioeconomic impacts are measured and proposing a new set of guidelines to improve them. The analysis consisted of gathering, encoding, and summarizing key information from different sources. The novelty and lack of research surrounding the topic, especially focused on socioeconomic impact, required the use of interviews and public documents as primary sources of information. The focus on A/R projects situated in LICs and LMICs allowed us to define a scope and focus on countries in which the socioeconomic impact is higher. We are able to outline three limitations of the analysis regarding the scope of the study, the quality of the data sources, and the overall applicability of the proposal in terms of financial availability.

The first limitation concerns the scope of the study. The projects selected for the analysis corresponded to A/R projects in LICs and LMICs. The analysis was undertaken under these parameters given the focus of the projects on socioeconomic impact. Communication material found for each of the standards under analysis highlighted the impact generated in the community. Nevertheless, we are uncertain if other types of projects analyzed by the standard featured increased robustness checks to measure socioeconomic impact. Furthermore, the focus on LICs and LMICs can limit the conclusions to countries in a similar condition. It is possible that projects in high-income countries present a larger number of socioeconomic indicators and more comprehensive methods. Nevertheless, focusing on LICs and LMICs highlights the shortfalls of projects located in these areas where the upside of improvement can bring significant socioeconomic benefits towards the community.

The second limitation corresponds to the quality of the sources. Given the lack of information available publicly, it was imperative to create our own data for the analysis. The information was collected throughout interviews with representatives from the main standard bodies, one representative from an ongoing project, and official documentation for each project. Even though the collection tasks were undertaken with the highest degree of integrity and fidelity, there could be instances where the information was updated and not available to the general public, thus it could not be encoded. Another limitation is the number of interviews. Although we were able to gather initial interviews, representatives of the standard bodies were not able to provide further information unless confidentiality agreements were signed.

The confidential nature would have prevented future research to use this thesis as a first step to investigate further these issues. Despite the limitation, the initial interviews provided enough context to ensure that the following steps, such as using PDDs, were complete with no missing information. Lastly, the third limitation of the study focuses on the availability of funds required to put into practice our proposal. Monitoring a higher number of indicators requires a larger financial budget for training, surveys, and collecting information. This can have a negative effect on the operations given the long-term ROI that projects must deliver. Nevertheless, the buyers of this type of carbon-offsetting mechanisms should be further incentivized to invest in these types of projects given the transparency offered with the use of improved socioeconomic indicators.

2. Recommendations for Further Research

Based on the analysis presented in this study, a number of interesting areas for future research have emerged. We highlight two unexplored aspects of VCM meriting further investigation including a deeper dive into the specifics of each project and a quantitative analysis using field data.

It is particularly interesting to further explore other A/R projects in depth, drawing on the various cases already analyzed in different countries. The current analysis provides a solid basis for a broader and more comprehensive analysis. Broadening the field of investigation in this direction has the potential to open up new frontiers for research and offer valuable perspectives in this area. Our study focused on three standards, although they represent the majority of the market, it would be interesting to dive deeper into other standards. This would benefit the analysis by using a broader range of methodologies and assessments to be compared.

In terms of quantitative analysis using field data, it would be very interesting and valuable to continue interviewing project developers and gather information on the field. On-the-field interactions provide valuable information and a better understanding of the inner workings of the projects. This approach also allows for an in-depth comparison between the information documented in the Project Design Documents (PDDs) and actual practices and observations on the ground. Such in-depth exploration would provide crucial information on the alignment or divergence between theoretical plans and practical implementations, highlighting potential areas for improvement and optimization. An analysis spanning several years would create enough data to analyze the causality between the carbon-offsetting projects and its impact on the socioeconomic variables in the community.

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Specific Section – Project Design Documents (PDDs)

Gold Standard

1. ACROSS FOREST AS: Reforestation Program in the Southeastern Region of Nicaragua on degraded pasture land. Nicaragua. (2016, August). [Project Design Document]. Retrieved from Gold Standard Registry.
2. WithOneSeed Community Forestry Program. Timor-Leste. (2016, March). [Project Design Document]. Retrieved from Gold Standard Registry.
3. Humbo Ethiopia Assisted Natural Regeneration Project. Ethiopia. (2009, December). [Project Design Document]. Retrieved from Gold Standard Registry.
4. JOil Jatropha plantation. Ghana. (2021, April). [Project Design Document]. Retrieved from Gold Standard Registry.

Verra

CCB

1. Reduced Emissions from Deforestation and Degradation in Seima Protection Forest. Cambodia. (2014, December). [Project Design Document]. Retrieved from Verra CCB Registry.
2. Laguna Seca Forest Carbon Project. Belize. (2011, January). [Project Design Document]. Retrieved from Verra CCB Registry.
3. The Chyulu Hills REDD+ Project. Kenya. (2015, June). [Project Design Document]. Retrieved from Verra CCB Registry.

SD VISTa

1. THE SOUTHERN CARDAMOM REDD+ PROJECT. Cambodia. (2021, August). [Project Design Document]. Retrieved from Verra SD VISTa Registry.

VCS

1. Agroforestry Plantation Batéké Plateau. Republic of Congo. (2022, November). [Project Design Document]. Retrieved from Verra VCS Registry.
2. Reforestation of Degraded Forest Reserves. Ghana. (2018, April). [Project Design Document]. Retrieved from Verra VCS Registry.
3. [Project Design Document]. Retrieved from Verra VCS Registry.
4. Reforestation of Degraded Land by MTPL. India. (2021, May). [Project Design Document]. Retrieved from Verra VCS Registry.
5. Afforestation in Eucalyptus and Acacia plantations for Burapha Agroforestry Co., Ltd. Laos. (2023, May). [Project Design Document]. Retrieved from Verra VCS Registry.

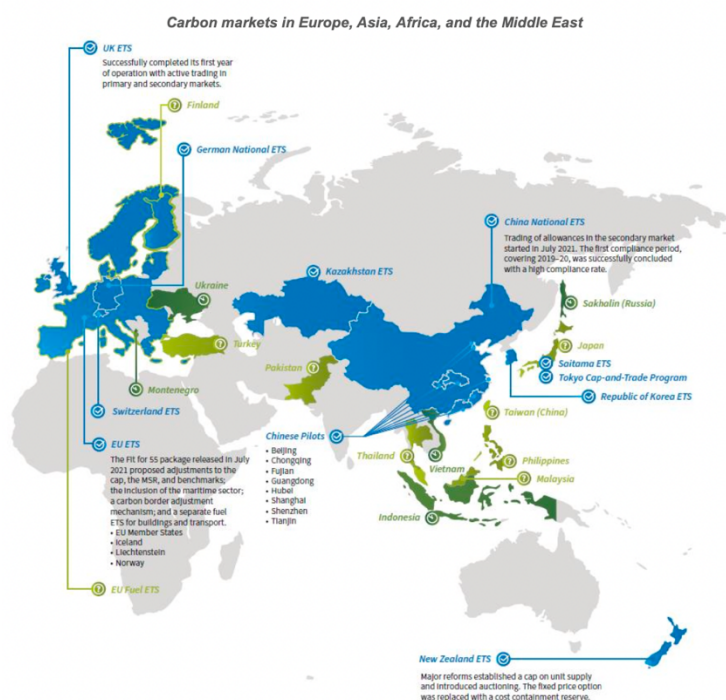
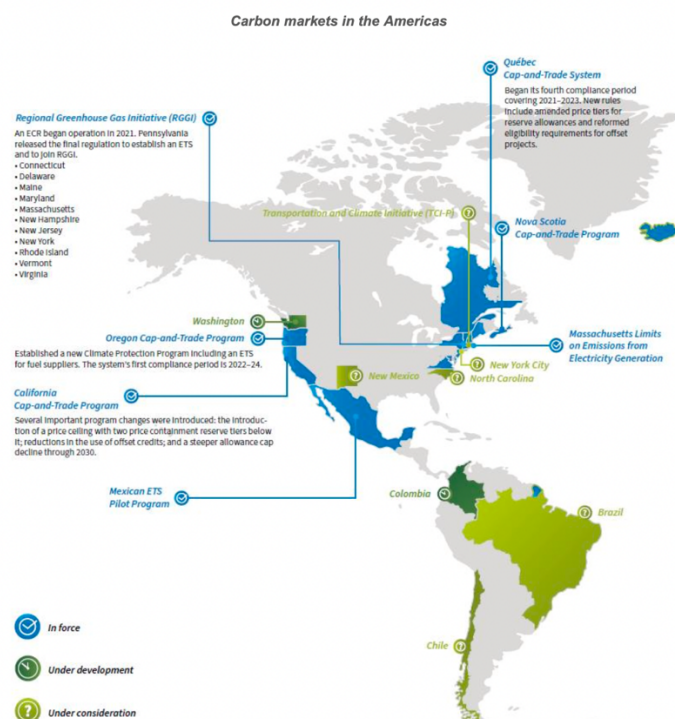
6. Reforestation and Restoration of degraded mangrove lands, sustainable livelihood and community development. Myanmar. (2018, February). [Project Design Document]. Retrieved from Verra VCS Registry.
7. EcoPlanet Bamboo Central America. Nicaragua. (2012, February). [Project Design Document]. Retrieved from Verra VCS Registry.
8. Reforestation of Degraded Lands. Sierra Leone. (2021, January). [Project Design Document]. Retrieved from Verra VCS Registry.
9. Natural High Forest Rehabilitation Project on degraded land of Kibale National Park. Uganda. (2007, November). [Project Design Document]. Retrieved from Verra VCS Registry.

Plan Vivo

1. CommuniTree Carbon Program. Nicaragua. (2014, August). [Project Design Document]. Retrieved from Plan Vivo Registry.
2. Rehabilitation and sustainable management by REACH Italia of degraded pastures. Burkina Faso. (2019, October). [Project Design Document]. Retrieved from Plan Vivo Registry.
3. Ecosystem restoration and valorisation by associations of landless farmers in the Tembien Highlands. Ethiopia. (2016). [Project Design Document]. Retrieved from Plan Vivo Registry.
4. Restoring and Conserving Meghalaya's Hill Forests through Community Action. India. (2022, January). [Project Design Document]. Retrieved from Plan Vivo Registry.
5. Gula Gula Food Forest Program – Ecosystem restoration. Indonesia. (2022, March). [Project Design Document]. Retrieved from Plan Vivo Registry.
6. MIKOKO PAMOJA Mangrove conservation for community benefit. Kenya. (2020). [Project Design Document]. Retrieved from Plan Vivo Registry.
7. Tahiry Honko Community Mangrove Project, Southwest Madagascar. Madagascar. (2019, August). [Project Design Document]. Retrieved from Plan Vivo Registry.
8. Hiniduma Biolink Project. Sri Lanka. (2011, June). [Project Design Document]. Retrieved from Plan Vivo Registry.
9. Emiti Nibwo Bulora, "Trees Sustain Life". Tanzania. (2016, August). [Project Design Document]. Retrieved from Plan Vivo Registry.
10. Halo Verde Timor Community Forest Carbon. Timor-Leste. (2020). [Project Design Document]. Retrieved from Plan Vivo Registry.
11. Trees for Global Benefits. Uganda. (2020, May). [Project Design Document]. Retrieved from Plan Vivo Registry.
12. Loru Forest Project. Vanuatu. (2015). [Project Design Document]. Retrieved from Plan Vivo Registry.
13. Hieu Commune PLAN VIVO project. Vietnam. (2021). [Project Design Document]. Retrieved from Plan Vivo Registry.

XI. Appendices

Appendix 1 - Current Compliance Markets in force, under development and under consideration, in the world

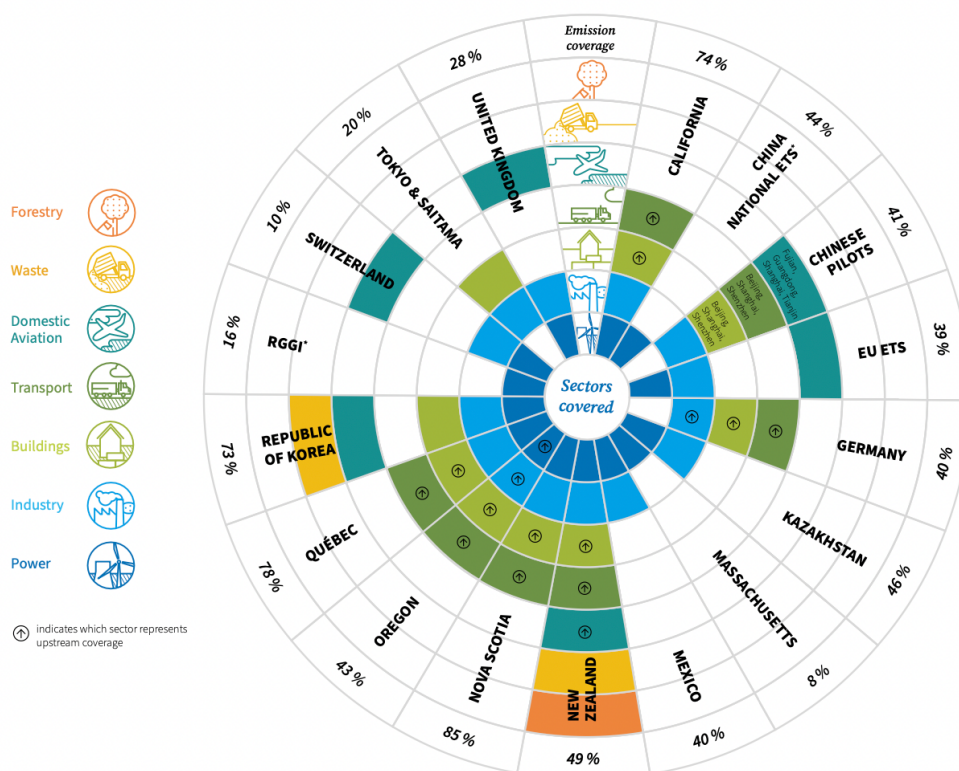


Source: ICAP. (2022).

Appendices 2 and 3 - Industries covered by the currently in force Compliance Markets

Figure 1 – ETS in operation around the world as of December 2014

Jurisdiction	Start date	Power & heat	Industry	Liquid fuels	Buildin g	Trans port	Waste	Forest	Cov. (%)	Cov. (Mt CO ₂ e)
EU ETS (28+3)	2005								45%	2,000
New Zealand	2008								50%	37
Kazakhstan	2013								55%	153
Switzerland	2013								7%	3.5
Republic of Korea	2015								≈ 60%	400
RGGI (9)	2009								22%	104
California ²	2013								85%	395
Alberta	2007								45%	108
Quebec	2013								85%	61
China's Pilots (7)	2013								70%	1,000
Tokyo	2013								20%	13
TOTAL										4,275



Source: ICAP. (2022).

Appendix 4 - Explanation of the different phases of the EU ETS Plan

Phase 1 (2005-2007)

This was a 3-year pilot of 'learning by doing' to prepare for phase 2, when the EU ETS would need to function effectively to help the EU meet its Kyoto targets.

Key features of phase 1:

- Covered only CO₂ emissions from power generators and energy-intensive industries
- Almost all allowances were given to businesses for free
- The penalty for non-compliance was €40 per tonne

Phase 1 succeeded in establishing

- a price for carbon
- free trade in emission allowances across the EU
- the infrastructure needed to monitor, report and verify emissions from the businesses covered.

In the absence of reliable emissions data, phase 1 caps were set on the basis of estimates. As a result, the total amount of allowances issued exceeded emissions and, with supply significantly exceeding demand, in 2007 the price of allowances fell to zero (phase 1 allowances could not be banked for use in phase 2).

Phase 2 (2008-2012)

Phase 2 coincided with the first commitment period of the Kyoto Protocol^{EN•••}, where the countries in the EU ETS had concrete emissions reduction targets to meet.

Key features of phase 2:

- Lower cap on allowances (some 6.5% lower compared to 2005)
- 3 new countries joined – Iceland, Liechtenstein and Norway
- Nitrous oxide emissions from the production of nitric acid included by a number of countries
- The proportion of free allocation fell slightly to around 90%
- Several countries held auctions^{EN•••}
- The penalty for non-compliance was increased to €100 per tonne
- Businesses were allowed to buy international credits totalling around 1.4 billion tonnes of CO₂-equivalent
- Union registry^{EN•••} replaced national registries and the European Union Transaction Log (EUTL) replaced the Community Independent Transaction Log (CITL)
- The aviation sector^{EN•••} was brought into the EU ETS on 1 January 2012 (but application for flights to and from non-European countries was suspended^{EN•••} for 2012)

Because verified annual emissions data from the pilot phase was now available, the cap on allowances was reduced in phase 2, based on actual emissions. However, the 2008 economic crisis led to emissions reductions that were greater than expected. This led to a large surplus of allowances and credits, which weighed heavily on the carbon price throughout phase 2.

Phase 3 (2013-2020)

The reform of the ETS framework for phase 3 (2013-2020) changed the system considerably compared to phases 1 and 2.

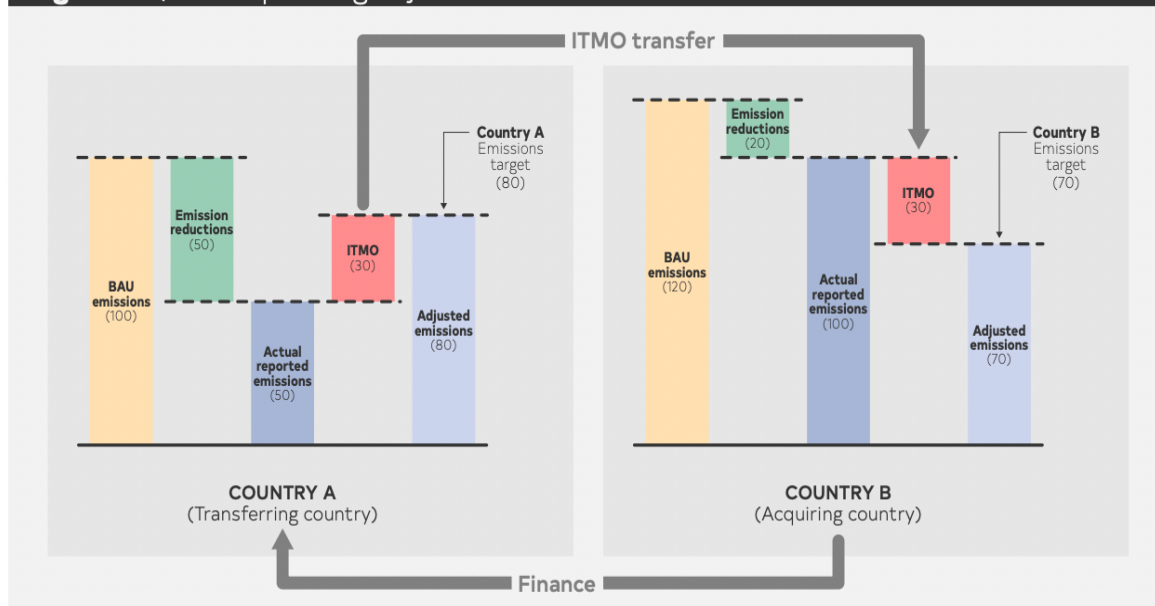
The main changes included:

- a single, EU-wide cap on emissions in place of the previous system of national caps;
- auctioning as the default method for allocating allowances (instead of free allocation);
- harmonised allocation rules applying to the allowances still given away for free;
- more sectors and gases included;
- 300 million allowances set aside in the New Entrants Reserve to fund the deployment of innovative, renewable energy technologies and carbon capture and storage through the NER 300 programme.

Source: The European Commission. (2023).

Appendix 5 - Corresponding Adjustments' Mechanism

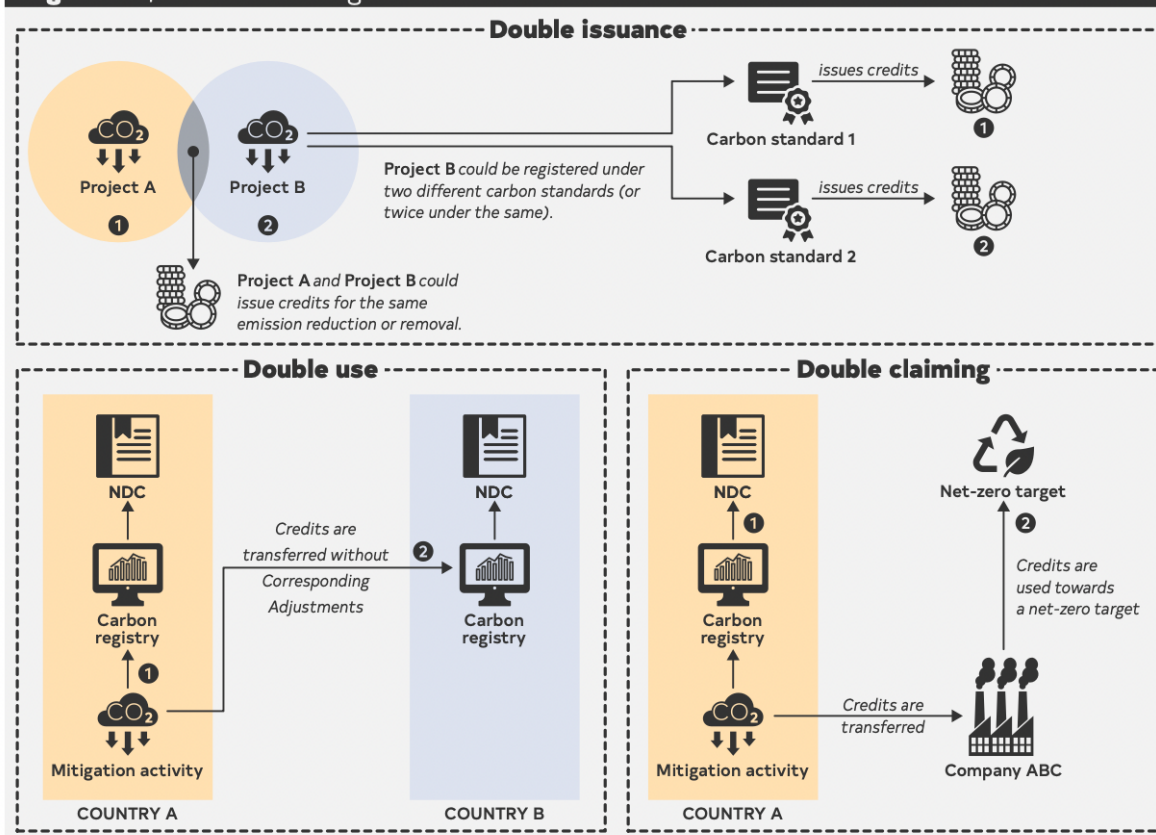
Figure 3.1 | Corresponding adjustment between two countries



Source: Streck, C., Dyck, M., & Trouwloon, D. (2021)

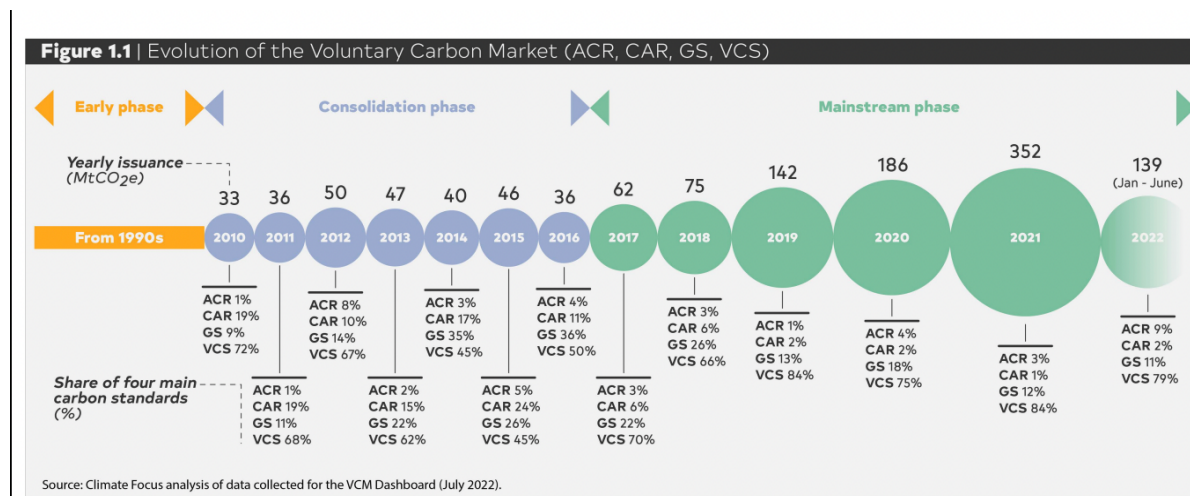
Appendix 6 - The Issue of Double Counting

Figure 4.1 | Double counting



Source: Streck, C., Dyck, M., & Trouwloon, D. (2021)

Appendix 7 - Yearly evolution of VCM carbon credits issuance, combining credits issued by 4 main standards



Source: Streck, C., Dyck, M., & Trouwloon, D. (2021)

Appendix 8 - Complete list of project typologies

Renewable energy	Biogas
	Hydropower
	Solar
	Biomass/ Biochar
	Wind
	Geothermal
Household and Community	Clean Water Distribution
	Lighting Efficiency
	Clean Cookstove Distribution
	Biogas - Community
	Cookstove and Water Purification
	Energy Efficiency
Chemical/ Industrial	Rural Solar
	N ₂ O Distribution - Adipic/Nitric acid
	Carbon Capture and Storage
	Refrigerant - HFC
	Refrigerant - Ozone
	Fugitive Emissions
Energy Efficiency	Energy Efficiency
	Fuel Switching
	Energy Efficiency: Industrial
Waste Disposal	Waste Incineration
	Waste Gas Avoidance
	Waste Gas Recovery
	Recycling
Agriculture	Sustainable Agriculture
	Livestock Methane
	Grassland/ Rangeland Management
	Nitrogen Management
Transport	Public Transportation
	Shipping
Forestry and Land Use	Urban Forestry
	Soil Carbon
	Improved Forest Management
	Avoided Forest Conversion
	Agro-Forestry
	Afforestation/Reforestation
	Blue Carbon
	REDD+

The Ecosystem Marketplace, (2022)

Appendix 9 - The complete list of NbS project type classification by main standard bodies

a. GS (Gold Standard) and VCS

Methodologies GS&VCS	Methodology name	Group	Category	Sub-category
AMS-III.AU.	Methane emission reduction by adjusted water management practice in rice cultivation --- Version 4.0	NbS	Avoided emissions	Agriculture
AR-ACM0001	Afforestation and reforestation of degraded land --- Version 5.2.0	NbS	Removal	Afforestation/Reforestation
AR-ACM0002	Afforestation or reforestation of degraded land without displacement of pre-project activities --- Version 1.1.0	NbS	Removal	Afforestation/Reforestation
AR-ACM0003	Afforestation and reforestation of lands except wetlands --- Version 2.0	NbS	Removal	Afforestation/Reforestation
AR-AM0002	Restoration of degraded lands through afforestation/reforestation	NbS	Removal	Afforestation/Reforestation
AR-AM0003	Afforestation and reforestation of degraded land through tree planting, assisted natural regeneration and control of animal grazing ---Version 4.0	NbS	Removal	Afforestation/Reforestation
AR-AM0005	Afforestation and reforestation project activities implemented for industrial and/or commercial uses --- Version 4.0	NbS	Removal	Afforestation/Reforestation
AR-AM0007	Afforestation and Reforestation of Land Currently Under Agricultural or Pastoral Use --- Version 5.0	NbS	Removal	Afforestation/Reforestation
AR-AM0014	Afforestation and reforestation of degraded mangrove habitats --- Version 3.0	NbS	Removal	Wetlands
AR-AMS0001	Simplified baseline and monitoring methodologies for small-scale A/R CDM project activities implemented on grasslands or croplands with limited displacement of pre-project activities --- Version 6.0	NbS	Removal	Afforestation/Reforestation
AR-AMS0002	Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the CDM implemented on settlements --- Version 2.0	NbS	Removal	Afforestation/Reforestation
AR-AMS0003	Afforestation and reforestation project activities implemented on wetlands --- Version 3.0	NbS	Removal	Wetlands
AR-AMS0004	Simplified baseline and monitoring methodology for small-scale agroforestry - afforestation and reforestation project activities under the clean development mechanism --- Version 2.0	NbS	Removal	Agriculture
AR-AMS0005	Simplified baseline and monitoring methodology for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on lands having low inherent potential to support living biomass --- Version 2.0	NbS	Removal	Afforestation/Reforestation
AR-AMS0006	Simplified baseline and monitoring methodology for small-scale silvopastoral - afforestation and reforestation project activities under the clean development mechanism --- Version 1.0	NbS	Removal	Agriculture
AR-AMS0007	Afforestation and reforestation project activities implemented on lands other than wetlands --- Version 3.1	NbS	Removal	Afforestation/Reforestation
GS GHG A.R GHG Emissions Reduction Sequestration v1.	GHG Emissions Reduction Sequestration	NbS	Removal	Afforestation/Reforestation

VM00015	Avoided Unplanned Deforestation	NbS	Avoided emissions	Avoided deforestation
VM0003	Methodology for Improved Forest Management through Extension of Rotation Age, v1.2	NbS	Removal	Improved forest management
VM0004	Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, v1.0	NbS	Avoided emissions	Wetlands
VM0005	Methodology for Conversion of Low-productive Forest to High-productive Forest, v1.2	NbS	Removal	Improved forest management
VM0006	Carbon Accounting for Mosaic and Landscape-scale REDD Projects, v2.2	NbS	Avoided emissions	Avoided deforestation
VM0007	REDD+ Methodology Framework (REDD-MF)	NbS	Avoided emissions	Avoided deforestation
VM0009	Methodology for Avoided Ecosystem Conversion	NbS	Avoided emissions	Wetlands
VM0010	Improved Forest Management: Conversion from Logged to Protected Forest	NbS	Removal	Improved forest management
VM0011	Methodology for Calculating GHG Benefits from Preventing Planned Degradation, v1.0	NbS	Avoided emissions	Improved forest management
VM0012	Improved Forest Management in Temperate and Boreal Forests (LtPF), v1.2	NbS	Removal	Improved forest management
VM0015	Avoided Unplanned Deforestation	NbS	Avoided emissions	Avoided deforestation
VM0017	Adoption of Sustainable Agricultural Land Management	NbS	Removal	Agriculture
VM0026	Methodology for Sustainable Grassland Management (SGM)	NbS	Removal	Agriculture
VM0032	Methodology for the Adoption of Sustainable Grasslands through Adjustment of Fire and Grazing	NbS	Removal	Agriculture
VM0034	British Columbia Forest Carbon Offset Methodology, v1.0	NbS	Removal	Improved forest management
VM0037	Implementation of REDD+ Activities in Landscapes Affected by Mosaic Deforestation and Degradation	NbS	Avoided emissions	Avoided deforestation

b. ACR (American Carbon Registry)

ACR Category	Group	Category	Sub-category
Agricultural Land Management	NbS	Avoided emissions	Agriculture
Forest Carbon - Other	NbS	Removal	Afforestation/Reforestation
Forest Carbon - Improved forest Management	NbS	Removal	Improved Forest Management
Wetland Restoration	NbS	Removal	Afforestation/Reforestation

c. CAR (Carbon Action Reserve)

CAR Categories	Group	Category	Subcategory
Forestry - MX	NbS	Removal	Afforestation/Reforestation
Avoided Conversion	NbS	Avoided emissions	Wetlands
Improved Forest Management	NbS	Removal	Improved forest management
Avoided Grassland Conversion	NbS	Avoided emissions	Wetlands
Conservation-Based Forest Management	NbS	Removal	Improved forest management
Reforestation	NbS	Removal	Afforestation/Reforestation

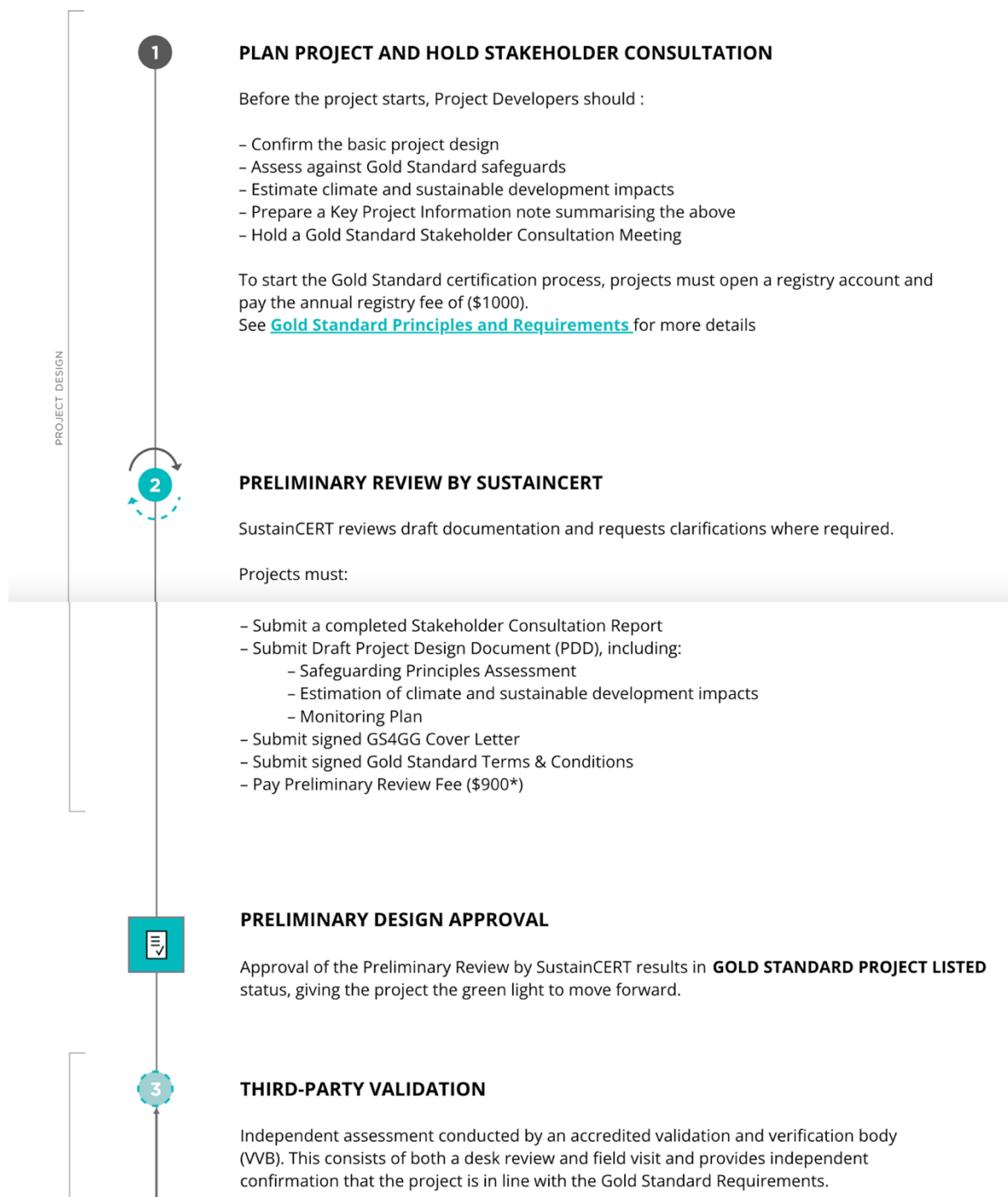
d. Plan Vivo

Plan Vivo category	Group	Subcategory
Forest Conservation & Avoided Deforestation	Labelled on a project basis	Labelled on a project basis
REDD	Avoided emissions	Avoided deforestation
Improved forest management	Removal	Improved Forest Management
Afforestation / Reforestation	Removal	Afforestation/Reforestation
Forest Restoration	Labelled on a project basis	Labelled on a project basis
Reduced emissions from deforestation & degradation	Avoided emissions	Avoided deforestation
Agriculture land management	Removal	Agriculture
Forest	Labelled on a project basis	Labelled on a project basis

Source: Landholm, D. & Bravo, F. & Palmegiani, I. & Minoli, S. & Streck, C. & Mikołajczyk, S. (2022).

Appendix 10 - Gold Standard Certification Process

PROCESS TO BE CERTIFIED GOLD STANDARD:



4

Projects must:

- Have “Gold Standard Project Listed” status
- Identify, contract and pay VVB to carry out validation – Find an [approved VVB](#)
- Provide a fully completed Project Design Document (PDD) and all relevant supporting documentation for VVB validation

PROJECT DESIGN REVIEW BY SUSTAINCERT

SustainCERT reviews documentation and requests clarifications and resolutions of corrective actions where required.

Projects must:

- Have a positive validation opinion from VVB
- Submit VVB approved Project Design Document (PDD) and all relevant supporting documentation
- Submit VVB Final Validation Report
- Pay Design Review Fee (\$1000*)



DESIGN CERTIFICATION

SustainCERT certifies:

- Safeguards are covered by the project design
- Stakeholder inclusive design
- Robust monitoring plan
- Estimated climate and sustainable development impacts
- Approval results in **GOLD STANDARD DESIGN CERTIFIED** status

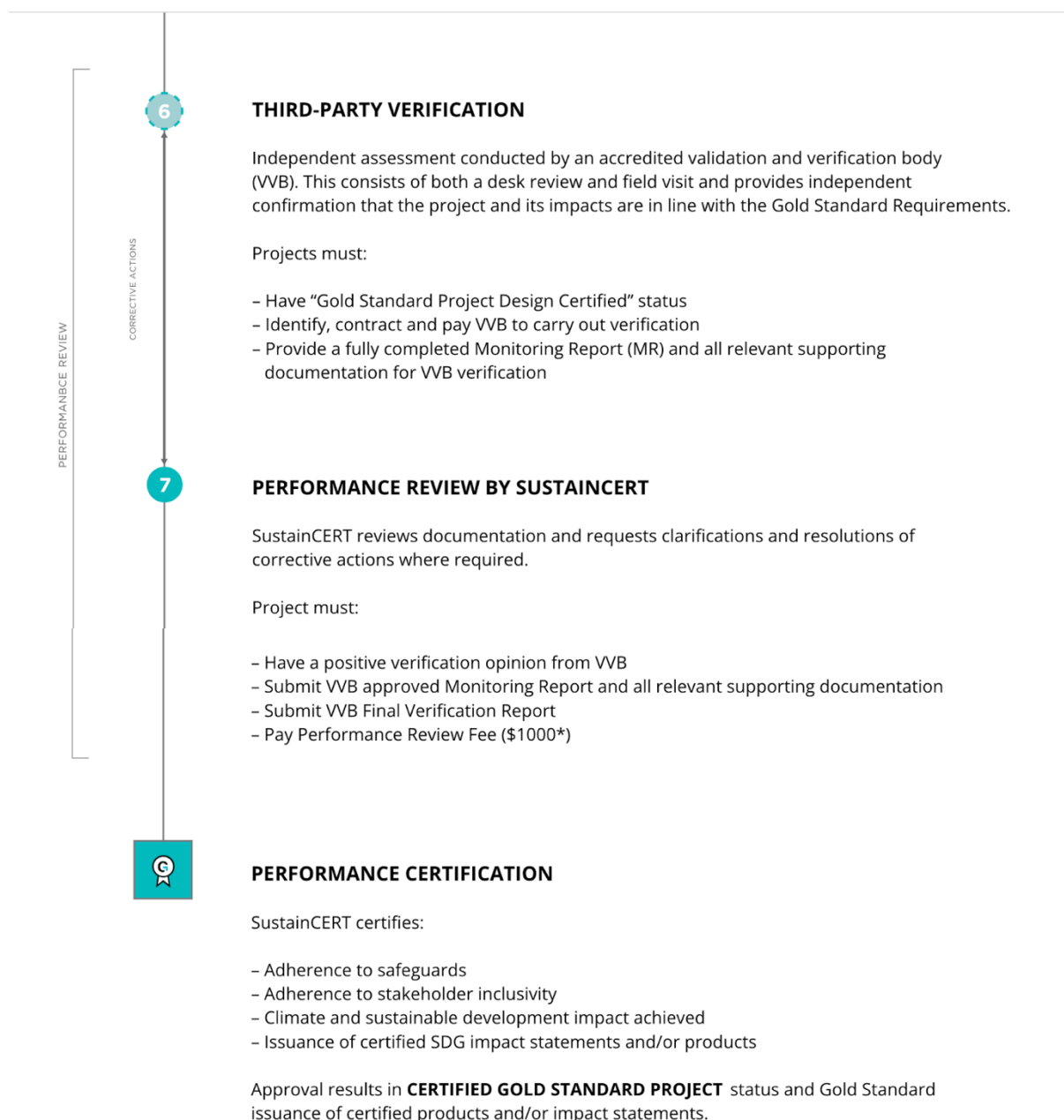
5

PROJECT MONITORING

Project Developer monitors project according to the approved monitoring plan.

Projects must:

- Continuously engage with stakeholders
- Submit Annual Reports in years when verification does not occur
- Prepare a Monitoring Report for verification to request issuance of impact statements and/or products



Source: Gold Standard, 2023a.

Appendix 11 - Indicators figuring in the UN's Global Indicator Framework for SDGs

Goals and targets (from the 2030 Agenda for Sustainable development)	Indicators
GOAL 1. End poverty in all its forms everywhere	
1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day	1.1.1 Proportion of the population living below the international poverty line by sex, age, employment status and geographic location (urban/rural)
1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	1.2.1 Proportion of population living below the national poverty line, by sex and age 1.2.2 Proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable	1.3.1 Proportion of population covered by social protection floors/systems, by sex, distinguishing children, unemployed persons, older persons, persons with disabilities, pregnant women, newborns, work-injury victims and the poor and the vulnerable
1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	1.4.1 Proportion of population living in households with access to basic services 1.4.2 Proportion of total adult population with secure tenure rights to land, (a) with legally recognized documentation, and (b) who perceive their rights to land as secure, by sex and type of tenure
1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	1.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population 1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP) 1.5.3 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 1.5.4 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies
1.a Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions	1.a.1 Total official development assistance grants from all donors that focus on poverty reduction as a share of the recipient country's gross national income 1.a.2 Proportion of total government spending on essential services (education, health and social protection)
1.b Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions	1.b.1 Pro-poor public social spending
GOAL 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	
2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	2.1.1 Prevalence of undernourishment 2.1.2 Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)
2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the	2.2.1 Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health

nutritional needs of adolescent girls, pregnant and lactating women and older persons	Organization (WHO) Child Growth Standards) among children under 5 years of age 2.2.2 Prevalence of malnutrition (weight for height $>+2$ or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight) 2.2.3 Prevalence of anaemia in women aged 15 to 49 years, by pregnancy status (percentage)
2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	2.3.1 Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size 2.3.2 Average income of small-scale food producers, by sex and indigenous status
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	2.4.1 Proportion of agricultural area under productive and sustainable agriculture
2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed	2.5.1 Number of (a) plant and (b) animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities 2.5.2 Proportion of local breeds classified as being at risk of extinction
2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries	2.a.1 The agriculture orientation index for government expenditures 2.a.2 Total official flows (official development assistance plus other official flows) to the agriculture sector
2.b Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round	2.b.1 Agricultural export subsidies
2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, to help limit extreme food price volatility	2.c.1 Indicator of food price anomalies
GOAL 3. Ensure healthy live and promote wellbeing for all at all ages	
3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births	3.1.1 Maternal mortality ratio 3.1.2 Proportion of births attended by skilled health personnel
3.2 By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births	3.2.1 Under-5 mortality rate 3.2.2 Neonatal mortality rate
3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases	3.3.1 Number of new HIV infections per 1,000 uninfected population, by sex, age and key populations 3.3.2 Tuberculosis incidence per 100,000 population

	3.3.3 Malaria incidence per 1,000 population 3.3.4 Hepatitis B incidence per 100,000 population 3.3.5 Number of people requiring interventions against neglected tropical diseases
3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being	3.4.1 Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease 3.4.2 Suicide mortality rate
3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol	3.5.1 Coverage of treatment interventions (pharmacological, psychosocial and rehabilitation and aftercare services) for substance use disorders 3.5.2 Alcohol per capita consumption (aged 15 years and older) within a calendar year in litres of pure alcohol
3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents	3.6.1 Death rate due to road traffic injuries
3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes	3.7.1 Proportion of women of reproductive age (aged 15–49 years) who have their need for family planning satisfied with modern methods 3.7.2 Adolescent birth rate (aged 10–14 years; aged 15–19 years) per 1,000 women in that age group
3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	3.8.1 Coverage of essential health services 3.8.2 Proportion of population with large household expenditures on health as a share of total household expenditure or income
3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	3.9.1 Mortality rate attributed to household and ambient air pollution 3.9.2 Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services) 3.9.3 Mortality rate attributed to unintentional poisoning
3.a Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate	3.a.1 Age-standardized prevalence of current tobacco use among persons aged 15 years and older
3.b Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all	3.b.1 Proportion of the target population covered by all vaccines included in their national programme 3.b.2 Total net official development assistance to medical research and basic health sectors 3.b.3 Proportion of health facilities that have a core set of relevant essential medicines available and affordable on a sustainable basis
3.c Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States	3.c.1 Health worker density and distribution
3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks	3.d.1 International Health Regulations (IHR) capacity and health emergency preparedness 3.d.2 Percentage of bloodstream infections due to selected antimicrobial-resistant organisms

GOAL 4. Ensure inclusive and equitable quality education	and promote lifelong learning opportunities for all
4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes	4.1.1 Proportion of children and young people (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex 4.1.2 Completion rate (primary education, lower secondary education, upper secondary education)
4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education	4.2.1 Proportion of children aged 24–59 months who are developmentally on track in health, learning and psychosocial well-being, by sex 4.2.2 Participation rate in organized learning (one year before the official primary entry age), by sex
4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university	4.3.1 Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex
4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship	4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill
4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations	4.5.1 Parity indices (female/male, rural/urban, bottom/top wealth quintile and others such as disability status, indigenous peoples and conflict-affected, as data become available) for all education indicators on this list that can be disaggregated
4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy	4.6.1 Proportion of population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex
4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development	4.7.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment
4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all	4.a.1 Proportion of schools offering basic services, by type of service
4.b By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries	4.b.1 Volume of official development assistance flows for scholarships by sector and type of study
4.c By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States	4.c.1 Proportion of teachers with the minimum required qualifications, by education level
GOAL 5. Achieve gender equality and empower all women	and girls
5.1 End all forms of discrimination against all women and girls everywhere	5.1.1 Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex
5.2 Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation	5.2.1 Proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by a current or former intimate partner in the previous 12 months, by form of violence and by age

	5.2.2 Proportion of women and girls aged 15 years and older subjected to sexual violence by persons other than an intimate partner in the previous 12 months, by age and place of occurrence
5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation	5.3.1 Proportion of women aged 20–24 years who were married or in a union before age 15 and before age 18 5.3.2 Proportion of girls and women aged 15–49 years who have undergone female genital mutilation, by age
5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate	5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location
5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life	5.5.1 Proportion of seats held by women in (a) national parliaments and (b) local governments 5.5.2 Proportion of women in managerial positions
5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences	5.6.1 Proportion of women aged 15–49 years who make their own informed decisions regarding sexual relations, contraceptive use and reproductive health care 5.6.2 Number of countries with laws and regulations that guarantee full and equal access to women and men aged 15 years and older to sexual and reproductive health care, information and education
5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws	5.a.1 (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure 5.a.2 Proportion of countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control
5.b Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women	5.b.1 Proportion of individuals who own a mobile telephone, by sex
5.c Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels	5.c.1 Proportion of countries with systems to track and make public allocations for gender equality and women's empowerment
GOAL 6. Ensure availability and sustainable management of water and sanitation for all	
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 Proportion of domestic and industrial wastewater flows safely treated 6.3.2 Proportion of bodies of water with good ambient water quality
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 Degree of integrated water resources management 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1 Change in the extent of water-related ecosystems over time
6.a By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
6.b Support and strengthen the participation of local communities in improving water and sanitation management	6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management
GOAL 7. Ensure access to affordable, reliable, sustainable and modern energy for all	
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1 Proportion of population with access to electricity 7.1.2 Proportion of population with primary reliance on clean fuels and technology
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption
7.3 By 2030, double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and GDP
7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	7.a.1 International financial flows to developing countries in support of clean energy research and development and renewable energy production, including in hybrid systems
7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and landlocked developing countries, in accordance with their respective programmes of support	7.b.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)
GOAL 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
8.1 Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries	8.1.1 Annual growth rate of real GDP per capita
8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors	8.2.1 Annual growth rate of real GDP per employed person
8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services	8.3.1 Proportion of informal employment in total employment, by sector and sex
8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead	8.4.1 Material footprint, material footprint per capita, and material footprint per GDP 8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	8.5.1 Average hourly earnings of employees, by sex, age, occupation and persons with disabilities 8.5.2 Unemployment rate, by sex, age and persons with disabilities
8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training	8.6.1 Proportion of youth (aged 15–24 years) not in education, employment or training
8.7 Take immediate and effective measures to eradicate forced labour, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of	8.7.1 Proportion and number of children aged 5–17 years engaged in child labour, by sex and age

child labour, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms	
8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment	8.8.1 Fatal and non-fatal occupational injuries per 100,000 workers, by sex and migrant status 8.8.2 Level of national compliance with labour rights (freedom of association and collective bargaining) based on International Labour Organization (ILO) textual sources and national legislation, by sex and migrant status
8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products	8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate
8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all	8.10.1 (a) Number of commercial bank branches per 100,000 adults and (b) number of automated teller machines (ATMs) per 100,000 adults 8.10.2 Proportion of adults (15 years and older) with an account at a bank or other financial institution or with a mobile-money-service provider
8.a Increase Aid for Trade support for developing countries, in particular least developed countries, including through the Enhanced Integrated Framework for Trade-related Technical Assistance to Least Developed Countries	8.a.1 Aid for Trade commitments and disbursements
8.b By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labour Organization	8.b.1 Existence of a developed and operationalized national strategy for youth employment, as a distinct strategy or as part of a national employment strategy
GOAL 9. Build resilient infrastructure, promote inclusive	and sustainable industrialization and foster innovation
9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	9.1.1 Proportion of the rural population who live within 2 km of an all-season road 9.1.2 Passenger and freight volumes, by mode of transport
9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	9.2.1 Manufacturing value added as a proportion of GDP and per capita 9.2.2 Manufacturing employment as a proportion of total employment
9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets	9.3.1 Proportion of small-scale industries in total industry value added 9.3.2 Proportion of small-scale industries with a loan or line of credit
9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	9.4.1 CO ₂ emission per unit of value added
9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending	9.5.1 Research and development expenditure as a proportion of GDP 9.5.2 Researchers (in full-time equivalent) per million inhabitants
9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States	9.a.1 Total official international support (official development assistance plus other official flows) to infrastructure
9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities	9.b.1 Proportion of medium and high-tech industry value added in total value added

9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020	9.c.1 Proportion of population covered by a mobile network, by technology
GOAL 10. Reduce inequality within and among countries	
10.1 By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average	10.1.1 Growth rates of household expenditure or income per capita among the bottom 40 per cent of the population and the total population
10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status	10.2.1 Proportion of people living below 50 per cent of median income, by sex, age and persons with disabilities
10.3 Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard	10.3.1 Proportion of population reporting having personally felt discriminated against or harassed in the previous 12 months on the basis of a ground of discrimination prohibited under international human rights law
10.4 Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality	10.4.1 Labour share of GDP 10.4.2 Redistributive impact of fiscal policy
10.5 Improve the regulation and monitoring of global financial markets and institutions and strengthen the implementation of such regulations	10.5.1 Financial Soundness Indicators
10.6 Ensure enhanced representation and voice for developing countries in decision-making in global international economic and financial institutions to deliver more effective, credible, accountable and legitimate institutions	10.6.1 Proportion of members and voting rights of developing countries in international organizations
10.7 Facilitate orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies	10.7.1 Recruitment cost borne by employee as a proportion of monthly income earned in country of destination 10.7.2 Proportion of countries with migration policies that facilitate orderly, safe, regular and responsible migration and mobility of people 10.7.3 Number of people who died or disappeared in the process of migration towards an international destination 10.7.4 Proportion of the population who are refugees, by country of origin
10.a Implement the principle of special and differential treatment for developing countries, in particular least developed countries, in accordance with World Trade Organization agreements	10.a.1 Proportion of tariff lines applied to imports from least developed countries and developing countries with zero-tariff
10.b Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular least developed countries, African countries, small island developing States and landlocked developing countries, in accordance with their national plans and programmes	10.b.1 Total resource flows for development, by recipient and donor countries and type of flow (e.g. official development assistance, foreign direct investment and other flows)
10.c By 2030, reduce to less than 3 per cent the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5 per cent	10.c.1 Remittance costs as a proportion of the amount remitted
GOAL 11. Make cities and human settlements inclusive, safe, resilient and sustainable	
11.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums	11.1.1 Proportion of urban population living in slums, informal settlements or inadequate housing
11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	11.2.1 Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities
11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries	11.3.1 Ratio of land consumption rate to population growth rate

	11.3.2 Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically
11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage	11.4.1 Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal)
11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	11.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population 11.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP) 11.5.3 (a) Damage to critical infrastructure and (b) number of disruptions to basic services, attributed to disasters
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.1 Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities 11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)
11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities	11.7.1 Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities 11.7.2 Proportion of persons victim of physical or sexual harassment, by sex, age, disability status and place of occurrence, in the previous 12 months
11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning	11.a.1 Number of countries that have national urban policies or regional development plans that (a) respond to population dynamics; (b) ensure balanced territorial development; and (c) increase local fiscal space
11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels	11.b.1 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030 11.b.2 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies
11.c Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials	<i>No suitable replacement indicator was proposed. The global statistical community is encouraged to work to develop an indicator that could be proposed for the 2025 comprehensive review. See E/CN.3/2020/2, paragraph 23</i>
GOAL 12. Ensure sustainable consumption and production patterns	
12.1 Implement the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	12.1.1 Number of countries developing, adopting or implementing policy instruments aimed at supporting the shift to sustainable consumption and production
12.2 By 2030, achieve the sustainable management and efficient use of natural resources	12.2.1 Material footprint, material footprint per capita, and material footprint per GDP 12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	12.3.1 (a) Food loss index and (b) food waste index
12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life	12.4.1 Number of parties to international multilateral environmental agreements on hazardous waste, and other

cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment	chemicals that meet their commitments and obligations in transmitting information as required by each relevant agreement
12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment
12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle	12.5.1 National recycling rate, tons of material recycled
12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities	12.6.1 Number of companies publishing sustainability reports
12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature	12.7.1 Number of countries implementing sustainable public procurement policies and action plans
12.a Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production	12.8.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment
12.b Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products	12.a.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)
12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities	12.b.1 Implementation of standard accounting tools to monitor the economic and environmental aspects of tourism sustainability
GOAL 13. Take urgent action to combat climate change and its impact	
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	12.c.1 Amount of fossil-fuel subsidies (production and consumption) per unit of GDP
13.2 Integrate climate change measures into national policies, strategies and planning	13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population
13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030
13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of	13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies
	13.2.1 Number of countries with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change
	13.2.2 Total greenhouse gas emissions per year
	13.3.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment
	13.a.1 Amounts provided and mobilized in United States dollars per year in relation to the continued existing collective mobilization goal of the \$100 billion commitment through to 2025

developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	
13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	13.b.1 Number of least developed countries and small island developing States with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change
GOAL 14. Conserve and sustainably use the oceans, seas	and marine resources for sustainable development
14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	14.1.1 (a) Index of coastal eutrophication; and (b) plastic debris density
14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration to achieve healthy and productive oceans	14.2.1 Number of countries using ecosystem-based approaches to managing marine areas
14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels	14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations
14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	14.4.1 Proportion of fish stocks within biologically sustainable levels
14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information	14.5.1 Coverage of protected areas in relation to marine areas
14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation ⁴	14.6.1 Degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing
14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism	14.7.1 Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries
14.a Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries	14.a.1 Proportion of total research budget allocated to research in the field of marine technology
14.b Provide access for small-scale artisanal fishers to marine resources and markets	14.b.1 Degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries
14.c Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of "The future we want"	14.c.1 Number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the United Nations Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources
GOAL 15. Protect, restore and promote sustainable use of combat desertification, and halt and reverse land	terrestrial ecosystems, sustainably manage forests, degradation and halt biodiversity loss
15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater	15.1.1 Forest area as a proportion of total land area

ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type
15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	15.2.1 Progress towards sustainable forest management
15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation- neutral world	15.3.1 Proportion of land that is degraded over total land area
15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, to enhance their capacity to provide benefits that are essential for sustainable development	15.4.1 Coverage by protected areas of important sites for mountain biodiversity 15.4.2 (a) Mountain Green Cover Index and (b) proportion of degraded mountain land
15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	15.5.1 Red List Index
15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed	15.6.1 Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits
15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products	15.7.1 Proportion of traded wildlife that was poached or illicitly trafficked
15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species	15.8.1 Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species
15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	15.9.1 (a) Number of countries that have established national targets in accordance with or similar to Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020 in their national biodiversity strategy and action plans and the progress reported towards these targets; and (b) integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting
15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems	15.a.1 (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments
15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation	15.b.1 (a) Official development assistance on conservation and sustainable use of biodiversity; and (b) revenue generated and finance mobilized from biodiversity-relevant economic instruments
15.c Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities	15.c.1 Proportion of traded wildlife that was poached or illicitly trafficked
GOAL 16. Promote peaceful and inclusive societies for and build effective, accountable and inclusive	sustainable development provide access to justice for all institutions at all levels
16.1 Significantly reduce all forms of violence and related death rates everywhere	16.1.1 Number of victims of intentional homicide per 100,000 population, by sex and age 16.1.2 Conflict-related deaths per 100,000 population, by sex, age and cause 16.1.3 Proportion of population subjected to (a) physical violence, (b) psychological violence and (c) sexual violence in the previous 12 months

	16.1.4 Proportion of population that feel safe walking alone around the area they live after dark
16.2 End abuse, exploitation, trafficking and all forms of violence against and torture of children	16.2.1 Proportion of children aged 1–17 years who experienced any physical punishment and/or psychological aggression by caregivers in the past month 16.2.2 Number of victims of human trafficking per 100,000 population, by sex, age and form of exploitation 16.2.3 Proportion of young women and men aged 18–29 years who experienced sexual violence by age 18
16.3 Promote the rule of law at the national and international levels and ensure equal access to justice for all	16.3.1 Proportion of victims of violence in the previous 12 months who reported their victimization to competent authorities or other officially recognized conflict resolution mechanisms 16.3.2 Unsented detainees as a proportion of overall prison population 16.3.3 Proportion of the population who have experienced a dispute in the past two years and who accessed a formal or informal dispute resolution mechanism, by type of mechanism
16.4 By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime	16.4.1 Total value of inward and outward illicit financial flows (in current United States dollars) 16.4.2 Proportion of seized, found or surrendered arms whose illicit origin or context has been traced or established by a competent authority in line with international instrument
16.5 Substantially reduce corruption and bribery in all their forms	16.5.1 Proportion of persons who had at least one contact with a public official and who paid a bribe to a public official, or were asked for a bribe by those public officials, during the previous 12 months 16.5.2 Proportion of businesses that had at least one contact with a public official and that paid a bribe to a public official, or were asked for a bribe by those public officials during the previous 12 months
16.6 Develop effective, accountable and transparent institutions at all levels	16.6.1 Primary government expenditures as a proportion of original approved budget, by sector (or by budget codes or similar) 16.6.2 Proportion of population satisfied with their last experience of public services
16.7 Ensure responsive, inclusive, participatory and representative decision-making at all levels	16.7.1 Proportions of positions in national and local institutions, including (a) the legislatures; (b) the public service; and (c) the judiciary, compared to national distributions, by sex, age, persons with disabilities and population groups 16.7.2 Proportion of population who believe decision-making is inclusive and responsive, by sex, age, disability and population group
16.8 Broaden and strengthen the participation of developing countries in the institutions of global governance	16.8.1 Proportion of members and voting rights of developing countries in international organizations
16.9 By 2030, provide legal identity for all, including birth registration	16.9.1 Proportion of children under 5 years of age whose births have been registered with a civil authority, by age
16.10 Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements	16.10.1 Number of verified cases of killing, kidnapping, enforced disappearance, arbitrary detention and torture of

	journalists, associated media personnel, trade unionists and human rights advocates in the previous 12 months 16.10.2 Number of countries that adopt and implement constitutional, statutory and/or policy guarantees for public access to information
16.a Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime	16.a.1 Existence of independent national human rights institutions in compliance with the Paris Principles
16.b Promote and enforce non-discriminatory laws and policies for sustainable development	16.b.1 Proportion of population reporting having personally felt discriminated against or harassed in the previous 12 months on the basis of a ground of discrimination prohibited under international human rights law
GOAL 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	
Finance	
17.1 Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection	17.1.1 Total government revenue as a proportion of GDP, by source 17.1.2 Proportion of domestic budget funded by domestic taxes
17.2 Developed countries to implement fully their official development assistance commitments, including the commitment by many developed countries to achieve the target of 0.7 per cent of gross national income for official development assistance (ODA/GNI) to developing countries and 0.15 to 0.20 per cent of ODA/GNI to least developed countries; ODA providers are encouraged to consider setting a target to provide at least 0.20 per cent of ODA/GNI to least developed countries	17.2.1 Net official development assistance, total and to least developed countries, as a proportion of the Organization for Economic Cooperation and Development (OECD) Development Assistance Committee donors' gross national income (GNI)
17.3 Mobilize additional financial resources for developing countries from multiple sources	17.3.1 Additional financial resources mobilized for developing countries from multiple sources 17.3.2 Volume of remittances (in United States dollars) as a proportion of total GDP
17.4 Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress	17.4.1 Debt service as a proportion of exports of goods and services
17.5 Adopt and implement investment promotion regimes for least developed countries	17.5.1 Number of countries that adopt and implement investment promotion regimes for developing countries, including the least developed countries
Technology	
17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge-sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism	17.6.1 Fixed Internet broadband subscriptions per 100 inhabitants, by speed
17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed	17.7.1 Total amount of funding for developing countries to promote the development, transfer, dissemination and diffusion of environmentally sound technologies
17.8 Fully operationalize the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology	17.8.1 Proportion of individuals using the Internet
Capacity-building	

17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the Sustainable Development Goals, including through North-South, South-South and triangular cooperation	17.9.1 Dollar value of financial and technical assistance (including through North-South, South-South and triangular cooperation) committed to developing countries
Trade	
17.10 Promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the World Trade Organization, including through the conclusion of negotiations under its Doha Development Agenda	17.10.1 Worldwide weighted tariff-average
17.11 Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020	17.11.1 Developing countries' and least developed countries' share of global exports
17.12 Realize timely implementation of duty-free and quota-free market access on a lasting basis for all least developed countries, consistent with World Trade Organization decisions, including by ensuring that preferential rules of origin applicable to imports from least developed countries are transparent and simple, and contribute to facilitating market access	17.12.1 Weighted average tariffs faced by developing countries, least developed countries and small island developing States
Systemic issues	
<i>Policy and institutional coherence</i>	
17.13 Enhance global macroeconomic stability, including through policy coordination and policy coherence	17.13.1 Macroeconomic Dashboard
17.14 Enhance policy coherence for sustainable development	17.14.1 Number of countries with mechanisms in place to enhance policy coherence of sustainable development
17.15 Respect each country's policy space and leadership to establish and implement policies for poverty eradication and sustainable development	17.15.1 Extent of use of country-owned results frameworks and planning tools by providers of development cooperation
<i>Multi-stakeholder partnerships</i>	
17.16 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	17.16.1 Number of countries reporting progress in multi-stakeholder development effectiveness monitoring frameworks that support the achievement of the Sustainable Development Goals
17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships	17.17.1 Amount in United States dollars committed to public-private partnerships for infrastructure
<i>Data, monitoring and accountability</i>	
17.18 By 2020, enhance capacity-building support to developing countries, including for least developed countries and small island developing States, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts	17.18.1 Statistical capacity indicator for Sustainable Development Goal monitoring 17.18.2 Number of countries that have national statistical legislation that complies with the Fundamental Principles of Official Statistics 17.18.3 Number of countries with a national statistical plan that is fully funded and under implementation, by source of funding
17.19 By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries	17.19.1 Dollar value of all resources made available to strengthen statistical capacity in developing countries 17.19.2 Proportion of countries that (a) have conducted at least one population and housing census in the last 10 years; and (b) have achieved 100 per cent birth registration and 80 per cent death registration

Source: UN Statistics. (2020).

Appendix 12 - Indicators for Forestry projects in Gold Standard's SDG Impact Tool

Indicator	SDG
Number of beneficiaries: households	7. Affordable and clean energy
Number of beneficiaries: individuals	7. Affordable and clean energy
Amount of GHGs emissions avoided or sequestered	13. Climate action
Total non-renewable	15. Life on land
Forest areas managed sustainably for forest products including sustainable produced fuelwood	15. Life on land
Total number of jobs	8. Decent work and economic growth
Total number of employees earning above local minimum wage	8. Decent work and economic growth
Total number of employees paid living wage	8. Decent work and economic growth
Average time saving associated with cooking time and fuel collection	5. Gender equality
Gender wage equity	5. Gender equality
Number of women serving in managerial/leadership/ownership role	5. Gender equality
Number of employees provided skill development training	4. Quality education
Total above and below ground biomass stock in forest	15. Life on land
Total area of trees planted	15. Life on land
Total protected land area	15. Life on land
Total area of trees planted: native species	15. Life on land
Number of protected threatened species in the project area and conservation status of species	15. Life on land
Trends in species diversity	15. Life on land
Trends in species distribution	15. Life on land
Total area under sustainable forest management	15. Life on land
Average reduction (%) in synthetic fertilizer used per ha	12. Responsible consumption and production
Average reduction (%) in pesticide used per ha	12. Responsible consumption and production
Direct in-field labor created	8. Decent work and economic growth
Economic value generated locally via employment	8. Decent work and economic growth
Income generation from other activities for example ecotourism	8. Decent work and economic growth
Number of training hours provided for employees (full-time, part-time or temporary)	4. Quality education
Turbidity of (river) water	6. Clean water and sanitation
Change in SOC stock due to activities implemented in project activity	2. Zero hunger
Water retention capacity	6. Clean water and sanitation
Area under reduced/avoided open burning of biomass, crop residue	3. Good health and well being
Number of farmers reduced/avoided open burning of biomass, crop residue	3. Good health and well being
Change in farmer income as a result of project, by gender and indigenous	2. Zero hunger
Proportion of the population living below the international poverty line by sex	1. No poverty
Proportion of population living below the national poverty line by sex	1. No poverty
Proportion of women in managerial positions	5. Gender equality
Average hourly earnings of employees by sex, age, occupation and persons	8. Decent work and economic growth

Source: Gold Standard, (2023bis).

Appendix 13 - Interview with George K. Tarus; Abatable, Plan Vivo, Verra

K: Thank you a lot for accepting this call. I think it will be useful for us. Unfortunately, my colleague is not here today, so I will be alone. My first question would be: just tell me more about what you're doing, your position and your daily activities.

Tarus: Thank you very much. I work for an institution called Kenya for Service which is a government institution to conserve forest resources. I am the current head over climate change. It is a department within the organization, but is integrating climate change actions, so climate change issues into forestry management in the county. So, it transforms activities that are supporting climate change adaptation to the forest and communities to also actions that deliver climate change mitigation.

K: Amazing. What type of projects, or which projects are you currently working on now?

Tarus: We are implementing quite a number of project level activities, REDD+ actually, which is voluntarily, and it just starts by the government, together with other partners. Of course, we are implementing restoration projects, delivering the restoration results, restoring degraded forests, improving community livelihoods, ... all of them that are climate change lens in its implementation. Of course, we are also implementing programs that are looking at the generating data for greenhouse gas emission estimations, and implementing a national climate change, the documents, and all frameworks.

K: OK, so are you working closely with the government or is it private?

Tarus: It's government. I work with some government, the institution is established under parliament, so that's what I do. On the sidelines, I voluntarily participate in other private ventures, and some of them ranging from being a member of Voluntary Carbon Market standards like Verra and Plan Vivo. Those ones I do my own personal capacity, but the main role that I play from 8:00 to 5:00 is government work.

K: OK super interesting, thank you so much. So, these projects are initiated by you? Or the projects, the investment, are they projects such as carbon offsetting projects that we that we currently see in the in the voluntary carbon market, or the projects are funded by the government? Is it private or does the government give the funding?

Tarus: It's a mixture of the two. Of course, for carbon offsets, they are privately funded through the carbon financing. They are registered in the voluntary carbon market space; the activities are funded by the government for the purposes of delivering what the government has asked to deliver. So, it's a mixture of both.

K: Since you are also working at Verra and Plan Vivo next to your main job, what are the major differences that you can see in all of these? For instance, you mentioned the local communities. Do you

feel privately led rating agencies like Verra or Plan Vivo do really include local communities when they rate a project for instance, or not?

Tarus: Yes, I really think they do, because the project development phase is a nine-step process, and the role of course of communities are clearly cut while you're designing a project. It is a requirement when you are doing validation and even verification of results, that the aspects that touches on community and the community benefiting from the project, a part of the indicator someone asked to check before they issued with the credit certificate. So, I would say for those that I work with, communities are the direct beneficiaries of the intervention. Of course, in any case they are the source of the obedience that sometimes degrade those landscapes and forage to be converted back, then they have to be part of parcel over the day-to-day activities. So, my answer is yes, they're doing good.

K: OK. How do they include it? What are the variables that they analyze and how?

Tarus: What I've seen is the assets that are issued so the project asks to demonstrate that there was free prior informed consent, and that the indigenous rights and the communities were consulted, while a project developer is going through the process of setting up their project. Of course, that is not only by word but by documentation, you have to provide proof that they did consult communities. Indeed, you are able to follow through required steps of arriving at the free prior and informed consent by the project. And when you're doing the monitoring model, the monitoring of activities, the beneficiaries also have to be documented. Of course, the communities are part and a parcel of most of these projects, so you would visit a community group, they will tell you "we did have a beehive or we didn't have clean water but now we have a clean water, we have problems of accessing energy, now we've benefited, we have health issues"... so there is documentation, they are physical and secondly, there are requirements by the laws of the land. You have to do what we call public participation. So public participation is a publicly driver consultation process, to get views from the communities whether what is being proposed is good for them, whether it's proposing to them or addressing their challenges, and all that is documented.

K: OK, so it's more of a conversation between local communities for each project than just clearly defined variables that are measured and that are the same in each project? It varies depending on the communities, on the project, everything?

Tarus: Of course, the community's needs could be varied. Communities also are varied across landscape, but the information on the requirements are the same. You have to do what we call public participation. And the public participation is a process where you let the community sit down, they identify their development challenges, the needs they prioritize. And the next round is also awareness creation and sensitization, used to cure capacities of communities around what you want to do, you synthesize what project is all about, how the project will deliver results... You also over engaging, in an arrangement of beneficiary, on how much would come to their temple, and what are the steps that would be used to ensure that those resources flow back to those landscapes. There would also be a key

explanation of conflict and resolution mechanism. If I'm conflicted, affected by a conflict, or if conflicts arose because of the project, the question is "how do I get this in order?". So they are clear, but of course the one thing that I know is the needs, and the value of community is attached to a resource.

K: For these, do you see any difference? Because when we look at both the rating agencies Verra and Plan Vivo, there is one that is major on the market which is Verra, and then Plan Vivo which is also very big but that really puts forward the help to local communities and also the impact on biodiversity. Do you see any difference in their methodologies for both of them or do they rate projects the exact same way?

Tarus: The concepts are all the same, but the approaches are different. So, you will see that Verra has a way in their processes in terms of the validators and what somebody needs to go through, and also the methods that anybody can use to be able to develop a couple of certifications. Plan Vivo also has almost the same process, but there's a little bit of a variance because their focus, in terms of scale and scope, is a little bit different from what Verra is passing on but the whole ideation originated from the compliance market framework, which is CDM, then they were able to build itself now to operate in the voluntary space where they are factors of supply and demand, and the methodologies of translating actions into a couple of credits, there's a little bit of variance. Because that's for you to deliver a couple of credits for instance, when you're doing afforestation or when you're doing the avoid of deforestation. The methods and the calculations are little bit different, but the concept is the same and the procedure is more or less the same.

K: OK thank you. What is something that you would like to add in processes that is currently not been taken care of enough? Regarding whatever you want. Maybe there is something, since you can see what is happening there and you have a clear linkage with the government, maybe there's a gap somewhere and you would say that should really be considered.

Tarus: I think one thing that I would want to see being part and parcel the processes is the due diligence by the standards before they issue these credits. Most of the time, it depends on the paperwork and on the team of people visiting the ground, but some of those written in the paper may not really say what is happening on the ground. I have seen some situations like those. And then secondly, is the issue of the integrity of the credits. I know it's a big debate now on how these standards are issuing their credits, their procedures, and the methodologies. Some of them, you would understand because of the inadequacy of some information, to deliver the number. They end up being a unit. But those are ideas I think personally. And lastly, also that is a little bit off the markets, because when you operate in a voluntary carbon market space, it means it's an environment where it's a willing buyer and a willing seller, and the prices are dependent on the supply and demand curves. So, not so simple, especially for the community lands, which may not be able to meet those very stringent requirements because of either a number of optionality. It's not to downplay the need for integrity, but I most likely look other markets space not really compensate actions that alleviate poverty and transform local communities.

Because as it stands, it looks like for certain activities, to find themselves in the market space, it has to meet certain areas, in terms of special extend on the actions that needs to be put into act to rate a credit.

K: When you when you talk about due diligence, and that sometimes what is happening is not really what you can see on the paper, do you mean that for instance the forests are not capturing that many carbon credits and they're saying there is that much but in reality it's much less? Or is it more about the impact that it has on communities and biodiversity? What are the differences?

Tarus: It speaks to both. There are scenarios where whatever is being reported as results to some level, may not be really meeting the results that are announced, or more or less that are credited. But you also try to figure out the amount of what data that causes, especially when you're operating in very remote places, it was appearing the numbers that I could get finally issued. Then the second part is the community part, the benefits and the impacts that are being created out of compensation. I have seen projects that may not be, I would say, exactly what they claim on the community level.

K: What is the common practice when it comes to distributing gains? Is it only on the monetary basis? Or is it also based what types of trees you are planting, that are going to increase the productivity of land, and this type of new trees will appear so you can create trades out of this fruit? Is it resilient in a way for the community other than just giving money directly? How is it distributed?

Tarus: The distribution model may not be clearly cut. It depends on the arrangement and agreement between project proponents and the communities. There are projects that bring back benefits to the community, in monetary terms. There are some that now bring back benefits in terms of supporting livelihood transformative projects, and let's say building hospitals, building schools, paying school fees for kids, supplying clean water, creating employment opportunities for the local communities, ... it varies and the value of what the benefit is, varied from one community to another. Some communities say that the only way they feel they are benefiting is when the unit of measure is in terms of a dollar. Some are in terms of addressing the needs of the community, when they need a school, the school is built. If they need a hospital, or if they need employment opportunities for teachers, for doctors, or if they need supply of medical facilities and medicine etc. It's a range of benefits and most of them now are agreed upon while the project is being designed.

K: Are there check points that are happening after a certain number of months, or years, when the project has started?

Tarus: Yes definitely, there is actually numerous checkpoints for a project. There is the validation, to ascertain that whatever the project has put in terms of their proposal and the activities they are going to implement to deliver an emission reduction, is actually feasible, possible, that it can be done. So, the project is validated. And another checkpoint is to verify that the documentation and every other thing

that touches on that project is actually expertly possible, you discuss with the cross consultation, it's a requirement, you have to talk to indigenous people to ascertain that indeed, the project discussion is casual and whatever is documented on what came from community. There's also monitoring for results, because you can't issue a credit by not looking at the activities and whether those activities are indeed delivered to the good actions or good benefits. Now, that can easily be converted into a unit that is issued of a credit. So, all those are part of the process. What I've also seen happening is that the governments, where these projects are located, also participate in a process of checking what is being implemented. They are addressing conflict when they arise, and the conflict resolution mechanism in place between the project and the partners may not be working, so they have to intervene. Sometimes, also for purposes of getting to know what is happening and appreciating the action from the council. So, they are monitoring and the processes that check the milestones at one point or the project implementation.

K: OK thank you. I was just about to ask how the government is implicated in these projects, because at the same time you are developing REDD+ projects that will be entirely government led, and that will enable payments directly to your country. But at the same time, there's a lot, I guess, of private investments to create carbon credits on your territory that will not directly benefit your country the same way that REDD+ projects can create benefits. So, how do you see this difference? Is the government going to put into place more actions so that you can benefit from reforestation projects, for instance?

Tarus: Yes, I think it is a question that is very valid. What the governments or what I can intend to do is, to have a centralized portal or a registry that will document or records all the couple of projects that are operating within the territory of the country. And then be able to evaluate the contribution, both in terms of emission reduction and also the social livelihood impact it's creating to the communities. I know through the Paris Agreement, there are market frameworks, specifically Article 6 that also created all avenues for the markets to support conservation activities and support countries to meet their NDC targets. So, it is ambition that the role of private sector and the role of government has to work in a complementary manner, because the private sector, you know the strategic documents about the role to play, they have significant capital invested in them, and they can bring them back to transform the landscape and achieve the conservation goals that the country has set itself into. There are possibilities or project listings, which means allowing the already existing projects to continue doing what they are doing. But now, operating within the bigger national framework, that delivers the NDC commitments, and other social livelihoods goals that the country is looking to achieve down the road. We have regulations and laws that will enable us to fit together, because every time we report to UNFCCC, in terms of our greenhouse gas inventories, our NDC achievements or our NDC actions, and we are able also to down the road, be able to track even the flows over climate money into the country. So, they start to be more ready to do the work, and we appreciate which already these projects are going to the local communities.

K (26:38): So, the government is implicated in all of this, and I know that there are some countries where it's not the case yet. Why do you think it is? What facilitated the transfer of information, maybe to take action on a federal level?

Tarus: Firstly, because the entire climate change space has some level of complexity in understanding how it's working and then secondly, the amount of resources that is needed to put in the right structures for countries, to actually and optimally operate within the climate change space in terms of having the right policies and in terms of having the requisite technical and financial capacities to implement them. We are actually, as a country, also trying to put in some additional policies or framework. One of them, that we might be finalizing soon, is the one talking specifically on carbon markets. So, what I'm telling you is that the climate change discussions and requirements continue to transform, as time goes by. Some decisions were taken in Charm el-Cheikh last year, some will be taken in Dubai or Cop 28. So, those dynamic nature climate change at times, keeps some countries off balance or place them in an awkward situation, because you are able to get hold of what you need to do, there's a next decision that introduce an additional layer of requirement and all that. For the players within the voluntary carbon markets, and that market also has been growing, and the regulations and methodologies are continuously being strengthened, they are being reviewed, some are being amalgamated. So, it's been a moving belt conveyor, they are there but I know it's becoming very apparent to eventually everyone that climate change is with us, and we need to do a lot of actions to address them. But that also markets can play a very critical role in terms of delivering what we need to deliver. So, the alibies in the space are already transforming societies and communities and making profits out of it, and some countries may be operating within a legislative regime that is not anticipatory, or to such emerging changes because their laws are created through a process. For example, Canada has to go through the legislature which is politically of course ran, so it's not on top of the political agenda of the politicians. That's the difference. You're from which country again?

K: I am from Belgium.

Tarus: OK, I thought you were from the US, because at some point, the US were not for climate, now they're for climate... You never know what the next round of government will be for. So, it's a complex balance at times to manage.

K: Yes, that is for sure. So, projects are linked with local policies and goals? Because I guess as you mentioned, one of the goals that, as a country level you have, is that all the communities can gain from these projects and see their life improving. But also, I guess from REDD+ and from other carbon credit issuing, you can gain a lot of money out of it that can be reinvested into infrastructures for your country for instance. Is it linked? Do you see any linkage between these carbon credits on voluntary carbon market initiatives and local policies and goals?

Tarus: Yes, I have seen that. I am part and parcel of an ongoing voluntary carbon market couple of projects, as degraded resources that are enabled for structural development such as reforestation. We procure some vehicles, we did revamp and train the nursery, we build houses, that project again is still doing, also building community hospitals.... Yes, I have seen them.

K: That's great. I've also noticed that you know a lot about forestry and forest management in general. We were thinking for our thesis to do some proposal of adding some criteria for rating agencies to check both for socioeconomic issues matters, so local communities' well-being etc. but also in terms of biodiversity, there's some linkage between the two of them, for instance the contribution of nature to people's food security and forest management. How do rating agencies check if forest management is well done, or not? I had in mind some criteria and I wanted to know what you thought about them, if it was relevant or not.

Tarus: Yes, I think it is important that the question is really required in terms of what we call the compound benefits of projects. If you want to critically assess, even the existing projects, quite a number of them are going for an additional certification through another standard called CCB community, climate and biodiversity. Because it is the expectation, not the interventions you are deploying out there, it should be able to deliver carbon credit because that's the motivation. But it should be able also to have other non-carbon benefits, and one measure is the biodiversity, because globally, we are now addressing the three planetary challenges, and also biodiversity is one of them for climate change. So there's a lot of similarity between greenhouse gas reduction through projects, and again the parcel of biodiversity loss, especially when you are implementing a land-based carbon project, like forestry or REDD+. The market is demanding for that indicator to come out, and I have seen now methodologies being developed to assess biodiversity. Maybe down the road, what will be traded in the market is no longer carbon, but biodiversity credits. It looks like that's the direction people are going into. I know within Plan Vivo, there are those intentions and the discussions to develop methods of issue of biodiversity credits, Verra I know is doing the same. I also know that there is a standard called Social On, that is heavy on environmental integrity and the social integrity of a project where you are not misplaced in your intention to try and provide information, in regard to the biodiversity. So maybe you could ask about the assess, whether it is something that relates to tropical forest.

K: Unfortunately, I don't think that I have the knowledge to be able to differentiate how biodiversity has to be validated, or that the positive impact is indeed the case. But it's interesting that you are mentioning that they're currently making some research about it, but does that mean that right now, there is no methodology or no criteria that takes into account biodiversity? Because I notice that there is this debate on how it's nice to reforest, to create carbon credits, but if you're just putting trees in some place and realize that it's not supposed to be like this or if you realize it's the wrong type of trees, that thus can lead to degradation in another way?

Tarus: Of course, I must clarify that my statement did not try to communicate that biodiversity assessment is not part and parcel the ongoing couple of projects, especially in the land. It is of course a requirement that when you are doing activities, either reforestation or avoided deforestation, the issue of invasive species is clearly a no. So, there is no standard that can credit or certify a project that seeks to introduce invasive species, or encourage monoculture, because the two are known to be anti-biodiversity. Of course, part of the project design and description stages, issues to do with biodiversity is an attitude, it's a section you have to feel, in terms of wise identifying the biodiversity of the land where you want to implement your activities, are there presence of endangered species, what is the biodiversity, what causes biological biodiversity so the indices to measure the diversities... but the unit of the compensation, down the road, is a carbon credit, because you are measured by the units of emissions you've been able to reduce. But the thinking is, down the road, the projects that are to be built on biodiversity platform is not the units of emissions or tons of CO₂ you've been able to reduce, but most likely it could be the number of biological, or the species that your project has been able to manage, increase, or stopped from being lost. Well, you see now where the difference is. While for the carbon credits, the unit of measure is the ton of CO₂ equivalent, reduced or avoided, down the road, the biodiversity projects would most likely be talking on the number of species you've been able to protect from being decimated from the landscape, the number of species you've been able to grow through your interventions, or the diversity your project has brought in terms of both flora and fauna, and other indicators that define a biological diversity. Of course, scientifically, there are measures that can be used to assess biodiversity. There are indexes when you assess the presence or absence of a certain biodiversity, whether plants or animals. When you run, it will give you a number and it tells you that this area, based on let's say Simpson indices, it's 1.5, that's how diverse you are, how diverse your landscape is, in terms of fauna and flora, or the biology of it, if it's diverse to that level. There's another landscape where you would go, and you only have one species, while in another one probably 10 or 15, so there's some variance. As to how the scientists are putting up together the methods are not being keen to follow, as a biologist (because I am a forester now, with the advanced degree in climate change and natural resources), I know the basics of biology, you measure living organism, it is flora or fauna in terms of biodiversity. And we manage our forests. Of course, for biodiversity and gene pool functions, I would say climate stabilization and flow of water matters. Biological diversity is one of the objects of many things in the forest.

K: Thank you. The number of species was one of my ideas, so I'm happy that I didn't get everything wrong in terms of biodiversity. I thought of the number of species present on the territory in terms of flora and fauna, and its evolution but also genetic diversity loss or gain. I also thought of resilience, which is a bit linked with communities, in a way that even if the carbon market crashes, which is not likely to happen, but still, the communities and the nature would be able to sustain even without the payments made through carbon credits? And also, ecosystems, are they valid and able to sustain on their own or are they the right ecosystems?

Tarus: Yes, of course, that part of sustaining without an intervention is the cornerstone over carbon credits projects, but you have to demonstrate the additionality, so maybe you could borrow from that lens, but the increase in biodiversity is not possible under the usual scenario, and the only way you will see increase in biological diversity is if there's an extraordinary action in the landscape. But that is only possible through an interventional of biodiversity credit. I think that can work.

K: How would it be different to have a biodiversity credit, from a carbon credit? What would be different?

Tarus: I think the unit of measure would not be the ton of CO₂ reduced or protected. It would be the number of the biological diversity, increased or stopped from being lost or getting extended from the landscape. When you talk over a carbon credit project, the commodity traded is a ton of CO₂ reduced, but I believe the traded credits of projects will be the number of biodiversity the project has delivered.

K: Yes. And lastly, it would be the socioeconomic criteria that could be measured. I did a previous project on the impact on local populations of a project that the World Bank has initiated in Mozambique, based on REDD+. Mozambique received its first payment and based on previous research that measures socioeconomic impact, we thought that it would be interesting to measure population displacement. I don't know what you think about it.

Tarus: Ideally, population displacement is the safeguard issue. Because your project is to displace population, then it may not be a socially fit project, because the safeguard means that the interventions should do no harm to the social cultural aspects of the local community. So, if there are displacements of livelihoods, of people, for all the landscape on which the project is operating, then it has failed the safeguard requirements. Because it is expected that the two should be able to operate in a harmonious way. So, if there's displacement, then there must be some very good justification as to why that displacement is happening and whether it is on a voluntary basis, whether the people are appreciating the bigger picture on their own free will. Deciding that "we are going to shift from where we are, to another place for purposes of allowing the landscape to recover". It's not because of the economic motivation of the carbon project, because if it does, then the social safeguard is not fulfilled. I know that's why one requirement of REDD+, it's called a safeguard information system, which documents on the given indices for measuring these social safeguards while implementing REDD+ projects. Because governments, especially in the developing protocol countries, have been known to do armed evictions of people from the ancestral land at times or land with community attachment, because they want to conserve forest or because they want to benefit from the carbon finances, and most of them have always failed the social safeguards tests. So, it means that the communities have to leave a certain portion of the land to re-grow and recover naturally, through other actions that have to be in their own free will. Having understood the context and the concept in which this project is operating, and that they are saying they feel there should be part and parcel of the solution. I know that it did happen where people voluntarily left and allowed the forest to recover. That's why it is a requirement that you do what

we call the “free, prior and informed consent process”, so that people get to appreciate and share their views, and they own the process, and they give a clean set so that it can continue.

K: Ok. I guess criteria like the number of jobs created or income of the local communities would be more interesting.

Tarus: Yes definitely. When you are looking at the SDG documents of decent jobs, it should not only be a job, but it will be a decent job. So, one social indicator used is the jobs created, the income generated... And other parameters that are measure of the social well-being of a person.

K: Yes, I also guess health and food security, and education...

Tarus: Yes absolutely. They are all part of social measure. When you have good education, have access to at least the requisite nutritional intake, access to clean water, medical facilities, and all that. They all sum up the social aspects of human being.

K: OK yes, thank you. It's almost been one hour; I will wrap it up so I can leave you to your afternoon. What we planning to do is doing your first round of interviews to gather some data, so we can continue our research in a relevant way. Thanks to you, it's going to be very insightful. It's easier for us to target interesting insights, and then we would like to have a second round of interviews that would be I think in two months when our research is more advanced. We can also share with you other insights, maybe that we gathered from other interviews or that we found online. Would it be OK for you if we reach out in May or June, to just have a quick chat?

Tarus: No problem. I think I understand the face you went through, I am also doing my PhD, so I know what is required, at what point in terms of your academic growth. I want to wish you the very best. So, if you need any clarification, you can reach out so we can discuss.

K: Thank you, I wish you the very best in your research too.

Appendix 14 - Interview with Brian Oronoz; Plan Vivo

S: Good morning. We would like to thank you again for taking your time today to answer some of our questions. How do you want you to proceed? Do you want to point out the questions that were the most relevant for you or do you want to go and follow the order of the questions?

Plan Vivo: Whatever best works for you. I thought it would be a very good round of introductions just maybe also from my side to manage expectations and basically saying what I do. And I think it was kind of one of the questions?

S: Yes, absolutely. Please go ahead.

Plan Vivo: I'm currently working as a carbon markets coordinator, and there's two sides of it. The first one is the commercial part which has to do with the resellers and the intermediaries, who have to take care of the registry and the features in it. For example, we are including the updates from the version 5 of the standard, which was just released last year for Plan Vivo etc. And then, there is this other kind of specialized or more research-focused, which has to do with basically where is Plan Vivo in relation to the wider carbon markets world, Article 6 or ICCM, VCMi, but also doing market research, statistics, etc. Also, now that I'm in Mexico at the moment, as you know, I'm working to establish a regional office with an ambassador and a regional project officer. Working not only here, but also in Asia with special focus now because of several things that happening there, and also in Africa. Although, I'm not working with the African office at the moment. To wrap up, I'm not working directly with projects, I work directly with the other end of it, with the resellers and other intermediaries. So, my focus is more on markets, more than product development, because that's also my background. I have been working in emissions trading, schemes, carbon taxes and now focusing on the VCM. But not on project development, in the technical way. Although, I can try to answer some of your questions regarding it, and when not, I'll just redirect you to the standard. Maybe I'll tell you bits and then you can do some more research about it.

K: Thank you. As you may have read, one of our questions was: which type of projects are you currently working on, but you're not really working on particular projects. Can you tell us more about it?

Plan Vivo: We work only with AFOLU projects, not other sectors such as regulated energy or waste, just reforestation. In this case, the kind of projects (reforestation, afforestation, REDD projects, low carbon - which in theory gets into the reforestation/afforestation) but marketing wise, it's treated differently. We actually have a blue carbon hub and other stuff, and that's from the carbon side, and we're currently also working on developing biodiversity standard, which I think was just another focus in your questions. I think it has to do a lot with the history of Plan Vivo. As you know, we're the oldest standard - even though we're quite small or quite niche - and it has to do with the idea that our projects come from smallholders. Actually, it's a foundation and also the standard. The standard and everything focuses more on the smallholder communities, local communities, and in theory those most affected by

climate change. And then, the carbon becomes not the end goal, but the enabler to make changes in those communities. And that's something quite different in terms of the end goals, compared to other standards. That's why we're kind of niche, because we make sure that all of our projects have a very strict certification process. They also go through other things that the major standards do not go through, because we have these cool benefits attached to it. And you can see that there are labels for biodiversity, for example, under the VCS and the Gold Standard etc. In reality, what happens with Plan Vivo standard, is that clients and intermediaries know that, if you have a certified PVC (Plan Vivo Certificate), it already comes with a lot of co-benefits, in different areas. We have a report which states that at least 6 SDGs are positively impacted with the certification of the Plan Vivo (PVC). And that goes up to 11 SDGs or something. It's in the SDG report, I can share it with you, but it's very easy to access. There are co-benefits of all sorts, and some of our projects were originally intended to be more biodiversity focused, but because back in those years, there was no market for biodiversity, they decided to enter the carbon market with a special focus on biodiversity. And now, because we were aware of the challenges seen by the biodiversity worldwide, and also because there are some countries, such as Indonesia for example, or India, or others, who start putting some sort of restrictions on carbon markets, and also because it can be an additional source of income for certain projects that cannot enter the carbon market, or because there are other regulations of the Article 6, or countries are actually focusing on non-market approaches Then the biodiversity standard and the biodiversity units or credits become an interesting option for those projects, and especially those communities looking for climate finance coming from biodiversity. All of that to say that we are also developing that standard, that's another coordination and everything. Last month, they had a webinar, which I can share with you, on how it works, and the methodologies, and everything, and it was open for public consultation which I think now should be closed. That will be additional, obviously you cannot claim, it's not going to be used as a carbon credit for example, you have to do very different claims, like the climate positive claims, etcetera. The difference between ours and the others is that, for example, in others it has to be very specific to the bio that is affected by the implementation of the project, and it cannot be fungible with other credits from another region or another land. In this case, we're trying to do that. I mean that's the idea, that it can be fungible. That's pretty much what I can say because it's not really my area of expertise. So that's regarding biodiversity.

K: How Plan Vivo is different from other agencies? You're mentioning that indeed, you have a different methodology because you're focusing more on co-benefits, how are you measuring those co-benefits?

Plan Vivo: Those are measured in the PINs, the PDDs and the annual reports, all of those are open access in our website. You go through the projects and the projects have the projects recommendation and you have all the technical loads, they have to report on how they go with the carbon, because they have a baseline and everything, so they have to report that and how they're managing the different communities. This is also kind of important, we work with - I don't like to call them intermediaries because of the nature of the project implementers - but they usually don't have access to the carbon market because they are small, and they don't have the financial capacity and they don't have the

technical or the knowledge to develop or the expertise in developing these kinds of projects. So, we work with project coordinators and different projects can be under each coordinator in the region, or in different regions etc. These are the people in charge of creating these reports. They have technical capacities, the resources etc. And they have to make sure that the money coming from the current market also gets equally distributed and they actually care of that and the benefits coming from it, so coming from the project and going to the project developers. They have to manage all that and also, the impacts on the co-benefits. It all has to be reported and go through the verification process.

K: If we understand correctly, these project managers, these coordinators have the power to check if the covenants are indeed there etc., but is there any other team maybe that comes and just verifies if what they're saying is actually true?

Plan Vivo: Yes, it has to happen for PVC, for a project to be set up, accepted and registered with us. And then, for issuance processes of the PVCs, and then for verification of those PVCs, that has to happen. Now, it depends on the nature of how we work. We work with microscale projects or regular macroscale projects. For the microscale projects, those issuing less than 10,000 PVCs per year, it has to go through an external project validator and verification, these are called the VVBs (validation and verification bodies). It can be an external one, a third party one, a large one, or it can be an independent expert like in country expert. But at the end, Plan Vivo partially verifies what's happening. For the macroscale ones, it has to be a well-known VVB like the classic ones from all over the world, that also Verra or Gold Standard use. The other one is obviously to give more flexibility on costs to smaller projects, but it doesn't have to hinder in any way the trust or with how the project has to be seen in terms of how trustable it is and everything. It has to be high quality always, and really verifiable. Another very important thing or point that differentiates Plan Vivo from other standards is the beneficiary mechanism, which is unique from Plan Vivo. This basically states that at least 60% of the revenue coming from the purchase or the sale of the PVC, has to go back to the communities, back to the originators of the climate benefits. This has to be after taxes. The other 40% should be used/Could be used by the project coordinators, for example, to cover all the administrative cost for growing the initiatives, for increasing capacities... whatever and the 60% has to go back to the communities. And sometimes there are different smallholders, so it has to make sure that the 60% are not equally split but fairly split within the different areas that it covers. These 60% is not always cash, they have to agree on something, it can be in kind, for example. Some communities ask for schools, or sewage, or whatever they need, whatever the town or the community needs. Or it can be cash or even can be a combination of both. It has to be agreed previously.

K: Ok. So, there is a common practice on gain distribution. Do you also have to create some sort of resilience towards the communities, in the sense that, if the carbon market crashes - even if this doesn't happen - can the community still live with what is being created (i.e., the reforestation)? In other words, because of the reforestation, for instance, certain types of plants are produced, and it makes fruits that the community can trade and eat, and so the project lives on its own? Is this an obligation?

Plan Vivo: I don't know if it's written in stone, but it's inherent to the Plan Vivo standard. Why? Because of these co-benefits that I was mentioning. One of the issues in this sector is permanence, right? So, there are many ways that different standards use and plug in addition to those, using co-benefits as one more element towards permanence. Why? Because in the end, both of those co-benefits that can be financial co-benefits, for example, or just as you were mentioning like the fruits growing, or for example, conservation that leads to higher rates of tourism for certain areas, for example, or something else. They inherently mean that there are additional financial incentives for the communities to stay within the program, or that those create the environment for more investment from other services. And that's something that we've seen, in many areas but also in our PVCs. And for example, we have longer standing project within the VCM that was certified under Plan Vivo technically in 1997 or 1998, which is a project based here, in Mexico. That's actually how it all started, the story goes that it was at the University of Edinburgh, and at a university here, in Mexico which is in the Chiapas, a state in Mexico. They developed this project, and then it was called Plan Vivo, because they had this idea that it was evolving with time, and adapting to everything, and then it became a foundation. And they became a standard. So that's why it also has a name in Spanish. It all started with the idea of enabling communities to have better livelihoods, and then the carbon became an enabler. That's the way it has grown, and we actually have a very ambitious plan of continued growth, which is scaling with care. Until recently, we thought that the model could not be replicated without having impacts on the way that the standard works, but then in practice we saw that there are at least two projects; one in Central America and another one in Africa which actually grew exponentially, and they kept all of these co-benefits and everything. So, we learned from that, and now we're trying to share through the projects and the project coordinators, and everything, so we can have the same all over the world, which is interesting and important. Also, these co-benefits mean additional climate finance for communities, and it's not that these communities are surviving only for the selling of carbon credits, which would be insane, no one does that. That's why, in some jurisdiction, there is an incentive that these offsets have higher prices because then, they can be used in ETS or for carbon taxes or for other purposes. And that's why, one of the reasons of why people leave the projects, it's because the prices are not an incentive. This is also why only large corporations use it for waste, for example, which is let's say assets, or well it's trash that can be turned into assets, and that's why they got that idea of creating that project. Smallholder does not have the capacity to do them, so that's a completely different market, and that's part of the strength of the Plan Vivo Standard, the kind of communities we work with. These co-benefits that are transformed into climate finance, and in the end are transformed into higher chance of permanence for the projects, which I think is very high. We have projects that are into regional civil war at the moment, for example, and it has become an important part of basically how these communities are surviving through this crisis and everything, so it's very biting at some point today. I think so far, it's been only one project who has been cancelled or discontinued from Plan Vivo in more than 25 years of experience, which is good.

K: It is great, indeed. You're mentioning projects that seem interesting, that achieve great milestones. We are aiming to analyze some projects, and just compare them, it will be interesting to know which ones and I don't know if there is any kind of access that we can get to these people that are in charge or coordinators, but it would be amazing if we could get more information about this.

Plan Vivo: Yes, for sure. First of all, information is publicly available, so you can pick those projects that you prefer. Also, the annual reports contain are prepared by the project coordinators, so you can get the information from the annual reports that are based there, that are publicly available. I think that would be a first step, looking at the different projects. Maybe you're going to choose one from tree planting projects, and another one from blue carbon, or something else, and different regions of the world...

K: For our master's thesis we're only focusing on reforestation and afforestation projects. Do you maybe have any person, even in Mexico, that is currently handling an A/R project there?

Plan Vivo: Well, in Mexico there is only one current project, the same one, because the others are carbon and are in the pipeline. I wouldn't know which one to recommend, because that's not my area of knowledge. What I can do is, if you come back to me with a project that you're interested in, maybe once you look at the website, I can give you the details for you to contact them.

S: OK thank you, we are going to have a look and search for a project we would be interested to analyze.

K: We are also wondering how you're handling the relationship with local governments and local policies, and their goals. We have multiple questions about this, but one of them would be: is there a perfect legislative environment for this type of project?

Plan Vivo: That's very good question. I think I can only think of perfect-ish environment from a theoretical perspective. Which is one that has complete, well not complete but robust legislation on... I mean I was going to say carbon markets but that's obvious. But I mean like in terms of if it has any chance, if it has another climate change mitigation instrument, then it's aligned and obviously that it involves the property of land which is a huge issue always, and the interoperability of different policy instruments, which may include, in this case, carbon markets, and more ideally, if they have a policy that that is specifically for voluntary carbon markets. This is actually something that countries are trying to build, especially in America for some reason, but it doesn't mean that the other regions, for example in Europe, are less effective for the implementation of projects, it's just different because the way their policies are interconnected is quite different. And they have clear stance on other international legislations, obviously Article 6 for example. Any prohibitions, or any sort of barriers that exist in the market are clearly defined and communicated by the governments to project developers and to anyone that is working on the space. We've seen that for example in Indonesia and India. Both have some sort of ban on current markets, or on carbon credits, but one is very vague, Indonesia is very vague, statements

are low, so they don't have deadlines they don't have anything, and it happens basically overnight. The other one, it's kind of clearly stated which sectors and which kind of credits and affecting what kind of everything. So, companies, project developers, standards, can make a strategy on how to tackle that barrier and that's something that we cannot do in Indonesia. That means projects being stopped for years, and that means lot of money invested and probably lost for everyone involved. If you have a restriction, for example in Ecuador or in Bolivia, where they claim that they were using non-market approaches - whatever that means because no one knows what that means - that you have a clear sense of what that is, and maybe you have a series of criteria that you have to meet to become part of the market in those countries, for example. Or just in perfectly open world market, where you can come on the market, comply with the legislation that's taking place and have everything sorted. But obviously you will find that but in places that are buying the offices, or the carbon credits, not in those countries where those are reintegrated, for various reasons. I hope it answers your question. Another thing I was going to mention is that, and that links to your question, what makes it different and the feature of the market itself. Probably you're aware of these ICCM, VCMI etc. The ICCM, they are discovering what the best practices are, and all the co-benefits and all the characteristics that high quality credit has to have. And it's surprisingly not at all. Those are things that Plan Vivo credits have had for more than 20 years. We shouldn't worry because we're obviously going to be certified under this standard. It will take a long path because of some technicalities, but anyways. They're just realizing that they actually have to get involved with these communities, they're setting up the projects for a series of reasons that they didn't do in the past, I mean not only carbon pricing projects but also renewable energy projects etc. I think it's becoming an issue, well it became an issue at some point, and now they are trying to turn this around. But it's something that could have been prevented from the very beginning, just consultations and a series of things that we actually have in our standard. We have a section which is social and environmental safeguards, for us to answer the environmental risk, which is the risk management. Then there are the environmental and social safeguards and one of those refers to the free prior and informed consent of the local communities. I think there is a differentiation between directly involved communities and indirectly involved communities. There are several steps that you have to follow based on the existing best practices and all of that is included within the standard as well. And something that obviously came up during the ICCM conversations, and now they're also pushing a little bit because we requested it on the benefit sharing mechanisms. Other standards have this low level of compliance for this topic, it has to be clearly stated what the benefits should be, how the benefits should be split, but we don't see how much or how of anything so yeah.

K: You mean that there is no obligation on what type or just the amount?

Plan Vivo: Yes, basically it's up to the project developer to make an agreement and it has to be clearly stated, but it can be a very bad agreement on one side. Although it is clearly stated and even if it complies, it can be not really significant, right?

K: Yes. But then, you mentioned that if the country has laws and regulations about the voluntary carbon market, it's even better. What do you mean by that? Is it about mentioning clearly who gets to use carbon rights, etc.?

Plan Vivo: Yes, it could be. For example, in countries where there is an ETS, there is legislation on how it should operate, including offsets and the use of offsets, and where they should come from and what are the characteristics and the different criteria. So, kind of the same can happen for voluntary carbon market and actually, in Mexico, they are drafting a legislation to do that, including you know prices indexes, which is a very tricky one. And I think it's the first one that would do it, I mean things aside, I don't think it will be ready anytime soon, but it's nice that they try. Some other countries in the region are doing the same tour, for example Ecuador is doing the same and I know this because they kind of signed with other consultancies. Basically, they conducted a way to implement current markets in the region and also to advise on which kind of standards were the best fit for whatever their needs are, based on these non-market approaches etc. Also, many countries in the region are focusing on climate justice and how these communities have been affected in the past, how to prevent that from happening again etc. And for example, in Mexico they didn't know Plan Vivo existed a few years ago, and then they heard of us, and they really loved the concept and how to involve the communities, engage with communities and everything. So, they are drafting their legislation based a bit on all of these ideas which are, again, in line with the ICCM at one point in history. If that kind of exists in a country, and it clearly states what their rules are - because in the end, let's forget that it's a voluntary carbon market - so be regulated until some point, I mean just as much, it's a framework. It means that you're able to do things, according to the local law and everything. It's more like a framework than a regulation for the ETS, but still that's very helpful because for everyone, having a theory or a commercial way of dealing with everything is always useful.

K: What you're mentioning a lot is that you are focusing way more on Co-benefits and everything, than other certifiers. Don't you feel that there is a lack of transparency on the market? Because when we dig into the different information that we could find, we found on your website that there was clear focus on communities' well-being and biodiversity, but we didn't really see actual data on how this was measured. In comparison of Verra or Gold Standard and so we were wondering a little bit about that. For instance, does the project developers have to provide some baseline information, some baseline data, so you can measure the impact of their projects after?

Plan Vivo: That's very interesting and very good feedback. I'm not 100% sure, but it's not because we don't have the data or that it doesn't happen that we have to make sure that it happens, but I can imagine the other standards doing it because it's obviously a good selling point and it's good to show off that you have done all of that work. This is something we have not focused on that much, because again, we are in a niche market and people don't really know that those co-benefits exist, but maybe we should put more emphasis on how we measure that, and I'm pretty sure that exists in the methodologies and everything that I could even know. I'm sure it is it is stated in their reports, and

again I'm pretty sure that also in the SDG impact report, that all these methodologies, maybe not the methodologies but at least the results of each project should be there. I don't know if it is aggregated or something, but yes that should help. I am sorry if I don't have a straight answer to that one because I really don't know the methodologies, that's on the project officers or maybe the validators. But if a co-benefit is stated for happening in that region, or for that project intervention and it's stated on the project idea node or the PDD, then it has to be validated and corroborated VS a baseline, as you mentioned. I don't know if it's a baseline just as a carbon one, or something different. But if that is stated on the PDD, that has to be validated at least every five years which is the validation period. Again, it can happen every year, but because of the nature of our projects, but for costs and everything, they can do it every five years. And every time the validation happens, the VVB has to make sure that what's being written is valid, basically, and if not, well they do not get verified. So, I think that's probably all I can say about it.

K: Ok, thank you. We were wondering also is there something you would like to add in current rating methodologies that is currently not being taken care of? Besides what we already mentioned.

Plan Vivo: Oh yes maybe something. For example, two different rating agencies have approached us in the last year. Verra and BeZero Carbon. Our position is Plan Vivo as a certifier, a certification standard. It's not really getting involved in any process that happens between the project and rating agency, so we just make the introductions let's say, and then they can choose to participate in integrating or not, or in other regions obviously. And what we have seen, feedback from projects working with any of those, is that the agencies - of course they're rating something, so they have to compare it within the standard that they already have - but they are measuring things sometimes without the full context of the standard itself, which we acknowledge with very different standards in some aspects, compared to others. Especially in the past, for kind of old projects, where they do not get into the context of the projects themselves, and then there is a misunderstanding in the way that measures are happening, what measurements are happening for either carbon or other things, so they can end up with a little note on something, and then there are other things are not being considered within the same standard, the same rating. Some criteria that are not being considered, which is actually a strong point of one project. I think that's probably it, sometimes rating agencies don't get involved in the context of the standard itself, or the project, and they just want to measure something very standardized, and then it can be leading towards incorrect assessment of projects.

S: How do you explain the fact that they do not get involved in the context deeply, that leads to a misunderstanding and then to a rate that is not really accurate at the end of the day?

Plan Vivo: The bad rating, or the inaccurate rating, the invest case (that's how we call it), they come to us with lots of questions and to the projects and then the rating never happens, it's a never-ending process because they have to keep on learning on something that they should have known from the

very beginning, before starting the rating itself. The worst outcome would be the inaccurate rating and then obviously having an impact, a commercial impact on the project, that would be the worst.

K: How could this be resolved?

Plan Vivo: With the revision of the methodology they used for assessing the project.

K: We had some ideas on certain criteria that we wanted to measure, for both socioeconomic factors and biodiversity factors. We already had an interview with someone located in Kenya that told us that some of our ideas were not relevant. I'm going to explain. For socioeconomic factors, we thought of displacement of populations, for example. In this case, what the person mentioned is that normally, displacement isn't supposed to occur at all. That means that the project is not even certified in the first place, so it's a bit weird to measure it for a rating agency. What do you think?

Plan Vivo: It makes sense from a theoretical point of view, because it has to be one of the risk management, well in this case for us, it should be contained within risk management, and also all of these green form, free prior informed consent, ... So yes, it shouldn't happen. But that doesn't mean that throughout the lifetime of the project, other things can happen, including displacement. Now, how can you make sure that these displacements happened because of the project being implemented? That's a completely different question. And I think that's very hard to measure. You would have to go there and do some field work, for a specific project. But it's quite interesting because in the end, obviously, that's something that's not supposed to happen. But then what happens if that happens? Does the project get cancelled or something? I would imagine it's extremely hard to measure.

K: Yes. So, bouncing back on this, imagine a project is implemented and you're having a baseline of what's happening, regarding socioeconomic factors. Is there anything that happens two years from there? Saying for example, you'll just do a checkup and measure some variables to see if something has changed? If for example you promised a hospital, is the hospital in construction etc. Is there a methodology that follows up in that way or not at all?

Plan Vivo: Regarding the methodology I really don't know. But again, it's on the VVBs to make sure it's in the PDD the things that you promised would happen. If there was supposed to be a hospital or something, then it should be there. And if not, it cannot be verified and well, the project, not the project really but the PVCs coming from the project should not be verified. And there is a commercial impact for the project, and then they should resolve it before they can go out and sell their carbon credits. It's an answer on the surface, and there should other ways to solve it further, but I don't I really know them.

K: OK thank you. I think it would be interesting to know, even if something was not specially agreed on upon the project. For example, we have to build a hospital but we're not going to count the calorie intake for the lifetime of the project. So, it would be interesting to know if this is something that is actually taken into account.

S: Yes, a sort of verification process, 1,2,3,4,5 years after the project was implemented.

Plan Vivo: I don't really know who do that, but I would imagine them to do that at least. What I know is that it exists a grievance mechanism, if there is any conflict between any of the parts, any of the stakeholders, they should follow the processes described there. In this case, it could have been this hospital that you mentioned earlier, that is not there. The last one to notice it would be the VVB, but before that, the communities probably would have raised their voices to say "hey this is not happening", and then there should be the grievance mechanism, a conflict solving mechanism or something. I know that exists for a standard, and that should exist for others too.

K: OK thank you. I think we thought also about jobs created, wage devolution, calorie intake, food security, health, education, etc.

Plan Vivo: I know the right person you can talk to. She's in Kenya at the moment. She was going to be there for three months, and I think it's been 1 month only, her name is Caroline Steelman. She should be there on the website. She wrote the SDG report, she should know way more about that. I think she changed her job title at the moment, so it's hard to keep track of what everyone's doing at the moment, but she worked on that for a long time so she obviously knows a lot about that.

S+K: OK thank you very much for bringing her name. The last question would be about biodiversity, it would be interesting to talk to her about biodiversity.

Plan Vivo: There is another one who's another genius in the biodiversity team, but it's more for the standard, not really the carbon part.

K: OK great, thank you. I think that's all, so we would like to say that your information was were really valuable, thank you so much and thank you for taking your time for this meeting today, we really appreciate it. As discussed today, we would be really interested to work on one of your projects. We will come back to you with further information, and we hope to continue this interesting conversation very soon.

Plan Vivo: You're welcome. Yes, just reach out to me via email. Have a nice day!

Appendix 15 – Interview with Leonardo Santiago; Pachama

K+S: Good morning. Thank you for taking your time today to answer a few questions we have regarding Pachama and its projects. We're currently writing our master's thesis in Belgium, and for this master's thesis we wanted to analyze nature-based carbon offsetting projects and wanted to see the impact it had on local communities and we wanted to also check out biodiversity. We are currently doing a first round of interviews, that will help us define more precisely what would be useful or not for us to focus on, because there's a lot of information and it's difficult for us to navigate and to have a concrete idea. Most of all, we want to do something that can be of any use and that has an impact.

Pachama: OK I see. Maybe it's good for you to know a little bit more about Pachama and my role here because I'm not sure if I am the best person to help you to go deep in the subjects that you are researching so I'll try my best. Pachama as you know, is a technology-based company. We weren't born to develop carbon projects from scratch. Which is different from many project developers around. Pachama has developed some technologies that enable us to evaluate the integrity and the quality of a carbon project and carbon credits from permits only for forests so conservation and restoration. We used those technologies such as biomass models to estimate how much carbon is stored in the forest or a dynamic baseline so that providers, deforestation rates, ... are really updated, not looking to the past to predict the future. So, things like that help us to evaluate the quality and integrity of a project and when we find a good project, what we do is to buy those carbon credits and sell for companies that don't have this knowledge or the team to evaluate a good project. So, by buying from Pachama, they are sure that they're buying a good and high-quality carbon credit. We did it for a couple of years in this way, but we found out that the demand is so high and there is no merged carbon projects over there, we decided just like Netflix to instead of using movies from another source, to produce our own movie. So, there was this part that motivated us to start developing our own carbon projects and this is starting right now. That's exactly my role here, managing the projects in Latin America on the implementation side. After the projects are designed, I just get everything that needs to be done and execute until it becomes a really carbon project so my great from our restoration or conservation project to a carbon project for those areas. That's my role here and we're still learning so, I think that's the interest on the exchange that I think that we can make here with your research. Right now, we have field pilots here in Brazil and in Mexico, so the projects are really just starting, we are starting to collect data not only for carbon but beyond carbon too. Diversity and social impacts. Right now, we're just collecting data to build our baseline on those subjects but we're starting to execute some social activities but much more focused on implementing the project. I mean by implementing, planting siblings instead of a deeper focus on beyond carbon activities such as social impacts or reliability. What we have as a procedure to start and to get involved with the communities and everything is a stakeholder mapping where we are getting to know people and absorbing their needs to design what we are going to do that makes sense for that specific community. We just don't have a playbook on what we do in every project, because it doesn't work like that. Indeed, each project has its own particularities, and we need first to identify what would be the negative or the positive impact(s) of our activities in the territory. To do so, we are doing

everything, respecting every requirement from the FPIC process. I don't know if this is something that sounds familiar to you.

K + S: no, not really.

Pachama: FPIC is the acronym of "Free Prior and Informed Consent". If you google it, you'll find a lot of stuff about it? It is a framework that requires that every time you develop any kind of project in a territory, and you identify any traditional community, indigenous people... you must execute and follow a specific process for informing the people and get them involved into this project. It allows you to friendly enter their territory and do whatever you have to do. It's a very interesting process about listening and exchanging and getting communities involved on the process. So, everything we do, we have to map, and we have to find if there is any stakeholder like that in the territory. And if it is, if they are there, we just must respect those concepts from FPIC to be able to enhance positive impacts and to minimize negative impacts, for example. Because you never know how they can see a couple of projects like. Many times, we just think that it's going to be super, well received, but if you are substituting their traditional activities for restoration activities, or if you are conserving a place that is sourced for any kind of sustainable use, they can feel that you are entering their territory without allowance, and this could bring negative impacts for everybody. This is why we always try to follow this model but also add some requirements that come from the carbon standards such as the VCS and we always try to look after the CCB requirements so we can add this value to the carbon project. For the moment, we are starting to do that by our own hands. Pachama doesn't have like a team operating and executing those activities in the field. What we do is always try to work with a local implementation partner, such as an NGO that has history in territory... Usually, they are our hands executing activities that we suggest but we also listen to what they can do in the field to be able to being there. It means that they know much more than us, what are the needs for their specific community and everything. It's always an exchange work that you learn and listen and then we try to design activities that make sense for the communities but also for the carbon project. I think it's associated to with the technology that Pachama has, not only for monitoring, but for creating all the evidence and recording it in a way that it could be auditable in the future and transparent and easy to communicate with buyers and different stakeholders. We always try to promote this, for the health of the project, but also, we try to bring stories and bring all the beyond carbon that is so important for a complete and high-quality carbon project.

S: For example, you mentioned that you try now to create and to enhance your own projects. What are the big steps? The first one is to design the project, then to implement it but is there a post implementation process where you would go on the field and check if everything is in order?

Pachama: Yes. Right now, we just have a road map on what we are going to do in the future because projects are being implemented right now. We don't have any running projects to monitor yet. Of course, we monitor 30 projects from other project developers. We call that the "verified" that means that when we do the partnerships with those project developers, we provide them our technology so they can

monitor and value their projects. We're just applying the same concepts on our originals i.e., the projects that we do from scratch. The process is quite long until start implementing. We are running for example a request for proposals where we received lots of proposals from NGOs and companies and landowners who wants to develop a carbon project. We just evaluate them, according to our criteria, so there is a long list of criteria to be met, and then we start developing these local partnerships for really implementing the project. We evaluate the capacity of the proponent and the carbon potential and all other beyond carbon impacts that they are saying. And then, we start to get this projects that are only like conservation and/or restoration projects, and we try to see if they are really additional, really eligible, for being considered and validated as a carbon project. After all the green lights, we start to design the project. So, we have the phase of identification and qualification, and then we start to design the projects and when you have all the contracts signed, every partnership in place, every model built (the financial model, the carbon yield estimation for this project...) and every detail like an execution plan in place, then we start implementing the project. This is the start date. Right now, for example, we are finishing planting because it's the end of the rainy season here in Brazil, and this is where we are focused so, implementing with respecting the implementation plan like what species are implanted but also paying attention to the spacing, the species, the density, the data we have to acquire right now and so on we enter in a phase where everything is implemented (like trees are in place) but now we have to start doing side activities such as biodiversity and social activities beyond communication. Because communication with the community starts before we entered their territory, and then we start the PDD to submit to validation. We have three years after the start date to present that project if we are chasing the VCS standard. And then we start writing, and putting things together, getting all appliances ... This is like one branch of the job. Another one is starting to monitor the indicators of the project progress until it is mature. And we estimate like five to six years to be able to monitor the first round and get the first insurance of a restoration project. When we talk about conservation, about REDD+, I think the cycle is a little different because we can validate and measure and make the first insurance right in the first or second year. This is a matter of monitoring, putting everything in place. The projects are intended to last 30-50 to until 100 years but we don't think about this, we just do contracts on a timeline of 30 years and then if everything's going fine, 30 years from now, we will probably renew that project if it makes any sense to be renewed. Also, we start the projects as small pilots to test the implementation partner capacity, to test if it really is a good place that shows expansion potential. We are always starting small.

S: What does it mean to start small?

Pachama: 100 actors. Each one for restoration. When we talk about REDD+, there's no way to start small. It's big. But when we are talking about restoration, which are most of the originals here in Brazil, we just start a pilot and as a group project, we expect to expand this, year by year, until it becomes financially feasible in order to explore the importance of an area, of a region, that is expected to be developed in the project. And then, you can scale it up and make it bigger. We first define the interest region to grow the project, for example a river basin or an ecological corridor, that makes sense in the landscape. The projects are not that spread out in the country.

S: OK so only in the Latin America and in Brazil for the moment?

Pachama: For the moment yes, we are working here in Mexico and Brazil right now, but we expect to expand for other countries or other states in Brazil because Brazil is really huge.

K: At some point, you mentioned collecting data both for baseline values but also for other values. What type of data are you collecting?

Pachama: We are collecting all the pre implementation data. This means that we have to know what the break distant biomass is, but also talking about the biodiversity and social additionality, we have to know what the situation before the project is arrives. For example, for carbon, we have to collect especially field plot data and video slider for applying our biomass model. Slider is 3D scanning of the... when you fly drones or airplanes according to the area and then just scan, using laser, to model that biomass. We are acquiring that, but we acquire a lot of things too. For example, if we are applying any kind of fertilizer, we collect this kind of data. If we are using machinery to do the site preparation, we have to collect data on fuel usage, etc. You have to think on everything that is causing any emission for the project or everything that is going to help you to have evidence on how the place is before the project starts. Regarding biodiversity, we haven't started collecting anything, but we are thinking on collecting environmental DNA samples to map all the species that are present in the region, and we'll plan to put in place some camera traps and some bioacoustics devices so we can have some indicators on richness and biodiversity. Regarding the social, we just collect for example how many jobs we are creating, how many women are involved, how many families are indirectly related to the project, how many people are living in the project region ... there are a lot of social indicators that we can think about, like the income that is coming from the project' supply chain... For example, we have to hire local nurseries, and this brings an impact on who's working there, and we have to collect all these numbers, so we can have it as evidence that the project has caused any change in the future. So, this is what we can collect. It's a big list of indicators, which I don't have in mind right now.

K: Yes of course. Regarding the social indicators it's interesting to know that you're already collecting some data and for the biodiversity ones. Are you aiming towards specific SDGs that you can maybe put forward for pricing reasons or not? Because we know that thanks to a project, there are some SDGs that can be tackled, that can be put forward. Are these SDGs constant in all the projects or not specifically?

Pachama: I wouldn't say that the SDGs are used as a guide to make us chase any specific one or to develop an activity that would be tackling an SDG. I think it's not that top down, I think it's button up. We identify what are the projects' potential, what can we explore that will bring more impact to the communities or I don't know different SGD's and then, from bottom up, we associate them with the SGGs to communicate better about the project. It's more used as an outcome to relate and to better

communicate about the project's impact, rather than chasing a specific SDG for the project. I don't think it's working like that. I think it's not the main driver right now to motivate us to execute anything. I think it's the opposite process. Of course, if there are many SDGs that can be related for the project it's good, and we are going to explore that, but I don't see that as a guide right now to promote any activity in the projects.

K: It's really interesting because we talked to other rating agencies that were putting this forward, I mean they were not creating any projects from scratch but in their analysis, they were looking at which SDGs they could use to put them forward for the buyers to know that this project tackles this SDG or that SDG.

Pachama: We also communicate that but in another sense. We use that to add value to the project but trying to relate. I think the reason is not forcing anything because of an SDG. I think it's more about "let's see what the project has as a potential". And of course, we want to relate that as to any SDG and then communicate that to the market.

K: OK thank you. We were also interested in knowing how gains are distributed within the community. We assume that most of gains are monetary, but as you mentioned, there is also an agreement upfront. Are there some types of gains that have to be included for the community so that they can, even if the project has no more value carbon wise, can still make some money out of it, or eat thanks to it?

Pachama: I can tell you more specifically about the benefits that we offer to landowners when we talk about restoration projects and agroforestry projects too. We offer other things to the landowner, beyond paying them for the environmental services or revenue sharing. We want to make them more interested about joining the project, we use that as an attractive to get them involved with the project instead of using that as an attraction. Because we are working with small landowners in a group project, not like a huge land that we just restore, or we are not buying anybody's land to just make these deals, to make them accountable and involved with the project. We offer things like fencing, we offer them of course the restoration of their water springs, because we are restoring what we call here in Brazil APPs that are like buffers around rivers and water springs. So, we aim to restore those places, and in consequence they will have their water springs back. We also offer, when they raise cattle, like a management plan and a technical assistance to use a smaller portion of their lands to produce more and then they create space for us to restore. As a result, they have a better production on their cattle. We don't want to remove their traditional activities such as cattle raising, but we just offer ways that at the same time will reduce the project leakage but also creates more opportunity for them to have their own income improved. We offer also like fire brigade that is always monitoring and avoiding fires on their properties, which is a good thing for them. Indeed, they suffer each year the drought season with fires here. We also offer a model for revenue sharing, after the credit issuance or a model of upfront payments, like we reserve certain amount of money and pay them quarterly or monthly or yearly according to their progress. If they're taking a good care of their land, they're respecting every clause of the contracts, they are paid for that. So that model makes that more interesting because they don't have to wait five

years for the first issuance, and they know exactly how much they're going to earn. It's different when you say "hey I'll share 15% of the of the results of the project" but this could vary because the price of the carbon could vary with the exchange so it's always a question mark, and they prefer to know exactly how much they're going to earn. This model of payment for environmental services upfront, or a revenue sharing model is what we can offer them. This can vary from project to project, according to the opportunity cost that they have on their land. And according to the project implementation costs, some projects are more tied, some projects have more carbon yield than others, ... It varies a lot. Also, every project that has either a revenue sharing or payment for environmental services, this is super transparent for the buyer and for the landowners too. They always know how much their neighborhood is earning too and the buyer of the carbon credit knows exactly how much is going to be paid to the community. This works only when we have this kind of agreement with landowners, where we don't buy the land. If we start to buy land, it makes no sense to do this. We have one project with coffee agroforest in Amazon, and it's interesting because if it wasn't to produce the coffee and the revenue that comes from it, nobody would agree on this project because they're not interested in green forest and get paid like a small amount for that. They want to produce; they want to get involved with the land and it is an important factor for their permanence in the field. In that specific project, beyond paying for the carbon of the project, we guarantee through this implementation partner, and they guarantee that they buy all the production from that specific landowner where the coffee was produced. And there is a complete chain for fitting and roasting the coffee and packaging and selling to the market. The landowner just has to worry about planting and collecting coffee, and that's it. All the supply chain like the logistics, the selling, the treatment, and the preparation of the product is done and promoted by this implementation partner through a local Community Association. It perfectly closes the circle of the restoration system and the revenue. It's an interesting project to see how much the community is involved, and how generating revenue from the restoration really makes a difference to expand. And despite that the carbon yields are lower in an agroforest system; it's compensated by the volume of landowners interested in participating on that. So, it's very interesting to see this example.

K: For the other projects that you're analyzing externally, are you asking for baseline data as well to the project developers?

Pachama: Yes. That's not my role but I know that we ask for the complete set of information, not only the PDD but we ask for more detailed information so we can evaluate those projects. We also audit the projects with our own tools using remote sensing.

K: Thank you. It would be interesting for us if we had the opportunity to deep dive into a specific project. For example, the coffee project in Amazonia that you're mentioning is quite fascinating. Is there any possibility for us to have a deeper contact and deeper information about this so we can use it as a case?

Pachama: Yes, of course I can check it. But on the first side, I don't think it's any problem because those projects are meant to be transparent, so I don't see any issues on that. Just about this specific project

with the coffee in Amazon, this project is not going to be registered in any standard right now. We are just piloting, and because there is a discussion on additionality for agroforest projects. When it comes to the question if the project is generating revenue from the agroproducts, why does it need the carbon credit benefits? So, there is this question, about additionality, that we are not sure how to solve it. But of course, there are climate benefits from this project, it's removing carbon from atmosphere just like any restoration project, so it's going to be certified and audited internally. So, buyers can buy those carbon credits, but they won't have the VCS tampon or any standard stamp. We are piloting that to learn more about agroforest and if we see opportunity, of course we are going to try to chase validation and certification for that project. But I need to check if we can share, I don't see any problems but of course I have to ask internally how much I can share. But I think every time we share anything, we expect something back. I will be very interested on your research results, and I would like to know more about what your specific goals are and what you expect as a result after you finish your research, so you can even try to use that for building our own indicators for example. We are in this moment right now building framework for biodiversity and social and everything that we need to monitor, so it would be very interesting to have any counterpart from you.

S: Yes, for sure. If you have any project in mind that we could also analyze, if we for example do not have access to the coffee one, that would also be very useful because we are looking to deep dive into one project to be able to analyze it, to be able to have contact, to be able to have as much as possible information about it.

Pachama. Yes, I can see the potential so I'll bring this opportunity to the team and I think what is could be very useful for me to present, is to receive from you some bullet points on your goals and what you expect on from us, what you need from us, and what you think that you could deliver as your analysis results from here.

K: Thank you. I don't know if this is of any help but right now, we also have information about another project that is currently launched in Kinshasa, near Kinshasa in Congo. I think it will be interesting also for you, because it's a project that has been launched in 2020-2019, so it's been already in a longer process, I think it would be interesting to see like how they implemented it, etc.

Pachama: Yes, indeed. What I had to share are mostly A/R projects, so reforestation projects. We're not executing any REDD+ on our own yet, so A/R projects are going to be what they have to share around.

S: Yes, absolutely. Well, we don't have any further questions. We want to thank you for taking your time to answer our questions, your answers were insightful, and we are looking forward to potentially analyze one of your projects in the future. We will come back to you with a small presentation of our goals and what we aim to analyze. Thank you again, and have a nice day!

Pachama: It was a pleasure to talk with you. I will come back to you once I have talked with my team so I can share the information you're a looking for. Have a nice day too!

Appendix 16 – Interview with Olivier Mushiete, Ibi Batéké Village

K+S : Bonjour Monsieur Mushiete. Merci d'avance d'avoir accepté aujourd'hui de nous rencontrer virtuellement afin de répondre à quelques questions sur votre projet IBI Village. Comme vous le savez, nous sommes actuellement en train de rédiger notre mémoire en duo sur l'impact social des projets de reforestation dans le marché du carbone volontaire. Avoir l'opportunité de vous poser nos questions sera certainement d'une grande aide. Pouvez-vous nous parler d'IBI Village, comment ce projet est-il né ?

M : Le projet connaît un développement long maintenant. On est passés d'une phase d'abord de conception ensuite de mise en œuvre, ça a duré des années, pas des mois mais des années, et maintenant on est en phase d'exploitation avec cette technique de développement. Donc voilà à vous de me dire dans ce contexte qu'est-ce qui ce qui vous intéresse plus particulièrement et ce que vous voulez savoir il me semble pour avancer rapidement étant donné qu'aujourd'hui c'est une première rencontre que nous avons, on peut prévoir d'avoir d'autres discussions.

K : Merci beaucoup en tout cas. Quel est l'organisme pour l'instant qui vérifie vos crédits carbone ? Car le projet a commencé quand le CDM (Clean Development Mechanism) était encore en vigueur et donc du coup, on se demande un petit peu comment ça se passe maintenant. Est-ce que cela a été transféré vers Verra ? Car Verra est en lien avec eux et si oui, comment ça s'est passé ?

M : Est-ce que ça a été transformé vers Verra ? Non, ça n'a pas été transféré vers Verra. Oui on a fait la procédure du mécanisme de développement propre de A jusqu'à Z, et on n'est pas sorti de là. Les crédits carbone qui sont sortis du puits « Ibi Batéké » sont des TCR donc des crédits temporaires. Vous pourrez chercher dans la littérature, à mon avis dans le monde il y a même plus une centaine de projets qui sont TCR parce que les crédits temporaires c'était vraiment du bullshit et aujourd'hui, on n'a pas trop le choix hein, on était dedans et on l'a fait jusqu'au bout. Ces crédits maintenant sont portés évidemment aux bénéfices globaux de la République Démocratique du Congo, ce qui est quand même déjà pas mal. Et donc vous me posiez la question de savoir quel est l'organisme qui a vérifié. En fait, la dernière vérification a été faite en 2021 par une boîte privée qui a été engagée par le Bio Carbon Fund et d'ailleurs le Bio Carbon Fund, qui est notre client aujourd'hui, n'existe plus. La structure a été dissoute et donc les détenteurs aujourd'hui des crédits carbone qui viennent du puits IBI sont les États qui étaient membres du Bio Carbon Fund. Je crois qu'il y en a 4 ou 5 : l'Espagne, je me demande si le Japon n'est pas dedans aussi, mais ça je ne connais par cœur. Mais ça c'est une information que vous trouverez dans les documents que je vous ai envoyés. La formule de crédit qu'on a fait sur le puits IBI Batéké ce sont des crédits qui sont émis une fois pour toutes donc on les a émis et ils ont été payés

définitivement en 2021 ou 2022 je pense et puis c'est terminé, il n'y aura plus d'autres paiements. Aujourd'hui on est dans une réflexion, une démarche de de poursuite de développement du projet et il est très fortement probable que l'on ne va pas suivre la même démarche. On va essayer de combiner des crédits de de séquestration, comme on l'a déjà fait, mais sur lesquels on va rajouter des crédits alors de déforestation évitée. Parce que dans le prix de carbone, dans sa formule actuelle, l'aspect de déforestation n'est pas du tout comptabilisé parce que à l'époque où nous avons mis le projet en œuvre, le REDD n'existait pas. Pour IBI on a signé l'ERPA en 2009, et si vous regardez dans la littérature à cette époque-là, le mot REDD n'existait même pas encore. On commençait un peu à le balbutier mais c'est en 2011 que ça a commencé sérieusement et donc on avait une longueur d'avance. Mais de ce fait là, le project design document (PDD) d'IBI n'a pas du tout comptabilisé du REDD. Nous avons commencé à travailler là-dessus, sur une prolongation du projet unique qui s'est appelé Novacel et sur lequel là on a développé alors tout un programme qui tenait en compte les effets de déforestation et aussi les effets de séquestration. Mais pour diverses raisons malheureusement on n'a pas pu aller jusqu'au bout de ce projet pour l'instant.

K : Nous ce qui nous intéresse le plus ce sont les vérifications par les standards, c'est-à-dire comment les standards vérifient l'impact sur les populations des projets de reforestation/afforestation.

M : Mais dans le cas d'IBI, c'est terminé, il y a eu un point final qui est le paiement des crédits donc il n'y aura plus de de suivi à moins que nous, donc la société qui porte le projet qui s'appelle Mushiete & Co, le décide (et elle va le faire). Mais la situation actuelle avec IBI c'est que la forêt est en place donc il y a effectivement 1700 hectares de forêts qui sont plantés, et sur ces 1700 hectares, il y a 3766 tonnes de CO₂ vérifiées en 2021. Maintenant on va s'engager dans une nouvelle génération de projets et dans lesquels on va alors effectivement mettre en place les dispositifs de suivi et de surveillance qui nous permettront d'évaluer les impacts environnementaux mais aussi sociaux parce qu'on ne l'a pas fait dans la première version, c'est une grave erreur de ne pas avoir fait ça parce que c'est là-dessus en fait qu'on a eu les meilleurs résultats. Aujourd'hui la forêt d'IBI (enfin je dis aujourd'hui, mais c'est depuis 2015) la forêt IBI est en exploitation donc ça veut dire qu'on coupe les arbres et on produit du charbon) mais sur 80 hectares à l'intérieur des 1700 (donc le pourcentage de prélèvement est très faible) et de toute façon non seulement il est faible en quantité mais en plus de ça il est court dans le temps. Parce que comme les arbres reprennent tout de suite, le déficit de stock qui est lié à la courbe des arbres et surtout à la carbonisation est presque immédiatement compensée. Donc sur des courbes de suivi à long terme, ça ne se verra même pas. Les ouvriers qui exploitent la forêt sont en fait engagés par des associations qui sont en contrat avec notre société. Si vous voulez, nous mettons en location des lots de forêts qui sont très (2-3 hectares) et sur lesquels les associations viennent et se mettent à travailler. Or il faut savoir que, un hectare de de travail en forêt, en mode agroforestier, ça demande d'employer 10 personnes. Donc vous aurez vite fait le calcul, 80 x 10, il y a 800 personnes qui travaillent en emploi direct dans la forêt d'IBI. Or, les 80 hectares à l'échelle de la République démocratique du Congo vous voyez ça me fait sourire et c'est quelque part un peu notre frustration parce que si les autorités publiques vous avez suivi on aurait copié coller le modèle d'IBI, en on en aurait aujourd'hui

une centaine dans le pays et non pas un seul. Il y a d'autres projets qui dont nous sommes d'ailleurs inspirés du modèle mais qui ne se sont pas mis dans le marché carbone et donc ils ont développé des plantations agroforestières mais sans se mettre dans le marché carbone. Alors de toute façon ils font tout le travail de suivi qui permet simplement d'évaluer les performances du projet, mais ils n'en retirent aucune valeur, au-delà de la valeur informative. Et donc là maintenant moi je fais partie de réseaux autour de moi dans lesquels on s'efforce le mieux possible d'avoir beaucoup plus d'opérateurs qui s'engagent là-dedans. Les démarches pour réussir à planter le « drapeau du marché du carbone » dans un projet est très compliqué car ça coûte cher, c'est compliqué à réaliser et le dispositif de monitoring qu'on met en place est lui-même aussi très coûteux et avec une rémunération du service environnemental effectif qui est beaucoup trop faible par rapport aux efforts qui sont fournis. Du coup cela n'est pas du tout attractif pour un opérateur privé. Même un petit paysan lambda, surtout un petit paysan lambda, qui souffre déjà de toutes ces choses. Et donc les quelques rares expériences que je connais, il y en a très peu et qui ont fonctionné. Alors aujourd'hui il y en a je pense 2 ou 3 qui ont commencé à générer des quantités d'argent importantes mais le dispositif de redistribution vers les communautés est mal-en-point, ça ne fonctionne pas bien.

K : Bon j'imagine qu'il y a pas mal de choses qui ont qui doivent être changées sur le marché volontaire de carbone en général, mais par exemple le dispositif de redistribution vers les communautés et cetera, est-ce que ce sont des choses qui peuvent être mieux implémentées par les standards de façon à obliger les développeurs de projets à faire plus attention à ce genre de choses par exemple ?

M : Pour cela, il y a 3 choses qui sont très importantes. D'abord il faut qu'il y ait une appropriation complète de la démarche par les autorités publiques congolaises (et on est très loin de ça, pour eux c'est quasiment de la science-fiction) et aujourd'hui l'exécutif congolais il est préoccupé par les élections à la fin de l'année. Moi j'ai commencé à travailler sérieusement sur ces aspects-là il y a 25 ans. On a été évidemment parmi les tout premiers à faire ça, mais depuis qu'on a vraiment bien bossé là-dessus jusqu'à la situation d'aujourd'hui, il y a eu 18 ministres de l'environnement différents et chaque fois qu'il y a un nouveau (un ou une d'ailleurs parce que là maintenant c'est une dame) ils remettent à chaque fois le système en cause, et si tu veux le système de gouvernance congolais n'a jamais vraiment fait le nécessaire pour que tout ce dispositif s'installe de manière solide à l'échelle du pays. Mais c'est très important de faire ça, parce que l'état a un rôle régalien qui est extrêmement important justement pour mettre des garde-fous - ça on peut faire, ça on ne peut pas faire, et si vous le faites ou si vous dépassez les bornes et bien vous serez puni de telle manière - et on a pas ça dans notre pays. Alors effectivement c'est très grave. Il y a 2 mois la ministre de l'Environnement met en place une autorité de régulation du marché du carbone. Bon très bien, on sort un arrêté ministériel. Mais il n'y a personne qui sait comment ça va fonctionner. Alors du coup ce qui se passe, la conséquence de ça, c'est que les opérateurs privés (qui en principe devraient rentrer dans le dispositif) attendent de comprendre comment ça va marcher ou pas. Donc l'aspect gouvernemental local congolais n'est pas au point. Le 2e aspect des choses c'est l'aspect international. Alors il y a évidemment toute l'évolution du marché du carbone qui lui aussi est relativement complexe mais sans doute vous aurez vu dans votre littérature, mais nous sommes un

certain nombre de personnes aujourd'hui qui voudraient que on mette en place un système de rémunération du service environnemental qui peut rester aligné sur la tonne de CO₂, parce que c'est un indicateur relativement fiable, mais encore faut-il bien voir sur quoi on le connecte. Parce que vous avez parlé tout à l'heure de l'impact social donc comment est-ce qu'on peut réussir à mettre une évaluation de la performance sociale du projet en traduisant ça en tonne de CO₂. Ce n'est pas facile hein. Et en plus il faut que ce soit réglementé par l'état. Donc il faut réussir à mettre tout ça en place et pour qu'on comprenne comment ça marche, on a besoin d'avoir des projets comme les nôtres avec des gens un peu dingues, comme mon frère et moi, qui nous sommes engagés là-dessus sans savoir comment ça marche. Et finalement à force d'y arriver, on commence à avoir des orientations mais on se bat aujourd'hui pour convaincre quelques-uns de nos collègues autour de nous pour nous imiter, de rentrer dedans mais ils sont très frileux parce que justement on ne comprend pas bien comment ça fonctionne et c'est extrêmement complexe. Alors donc ça c'est pour les opérateurs locaux. Pour la 3e partie, la plus importante, ce sont évidemment les villageois, le paysan. Aujourd'hui la République démocratique du Congo est en train de se diriger vers 100 000 000 d'habitants. Donc là on doit être aux alentours des 85 millions. 80% de cette population est en milieu rural, livrée à elle-même donc chacun fait ce qu'il veut comme il veut. La conséquence de ça c'est qu'il y a des pratiques agricoles très mauvaises qui continuent à perdurer avec comme conséquence la destruction des forêts, en plus de l'émission de CO₂ etc. En plus, sur le thème de performance, c'est très mauvais. Pour vous dire, on a 80000000 d'hectares de terres arables disponibles pour faire de la culture, il n'y a même pas 10% qui sont en exploitation (je pense que c'est 7%). Donc on a en même temps une population importante qui chôme sur un terrain qui n'est pas exploité. C'est du délire. Il est clair que si on avait un marché du carbone attractif, on pourrait alors mettre le paysan lambda beaucoup plus directement avec une rémunération extraordinaire, qui le récompenserait sur ses efforts justement de s'aligner sur des pratiques agricoles durables. Mais aujourd'hui ce que je vous dis là, ça n'existe pas quoi. Avec IBI ou même d'autres programmes, on a commencé à balbutier là-dessus mais c'est aujourd'hui c'est vraiment du balbutiement quoi. Et le travail de jeunes gens tels que vous êtes en train de faire ici maintenant a de l'importance hein, parce que justement vous allez faire fonctionner vos petits cerveaux là pour faire en sorte de bien comprendre comment ça se passe et comment on peut répercuter ça sur des plus grandes échelles. C'est d'une importance capitale.

K : Ce que vous dites par rapport aux paiements aux villageois ou même en général, nous avons remarqué également en lisant des articles et en nous renseignant sur le sujet qu'il y a une certaine opacité avec ce qui se passe réellement. En effet, les projets ont tendance à mettre en avant les bienfaits de leurs projets en décrivant les SDGs impactés et en disant par exemple que voilà les populations ont plus accès à des jobs et de là ils mettent en mesure le nombre de jobs qui ont été créés. Mais il n'y a aucune autre information sur qui a accès à ce job, quel est le salaire, est ce que ce sont des jobs saisonniers ou continus... Et en regardant un peu les recherches qui ont été faites, on se rend compte finalement que ce sont des populations qui ont été déplacées, qui n'ont plus accès à leur champ, qui sont en fait complètement dépendantes du paiement fait par ces organismes qui ne leur donnent pas l'opportunité de diversifier leurs revenus alors que c'est l'une des choses les plus

importantes. Et donc comment est-ce qu'on pourrait implémenter ça, pour essayer d'avoir moins cette opacité et d'avoir plus de transparence sur ce qui se passe réellement sur place ?

M : On a besoin d'avoir des dispositifs de gouvernance et d'administration du pays qui sont elles-mêmes mieux opérationnelles. Dans un pays comme le nôtre, ce qui nous handicap très fort, c'est que le système administratif de régulation de l'état est resté enligné dans des manières de faire il y a 30 ans en arrière quoi donc ça handicap complètement la réflexion que tu viens d'avoir et qui est très saine. C'est comme ça qu'il faut réfléchir, parce que c'est dans cette voie-là qu'on va trouver les vraies bonnes solutions. Mais ça implique de mettre en place un dispositif qui va permettre de faire évoluer les mentalités et quand je parle comme ça, je parle vraiment à très grande échelle. Cela veut dire qu'il faut travailler sur les systèmes d'éducation de base, ça veut dire qu'il faut travailler sur le système éducatif qui vient après l'éducation de base (les Masters et cetera) il faut travailler là-dessus et c'est là que je bosse en ce moment. Je bosse dans des écoles régionales d'agroforesterie, d'aménagement et gestion des forêts et des territoires tropicaux. Cette école-là elle forme 40 personnes par an et on a besoin de 4000 personnes. Donc tu imagines le déficit productif. On n'a pas besoin que des grands cerveaux, on a aussi besoin des cerveaux avec des bras et des bras tout courts et on a on a besoin de tout ça mais avec des quantités phénoménales et là je ne parle que de la République démocratique du Congo. Or ce genre de problème se retrouve à beaucoup d'autres endroits. Les pays qui ont réussi à sortir de ça en général sont les pays d'Europe occidentale ou les grands pays agricoles. Les grandes industries qui justement sont responsables de la pollution, la plupart d'entre elles sont rentrées dans l'ère industrielle à la fin du 19^e siècle en venant de systèmes agricoles tout à fait élémentaire. Si on a mis en place des voies de chemin de fer, qui évidemment avaient besoin de fer et d'énergie, c'était pour transporter de la bouffe. Donc ça veut dire qu'en amont il y a des agriculteurs qui bossent. Et quand on remplace ça dans le contexte actuel ici dans un pays comme le nôtre, on a des petits agriculteurs qui sont répartis un petit peu partout dans le pays mais si vous voyez comment ils doivent se déplacer, comment ils ont accès à de l'information, comment ils ont accès à leurs intrants agricoles... c'est du délire quoi. Produire un kilo de maïs quand on est au milieu du Congo c'est un travail d'hercule quasi. Donc ça explique évidemment beaucoup de choses. Alors ça ne donne pas forcément toutes les voix et les solutions, mais il y en a. Notamment parmi les solutions à trouver, il faut vraiment beaucoup travailler sur le dispositif de gouvernance et c'est ce que nous sommes en train de faire ici, pas dans le cadre de ma société, mais plutôt dans le cadre des groupes de réflexion et des réseaux avec lesquels je travaille de manière périphérique. Cela étant dit, le travail que nous faisons sur le terrain est lui aussi extrêmement important parce qu'il est générateur de d'informations. D'ailleurs la discussion que j'ai avec vous c'est exactement ça, des jeunes filles qui sont en train de préparer aussi des études et un jour vous allez commencer à exercer vos professions et inévitablement vous allez vous retrouver dans ce genre de dispositif quelle que soit l'institution pour laquelle vous allez travailler. De toute façon vous n'avez pas le choix, vous êtes humain sur la terre, un statut dont on peut difficilement se détacher.

S : Oui ça c'est sûr. Mais donc si on revient sur le village IBI Batéké, vous disiez que pour le moment il y a uniquement l'impact environnemental qui est mesuré à travers justement les crédits de carbone

payés mais alors vous parliez d'envisager une 2^{de} phase ou l'impact social en tout cas serait mesuré. Comment est-ce que vous envisagez cela ? Quels sont les critères que vous allez établir ? Comment mesurer ? Sur combien de temps ?

M : C'est relativement facile. En fait la vraie bonne réponse est que en fait, ce n'est pas que ce n'est « pas mesuré », disons plutôt que ce n'est pas comptabilisé. Donc on a on n'a pas de rémunération directe là-dessus mais de toute façon nous le mesurons ne fût-ce que par le nombre de personnes qui sont qui sont mises au travail sur le terrain. Tu sais le fait d'avoir 800 personnes qui travaillent dans un tel milieu... je veux dire la densité de population là où nous nous trouvons elle est de l'ordre de grandeur de 15 habitants par kilomètre carré. Donc tu imagines quand on a 800 personnes qui viennent travailler sur 80 hectares, ça veut dire qu'on a une densification de présence humaine qui est extraordinaire une fois de plus hein donc ça déjà ça a un impact très fort. Parce qu'il faut bien savoir que chacun de ces individus qui vient travailler dans une forêt qui a été plantée pour ça, il est évident que pendant qu'il fait ça, il n'est pas en train de détruire la forêt d'à côté et donc nécessairement ça a un impact. Et donc ce que je vous dis c'est que là pour l'instant nous n'avons pas mis en place le dispositif {.....} aujourd'hui on a notre disposition des outils d'observation tel que le satellite jusqu'au drone. Vous ne m'avez pas posé la question « mais comment est-ce qu'on mesure le stock de carbone par la forêt » et bien ce sont des ouvriers qui partent à pied dans la forêt, ils mesurent les arbres et quand on a la taille des arbres, on a la quantité de carbone qui se trouve dedans. C'est linéaire, c'est très facile à mesurer. Mais quand on commence à travailler sur des échelles beaucoup plus grandes, il faut mettre en place des dispositifs d'observation. Cela étant dit, des dispositifs de suivi et d'évaluation, il existe des tas de méthodes différentes et le vrai grand travail ça consiste à choisir la méthode la mieux appropriée en fonction de la situation dans laquelle on se trouve. Et ça c'est un grand travail de faire ça. Mais il existe plusieurs méthodes. Il faudrait que je cherche un petit peu mais je sais que dans mes archives j'ai encore le travail qui avait été fait par l'office national des forêts en 2017-18 peut-être un peu avant en 2015-2016, et ils avaient sorti un gros travail là-dessus. Mais bon c'est un peu vieux, et il existe des choses plus récentes mais je ne vais pas forcément en magasin. Mais je pense que vous n'aurez pas trop de mal à trouver ça. Je ne sais pas si vous avez déjà pris des contacts avec les quelques sociétés belges qui sont très pointues dans ces domaines-là. Je pense à mes petits camarades de CO2 logic là qui sont très forts. Antoine Guérin et son équipe. Il y a à L'UCL, de Meester et ses copains, ça s'appelle Climact, et eux aussi ils sont très forts là-dessus. Je ne sais pas si vous les avez déjà contactés. En fait ce sont des boîtes belges qui sont nées à la même époque où nous on a démarré le puits de carbone et à cette époque-là on n'était pas très nombreux et donc on se connaissait tous. Maintenant chacun a fait son petit bonhomme de chemin de son côté mais ils sont toujours opérationnels. Tout à l'heure, vous avez évoqué Verra. Verra est en fait une association internationale de très haut niveau et qui a pris le relais sur le VCS, Gold Standard etc. Donc quand vous commencez un peu à creuser avec eux, vous trouverez beaucoup d'informations. {.....} Ce que je peux partager avec vous notamment c'est ce qu'on a fait l'année dernière. On a préparé un gros dossier de projet qui s'appelle le Corridor Écologique des Batéké. On a préparé ça pour répondre à un appel à projet du CAFI donc le « Central Africa Forest Initiative » et c'est un dossier qu'on a préparé en partenariat avec {.....}, l'Agence Française de

Développement (l'AFD) et l'école dans laquelle je travaille aujourd'hui. Donc le dossier est en cours d'instruction, au CAFI et le concept du projet c'est de justement de répliquer le modèle d'agroforesterie climatique durable à très grande échelle. Quand je dis à très grande échelle, en fait ça concerne un territoire de 35 000 km² donc c'est plus grand que la Belgique.

K : Ah oui c'est conséquent ! Ce serait super, merci beaucoup. Donc donc par rapport aux mesures, vous n'étiez du coup pas obligé par l'organisme de certification de donner quoi que ce soit comme preuve au niveau des impacts sociaux du projet. Mais étant donné que vous travaillez sur place et vu toutes les choses qui ont été implémentées, comme par exemple l'atelier de menuiserie, l'école et cetera, est-ce que il y a des choses que vous avez l'habitude de mesurer ou que vous considérez comme étant important d'être mesuré dans un projet de reforestation qui a un impact sur des communautés ?

M : Oui. Mais la première chose pour que ce soit bien clair en fait c'est que les bénéfices sociaux sont pris en compte parce que quand le vérificateur passe il s'assure quand même qu'on ne travaille pas avec des enfants par exemple, ou encore que l'on n'ait pas accroché les gens aux arbres avec des chaînes hein. Donc l'impact social est quand même très important et ils ont quand même aussi voulu savoir comment est-ce qu'on peut distribuer les bénéfices. La mise en place du prix de carbone IBI Batéké sur ces 1700 hectares ça a coûté à peu près grosso modo tout compris à peu près 3 000 000 d'euros. Et le revenu sur les crédits carbone est même pas de 200 000€ quoi. Donc tu imagines, c'est insignifiant par rapport à la masse totale de ce qu'on a mis en place et donc en fait, le fait d'avoir créé une activité comme ça a généré des emplois qui n'existaient pas avant et donc inévitablement, il y a eu toute une série de d'impacts. Maintenant aujourd'hui l'école elle a été vidée, non pas à cause de nous, mais parce que sur le plateau des Batéké, il y a un apprenti quelconque qui a été réveillé à un vieux conflit foncier et ça a provoqué une guerre inter-ethnique dramatique donc tous les villageois ont fui. Il n'y a quasiment plus personne. Sans doute vous avez vu, on avait prévu de faire les portes ouvertes d'IBI au mois de juin, j'ai été obligé de les reporter en octobre. Car je n'ai plus aucun villageois. Et donc oui, il y a d'autres impacts à la situation donc on ne va pas rentrer là-dedans maintenant parce que ça va nous amener trop loin. Mais il faut quand même bien prendre en compte que l'aspect social est très important, même si aujourd'hui il n'est pas comptabilisé. Mais on va faire en sorte que dans l'avenir il le soit.

S : Oui, tout à fait, et d'ailleurs c'est tout à fait le point de notre mémoire. C'est de montrer à quel point cet impact socio-économique est important et de comprendre comment est-ce que les projets peuvent faire pour les comptabiliser, les prendre en compte de façon plus rigoureuse.

M : Tout à fait. Mais donc dans cet aspect-là des choses, ce qui est très important, et ça vous pouvez noter (je vais vous peut-être vous envoyer un peu plus d'infos là-dessus) mais ce sont justement les contrats qu'on a passés avec les associations locales. Il faut aller mieux voir comment ça marche, et qui est impliqué là-dedans et cetera. Maintenant il ne vous reste pas beaucoup de temps hein, et vous ne venez pas sur le terrain donc faire ça à distance c'est trop compliqué. Mais ce que je peux faire c'est

de vous mettre en contact avec les personnes qui travaillent là-dessus. Parce que bon moi je suis un peu loin de du terrain là maintenant, mais je peux vous mettre en contact avec Fabrice {.....} et comme je vous l'ai déjà dit dans les échanges qu'on a eus pour préparer cet entretien, depuis 2015 c'est beaucoup plus mon frère qui suit ça que moi. Et moi j'ai été travaillé sur d'autres choses. Bon c'est quand même moi qui ai mis le projet en en place, donc je sais effectivement comment il fonctionne, mais dans le détail opérationnel aujourd'hui je ne suis pas votre meilleur interlocuteur, il y a d'autres personnes qui peuvent mieux vous informer. Et notamment, parce que c'est un sujet qui nous intéresse beaucoup, c'est d'aller bien comprendre comment fonctionnent justement les contrats avec les associations. Cette association c'est qui exactement, ils viennent d'où, ils sont combien, comment ils fonctionnent... et finalement grâce au travail que nous avons fait, parce que ça c'est hyper important, donc nous on a planté une forêt et puis on ouvre cette forêt à ces associations. Donc si nous n'avions pas planté la forêt, ils feraient quoi à la place ? Sans doute qu'ils feraient aussi du charbon de bois, mais pas sur une forêt plantée. Or en exploitant la forêt que nous mettons à leur disposition, ils génèrent un revenu. Ils font quoi avec cet argent ? Il va où ? Il y a des belles grandes questions. Et ça reste des questions, on a on n'a pas encore toutes les réponses.

K : Vous avez parlé du fait que justement les plus gros impacts que vous avez vus, qui étaient positifs, n'étaient même pas tant au niveau du CO2 absorbé, mais étaient au niveau de la population. Vous avez parlé du nombre de jobs qui ont été créés justement, en parlant avec les gens sur place, quels autres impacts positifs avez-vous constaté avec ce projet ?

M : Parmi les choses intéressantes, c'est qu'il y a de plus en plus de gens qui veulent nous copier et qui veulent aussi rentrer dans le marché du carbone. Mais comme je viens de vous l'expliquer, ça reste une démarche qui est complexe et on ne peut pas le faire tout seul. Et si tu veux, la réponse qu'on a commencé à construire pour augmenter nos chances d'avoir beaucoup d'adeptes, c'est justement le corridor écologique des Batéké. Parce que l'idée c'est en fait de mettre en réseau un millier de villages sur le territoire dont je viens de parler, et dans chacun des villages nous fait 200, 300, 500 hectares d'agroforesterie avec le modèle que nous avons mis en place. Alors si on fait ça, on va travailler du coup sur 300 000 à 500 000 hectares et ça va impliquer 1 000 000 de personnes. Donc là ça va commencer à peser très lourd. Du coup les frais associés à l'engagement dans le marché du carbone, proportionnellement, sont beaucoup moins lourds que quand on fait ça sur des petites surfaces. En plus, on fait ça avec un montage institutionnel qui est à la fois plus sophistiqué et plus robuste que ce que nous avons fait sur IBI. Donc en fait, il faut voir Ibi comme un genre de prototype qui a été mis en place, et à partir de ce prototype, on sort toute une série d'informations qui sont utiles pour développer le programme à grande échelle. Et c'est exactement là-dessus qu'on est en train de travailler maintenant. D'ailleurs quand je vous en parle, ça me ça m'excite beaucoup parce que vraiment je croise les doigts qu'on arrivera à décrocher des financements parce que ce type de démarche va nous permettre de mettre ensemble des acteurs très diversifiés depuis des investisseurs privés, avec des institutions publiques, et de l'état etc. Cela va nous permettre de retravailler aussi sur la grande question de la gouvernance coutumière qui est une de mes grandes préoccupations... Cela va nous permettre

de mobiliser des jeunes gens qui, au lieu de prendre des machettes pour couper la tête des chefs coutumiers, vont se mettre à utiliser leurs machettes pour entretenir les forêts, ce qui est quand même plus productif. Comme ça j'espère vous faire comprendre comment on passe d'une réflexion élémentaire finalement vers une activité à plus grande échelle avec des impacts plus forts. C'est exactement ça le corridor écologique.

K : Comme vous l'avez mentionné précédemment, il y a énormément de problèmes qui sont spécifiques au Congo pour l'instant et je pense notamment à la localisation dans le pays. Est-ce que à ce niveau-là, ça va être facile de standardiser les façons de mesurer et comptabiliser un impact social ? Car pour l'instant ce qui est demandé par les standards, par exemple Verra et Gold Standard, c'est OK on voudrait que vous fassiez une consultation des communautés locales pour trouver un accord tous ensemble sur ce que vous pouvez leur apporter, ce qu'eux ils peuvent apporter... grosso modo la relation. Et ils font ça justement car il existe une différence entre chaque village, entre chaque pays, tous les projets sont tellement différents. Est-ce que il y a un moyen de pouvoir standardiser cela ? Parce qu'une des plus grosses complications sur le marché en terre du carbone c'est la standardisation.

M : En fait tout le tout le travail est là hein. C'est ça qu'il faut parvenir à faire. Pour que tout ça marche bien, on doit évidemment d'un côté avoir des modèles, qui permettent de se référer. Mais il est évident qu'en fonction des contextes dans lequel on va se trouver, il faut adapter le modèle au contexte local et on a besoin d'avoir un système de régulation qui, au cas où on dérive trop du modèle, te remet sur le bon chemin. Et c'est l'organisation de tout ça en même temps qui pose des problèmes parce que ce sont des mécanismes, des dispositifs, qui prennent du temps à, d'abord être conçus, comme vous l'avez compris. Nous ça fait 20 ans qu'on est dedans ici maintenant et en 20 ans on n'a pas encore été capables de simplement changer d'échelle. Donc ça veut dire qu'il y a un vrai blocage et qui n'est pas allié à nous-mêmes, mais qui est lié à la conjoncture dans laquelle nous nous trouvons. Et en plus de ça on a travaillé sur la mise au point d'un prototype, déjà ici ça demande beaucoup d'efforts pour avoir notamment des résultats financiers qui sont très petits cependant on a des résultats environnementaux et sociaux comme on vient d'en discuter à l'instant qui sont très prometteurs. Donc ça crée un modèle. Ce que je viens de dire ici n'est pas typique de la République démocratique du Congo, c'est partout comme ça. Et ce qui est nouveau, c'est qu'aujourd'hui la planète se préoccupe de son climat, de sa biodiversité, justement de ses impacts sociaux, ça c'est nouveau. Et quand je dis nouveau, disons que c'est adapté au contexte dans lequel on se trouve. Ces changements climatiques on sait comment ils ont été générés et on sait vers quoi ils nous mènent et si maintenant on veut réussir à modifier un peu les choses, il y a rien à faire, on doit travailler pour que justement ces populations en milieu rural qui ont été laissées à l'abandon pendant des dizaines d'années, soient maintenant accompagnées vers des processus beaucoup plus durables. Et donc ça touche le social, ça touche le technique, ça touche l'économie et cetera. C'est ce qu'on appelle d'ailleurs l'approche systémique, dont votre professeur Emmanuel Mossay est un des maîtres. Mais ce qui me rend quand même optimiste c'est que malgré les conjonctures difficiles dans des pays comme le Congo, il y a un potentiel qui est quand même extrêmement intéressant. C'est ce que je vous disais, il y a de la terre, il y a des gens, la population est

très jeune et donc ça ouvre des perspectives d'avenir qui restent quand même intéressantes malgré une conjoncture générale qui est un peu compliquée. Et il faut travailler dans ce sens-là, c'est pour ça que bien volontiers je partage mon temps avec vous parce que ça fait partie de mon boulot de provoquer des prises de conscience des jeunes gens tels que vous, de ce qui ce qui vous attend demain... J'allais dire vous êtes les bienvenues mais en fait où que vous soyez, vous pouvez d'une manière ou d'une autre contribuer à nous aider à avancer dans les travaux qu'on est en train de faire ici.

K : Merci encore pour votre temps et pour cette conversation intéressante.

M : Il est presque 11h je vais devoir vous laisser. Mais je vais vous envoyer les documents que je vous ai promis, je vais vous envoyer les adresses sans vous faire animer et croisés avec Jean Lejoly et Fabrice comme ça si vous avez le temps vous pouvez les questionner de façon plus pointue notamment sur les contrats avec les associations parce que ça c'est vraiment eux qui gèrent ça à fond avec mon frère, vous aurez les chiffres, mais vous n'aurez pas la température corporelle des opérateurs sur le terrain. Et si vous avez besoin de moi, on peut toujours faire un appel à un autre moment.

S : C'est très gentil merci beaucoup, ça nous aide beaucoup. Nous arrivons à la fin de cette entrevue. Nous reviendrons vers vous afin de programmer un deuxième meeting, si besoin. Merci encore d'avoir pris le temps de répondre à nos questions. Nous vous souhaitons une excellente journée.

M : Oui, à vous aussi. N'hésitez pas à me contacter si besoin. Je vous enverrai par email les contacts des personnes dont je vous ai parlé aujourd'hui, n'hésitez pas à les contacter également. Au revoir.