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CORPORATE SUSTAINABILITY COMMITMENTS: WHAT IS THE MISSING LINK TO TRANSFORM COMMITMENTS INTO ACTION AND END SOY SUPPLY CHAIN DRIVEN DEFORESTATION IN BRAZIL?

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“At first, I thought I was fighting to save rubber trees, then I thought I was fighting to save the Amazon rainforest. Now I realize I am fighting for humanity.”

— Chico Mendes
Brazilian environmentalist assassinated by a rancher in 1988.

Abstract

Commercial agriculture is by far the main driver of tropical deforestation worldwide, directly linked to the so-called forest-risk and internationally traded commodities: palm oil, soya, timber & pulp, and beef. In the past 20 years, the large-scale expansion of soy production in Brazil has been identified as one of the key drivers of deforestation in the country. Zero Deforestation Commitments (ZDCs) are voluntarily and publicly stated declarations of intent by private sector corporations to eliminate deforestation from their supply chains. The ZDCs movement has set the stage for amplifying global efforts to tackle deforestation and ensure ecosystems preservation. However, these pledges are not yet adequate to prevent the conversion of natural habitats. Private companies' policies are only valuable if fully implemented on the ground. Therefore, in-depth understanding of how different measures and instruments can influence the implementation process is crucial to advance on the zero-deforestation agenda. This master thesis aimed at identifying the main existing instruments, their challenges and opportunities, that support to transform multinational corporations' pledges into action with a focus on the Brazilian soy supply chain. The study used secondary data collected from 15 reports published by highly reputed organizations and the data analysis was made through qualitative content analysis. Twenty-four instruments were identified that could leverage the ZDCs implementation process. The findings of this study have shown that several barriers prevent companies from shifting from unsustainable towards deforestation-free practices, such as economic and technical constraints at the farm level, exclusion of smallholders', lacking capabilities of implementing transparency and traceability systems across the supply chain, incomplete internal policies and expensive certification processes. Besides that, it also includes challenges relating to land tenure, governance, weak support from financial institutions, ineffective legislation enforcement, poor data availability and lack of innovative approaches and collaborations across actors. The results clearly indicate that companies cannot succeed on their own. Involvement and collaboration across sectors and measures initiated by external stakeholders are crucial opportunities to advance on the ZDC agenda. Therefore, the missing link to the zero-deforestation soy supply chain relies on an ecosystem of global efforts and mechanisms linked to a complex network of actors that goes beyond the company and the farm levels, and which have a clear aim of influencing deforestation-free practices in all the stages of the supply chain, from farm to fork.

Keywords: soy supply chain, zero deforestation commitments, corporate sustainability

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List of Abbreviations

ABC Plan - Low-Carbon Agriculture Program of Brazil

APP - *Áreas de Preservação Permanente* (Permanent Preservation Areas)

CAR - *Cadastro Ambiental Rural* (Rural Environmental Registry)

CDP - Carbon Disclosure Program

CEO - Chief Executive Officer

CGF - Consumer Goods Forum

CRA - *Cotas de Reserva Ambiental* (Environmental Reserve Quotas)

CSR - Corporate Social Responsibility

EU - European Union

FLEGT - Forest Law Enforcement Governance and Trade

HA - Hectares

IPCC - Intergovernmental Panel on Climate Change

LCA - Life Cycle Assessment

NGO - Non-Governmental Organization

NYDF - New York Declaration on Forests

PRA - *Programa de Regularização Ambiental* (Environmental Regularization Program)

REDD+ - Reducing Emissions from Deforestation and Forest Degradation

RQ - Research Question

RTRS - Roundtable on Responsible Soy

SCM - Supply Chain Management

SCMSP - Supply Chain Management for Sustainable Products

SMRP - Supplier Management Risk and Performance

SSCM - Sustainable Supply Chain Management

TBL - Triple Bottom Line

TFA 2020 - Tropical Forest Alliance 2020

UNFCCC – United Nations Framework Convention on Climate Change

VPA - Voluntary Partnership Arrangement

WTO - World Trade Organization

WWF – World Wide Fund for Nature

ZD – Zero Deforestation

ZDC - Zero Deforestation Commitment

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1. Introduction

Forests resources are vital to the livelihoods of over one billion people. Forests are also providers of important ecosystem services, such as water-cycle regulation, precipitation and soil quality, erosion prevention and carbon sequestration. All of that is vital to enhance people's resilience and food security (SEN, 2017). During the past decade, about 13 million hectares of forest have been lost each year. Commercial agriculture was by far the top driver of forest loss between 2000 and 2012, directly accounting for 71% of tropical deforestation worldwide. Deforestation accounts for approximately 15% of global greenhouse gas emissions. Studies have shown that stopping deforestation is one of the most cost-effective climate solutions (THE CLIMATE AND LAND USE ALLIANCE, 2014).

Currently, deforestation occurs mainly in tropical forests and is driven mostly by the so-called forest-risk and internationally traded commodities: palm oil, soya, timber & pulp, and beef. Large shares of production and trade of these commodities can be traced to a few countries — Indonesia, Brazil, Malaysia, and Paraguay, where most of the tropical deforestation is concentrated (CLIMATE FOCUS, 2016). The demand for agricultural commodities is expected to double in the next decades, increasing considerably the pressure on forests (LUDWIG, 2018).

In the past 20 years, the large-scale expansion of soy production in Brazil has been identified as one of the key drivers of deforestation in the country, leading to significant biodiversity loss, as well as substantial greenhouse gas emissions in two main biomes, the Amazon and Cerrado. The global soy cultivation area has almost doubled during this period: from 62.4 million hectares (ha) in 1997 to 120.3 million ha in 2017. Soy is a globally traded commodity due to the increase in global demand for protein in international markets. Brazil is a key producer and the majority of Brazilian soy production is exported. Its main importers are China and the European Union (EU). With an anticipated increase of over six million ha in soy area in the next years to satisfy the ongoing increase in global soy consumption, Brazil is expected to show the greatest expansion of cropland globally, reaching USD 216 billion by 2025 (CHAIN REACTION RESEARCH, 2017).

A few policy instruments were implemented by the Brazilian government to reduce deforestation in the country, among them the Forest Code, the Brazilian main legislative tool regulating land use change; the Rural Environmental Registry, a measure that aims to inform land-use planning and assists with monitoring and enforcement of the Forest Code; and the Soy Moratorium, which prevented the commercialization of soy grown in areas illegally deforested. However, in the past years, the deforestation levels in the Amazon and Cerrado continue to rise. Many reasons are behind these current trends, including weaker enforcement of regulations (LAMBIN ET AL, 2018; WWF BRAZIL, 2018).

With increasing concern about the role of agriculture on deforestation, suppliers and buyers of key agricultural forest-risk commodities are coming under growing pressure to ensure that their supply chains do not destroy forests (CDP, 2015). Many private companies are making commitments to reduce deforestation in their commodity supply chains. As of March 2017, according to extent research done by the Non-Governmental Organization (NGO) Forest Trends, some 447 companies had made 760 commitments to curb forest destruction in supply chains linked to the four forest-risk commodities. This includes big brands, retailers, traders, and growers. Zero Deforestation Commitments (ZDCs), as they have become usually known, are voluntarily and publicly stated declarations of intent by private sector corporations to eliminate deforestation from their supply chains, both through individual sustainability policies, as part of a company's Corporate Social Responsibility (CSR) strategy, and through participation in larger initiatives (LAMBIN ET AL, 2018). The ZDCs movement started in the late 2000s and have set the stage for amplifying global efforts to tackle deforestation and ensure that carbon-rich forests and ecosystems are preserved (SEN, 2017).

In the Brazilian soy supply chain, at least 49% of soy trade is covered by some type of ZDCs made by companies. This number is relatively lower when compared to the palm oil supply chain in Southeast Asia, where the rate is 74%. Besides the low coverage, many of these commitments' focus lies on eliminating only illegal deforestation from supply chains (CHAIN REACTION RESEARCH, 2017).

1.1 Problem statement

Despite the growing efforts of companies to commit, these pledges are not yet adequate to prevent the conversion of natural habitats. Private companies' policies are only

valuable if fully implemented on the ground and accompanied by full transparency, a clear timeline and progress reporting (CHAIN REACTION RESEARCH, 2017). Besides that, even when fully committed, there are many challenges that companies need to overcome during the process of implementation. For example, tracing commodities to the farm level with very few geospatial information on supplier farms is very difficult for most companies. Also, just a few of them can enforce immediate change from their suppliers. In addition, the impact of the few frontrunners corporations that implemented policies is still difficult to be measured. It means that tracking of the commitments and their effectiveness is rare to be demonstrated in the current scenario (LUDWIG, 2018).

On top of the companies' self-context, supportive public policies and public governance are an essential component to enhancing the success rate and scale of supply-chain initiatives. Public and private environmental policies need to complement and reinforce each other. Overcoming weak government regulatory quality and lack of supportive public policies is also key for the effectiveness of company led sustainability approaches and the achievement of ZDCs (LAMBIN ET AL, 2018).

Although the ZDCs movement has been extensively studied, no work has yet demonstrated the pathways and available instruments to overcome the challenges that prevent adequate commitments implementation. Therefore, much remains to be understood about the ZDC policy ecosystem and how different measures and instruments can influence the implementation. Therefore, in-depth understanding of these challenges, the difficulties along the implementation process and the instruments to overcome them is crucial to achieve effective on the ground ZDC implementation and to advance on the zero-deforestation agenda.

1.2 Objectives and Research Questions (RQs)

The purpose of this study is to research the ZDCs implementation process and identify main existing instruments that support to transform multinational corporations' pledges into action. The study will be focused on the Brazilian soy supply chain. It seeks to understand the internal challenges of companies, based on their own processes, policies and strategies, and also external challenges, focused on public policies and public-private partnerships as a key tool for facilitating the ZDC implementation goal.

In order to meet the mentioned objectives, the main RQ to be answered is:

- *What is the missing link to transform commitments into action and support the end of soy supply chain driven deforestation in Brazil?*

To help to answer the RQ, the following sub-questions will be addressed:

- *What are the main existing opportunities, and which are the challenges faced by companies when implementing their ZDCs?*
- *Which instruments can be identified to support companies to overcome their challenges?*

1.3 Structure of this Document

The thesis is organized into seven chapters. The first one provides an introduction into the topic underlining the research problem, objectives and RQs of the study. The second chapter provides a literature review presenting concepts and background information necessary for the reader to understand the research problem and main findings from previous researches about the topic. The third chapter presents the theoretical background and framework on which the data analysis is based. The fourth chapter depicts the methodological approach, data collection, and research design. The limitations of the data are also discussed. Next, the results are presented, and key findings are lined out. Finally, the results are discussed with respect to other research findings, then, conclusions, recommendations and main ideas for further research are formulated. Lastly, references for the sources used in this study are provided.

2 Literature Review

This chapter is structured in two parts. The first one (2.1 - 2.5) provides background information to contextualize the reader about the problem statement and RQs. It covers deforestation, soy supply chain, the ZDC movement, and policy instruments and initiatives currently in place to reduce deforestation in Brazil. The final part of this chapter (2.6) covers a literature review about ZDCs implementation challenges, describing what was already studied by other authors.

2.1 Corporate Social Responsibility (CSR)

CSR is also known as corporate sustainability, sustainable business, corporate conscience, corporate citizenship, conscious capitalism or responsible business (Lin, 2018; Wood, 1991). According to SHEEHY (2015), CSR is a type of international private business self-regulation. For SMITH (2011), CSR can be defined as *"a business system that enables the production and distribution of wealth for the betterment of its stakeholders through the implementation and integration of ethical systems and sustainable management practices."*

CSR goes beyond making profits. Increasingly, stakeholders would expect that companies should be more responsible both socially and environmentally in their business. The World Business Council for Sustainable Development has described CSR as the business contribution to sustainable economic development (WBCSD, 2018).

The history of CSR dates back the beginning of XIX century. By the 1920s, the social responsibilities of business started to be discussed. The term Corporate Social Responsibility was coined in 1953 with the publication of Bowen's Social Responsibility of Businessmen. By the 1980s and 1990s, CSR was reviewed due to the acceleration of industrialization and the impact of businesses on society. Shell was the first company to implement CSR in 1998. By then, CSR evolved beyond the code of conduct and reporting. It then started to be an important part of the companies' business strategy (CORPORATE WATCH, 2018).

In the last two decades, consumers, investors, and governments are increasingly demanding better sustainability and social responsibility practices by pushing companies to implement significant and far-reaching reforms. CEOs of the 10 biggest corporations cite a variety of reasons why it makes business sense for them to be attentive to CSR, including meeting ethical and philanthropic responsibilities, developing and maintaining legitimacy and reputational capital, and building stronger relationships with stakeholders. Operational efficiency gains, reduced operating costs, and enhanced employee relations and productivity are also just a few of the many payoffs for firms focused on CSR (HOFFMAN, 2013).

In recent years, companies have made several important commitments to address their social responsibility and sustainability. Among them, Coca-Cola has pledged to become

water neutral by 2020, Associated British Foods introduced a policy to source all palm oil from sustainable sources, Unilever committed to engaging with at least 500,000 small-holder farmers in its supply network to improve their agricultural practices and Mars was the first in the industry to commit to sourcing 100% of its cocoa from certified sources by 2020 (HOFFMAN, 2013). Zero-deforestation commitments made by companies supplying agricultural commodities can also be included in this growing list of pledges as part of firms' CSR strategy.

2.2 Deforestation

2.2.1 Definitions

Deforestation, clearance, or clearing is the removal of a forest or trees from the land which is then converted to a non-forest use. Deforestation can involve the conversion of forest land to farms, ranches, or urban use (BRADFORD, 2018).

Many terms have been used to characterize zero deforestation. The most cited terms are defined below based on PIRARD ET AL (2014) and LUDWIG (2018) definitions:

- **Zero gross deforestation** means putting an end to the conversion of all existing forested land, without offsetting gains in forest cover. If forests elsewhere are afforested or reforested, they cannot be used to compensate for lost forest area for purposes of determining whether deforestation has occurred. Zero gross deforestation is criticized because of the lack of flexibility in land-use planning.

- **Zero net deforestation** means that conversion of a natural forest in one location can be offset by additional forest cover in another location, with no change to the total. The challenge of this concept lies in what kinds of new forest are good enough to compensate for forest losses and what can, therefore, be considered acceptable deforestation. Plantations replacing natural forests may or may not be acceptable because they are less biodiverse or store less carbon. Zero net deforestation is criticized because replacement forests are often not equivalent to cleared vegetation in terms of conservation value, carbon stock or other ecosystem services.

- **Zero illegal deforestation** is the least restrictive of the various forms of deforestation-free commitments. It requires only that legal requirements are met and focuses on the enforcement of national legal frameworks and the improvement of local forest governance.

Zero net deforestation enjoys most support among recent companies' pledges. It is used by the Consumer Goods Forum for formulating targets, as well as by its Tropical Forest Alliance 2020, and WWF. In this study, zero deforestation is used as a synonym of zero net deforestation which is also applied to companies' commitments and pledges definition.

2.2.2 Main Deforestation Drivers and Impacts

According to WWF (2019b), forests cover 31% of the land area on our planet and they produce vital ecosystem services. Forest is the habitat of most of the threatened and endangered animals and 1.6 billion people depend on forest resources to survive, including food, fresh water, clothing, traditional medicine, and shelter. But forests around the world are under threat from deforestation. The causes of deforestation comprise fires, clear-cutting for agriculture, ranching and development, unsustainable logging for timber, and degradation due to climate change. This impacts people's livelihoods and threatens biodiversity.

Forests are also key in mitigating climate change. They act as a carbon sink, soaking up carbon dioxide that would otherwise be free in the atmosphere and contribute to ongoing changes in climate patterns. Deforestation undermines this important carbon sink function. It is estimated that 15% of all greenhouse gas emissions are the result of deforestation (WWFB, 2019).

During the past decade, about 13 million hectares of forest have been lost each year. Commercial agriculture was by far the top driver of forest loss between 2000 and 2012, directly accounting for 71% of tropical deforestation worldwide (THE CLIMATE AND LAND USE ALLIANCE, 2014). Currently, deforestation occurs mainly in tropical forests and is driven mostly by the so-called forest risk and internationally traded commodities: palm oil, soy, timber & pulp, and beef. Large shares of production and trade of these commodities can be traced to a few countries, such as Indonesia, Brazil, Malaysia, and

Paraguay, where most of the tropical deforestation is concentrated (CLIMATE FOCUS, 2016). The demand for agricultural commodities is expected to double in the next decades, increasing considerably the pressure on forests (LUDWIG, 2018).

The unsustainable production of agricultural commodities and its close relation to deforestation not only compromises ecosystem services, but it mainly undermines climate, food, energy, water, social stability, and livelihood security locally and regionally. At the same time, this also threatens supply chains globally (BREGMAN ET AL, 2015).

The rising concern over climate change consequences also puts the forest risk commodities footprint at center stage. According to Carbon Disclosure Program (CDP, 2015), addressing deforestation and forest degradation could provide up to one-third of the carbon mitigation needed annually to keep temperature rises in check. The Intergovernmental Panel on Climate Change (IPCC) mentions that no other climate mitigation strategy has the potential for a higher and more immediate impact on the global carbon stock than reducing and preventing deforestation (RAUTNER ET AL, 2013).

2.2.3 Deforestation in Brazil

At the beginning of the Portuguese colonization in the year 1500, it is estimated that Brazil originally had about 90% of its area covered by forest. By the year 2000, the forest cover accounted for 62.3%. Some biomes had much greater reductions, especially the Atlantic Forest, one of the richest biodiversity forests in the world, of which less than 13% is now left (DRUMMOND, 2004).

In the first two-thirds of the twentieth century, the rate of deforestation has intensified. Getúlio Vargas, in the 1940s, was the first president to launch a major plan for the occupation and exploitation of the Amazon Basin, but he failed due to logistic challenges to reach the region. Thus, the Amazon remained almost intact until the 1970s (HALL, 1989). From 1990 to 2000, Brazil lost 22 million hectares of forest, and from 2000 to 2005 it became the world leader in deforestation, accounting for 47% of global losses (BARRETO ET AL, 2006). The pace of deforestation started to decline significantly since then, reaching a record in 2012, with the lowest rate in 24 years. This happened due to many measures, among them the rise in numbers of protected areas, the soy moratorium,

which prevented the commercialization of soy grown in areas illegally deforested; intensified enforcement of regulations and fine; and the restriction of credit to farmers that used to deforest. From 2013 on, the pace of devastation has grown rapidly again, losing the gains made in the past decade (IPAM, 2017).

However, during Michel Temer government, the situation got worse. Although his government celebrated the reduction in the rate of clearing in the Amazon between August 2016 and July 2017, the president was accused by Greenpeace and other environmental groups of making up the data. Several measures and decrees were approved, including the reduction of protected areas, freezing of indigenous land demarcations, legalization of land grabbing of up to 2,500 hectares, suppression of the rights of traditional peoples and communities, amnesty to environmental crimes and agribusiness debts, and flexible requirements for environmental licensing (O TEMPO, 2018).

As a result, in 2018 the forest cover losses in the Amazon grew 39%. Deforestation in the Amazon between 1970 and 2017 summed up 768,935 square kilometers, an area twice that of Germany (ORTOLANI, 2018). The Cerrado, the most biodiverse savannah in the world, is half the size of the Amazon and has already lost half of its native vegetation. In the last ten years, the Cerrado had the highest rates of deforestation in Brazil and currently is the most threatened biome. Many reasons are behind the current deforestation trends, including weaker environmental rules in the Cerrado than in the Amazon: landowners are allowed to clear only 20% of their property in the Amazon forest, while in Cerrado they can cut down as much as 80% of the forest. The driver of current deforestation is mainly massive agricultural expansion. Much of the land there is being converted to cattle pasture, but soy industry has become a major player (TOLLEFSON, 2018; WWF BRAZIL 2018).

From 2019 on, the election of Jair Bolsonaro as the new Brazilian president poses a risk to the increase of forest losses due to the government's anti-environment promises by making environmental licensing easier and supporting the expansion of agricultural production even in protected areas, among others.

2.3 Soy Supply Chain

2.3.1 From Farm to Households

The soy is native to South East Asia and is a very versatile commodity, used as one of the most important global sources of protein. It can be found as an invisible ingredient in many processed foods, being commercialized as whole soys grains and its two main derivatives, soy oil and soy meal (CHAGAS ET AL, 2018).

The soy supply chain includes five stages: conversion/production, processing, transport/trade/distribution, manufacturing and retail/consumption (CHAGAS ET AL, 2018; RAUTNER ET AL, 2013). The figure 1 shows how the soy supply chain is structured.

- Production/Conversion: soys are typically produced in large scale industrial farms. Farm owners may be part of a grower association or union, which helps them to increase their market access and bargaining power. After harvesting, soys are centrally stored in large silos by big traders for crushing or export, where various sources are mixed, which make it difficult to trace products to their origin within this supply chain. These operations are called elevators and may be operated by large farms, by cooperatives of smaller farms, or by larger processing and trading businesses.
- Processing: the main processors and traders are agribusiness giants such as Cargill, Bunge, and ADM. They crush the soys to produce oil and meal, and husks as a by-product.
- Transport/Trade/Distribution: market activity is also dominated by a few large corporations, which move the commodity toward distribution and exports.
- Manufacturing: soys are used in the manufacture of a huge variety of products from biofuels to personal care industries, from food products to feed for livestock.
- Retail/Consumption: after transformed into different products, they are sold to final consumers. There are a few dominant players in the food and cosmetics industries, including Unilever, Procter and Gamble, Kraft and Nestlé.

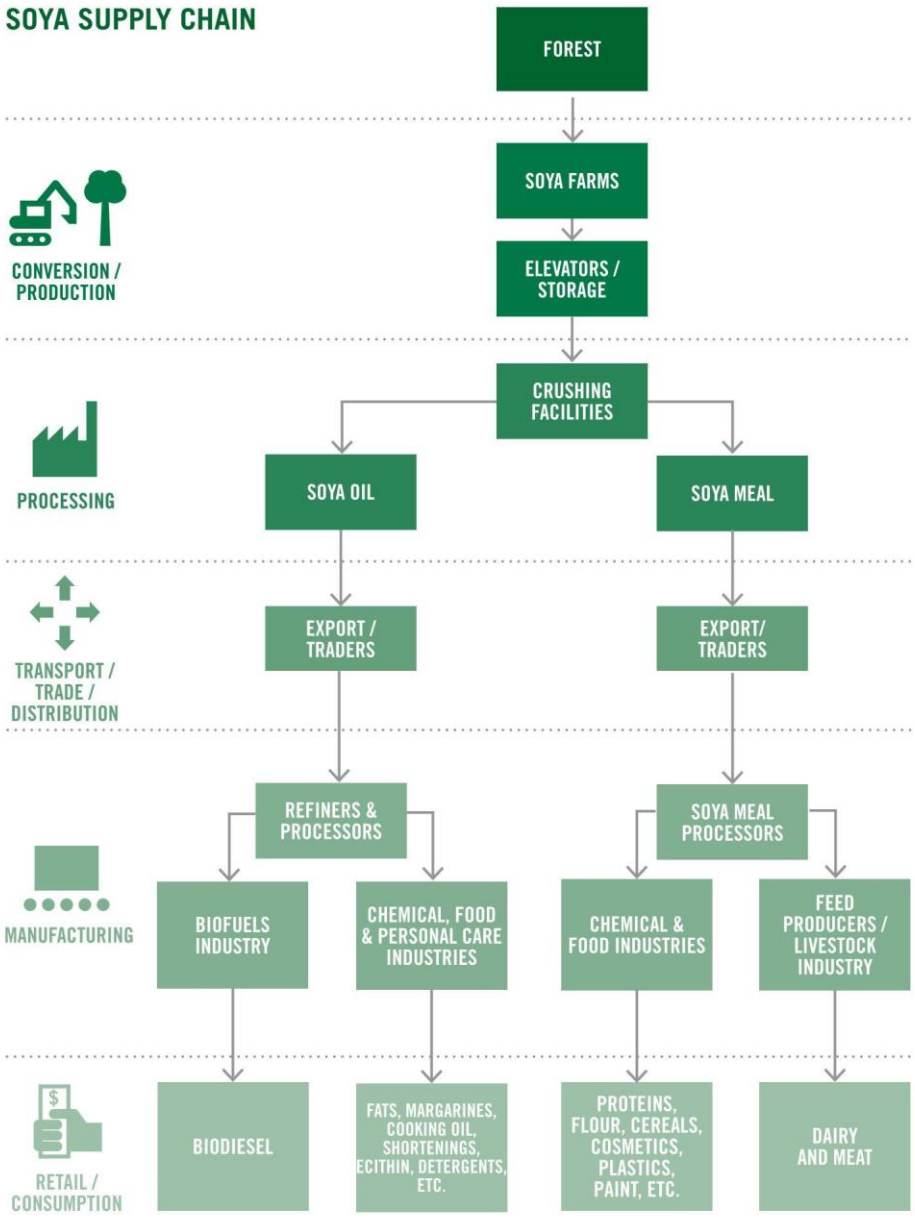

Figure 1: Soy Supply Chain Structure (Source: RAUTNER ET AL, 2013).

2.3.2 Soy as a Key Commodity in Global Markets

The global soy cultivation area has almost doubled during the last 20 years: from 62.4 million ha in 1997 to 120.3 million ha in 2017. Soys are an extremely important crop in Brazil. The country is the world's second largest producer of soys behind the United States and the first largest exporter. During the last 25 years, the cultivation area in the country more than tripled. The global market for soys and derived products reached USD 146 billion in 2017. It is expected to grow to USD 216 billion by 2025 (CHAIN REACTION RESEARCH, 2017; GREGORY, 2017).

74% of Brazilian soy production is exported. Global consumption of soy is concentrated among a few major importers: China and the EU. Increasing demand is driven by three key factors: a shift from non-commercial to commercial feed in the livestock sector; the move to protein-rich diets among the rapidly emerging middle classes, mainly in China and India, increasing demand for meat, milk and eggs; and a growing number of national biofuel support policies (CHAIN REACTION RESEARCH, 2017).

ProTerra and the Roundtable on Responsible Soy (RTRS) are the key soy certification standards of environmental and social sustainability performance. The share of certified soy under these certifications is still very small, reaching less than 2%. The origination, crushing, and trading of soy from Brazil are characterized by a high degree of concentration and internationalization. The top 15 traders control more than 76% of exports of soys and soy-derived products from Brazil to the world. A few agribusiness companies dominate the market - the so-called ABCD traders – ADM, Bunge, Cargill, and Louis Dreyfus Company (CHAIN REACTION RESEARCH, 2017).

2.3.3 Impacts of Soy Production on the Environment

Soy production has been one of the key drivers of deforestation in Brazil in the last two decades, leading to significant deforestation and biodiversity loss, as well as substantial greenhouse gas emissions. Between 1990 and 2010, land dedicated to soy production in South America increased by 270%. In 2015, more than two-thirds of land conversion in the Brazilian Cerrado was related to soy expansion, compared with one-third in the Amazon. While Amazon deforestation remains a concern, the interrelation between Amazon deforestation and soy expansion has been substantially weakened through the Amazon Soy Moratorium. In 2006, a range of stakeholders from industry, government, and civil society agreed a Soy Moratorium (CHAIN REACTION RESEARCH, 2017).

The new agricultural frontier in Brazil has moved to Cerrado in recent years. Large parts of this biome have been converted for agricultural use during the last decades. The remaining forested area is largely unprotected and therefore threatened by the ongoing conversion for commodity production. Environmental and social issues connected to the large-scale conversion of Cerrado land for agricultural use have also arisen due to the increasing land speculation in the area. This is based on a business model that aims to

produce value from appreciation by acquiring land, clearing it from its native vegetation, transforming it into farmland, and selling it off. With an increase in global soy consumption, Brazil is expected to show the greatest expansion of cropland globally threatening native forest areas (CHAIN REACTION RESEARCH, 2017).

2.4 Zero Deforestation Commitments (ZDCs)

2.4.1 Definition and Characteristics

ZDCs, as they have become usually known, are voluntarily and publicly stated declarations of intent by private sector corporations to eliminate deforestation from their supply chains, both through individual sustainability policies and through participation in larger initiatives. The four agricultural commodity supply chains most strongly associated with tropical deforestation (beef, palm oil, timber, and soy) are the sectors most commonly included in ZDCs. For a given commodity and corporation, these pledges cover an entire value chain, from producers, processors, traders, manufacturers until retailers (CHAGAS ET AL, 2018).

Over the past decade, there has been a growing number of corporations making ZDCs. These commitments have set the stage for amplifying global efforts to tackle deforestation and ensure that carbon-rich forests and ecosystems are preserved, and the rights and livelihoods of communities are strengthened (SEN, 2017).

A recent study identified four categories of supply chain initiatives aiming to reduce deforestation (LAMBIN ET AL, 2018). Table 1 also summarizes those initiatives.

- company pledges and commitments: publicly stated goals by single companies to eliminate deforestation from their operations, either associated with specific commodities and/or regions, or across entire supply chains. It often involves a commitment to exclusively produce or source commodities associated with no deforestation, along with other social or environmental criteria.
- collective aspirations by stakeholder groups that go beyond the direct control of individual actors: broad and common objectives are defined jointly and often include recommended best practices.

- company codes of conduct that define specific production or sourcing practices: it describes specific actions that are designed and managed by a company to reduce deforestation from its operations and supply chains, for example: sourcing from approved suppliers who meet pre-defined sustainability principles; giving preference to suppliers who offer third-party certified products; exclude sourcing from deforestation hotspots; auditing suppliers' operations against social and environmental requirements.

- sectoral standards: specific norms, principles, and criteria of verification adopted by groups of companies to define their practices with respect to sustainability. They help to operationalize and standardize codes of conduct across multiple actors within a supply chain. it may include either positive incentives (such as price premiums for certified products) or sanctions (moratorium on purchases from deforested lands) on suppliers.

Table 1: Characteristics of the main supply chain initiatives used to promote zero deforestation (Source: LAMBIN ET AL, 2018)

Initiative		Examples	Approach	Opportunities	Challenges*
Collective aspirations		Consumer Goods Forum, TFA2020, and 2014 New York Declaration on Forests	Broad, collective objective by a group of stakeholders	Potential to affect multiple commodities and regions	On their own, may lack accountability and fail to provide a clear path for implementation
Company pledges		Zero deforestation commitments by Wilmar, GAR, APP, Unilever, Cargill and McDonald	Establish and communicate a company's commitment to reducing deforestation	Combine a vision of change with clear accountability	Uncertain implementation, sometimes vague criteria and timeline
Codes of conduct		Approved supplier lists, and Unilever's Responsible Sourcing Policy	Set internal policies for production and sourcing practices	Provide actionable steps to reduce deforestation, tailored to a specific company's needs	May overlook perspectives of other stakeholders; often low transparency; difficult to monitor or verify. Potential for misaligned incentives to pass suppliers
Sectoral standards	Incentives	Certification programmes for sustainable production of palm oil, soy and sugarcane (developed by Roundtables or by certification bodies — for example, the Sustainable Agriculture Network)	Standardize sustainable production practices across participants; enable the assignment of market access or price premiums	If sufficiently stringent, changes behaviour at the property level; may address sustainability broadly	May reward those who comply easily (little additionality); unlikely to influence large regions
	Sanctions	Brazil's soy and cattle moratoria	Identify practices to be discouraged through market penalties by other actors within the supply chain	May reduce deforestation in a large region or biome for specific commodities; easy to monitor and communicate	Risk of leakage to other geographies and commodities: may shift patterns of clearing without stopping deforestation overall

*In general, and unless efforts are made to mitigate harm to local communities, these initiatives risk having disproportionately negative impacts on small-scale producers due to their dependence on local resources and unclear land rights in forest frontiers.

Companies make ZDCs motivated by many factors, including CSR concerns about meeting society's expectations and reducing reputational risks; reducing legislative risks by anticipating changes in public regulations; mitigating potential losses of critical environmental services and consequently ensuring long-term supply and reduction of operational risks; and increasing market shares and profits (LAMBIN ET AL, 2018; BREGMAN ET AL, 2015).

2.4.2 ZDCs Background and Current Status

The ZDC movement started in the late 2000s, when civil society activism against deforestation in global value chains grew significantly, demanding companies to cancel contracts and stop buying palm oil produced through primary forest conversion. In 2008, the WWF was the first organization to lead a major campaign that called for zero net deforestation by 2020, signed by 67 countries during the United Nations Climate Summit. In 2010, Nestlé became the first global food company to publicly make a ZDC. In the same year, the Consumer Goods Forum's (CGF) deforestation resolution was launched and represented the corporate response to the increased focus on forest-risk commodities in global supply chains. CGF members managed to coordinate the actions of around 400 companies, pledging to mobilize their resources towards achieving zero deforestation by 2020. This resolution led to the establishment of the Tropical Forest Alliance 2020 (TFA 2020) in 2012, a global partnership of public and private partners taking voluntary actions to reduce tropical deforestation, reduce greenhouse emissions, improve smallholder livelihoods, conserve natural habitats and protect landscapes. In 2014, the New York Declaration on Forests (NYDF) was released at the United Nations Climate Summit, with the aim of halving natural forest loss by 2020 and ending it entirely by 2030. In 2015, the Amsterdam Declaration was agreed by several European countries aiming to eliminate deforestation by responsible private-sector management of supply chains and trade. By 2016, there were 190 endorsers: 40 governments, 20 sub-national governments, 57 multinational companies, 16 groups representing indigenous communities, and 57 NGOs (CLIMATE FOCUS, 2016; PASIECZNIK, 2017).

As of March 2017, according to extent research done by the NGO Forest Trends, some 447 companies had made 760 commitments to curb forest destruction in supply chains linked to the four forest-risk commodities. This includes big brands, retailers, traders, and

growers. Leading consumer goods companies also participate in collective commitments, such as the 2014 NYDF and in the TFA 2020. Commitments vary between commodity supply chains with most commitments targeting sustainable palm oil and timber. Fewer commitments address soy and cattle. The number of companies pledging to reduce deforestation has grown rapidly in recent years and most of them are headquartered in industrialized countries. However, it is still a small percentage of companies in the agricultural commodity market (SUPPLY CHANGE, 2019; LUDWIG, 2018).

2.4.3 ZDC Implementation and Monitoring

Many strategies have been adopted to implement ZDC across supply chains. The most common instruments include certification, traceability systems, engagement with suppliers, and mechanisms to ensure supplier compliance with local regulations, and procuring from low-risk jurisdictions. (LUDWIG, 2018; CLIMATE FOCUS, 2016; JOPKE ET AL, 2018).

Certification is conceptually simple, and it is the most common policy used to implement commitments. A study has found that four out of five ZDCs rely on certification (SUPPLY CHANGE, 2019). The CGF also indicates that the certification schemes are considered sufficiently good to act as proxies for low deforestation risk. While certification serves as a clear baseline for commitments, many companies go further than the requirements set by standard bodies and establish additional policies (LUDWIG, 2018).

Traceability is also a key tool to ensure full ZDC implementation and it is one of the most used approaches too. Many companies have traceability systems in place, however few of the systems allow companies to trace commodities back to the local level of production. Another barrier is that suppliers are often reluctant to share commercially sensitive information and companies consequently often miss information on suppliers' sources of commodities (LUDWIG, 2018).

Currently, there is no available data that provides global coverage to determine whether cumulative company efforts are translating into measurable reductions in deforestation (CLIMATE FOCUS, 2016). Less than half of the companies make quantitative information on their progress available. Even for the commitments for which target dates already passed, companies have disclosed progress on fewer than half. This suggests that

companies are still struggling to implement and monitor their commitments (SUPPLY CHANGE, 2019).

2.4.4 ZDC in Soy Supply Chain

The soy sector is lagging the palm oil sector in terms of the amount and scope of ZDCs. At least 49% of Brazil's soy trade is covered by some type of ZDC whereas 74% of Southeast Asian palm oil sector is covered by ZDCs. Six of the top 15 soy traders have some commitment to zero deforestation. This includes generic pledges covering agri-commodities more broadly, or commitments that specifically mention soy. These pledges are not yet adequate to prevent the conversion of natural habitats, as the focus lies on eliminating illegal deforestation from supply chains. Accompanied by insufficient transparency and limited scope of sanction mechanisms, traders still accept soy linked to legal deforestation. This is an issue in the agricultural frontier areas of the Cerrado (CHAIN REACTION RESEARCH, 2017).

Leading consumer goods companies have committed to zero net deforestation in agri-commodity supply chains by 2020. This increases the pressure on commodity traders to adopt and strengthen similar assurances and address policy and implementation gaps in the short term. Cargill, ADM, and Bunge all have environmental and social governance policies that specifically refer to deforestation and soy as a forest-risk commodity. Grupo Amaggi and Louis Dreyfus Company have more generic guidelines with reference to deforestation (CHAIN REACTION RESEARCH, 2017).

A trend towards committing to zero-deforestation can already be observed. All traders operating in the soy supply chain in Brazil support the Amazon Soy Moratorium and a growing number of stakeholders signed the Cerrado Manifesto, a multi-stakeholder policy committed to eliminating deforestation and conversion of native vegetation in the Cerrado. Besides that, in November 2017, 64 Chinese company members together with WWF announced the Chinese Sustainable Meat Declaration to avoid land degradation and deforestation in the Brazilian soy supply chain since China is the recipient of two-thirds of Brazilian soy exports which could put significant pressure on soy producers and traders to improve their sustainability performance (CHAIN REACTION RESEARCH, 2017).

2.5 Policies Instruments and Initiatives

As by now, the most striking instruments put in place by governments and multi-stakeholder groups to reduce deforestation have been the moratoriums. In addition, national and local-level initiatives, such as enforcing public regulations and multi-stakeholder groups initiatives, are underway to reduce the impact of agriculture on deforestation, some with international donor support. Below the most relevant policies instruments and initiatives in place in Brazil for the ZDC discussions are listed.

2.5.1 Brazilian Environmental Legislation

The Forest Code is the Brazilian main legislative tool regulating land use change. It is the law that establishes the general rules on where and how the native vegetation of the Brazilian territory can be used. It determines the areas that must be preserved, and which regions can be used for agricultural production. The first Code dates from 1934, and since then it has undergone major changes as in 1965, which have made it more demanding. Receiving a major revision in 2012, it provided for the inclusion of the important new rural environmental registry (the Cadastro Ambiental Rural or CAR) and two types of conservation on private land – Permanent Preservation Areas (Áreas de Preservação Permanente, or APPs) and the Legal Forest Reserve (Reserva Legal) (O ECO, 2014).

Deforestation is prohibited in APPs, due to their role in providing important ecosystem services such as erosion protection or conserving biodiversity. Landowners must also set aside a percentage of their property as a Legal Forest Reserve. The percentage varies according to the location in Brazil (for example, in the Legal Amazon region, from 20% to 80% of land should be set aside depending on the biome, whereas outside the Legal Amazon the set-aside is 20% regardless of the biome). A special regime applies for certain properties that were deforested prior to July 2008, under the Environmental Regularization Program (Programa de Regularização Ambiental, or PRA). The PRA gives these landowners a few alternatives to restoring a particular property up to the Legal Forest Reserve, for example by offsetting ‘surplus’ Legal Forest Reserves on their other properties, or buying Environmental Reserve Quotas (Cotas de Reserva Ambiental, or CRAs) from other landowners who themselves have surplus Legal Forest Reserves (CLIMATE POLICY INITIATIVE, 2015).

2.5.2 Rural Environmental Registry (Cadastro Ambiental Rural, or CAR)

The Forest Code also requires that every private property should be registered on the Rural Environmental Registry, an online registry, accessible by the public, that provides information on each property's APP and Legal Forest Reserve. The CAR helps to inform land-use planning and assists with monitoring and enforcement of the Forest Code (CLIMATE POLICY INITIATIVE, 2015). It stores georeferenced private property boundaries and vegetation cover information. If widely adopted by landholders, these systems allow for the identification of whose land is being cleared and could prove a powerful combination to combat deforestation and support transparent, deforestation-free commodity supply chains (RAUTNER ET AL, 2013). It also helps to create accountability, because even though Brazil has a very well-organized satellite-based deforestation monitoring system that covers the Amazon, without CAR it is nearly impossible to assign responsibility for areas with unclear or non-existent land titles. CAR is also used by corporate commodity buyers to improve traceability in their supply chains (PASIECZNIK, 2017).

2.5.3 Soy Moratorium

Through the Moratorium, most of Brazil's soy industries agreed to stop buying soy grown on previously-forested lands that were cleared after July 2006. The Moratorium was inspired by the abrupt spike in deforestation rates in the Brazilian Amazon region in 2003 and 2004 when more than 25,000 square kilometers of forest were cleared each year. Soy fields expanded into the southeastern forests of the Amazon region and led Greenpeace to launch a campaign targeting European restaurants that bought chicken raised on meal containing Amazon soy. The Moratorium fostered important innovations. A system for monitoring soy fields in Mato Grosso was developed, identifying areas of new soy production that did not meet the Moratorium's cut-off date, and publishing the names of landholders not in compliance. A working group of Brazilian NGOs was established to accompany the process and a strong dialogue developed among civil society and industry actors. The Moratorium is renewed annually. The Soy Moratorium is best viewed as one important element of a combination of interventions that, together, have suppressed deforestation in the Brazilian Amazon (RAUTNER ET AL, 2013). According to WWF (2019a), Amazon Soy Moratorium is one of the most successful industry-led conservation initiatives ever. Before the moratorium, soy cultivation was directly or indirectly

responsible for around a fifth of deforestation in the Brazilian Amazon: since then, it's accounted for less than 1%. The moratorium is only valid for the Amazon region, other regions, such as Cerrado, are not covered.

2.5.4 Cerrado Manifesto

Cerrado Manifesto, an NGO-led initiative calling on the private sector to take immediate action to protect this biome. Several leading NGOs, including Greenpeace Brazil, Conservation International Brazil, WWF Brazil, among others, published a manifesto in September 2017, pointing out that 30% of the deforestation in the Cerrado could be prevented by the agribusiness sector. As of April 2018, 62 companies purchasing beef and soy from the Cerrado signed the Manifesto, committing to halting deforestation in the biome. The manifesto calls for a series of measures to end deforestation in the region and usher in robust sustainable agriculture standards for companies operating in the Cerrado. While steps to operationalize the manifesto are still being discussed, political efforts such as this are effective in bringing the Cerrado to the fore of discussions (CHAGAS ET AL, 2018).

2.5.5 Roundtable on Responsible Soy Association (RTRS)

The RTRS is an international multi-stakeholder initiative that was established in 2006, as a response to accusations from Greenpeace, to promote sustainable soy production, processing, trade and use through the development, implementation, and verification of a global standard. Includes geographies beyond the Amazon and aims to provide an incentive to producers that would offset the costs of compliance and certification by creating a demand for certified products. RTRS aims to facilitate a global dialogue on soy that is economically viable, socially equitable and environmentally sound; reach consensus among key stakeholders and players linked to the soy industry; act as forum to develop and promote a sustainability standard for the production, processing, trade and use of soy; and act as an internationally recognized forum for monitoring the sustainability of global soy production (RTRS, 2018).

2.6 ZDCs Implementation Challenges

In the business field of study, corporate campaigns represent a special form of institutional and stakeholder pressure that requires analysis to understand how it affects

the corporate decision. On the other hand, political scientists' focus is on how corporate campaigns are emblematic of the rise of non-state power and authority in world politics. In both fields, just a few studies examine how corporate commitments to improving social and environmental practices are put into practice (DIETERICHA ET AL, 2015). When it comes to studies focused specifically on the ZDC movement, we find even fewer publications. Of those, most are gray literature reports that rely on field-intensive data-collection to evaluate compliance and track ZDCs implementation (NEWTON ET AL, 2018).

Although very few researches were focused on the topic, difficulties of effective private sector commitments implementation are very well-known empirically so is the organizational challenges facing companies that seek to adopt social and environmental practices. The literature provides background information about the implementation of overall sustainability measures by companies. Scholars have categorized sustainability motivators into internal versus external motivators. These factors include market drivers (e.g. competition, customers and consumer demands), government (e.g. regulations and legislation) and social factors (e.g. civil society organizations and media), which may trigger organizational proactivity towards improving sustainability (SAJJAD ET AL, 2015).

Private-sector commitments to zero deforestation are a major step forward, with great potential to foster more sustainable production and consumption. But the implementation of these commitments must confront diverse challenges, such as the ambiguity in policy processes, the politics surrounding what is desirable, and the difficulty of enforcing regulations (PACHECO ET AL, 2017). Skepticism about their longer-term efficacy is driven by commitments that have been hard to meet in practice (DIETERICHA ET AL, 2015). For example, many companies have neither achieved compliance nor even identified a plausible road-map or mechanism for implementation of their ZDCs. Only half of all commitments have publicly available progress reporting, and one in every five commitments has a target date that is past due and has never had progress information available (NEWTON ET AL, 2018). ZDC's have also attracted criticism because they are restricted to specific commodities and geographies and lacking any clear implementation strategy. Besides, they are diverse in their wording, scope, timelines for implementation and level of transparency, many are recent, which limits the availability of evidence on their outcomes, and they interact in synergistic or antagonistic ways with public and

multi-stakeholder efforts, which makes it difficult to assign responsibility for changes (LAMBIN ET AL, 2018; NEWTON ET AL, 2018).

Furthermore, corporate motivation is key to achieving reductions in deforestation. If the primary motivation is image building or decreasing reputational risk, companies are likely to emphasize communication of vague goals, with little on-the-ground impact. If instead companies are truly motivated to make their business more sustainable, then transformations of their supply chains are more likely, with impacts on land use (LAMBIN ET AL, 2018).

However, regardless of whether the company is fully committed to embedding sustainability in its supply chain, barriers for implementation will rise. Some studies focused on Sustainable Supply Chain Management (SSCM) grouped barriers to implement sustainability measures into internal and external categories. The internal barriers involve organization-related issues such as financial constraints, lack of knowledge and awareness, and inadequate support of top management. On the other hand, external barriers involve forces present in the external environment, which sometimes impede corporate ability to engage in SSCM practices. These factors include lack of supplier capability, inadequate consumer demand for sustainable products or services and lack of government support (SAJJAD ET AL, 2015).

Another study focused on the ZDC movement describes a series of barriers to achieving on the ground implementation and reduction of deforestation. Among them, leakage is an important one. For example, under the Soy Moratorium, on-property leakage may occur when soy farmers continue to deforest for non-soy land uses such as cattle ranching. The outcome is that the soy-related deforestation will reduce due to ZDC, however, the overall deforestation will grow, as it will move to other supply chains not covered by a similar instrument (LAMBIN ET AL, 2018).

The incentives to adopt voluntary measures is very low as up to date it is not yet proved the benefits of ZDCs implementation for private sustainability schemes. A challenge that hinders the adoption of such measures is that the costs of shifting towards deforestation-free production systems are covered by producers and there are no price premiums for doing so or access to preferential markets. On the social side, farmers with good access

to capital and technology are more likely to comply with zero-deforestation standards, further marginalizing small-scale producers, who can play an important role in both deforestation and conservation. Unclear and insecure property rights may also weaken incentives for land users and financial institutions to invest in sustainable land-use practices that reduce deforestation. Tenure reform may help prevent negative social impacts of supply-chain interventions (LAMBIN ET AL, 2018).

Some pathways to overcome these barriers have been studied by LAMBIN ET AL (2018). Among them, the development of supportive public policies, that could enhance the success rate and scale of supply-chain initiatives. Governments can encourage industry self-regulation through the threat of stronger public regulations, endorse and reinforce private standards, facilitate information sharing and supply-chain transparency. Government and private-sector programs may also mitigate the marginalization of smallholders — for example, by offering better access to technologies, information and financial resources (LAMBIN ET AL, 2018).

Besides, it is also important to incentivize producers to participate in supply-chain initiatives by making it technically and economically feasible. For producers to shift their practices, traders, retailers, research agencies and governments must develop business cases and incentives for deforestation-free products. In addition to price premiums, alternate mechanisms can facilitate adoption by covering compliance costs at the producer level (LAMBIN ET AL, 2018). Improved traceability and transparency are also key to foster implementation. Increased supply chain transparency can help transform the sustainability of commodity production systems. Transparency can demystify complex supply chains, and help different actors identify and minimize risks and improve conditions on the ground and inform whether and where progress is being made (GARDNER ET AL, 2019).

Corporate campaigns and corporate commitments are not a sufficient end. They need to be situated and understood in relation to a broader range of policy initiatives. Therefore, it is very important to use instruments of incentives and also sanctions to motivate holistic implementation and utilize market pressure and government rules to expand the potential on-the-ground effects beyond a company's operations on a national or regional scale (DIETERICHA ET AL, 2015). Zero-deforestation initiatives by individual companies may

fail to target the forms of deforestation that are most difficult to address, including those associated with illegal activities or poor forest governance more generally. However, much remains to be understood about the complex policy ecosystems in which zero-deforestation commitments are implemented and how multiple, often parallel, initiatives influence commitment effectiveness (LAMBIN ET AL, 2018). Yet the ZDC movement is still in its early stages and several issues will have to be tackled in order to produce substantial and long-term impacts on the natural forests.

3 Theoretical Background

This section aims to review terms and concepts that are relevant to the understanding of sustainable supply chain management, the theoretical approach to be used in this study.

3.1 Sustainable Development and Triple Bottom Line (TBL)

Sustainable development is one of the main concerns of corporations, especially in supply chains that cause several impacts on the environment. The term sustainability is gaining strength and political expression since the 1980s because of the perception of a global environmental crisis and the awareness that countries needed to find ways to promote the growth of their economies without destroying the environment or sacrificing the well-being of future generations (SAVITZ ET AL, 2007).

In corporations, sustainability is generally operationalized using the Triple Bottom Line (TBL) concept, a term presented by John Elkington in 2004, which regards not only economic issues but also social and environmental ones (SAVITZ ET AL, 2007). The three dimensions of sustainability presented by TBL must be integrated so that, in the environmental sphere, natural resources are used in a way that does not harm future generations, reducing the impacts of the productive processes. From an economic perspective, it is necessary to assure the company's profitability and not to compromise its economic development. In the social sphere, the major objective is the development of a more just world through relationships with all stakeholders in the organization (ELKINGTON, 2011).

The integration of sustainability into the design and management models of organizations has been the objective of several stakeholders. This interest arose to meet a demand

imposed by society, in which organizations should be socially responsible, proposing plans and actions that include the environmental, social and ethical dimensions. This new perspective strengthened the creation of legal and institutional mechanisms to protect the environment.

For HART ET AL (2003), the pursuit for sustainability should be considered together as a portfolio in which strategies and practices have the potential to reduce costs and risks, raise the reputation and legitimacy of the organization, accelerate the process of innovation and repositioning in the business environment. These will be key factors for creating value for stakeholders.

3.2 Sustainable Supply Chain Management (SSCM)

Supply chain management (SCM) is presented in the business environment as a tool to connect the market, the distribution channels, the production process, and the procurement activities in such a way that consumers have a high level of service at the lowest total cost, thus simplifying the complex business process and gaining efficiency (BOWERSOX ET AL, 2006). According to BALLOU (2006), supply chain management refers to the integration of all activities associated with the transformation and flow of goods and services, from raw material suppliers to end users.

BRITO ET AL (2010) highlight a growing demand to integrate environmental and social issues into the supply chain management due to external pressures on business. According to SEURING (2011), SSCM comprises the management of information, material and capital flows, as well as cooperation between companies along the chain, integrating the goals of all three dimensions of sustainable development, that is, economic, environmental and social, involving all stakeholders that are part of a productive chain. In the SSCM, environmental and social criteria need to be met by actors within the supply chain, while competitiveness is expected to be maintained, meeting the goals of stakeholders.

A sustainable supply chain reflects the company's ability to plan, mitigate, detect, respond to and recover from potential global risks. These risks involve marketing, product development, channel selection, market decisions, procurement, transportation

complexity, government and industry regulation, resource availability, talent management and alternative platforms of energy and safety (CLOSS ET AL, 2011).

For SEURING and MÜLLER (2008), SSCM presents three aspects that distinguish it from SCM: it demands a greater number of impacts in an extended supply chain; considers a greater number of performance objectives due to the insertion of the environmental and social dimensions of sustainability; and presents a greater need for integration and cooperation among members of the supply chain.

Another organizational attribute important for the sustainable management of the supply chain is the managerial orientation. The literature suggests that companies need to be proactive and committed. Being proactive and committed can only be effective if the business model and the environmental and social sustainability elements are properly aligned with the production chain (PAGELL ET AL, 2009).

PAGELL ET AL (2009) suggest a model of practices for SSCM which is based both on aspects related to the integration of sustainability goals to the daily practices and on new behaviors adopted in sustainable chains, which lead them to perform well in all dimensions of TBL as follows: a new conception of the supply chain, regarding all stakeholders, customers, direct suppliers, NGOs, governments, communities, direct competitors, etc; a stable base of suppliers able to meet the demands of the supply chain through the following practices: transparency, traceability, certification and de-commoditization, as well as supplier development initiatives.

In the companies analyzed by PAGELL ET AL (2009), it was possible to verify that through the internalization of the sustainability goals to the business, the non-economic (social and environmental) aspect becomes a critical factor of growth and financial performance. Once inserted in the business, it is also passed on along the supply chain.

CARTER ET AL (2008) show that for succeeding at the implementation of sustainability in the supply chain, four key aspects are necessary:

- Risk Management: the organization's ability to understand and manage environmental, economic and social risks in its supply chain.

- Transparency: stakeholder engagement and proactive communication in order to ensure the participation of all actors in the improvement of processes from feedback information. It is essential to achieve improvements in traceability and visibility in operations and vertical and horizontal coordination in supply chains.

- Strategy: Integration of the organization's sustainability initiatives within its business strategy.

- Organizational Culture: Creating a long-term vision shared across the organization is significant in generating internal drive and passion to stimulate innovation and change. Thus, high ethical standards and respect for society and the environment must be disseminated throughout the company.

CARTER ET AL (2008) point out that these four aspects are not intended to be totally mutually exclusive. For example, involving stakeholders - an example of improving transparency - can reduce risks - such as possibilities for consumer boycotts and actions led by non-governmental organizations, and it can also be an explicit part of the organization's strategy.

DIAS ET AL (2012) show that the most common drivers for establishing sustainability strategies and practices originate from external forces such as government agencies and customer groups, lobbyists or NGOs that are able to influence regulators. The more rigid the regulation, the more companies seek to improve their performance. In this context, DIAS ET AL (2012) highlight the emergence of the various codes of conduct, certification, green labels and global governance systems signed in private unilateral agreements, which play the role of leading such practices where there is not enough public regulatory capacity.

SSCM requires the alignment and integration of the various actors seeking results in the three dimensions of TBL in the long term. However, such management only becomes real with the definition of the strategy that aligns the intentions of all the stakeholders and clarifies the path traced to reach the intended vision.

3.3 Seuring and Müller Model

In an extensive study about the core issues in SSCM using the Delphi method, SEURING and MÜLLER (2008) have reached the following conclusions:

- Reactions to customer demands and regulations are more relevant drivers of practices of SSCM than actions of NGOs, often presented in the literature as the main source of pressure on focal companies;
- Win-win situations between the dimensions of sustainability are more likely than trade-offs;
- The development of sustainable products requires close interaction with suppliers and integration of the supply chain, but this approach is less relevant than the monitoring of suppliers for the prevention of social and environmental problems that can affect the reputation of focal companies

According to these authors, embedding sustainability in the supply chain is driven by the pressures and incentives that result from the action of different external groups positioned on the demand side: customers, governments and stakeholders. The figure 2 illustrates the main triggers for SSCM, according to Seuring and Müller model.

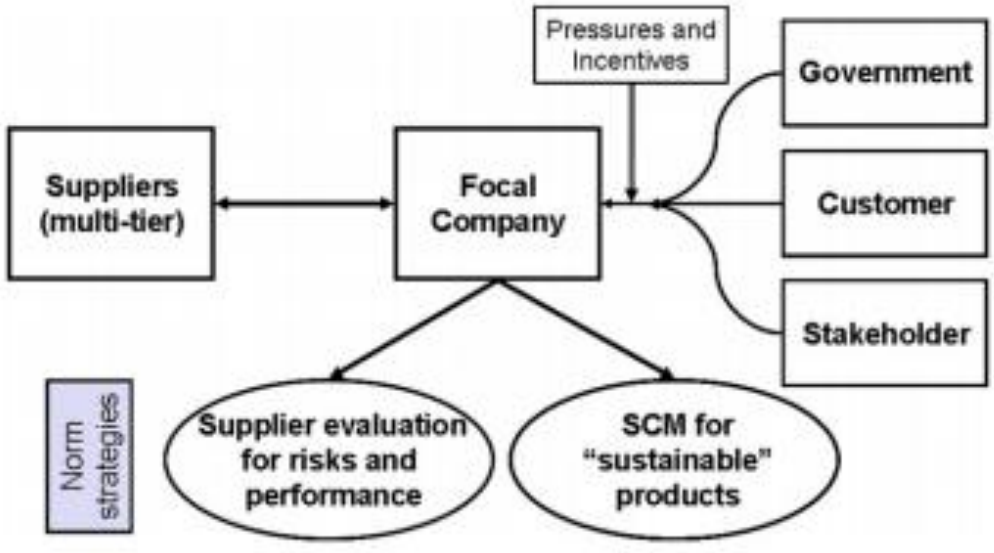

Figure 2: Triggers for sustainable supply chain management (Source: SEURING and MÜLLER, 2008)

It should be emphasized that although the first two groups are also stakeholders, the authors seek to make explicit the greater influence of customers and governments as pro-sustainability agents in the supply chain, although in the third group, other organizations play a relevant role as well (e.g. NGOs).

When the focal company is subject to pressures, it often passes them over to the supply chain. If such pressures relate the life cycle of the product with those who do not have a direct relationship, the focal company will necessarily have to consider further levels of its chain to provide answers or solutions to those who demand them, something that would not be justified in decision-making based purely in the economic dimension. Pressures and incentives to adopt sustainability practices affect collaboration with suppliers, from obtaining information on social and environmental aspects of the production in the initial parts of the chain until the search for improving the overall suppliers' performance (SEURING and MÜLER, 2008).

Focal companies can deal with such pressures and incentives in different ways. Approaches which focus on the productive process and seek to make it through the assurance of more appropriate social and environmental practices are being adopted along the chain to deal with pressures. A second approach is characterized by the focus on the sustainable product, which is also reflected positively in the productive process. SEURING and MÜLER (2008) define two groups of implementations of SSCM: supplier management risk and performance (SMRP) and supply chain management for sustainable products (SCMSP).

The SMRP strategy focus on the adequacy of the production process to more rigorous socio-environmental requirements. To prevent the focal company from incurring reputation, or to recover the image of a post-damage event, a process of incorporating social and environmental criteria to assess suppliers' socio-environmental standards play a central role in this approach.

The main barriers to the internalization of sustainability practices in SCM by the focal company are presented in three groups: (i) increase in management costs; (ii) greater coordination effort in a complex environment and (iii) insufficient or nonexistent communication in the chain.

The main factors supporting the internalization of sustainability practices in SCM are: (i) management systems focused on the environment or social practices; (ii) monitoring, evaluation, reporting suppliers' activities and implementation of suppliers sanctioning models, in order to encourage them to improve socio-environmental performance with risk of loss of the contract in case of unsatisfactory performance; (iii) training procurement team and suppliers in relation to socio-environmental aspects; (iv) communication on sustainability along the chain, and (v) integration of sustainability goals into the policies of the focal company, such as, for example, additional goals in socio-environmental performance for the procurement team.

Environmental management systems (e.g. ISO14001) are more widely implemented in SCM than social models (e.g. SA8000) and codes of conduct, which still play a secondary role in many supply chains. Among the factors supporting the internalization of sustainability practices, communication and training are the measures most aimed at improving relationships with suppliers along the chain (SEURING and MÜLER, 2008).

Suppliers' evaluation and monitoring results, in many cases, help at improving the performance of the chain, since these processes support win-win opportunities. The performance improvement can also be verified regarding aspects such as quality, agility, flexibility, and cost. Suppliers, in turn, tend to perceive the socio-environmental criteria imposed by the focal company as prerequisites for its supply chain. This encourages them to act according to the minimum requirements defined (SEURING and MÜLER, 2008).

The second strategy, SCMSP, aims at customer satisfaction and competitive advantage of the focal company. The life cycle assessment (LCA) of sustainable products is an essential tool to ensure that the focal company makes better decisions, from a broader spectrum of information on the goods and on the business model through which it intends to offer them to the market. Based on the LCA, the focal company is in charge of establishing requirements related to product performance and ensuring that they are met by suppliers. Cooperation among the focal company, suppliers and other stakeholders is also key in the SCMSP strategy. It might happen that the focal company needs to develop new suppliers to meet its demand for sustainable products or allocate investments in preparing current suppliers to meet the new standards (SEURING and MÜLER, 2008).

This process still demands intense communication between the focal company and supplier, in order to make it clear why these requirements have been imposed on them and must be met. The need for greater integration in SCM is evident when integrating sustainability on supply chain management. It should be emphasized that the SMRP and SCMSP strategies are not opposed, but ambivalent and can support each other, strengthening the SSCM by the focal company (SEURING and MÜLER, 2008).

3.4 Application of the Theoretical Background and Framework in this Study

Since this study aims to understand the challenges that the focal company faces to implement sustainability practices in its supply chain, the framework will be based on the model of Seuring and Müller with a few adaptations (figure 3). It includes dividing the implementation strategies between two groups: internal and external implementation strategies. In the internal group, SCMSP and SSCM are combined and in the external one, a third category will be added named institutions. Moreover, the instruments identified will be listed under each of the two groups of implementation strategies; and the challenges and opportunities to implement ZDCs based on them will be derived. It was elected to focus only on the focal company as the main actor in this framework as it is the central point of this study. All these adaptations were made in order to better analyze the research problem and answer the RQs which aims to understand the challenges and opportunities and identify implementation instruments to overcome them.

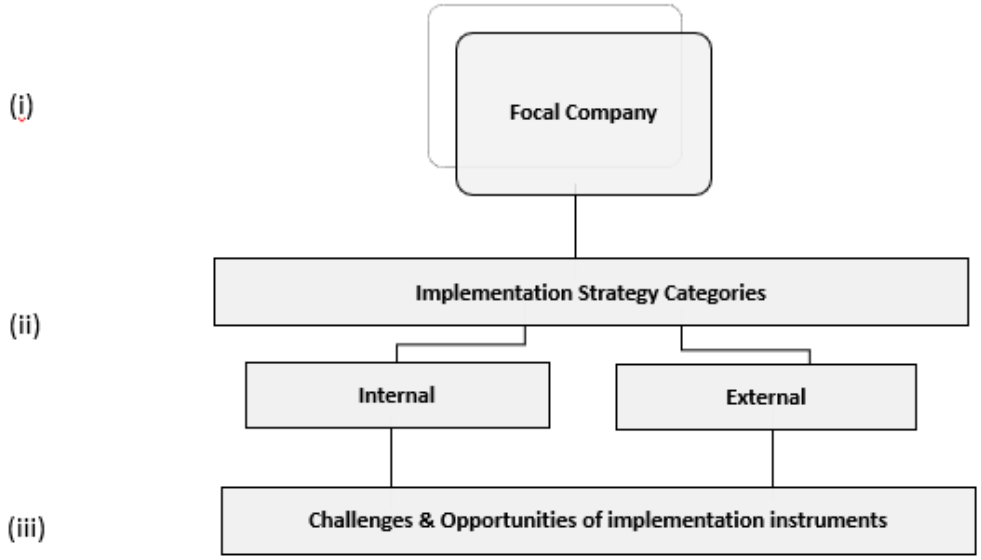

Figure 3: Framework used in this study (Source: own elaboration).

(i) The **focal company** represents the group of main soy processors and traders that have made publicly ZDCs and whose supply chains involve deforestation risks.

(ii) As per Seuring and Müller model, the **implementation strategy categories** are organized in two groups. The first one refers to the internal implementation strategies that could be initiated and put in place by the company itself along its supply chain. It encompasses the **supplier evaluation for risks and performance**, referring to the incorporation of social and environmental criteria to assess suppliers' socio-environmental standards and verify the adequacy of the productive process; and the **SCM for sustainable products**, referring to the development of requirements to improve the production process in order to offer a sustainable product. The second group refers to the external implementation strategies that rely on a variety of actors to be put in place, named institutions. In this group, **institutions** refer to the laws, regulations, policies, rules, agreements or mechanisms established by different actors that could potentially support the focal company to implement sustainable practices.

(iii) The **implementation instruments** refer to the existing measures that aim to support the implementation of the ZDC. The main **challenges** faced by companies when implementing their ZDCs and the **opportunities** to support

companies to overcome their challenges will be described and linked to each instrument identified during the data analysis.

4 Research Design

In order to perform this study, a qualitative and exploratory research approach is proposed, using secondary data and content analysis method. The following sections will discuss the choice of qualitative research. Subsequently, it will be explained how the data was gathered, analyzed, and, lastly, the limitations of the study.

4.1 Methodology

The research for this study is exploratory in nature and uses qualitative evidence to explain findings. Qualitative research can be defined as any kind of research that produces findings not arrived by means of statistical procedures or other means of quantification (STRAUSS ET AL, 1990). Thus, the focus lies on an in-depth understanding of words, opinions, and experiences rather than on numbers (FRAENKEL ET AL, 2006). The exploratory research provides the researcher with familiarity about the problem, making it explicit and allowing the development of hypotheses, with the main objective of improving initial ideas, as well as supporting new discoveries (AMARO, 2012).

This approach was chosen under the belief that new pathways to improve ZDC implementation can be better identified and understood by examining the interpretations of previous reports of renowned organizations that studied the subject under different angles. Hence, this study is based on a literature review using publicly available documents about the ZDC movement. Thus, qualitative and exploratory research approach seems to be the most suitable for this study's objectives.

4.2 Data Collection

The study used secondary data collected through reports published by highly reputed international organizations, think tanks, NGOs and multi-stakeholder groups – all of them focused on sustainability, environmental and/or food-related topics.

In order to answer this study's research questions, a Google search was made with the aim to find documents published by organizations that had previously studied the ZDC movement in forest-risk commodities supply chains. The expressions used to search it were "ZDC", "deforestation in forest-risk commodities supply chains", "supply chain commitments", "zero deforestation commitments in the soy supply chain", "companies zero deforestation commitments", "ZDC implementation challenges". In total, 150 documents were retrieved, downloaded and read in order to select the ones focused on identifying the challenges and instruments to a successful ZDC implementation, in particular in the soy supply chain. Among those, 15 most relevant reports were selected and used to withdraw qualitative data for this study (table 2). The Google search was performed between August – December/2018.

The 15 reports were chosen following three criteria: 1. Recently published, no more than 6 years ago; 2. Authored by organizations with expertise in doing research about the ZDC movement; their expertise was assessed by the author of this thesis during the scanning of the 150 documents retrieved from Google, when it was observed that many of the reports related to the topic were authored by these organizations 3. Focused on analyzing the challenges and opportunities to leverage the ZDC implementation, including also some pathways for change.

Table 2: Reports used as secondary data in this study

#	Document Title	Publication date	Authored by
1	The Little Book of Big Deforestation Drivers: 24 catalysts to reduce tropical deforestation from forest risk commodities	2013	Global Canopy Programme (GCP)
2	Disrupting the global commodity business: how strange bedfellows are transforming a trillion-dollar Industry to protect forests, benefit local communities, and slow global warming	2014	The Climate and Land Use Alliance
3	Implementing Deforestation-Free Supply Chains – Certification and Beyond	2015	REDD+ Energy and Agriculture Programme (REAP) Programme
4	Halting Deforestation and Achieving Sustainability: a rainforest alliance report on sustainable agricultural and forestry supply chains	2015	Rainforest Alliance

5	Achieving zero (net) deforestation commitments: What it means and how to get there	2015	Global Canopy Programme (GCP)
6	Saving forests at risk	2015	World Wildlife Fund (WWF)
7	Revenue at risk: Why addressing deforestation is critical to business success	2016	Carbon Disclosure Project (CDP)
8	Progress on the New York Declaration on Forests: Eliminating Deforestation from the Production of Agricultural Commodities	2016	Climate Focus in cooperation with the NYDF Assessment Coalition, the Climate and Land Use Alliance and the Tropical Forest Alliance 2020 (TFA2020)
9	Pathways to deforestation-free food	2017	Oxfam
10	Zero deforestation: A commitment to change	2017	European Tropical Forest Research Network
11	Commodities and Forests Agenda 2020: Ten priorities to remove tropical deforestation from commodity supply chains	2017	Tropical Forest Alliance 2020 (TFA2020) and the World Economic Forum
12	Zero-deforestation commitments: A new avenue towards enhanced forest governance?	2018	Food and Agriculture Organization of the United Nations (FAO)
13	Impacts of Supply Chain Commitments on the Forest Frontier	2018	Climate Focus, Forest Trends and Tropical Forest Alliance 2020 (TFA2020)
14	Corporate commitmentts to zero deforestation: An evaluation of externality problems and implementation gaps	2018	Center for International Forestry Research (CIFOR)
15	Drivers of Change: How Effective are Corporate Supply-Chain Commitments?	2018	Climate Focus

4.3 Data Analysis Methods

Qualitative content analysis was chosen as the data analysis method for this study. This method and how it was applied will be described in the following.

Content analysis is a research method for studying documents and communication artifacts, which might be texts of various formats, pictures, audio or video using the categorization and classification of written content. Social scientists use content analysis to examine patterns in communication in a replicable and systematic manner

(BENGTSSON, 2016). KRIPPENDORFF (2004) defined content analysis as *"a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use".*

The objective in qualitative content analysis is to systematically transform a large amount of text into a highly organized and concise summary of key results making it possible to draw realistic conclusions from it. The researcher attempts to stay true to the text and to achieve trustworthiness. The initial step is to read and re-read the qualitative data to get a sense of the whole. Then one needs to start dividing up the text into smaller parts, namely, into meaning units. One then condenses these meaning units further. While doing this, it is important to ensure that the core meaning is still retained. The next step is to label condensed meaning units by formulating codes and then grouping these codes into categories. Depending on the study's aim and quality of the collected data, one may choose categories as the highest level of abstraction for reporting results or it is possible to go further and create themes. By systematically labeling the content of a set of texts and grouping them in categories or themes, researchers can analyze patterns of content quantitatively using statistical methods, or use qualitative methods to analyze meanings of content within texts (BENGTSSON, 2016).

FRAENKEL ET AL (2006) identify five advantages of using content analysis. First, it is an unobtrusive research method. Second, it is useful in analyzing written texts. Third, the researcher can interpret the phenomena of an earlier time by digging into records and documents. Fourth, it is cost and time efficient, especially if the information is readily available in the form of written texts. Finally, because data is readily available it is possible to replicate the conditions of a content analysis study (ERLINGSSON ET AL, 2017).

The data collected in the reports were interpreted through categorial analysis, one of the various content analysis techniques which work by dividing the texts into smaller units, then in categories and, from there, regrouping in sets of similar meanings. It was performed a close reading to the 15 reports and then it was identified the presence of initial common categories. The categories were defined *a posteriori*, through an iterative process. The passages that referred to the same type of implementation instrument were combined and the number of the reports from which they were extracted was recorded. Next, the categories were named and organized based on the implementation strategy,

according to the framework in section 3.4. Further details about how the data analysis was performed during this study are explained in the results section.

The qualitative content analysis seems to be a valuable method for this thesis because it is a structured methodology to analyze a large amount of text in a concise way and it also allows considering the context in which the material was created backed up by existing theories.

4.4 Limitations

The main limitation of this study refers to the availability of primary data. Initially, I aimed to use primary data collected through semi-structured interviews over the phone with companies' sustainability department representatives from multinational companies operating in the Brazilian soy supply chain. However, all contacted companies declined the interview invitation for this study due to internal confidentiality policies. Thus, the use of secondary data from reports was the only option to perform this study because it was readily and publicly available online, with no restrictions of use for educational purposes.

The second limitation refers to time and resources. This study is a student's research work and hence, there is a limitation of time, money and other resources to make it possible to provide a full and deep overview of the ZDC implementation challenges in the whole supply chain.

5 Results

5.1 Summary of Results

In this section, the findings from the data analysis will be presented through figures, a table, and texts utilizing the content selected from the reports. The figures and the table provide a visual depiction of the overall results of the qualitative content analysis. In order to preserve the descriptive nature of the reports, it was elected to summarize the passages about the instruments identified in the reports, keeping the key original parts, in order to best present the findings of the study.

The analysis of the reports was based on the framework described in section 3.4, using as the criteria of defining thematic categories. It was taken into consideration the implementation strategies as pre-defined themes and the implementation instruments as categories elaborated *a posteriori*, after an exhaustive reading and analysis of the material. The name of each category was defined after grouping similar implementation mechanisms. Twenty-four categories were elaborated referring to the more relevant implementation instruments found in the reports. They were subdivided into two thematic groups, which refer to the implementation strategy (internal or external to the company).

The table 3 presents the instruments (categories) divided by implementation strategy (internal and external) distributed in the reports, numbered from 1 to 15.

Table 3: Implementation instruments identified in the data analysis

Strategies	Instruments	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Internal	Company‘s internal policies	X	X					X			X			X	X	X
	Top leadership involvement							X					X			
	Certification	X		X		X			X		X	X	X	X		X
	Traceability		X	X		X			X	X				X	X	X
	Transparency	X	X		X	X		X		X	X			X	X	
	Smallholders‘ inclusion		X	X		X	X		X	X	X	X	X		X	X
	Support for farmers and improved farm efficiency	X				X				X	X	X	X	X	X	X
	Suppliers engagement				X								X			
External	Prevention of leakage					X	X									X
	Data availability and monitoring systems	X		X		X	X		X	X	X	X			X	
	Partnerships and collaborations across actors	X			X	X		X	X	X	X		X		X	X
	Consumer campaigns	X				X										
	Landscape and jurisdictional approach			X			X	X			X	X	X	X	X	
	Property rights and land tenure	X	X			X	X			X		X			X	X
	Role of state and public governance	X	X					X	X				X	X	X	
	Public procurement and bilateral agreements	X	X			X	X				X					
	National legislation enforcement	X				X			X				X	X		X
	REDD+	X					X		X				X			
	Soy Moratorium	X							X		X			X		X
	Incentives from financial institutions	X				X			X			X				
	Import tariffs	X				X										
	Subsidies	X				X										
	Taxes	X				X										
	Financing incentives for farmers	X				X										X
Total (# instruments per report)		18	7	5	3	17	7	6	10	7	10	7	10	9	10	11

The figures 4 and 5 show how many reports mention each instrument as a potential ZDC implementation tool. The data revealed that for the internal implementation strategies, smallholders' inclusion is the instrument most cited in the reports as an opportunity to leverage the ZDC implementation. Behind that, farm support and farm efficiency, transparency, and certification are also mentioned as useful tools that could be initiated by the company. With regards to the external implementation strategies, partnerships and collaboration across actors are the most cited instrument in the reports that could influence the ZDC implementation process. Behind that, data availability and monitoring systems, landscape and jurisdictional approach, property rights and land tenure are also very frequent in the reports.

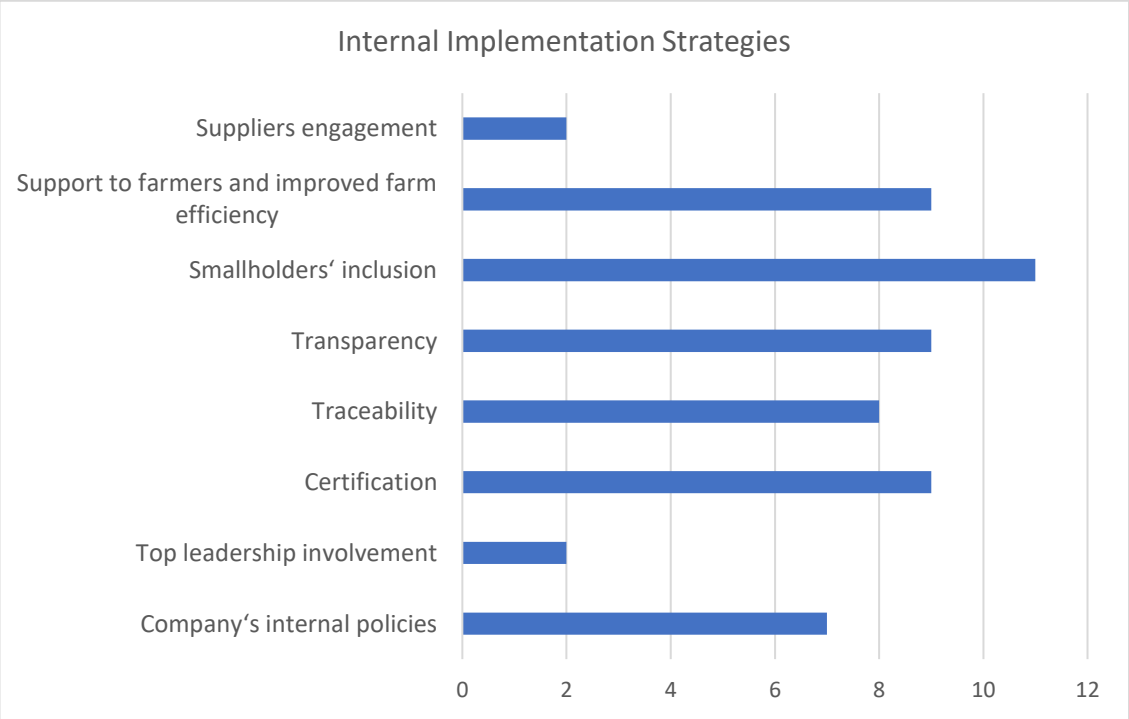

Figure 4: Total number of reports per internal implementation strategy

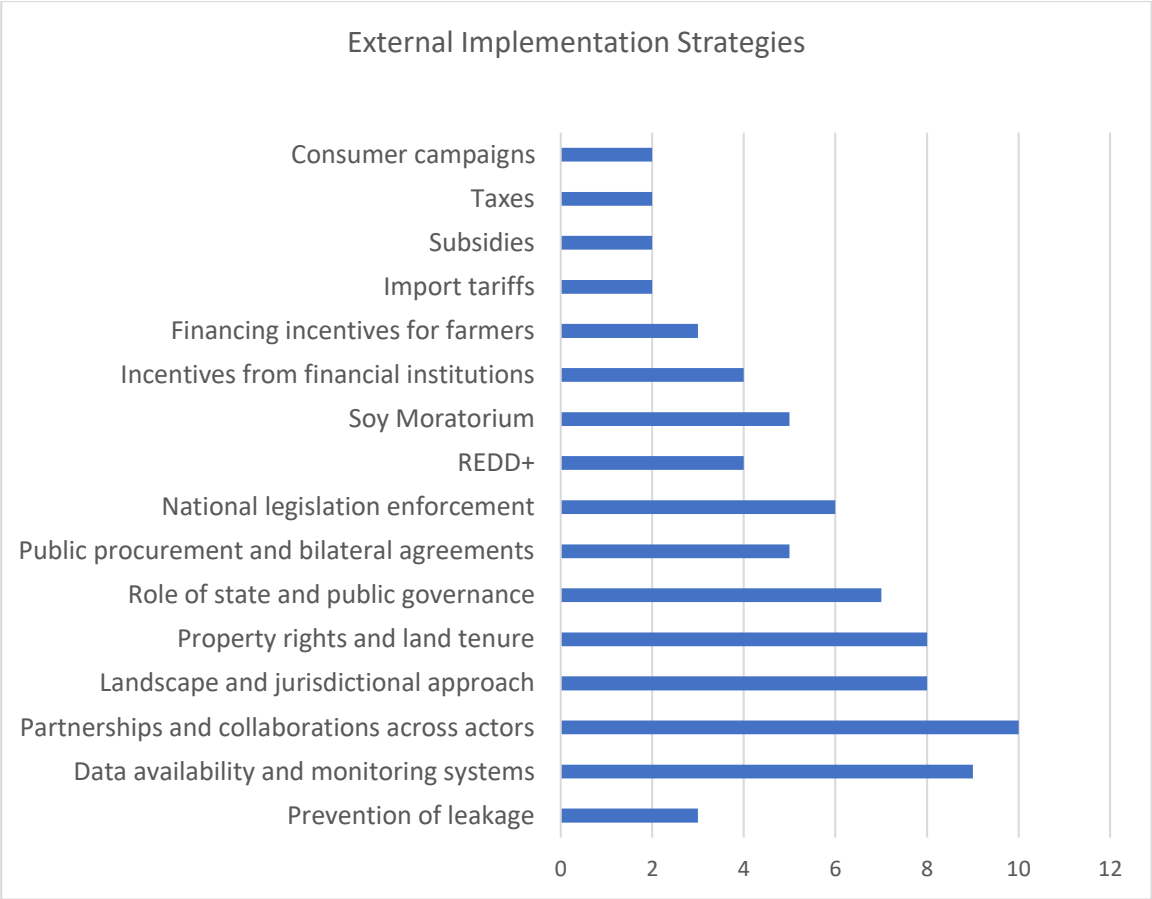

Figure 5: Total number of reports per external implementation strategy

On average, the reports presented 9 instruments each, the report with the fewest instruments has 3 and the one with the most instruments has 18. In order to identify patterns in the data, it was elected to classify the reports into 3 groups: with more than 17 instruments, from 10 to 16 instruments and less than 10 instruments.

The first group, reports 1 and 5, were both authored by the same organization, the Global Canopy Programme (GCP). Both aimed at providing a detailed overview of catalysts that can act to reduce deforestation in forest-risk commodities supply chains. Thus, this explains why both reports present the largest number of instruments identified in this study. The second group, reports 8, 10, 12, 14 and 15 is a mixed group with various goals. However, they all derive tools for effective deforestation-free supply chains from implementation gaps identified in the findings of the studies performed. The third group, reports 2, 3, 4, 6, 7, 9, 11 and 13, aim to analyze the context and impacts of the ZDC agenda in a broader way, giving a greater focus on assessing some specific instruments based on case studies, review of previous studies or surveys rather than listing many of the available options.

5.2 Description of the Implementation Instruments

The following section presents the description of the instruments, depicting how they could leverage the ZDC implementation process and the current opportunities and challenges to put them in place.

5.2.1 Internal Implementation Strategies:

a. Company' internal policies

Internal guidelines, codes of conduct and policies are some of the tools established by companies to achieve their ZDCs. The reports 1, 2, 7, 10, 13, 14 and 15 discuss the role of such tools and the need to improve them.

Company policies or codes of conduct are essential for a particular company to comply with its commitments. However, they are not indicative of a broader environmental impact as a company can meet its commitment goals without actually engaging in improved production methods on the ground. For high-level pledges, there are major gaps in commitment coverage in various parts of the value chain and markets. Besides, commitments from large companies often do not reach the producer level and are not passed on where commodities are distributed through informal channels. Furthermore, companies creating too many new rules and requirements implementing performance criteria across tens of thousands of farms is difficult, costly and increases the risk of failure. Due to that, reliable traceability and monitoring systems, third-party audits, and systems for reporting and responding to grievances are essential features of farm-by-farm performance systems that each company that makes a commitment must put in place as part of their internal guidelines.

Companies must also make sure that their guidelines and policies apply not only to the commodities they purchase but also to their investments and financial dealings with partner companies and affiliates. Another important role of companies' policies is that they can also connect goals and commitments with standards or sectoral agreements that describe particular means to achieve goals. These include for example sourcing standards (e.g., certification or product or production requirements) or supplier audits.

b. Top leadership involvement

Reports 7 and 12 mention the importance of bringing deforestation to the board room of companies, involving the top leadership. According to the report 7, more than a third (34%) of reporting companies do not have the board of the company as the highest level of responsibility for deforestation risk management. As well as reducing deforestation related risk, there is a positive business case for such oversight: companies with board-level responsibility identify 19% more opportunities than those that do not.

Leadership from the very top is necessary both to change corporate behavior and to send a clear message to suppliers and customers about the importance of tackling deforestation. However, board-level oversight of deforestation risk varies globally. Risk assessments that are comprehensive and company-wide will ensure that deforestation risk reaches the very top.

c. Certification

Certification schemes and roundtables are the most commonly used method by companies of ensuring agricultural commodities are sustainably sourced. However, they only cover a small proportion of global production. The reports 1, 3, 5, 8, 10, 11, 12, 13 and 15 mention key barriers of this instrument such as weak demand in buying markets, high transaction costs, exclusion of smallholders, and multiplicity of schemes.

For RTRS certification, companies report very limited demand from consumers and high transaction costs for meeting requirements. As a result, most of them don't pay any premiums for certified soy. This premium price is important to pass along the supply chain to allow production and processing partners to attain higher standards. If a premium price cannot be obtained (or if it is very small) this raises the issue of who would need to pay for any adjustments along the supply chain. Furthermore, certification schemes have been criticized for excluding small-scale producers who typically lack the technical knowledge and finance to meet the standards required. Public sector technical assistance and credit can be utilized to support smallholders in overcoming these barriers.

Another key problem with current certification schemes is that each of them has different priorities and therefore different criteria. Some are judged to have stronger criteria than others. Due to these differences and limitations, buyers vary in their certification requests.

This means that suppliers face multiple reporting and auditing which is costly and inefficient. Besides, as certification schemes are voluntary, they have a gradual uptake. Their impacts can thus be weakened by selection bias if producers who can easily comply due to previous deforestation, favorable location or pre-intervention compliance, are more likely to participate.

d. Traceability

The reports 2, 3, 5, 8, 9, 13, 14 and 15 highlight traceability as a key tool for ZDC implementation. By implementing traceability systems, companies develop a better understanding of their deforestation risk exposure and are able to prioritize the issues that need to be dealt with on the ground and the suppliers that they need to engage with to successfully implement their commitments. Without traceability, it is not possible to identify where the products originate and hence the impact on the forest.

A well-designed traceability system could improve the ability of industry actors to implement commitments, and for consumers to verify industry claims. A public registry of purchases by farm could support traders' current efforts of setting limits on sales by a single producer to reduce the probability of purchasing non-compliant products. Such a system would be challenging to implement due to concerns about sensitive business information and producer confidentiality but could reduce risk in the long run. Besides that, the soy supply chain is very complex and involves multiple stakeholders with different systems, processes, and requirements. This is a complex issue and sometimes very difficult for companies to deal with as traceability requires the engagement of all actors along the entire supply chain to trace a product back to the source of raw materials. In addition, it is costly for all supply chain stakeholders. Traceability requires an up-front investment in processes and technology in order to track products along the supply chain. These costs are a key concern for many stakeholders, but collaboration and common approaches along the supply chain can lower costs for individual actors.

e. Transparency

The reports 1, 2, 4, 5, 7, 9, 10, 13 and 14 list the need to ask for transparency and disclosure from suppliers as an important implementation instrument.

Major companies should request – and then require – that their suppliers disclose information about deforestation risks and opportunities. Such transparency should be the first step in collaboration to address problems and seize opportunities. The development of systems to establish supply chain transparency are critically important to implement a number of implementation instruments and to equitably allocate transition costs and apply incentives. Transparency and disclosure should be incentivized and regulated and should extend to the finance sector to ensure the accountability of financial institutions and their shareholders in their engagement in forest risk commodity supply chains. Additionally, it is important to support the development of a globally integrated transparency and accountability platforms such as, for example, Trase which was recently set up to provide data on trade flows of soy, beef, and palm oil from tropical countries.

f. Smallholders' inclusion

The reports 2, 3, 5, 6, 8, 9, 10, 11, 12, 14 and 15 discuss the impacts of smallholders' exclusion on the effectiveness of ZDCs implementation and the need to include them.

Companies dependent on many suppliers may be encouraged to reduce their number of suppliers in order to reduce their transaction costs, which will likely impact smaller producers whose operations are less likely to be completely formalized and often lack the necessary organizational and technical capacity to comply with more stringent procurement standards. Small producers are therefore vulnerable to being cut out of shifting production systems when supply chains are reconfigured to comply with the procurement guidelines of international traders. Small producers also have difficulty in obtaining the certification they need because of the high costs of improving their business practices, and because the certification process is itself costly. Although they face greater challenges, their exclusion reduces the effectiveness of conservation policies.

Complementary mechanisms should be devised to help smallholders to comply with forest conservation policies in their lands and neighboring forests. To guarantee that ZDCs are inclusive, companies committed to ZD should also be committed to helping in the very least maintain the size of their smallholder supplier base. To do so, it is crucial to embed incentives for smallholders within zero deforestation policies, to balance food security, forest preservation, and cash crop production.

g. Support for farmers and improved farm efficiency

The fact that zero-deforestation pledges do not typically involve support for producers puts the success of those pledges at risk. The reports 1, 5, 9, 10, 11, 12, 13, 14 and 15 discuss these issues.

Producers face a number of economic and technical constraints, such as high adoption costs and lack of access to credit, as well as land tenure, governance, and supply chain complexities that present barriers to their adoption of sustainable practices. Currently, few supply-chain companies provide positive incentives or assistance that would help producers in the transition toward more sustainable practices. Many farmers lack specialized knowledge and skills to improve their production. In Brazil, a lack of knowledge and understanding of new technologies and management practices reinforces producer insecurities for new investments. Report 15 highlights that the largest barrier to sustainable practices is indeed related to capacity and labor.

Besides that, at least in the short term, unsustainable practices can be economically more attractive than deforestation-free and sustainable production. Producers must typically bear most of the costs of shifting towards deforestation-free production systems and do not always perceive the benefits of such schemes, especially when there are no price premiums for doing so. Companies will need to invest in building the capacities of suppliers to comply with new procurement standards and to compensate for associated costs through premium pricing. Failure to do so may result in deficient ZD implementation and/or cut into supplier margins.

h. Suppliers engagement

As per reports 4 and 12, zero-deforestation initiatives can succeed only if they engage producers as allies. Only 13% of the 179 manufacturers and retailers tracked by CDP work directly with their suppliers to implement sustainability requirements. This lack of communication and coordination perpetuates a disconnect along the supply chain that is preventing commitments from being translated into action – namely by engaging with those companies that are directly involved in the production. However, there are positive examples of careful collaboration between companies with zero-deforestation pledges at the consumer end of the supply chain and their upstream suppliers. These collaborations are effective and have been found to reduce costs and business risks.

In order to engage suppliers, a few actions should put in place, such as create a positive value proposition for producers – especially smallholders – to drive sustainability improvements. Invest in sustainable intensification of primary production and increased efficiency of processing. Increase collaboration among government, companies, and NGOs to furnish producers with critical training, support, and access to information and inputs. Failing to secure the participation of producers in zero-deforestation pledges could compromise their environmental integrity, because those producers may then turn elsewhere, sidestepping attempts to promote sustainable production.

5.2.2 External Implementation Strategies:

a. Prevention of leakage

The implementation of zero deforestation pledges should increasingly mean agricultural production without deforestation. However, an underappreciated side effect of these commitments is the displacement (or "leakage") of deforestation between commodities, ecosystems, and jurisdictions. The reports 5, 6 and 15 provide some background information about this challenge and a few ways to tackle it.

Leakage, low and selective adoption, and unintended social consequences all undermine the potential of private interventions to aggregate towards meeting broader aspirational goals. Leakage occurs when interventions with a limited geographic scope restrict the production of commodities in one place, therefore decreasing supply of those commodities and encouraging the displacement of production to other locations. The Soy Moratorium was effective because it covered almost all soy producers in the Amazon. However, the limited regional scope led to a displacement of soy production to other regions, and the focus on one commodity indirectly favored other deforestation drivers. While more difficult to achieve, multi-sector agreements (e.g.covering soy, cattle, and other agricultural commodities) could provide a solution to the issue of inter-commodity leakage. Additionally, if strengthened to include more ecosystems and cover more commodities, moratoria have an important role to play in preventing leakage, for example, in Cerrado, currently not covered by the moratoria.

b. Data availability and monitoring systems

The reports 1, 3, 5, 6, 8, 9, 10, 11, and 14 highlights that reliable data on supply chains and monitoring systems are essential to the success of regional approaches to deforestation. Monitoring allows companies to gauge how well they are meeting deforestation targets, and it facilitates the creation of regional incentive systems based on performance. For example, Brazil's annual publication and dissemination of data on deforestation patches for the Amazon region has been central to the success of policy interventions that reduced deforestation rates.

However, companies need better data to be able to assess their deforestation risk and measure the impact of their actions. Significant progress has been made in obtaining global data on forest cover and deforestation, but additional efforts are needed. Complete geospatial information on concessions, licenses and land, and forest tenure would allow governments to implement policies and avoid the confusion and conflict that can arise from overlaps between concessions and protected, or community-owned, forests. Moreover, tools such as The World Resources Institute's Global Forest Watch platform provide an important insight into forest cover change. When combined with the location of commodity concessions, forest fire data, and protected areas, such tools offer a deeper insight into the impacts of agricultural supply chains across broad extents. Nevertheless, even if those tools are available, monitoring producers' compliance requires demarcated production sites and spatially explicit forest baselines. Complete reliance on remote-sensing approaches and geospatial tools often does not provide sufficiently precise information, thereby requiring on-the-ground monitoring and triangulation, especially in establishing socially beneficial land uses.

c. Partnerships and collaboration across actors

Collaborations and public-private partnerships were cited by reports 1, 4, 5, 7, 8, 9, 10, 12, 14 and 15 as an important instrument for ZDC implementation success. Shared zero-deforestation objectives between private and public sectors are an opportunity for improving forest governance. To address the barriers to securing sustainable and deforestation-free commodities, it will involve working across sectors and with consumers, governments and civil society. This means making the most of existing pre-competitive platforms, exploring new collaborations and innovative approaches linking commodity production and forest protection and entering into public-private partnerships.

To do so, the private sector must show leadership and financial commitment in funding such collaborations and must demonstrate greater acceptance of risk so that these initiatives can lead to tangible outcomes. Collaborate with regional governments and farmer organizations companies can lower implementation costs and increase the impacts of their deforestation pledges through partnerships with producer organizations and governments within commodity sourcing regions. Companies have also an opportunity to influence public policies to promote improved enforcement and to design incentive programs for producers. This helps avoid rejection of deforestation pledges while building a shared and locally owned agenda for addressing deforestation and other sustainability issues.

NGOs are also important in driving forward working groups, certification schemes, and other public-private partnerships. For example, they are key members of the Tropical Forest Alliance, responsible for bringing together public and private sector actors to reduce deforestation.

d. Consumer campaigns

Reports 1 and 5 highlight the role of consumer campaigns for supply chain commitments. Consumer campaigns related to deforestation are led by civil society organizations and often use investigative research to expose the supply chain links between deforestation activities in tropical countries and well-known brands in consumer countries.

In a successful campaign, the reputational risk of being linked to deforestation negatively impacts sales, market shares or stock prices, and pressures brand owners into behavioral changes (i.e. improved raw material sourcing). The threat of contract cancellations and loss of export markets, in turn, puts pressure on companies in producing countries to take action to reduce deforestation. In each case, company exposure to the reputational risk of being linked to deforestation resulted in improvements to the relevant supply chains.

Although consumer campaigns tend to be short they can directly support longer-term policy change across sectors. For example, the voluntary moratoria on soya and cattle expansion in the Amazon were the direct product of consumer campaigns by Greenpeace. However, the resilience of consumer campaigns to market and political changes and their

long-term effectiveness in creating a permanent reduction in deforestation, rather than a market shift to regions with less awareness and scrutiny, is still to be determined.

e. Landscape and jurisdictional approach

The reports 3, 6, 7, 10, 11, 12, 13 and 14 describe how landscape and/or jurisdictional approaches could serve as a useful instrument for ZDC implementation. Landscape approaches aim to meet the needs of different stakeholders within a landscape by moving away from a sectoral approach to land management and by seeking to simultaneously address competing for social, economic and environmental objectives. A jurisdictional approach is a type of landscape approach that uses government administrative boundaries (usually sub-national) to define the scope of action and involvement of stakeholders; this can include companies that operate in and source from the jurisdiction.

Stronger regulation and planning at a landscape level are critical ingredients in order to balance competing for land use goals. A landscape approach also permits alignment with local or district planning processes, enables cross-departmental or ministerial dialogue and facilitates the negotiation of priorities and trade-offs. Working across the landscape, beyond the farm unit, offers companies an operational nexus to ensure that collaborative processes for dialogue, planning, negotiating and monitoring are in place, involving government and local actors who influence land management decisions. Additionally, an example of a jurisdictional approach could be agricultural commodity certification across an entire administrative area. Such an approach has various advantages as it can benefit from of economies of scale to lower certification costs, reduce costs for monitoring deforestation and has the potential to link up with a country's REDD+ program, possibly taking advantage of a source of funds and the ability to account for leakage.

Although an attractive idea, the success of a jurisdictional or landscape approach will depend on the interest of local governments to support and implement the changes. Sub-national governments will need to be empowered to meet their environmental goals through appropriate high-quality regulation. This will require national governmental support and avoidance of regulatory duplication or overlap. Companies also need to embrace more advanced approaches to commodity sourcing, which aim to tackle deforestation at the landscape or jurisdictional scale and work with governments to ensure enabling regulatory environments are in place. If effective, companies can confidently

produce in and source from a ZD jurisdiction without having to develop comprehensive in-house monitoring and traceability systems. It will also enable smallholders to comply with private ZD requirements without having to comply with complicated and expensive certification standards.

f. Property rights and land tenure

The reports 1, 2, 5, 6, 9, 11, 14 and 15 mention the crucial role played by clear and uncontested land rights. They are essential for forest stewardship and investment in sustainable landscapes. Deforestation is more likely in areas where land tenure is insecure. Formal recognition of the legal rights of indigenous peoples and local communities can be particularly beneficial for forest protection. Unsolved land conflicts create tension limiting the potential for supply chain investments. Without land tenure, farmers are unable to obtain financing and lack security over their investments. This is especially the case for smallholders who often operate without registered, long-term tenure rights. Resolving tenure issues would enable smallholder farmers willing to adopt sustainable practices to access relevant credit lines, such as the ABC low carbon agriculture program in Brazil.

Moreover, clear and secure land tenure is also a vital enabling factor for the effective implementation of many other instruments, exerting a multiplying effect on the impacts and feasibility of establishing REDD+ projects and agricultural productivity initiatives, for example. This is mainly because clarity and security of land tenure lower the financial risk of public and private sector investment in land and land-use strategies, and enables long term strategic planning, and more effective resource management. However, land tenure clarification can be a long and costly process requiring strong political commitment. Once achieved, typically through legislative reform or some other means of clarification, considerable investments in enforcement and monitoring are required to ensure that rights are upheld in practice. As the government improve its property registration systems, monitoring and enforcing becomes more useful in supporting corporate efforts to exclude non-compliant suppliers.

g. Role of the state and public governance

The reports 1, 2, 7, 8, 12, 13 and 14 highlight the role of the state and improved governance of natural resources for transforming the global commodities business and

breaking its link with deforestation. Governments are important partners in the implementation of supply-chain commitments. Brazil suffers from weak forest governance, unclear land tenure, and unreliable law enforcement. Private actors alone cannot overcome these challenges and need intergovernmental and national level decision-making to provide an important frame of reference for companies to articulate their expectations towards governments and promote their sustainability efforts.

Weak public governance coupled with the numerous conflicting rules and regulations related to forests create opportunities for confusion and corruption. Additionally, lack of a single, transparent map showing where forests, plantations, communities, indigenous territories, and conservation areas lie to make it difficult to crack down on illegal producers and organized crime. Land titles and plantation concessions need to be clear, consistent, and publicly available. Governments must resolve overlapping and competing claims to land, build accountability, get serious about rooting out corruption by embracing transparency in decision-making, utilizing technology enhanced law enforcement, and prioritizing the collection of the taxes and fees associated with the commodities business. Moreover, the state can also play an important role to negotiate agreements with consumer markets to ensure preferential access to sustainable products and monitor jurisdictional progress towards zero deforestation. A 'virtuous circle' can be created where better governance encourages companies to act, companies respond to policy signals and take action, and this, in turn, enables governments to set more ambitious timeframes for reducing deforestation.

h. National legislation enforcement

National legislation to reduce deforestation can encompass an extremely wide range of regulations, incentives, and policies which can have major impacts on all stages of the supply chain. However, the effectiveness and resilience of such legislation are connected with the enforcement and monitoring of compliance as mentioned in reports 1, 5, 8, 12, 13 and 15.

While policies may be in place to incentivize or disincentivize producers to adopt better practices, governments often lack the capacity and leverage to implement these measures. The delay or absence in implementation creates an insecure and risky environment for producer level investment and behavior change. For example, the Brazilian government

faces challenges in enforcing the Forest Code. Registering properties in the Rural Environmental Registry – a core requirement of the Forest Code –has occurred slower than planned, and where it has happened it has not necessarily translated to a reduction in illegal deforestation. Researchers instead have observed variations in the effectiveness of CAR over time and across property sizes. Revisions to the code have created uncertainty and reluctance among producers to commit to new practices. Brazilian producers also observe that the risk of sanctions from Forest Code violations has decreased, and the benefits of undertaking deforestation still outweigh any potential risk and costs (including potential fines). Environmental agencies report that monitoring and inspecting deforestation events, even remotely, requires labor time and investments which makes it impractical to enforce small infractions. Thus, producers continue to undertake deforestation because of immediate benefits and low risk of prosecution.

Nonetheless, the use of technologies is playing an increasingly important role to fill this gap. This can include the use of near real-time satellite images to identify forest cover change and direct law enforcement efforts. The engagement of civil society and the use of private sector expertise are also becoming increasingly important in monitoring and enforcement. Effective enforcement can also involve the threat of legal action or the threat of loss of contracts or market share.

i. Public procurement and bilateral agreements

Governments have a big role to play in creating demand by meeting often-existing policy commitments, to purchase sustainably produced goods. Two key instruments related to that were mentioned in reports 1, 2, 5, 6 and 10: bilateral agreements and public procurement.

Central, regional and local governments in developed countries are major consumers of products made from forest risk commodities. Government procurement policies specify the exact criteria and specifications which must be met when government agencies purchase products and can be established while meeting the principles and guidance of the World Trade Organization (WTO). For example, EU procurement rules are dependent on national legislation but fit within an overall EU legal framework, which allows significant scope for including environmental and sustainability criteria. Procurement policy can also be developed and implemented more rapidly than many other policy

options. Requirements by governments for proof of legality or sustainability prior to purchase can also have significant impacts on the market beyond the direct effect of government purchases. Suppliers which have in place systems for traceability to assure certified legal and/or sustainable products for government contracts are likely to supply other customers using the same supply chains, creating a knock-on effect.

International laws and agreements can also provide a regulatory architecture to guide global efforts to reduce the production or trade in illegal or unsustainably harvested forest commodities at both the demand and supply side of the market. An example of relevant major multilateral environmental agreements could be mentioned the United Nations Convention on International Trade in Endangered Species of Wild Fauna and Flora and the United Nations Framework Convention on Climate Change (UNFCCC). Bilateral trade agreements, such as the Voluntary Partnership Arrangements (VPAs) of the EU Forest Law Enforcement Governance and Trade action plan (FLEGT), present another policy option to address deforestation from forest risk commodities. To date, FLEGT VPAs only tackle illegality within the timber sector. However, options may exist to explore the applicability of VPA type mechanisms within new bilateral agreements to leverage the demand for sustainable forest commodities, such as palm oil and soya.

j. REDD+

Reducing Emissions from Deforestation and Forest Degradation (REDD+) was first negotiated under the UNFCCC in 2005, with the objective of mitigating climate change through reducing net emissions of greenhouse gases through enhanced forest management in developing countries. The reports 1, 6, 8 and 12 list this instrument as an important mechanism to support ZDC implementation.

To implement national REDD+ strategies, prioritizing actions to address deforestation and forest degradation resulting from agricultural forest commodity supply chains is critically important. Payments for verified emissions reductions from REDD+ may act as an alternative funding source for forest owners seeking economic returns from standing forests. However, there is debate as to whether estimated returns from REDD+ per hectare, although fluctuating, will ever match the potential profits from agricultural production. Despite this, when other ecosystem services such as the provision of clean water and biodiversity are considered, even relatively low payments from REDD+ can

make the establishment of REDD+ projects a viable and attractive alternative to agricultural conversion or timber extraction. REDD+ payments from voluntary carbon projects can also provide on-going revenue streams to establish or maintain protected forest areas and support improved forest management initiatives. Furthermore, public sector international funding for REDD+ readiness activities can support improved enforcement and monitoring, clarified tenure rights, and institutional capacity building. These improvements, in turn, contribute to public sector efforts that support a transition to the sustainable production of agricultural commodities and the reduction of national greenhouse gas emissions. REDD+ could, therefore, be a significant contributor to reducing agricultural expansion into new forest areas, particularly when implemented in conjunction with other financial and institutional instruments. However, the vast majority of REDD+ strategies demand more work on stakeholder involvement and reform of policy and governance.

k. Soy moratorium

As mentioned previously in this thesis, Soy Moratorium contributed to a sharp drop in deforestation in the Brazilian Amazon. The reports 1, 8, 10, 13 and 15 also mention the moratorium as a key instrument to reduce deforestation in the Brazilian soy supply chain and the importance to extend it to other commodities and ecosystems in the country.

In 2014, almost no new deforestation occurred for soy production in the Amazon biome. In Mato Grosso, a state in Brazil covered mostly with Amazon rainforest, the deforestation rate was more than five times higher before the Soy Moratorium compared to after. Many companies with deforestation pledges also used the moratorium as a means to define their sourcing criteria. However, the moratorium has not stopped landowners from deforestation for other commodities. Despite commitments to zero-deforestation, large producers continue to accept legal deforestation from their suppliers in other regions like the Cerrado. This highlights the limitations of agreements that are restricted to a single commodity and geography in reducing deforestation overall.

l. Incentives from financial institutions

The reports 1, 5, 8 and 11 cite the role of financial institutions on the ZDC implementation process. It is well recognized that the financial sector as a whole lag behind their corporate peers when it comes to addressing deforestation risk across its products and services, yet

they are in a unique position to contribute to a rapid transition to a deforestation-free economy.

The introduction of environmental criteria specifically targeting reductions in deforestation into financial products such as concessional credit lines, loans, guarantees, and insurance, could support the costs of transition to the sustainable production and trade of forest risk commodities. In order to achieve this, eligibility to access such financial products would have to be linked to compliance with environmental criteria and the use of comprehensive systems for their monitoring and enforcement. The introduction of these criteria could promote more sustainable lending practices and make access to finance difficult for companies whose supply chains and projects are linked to deforestation.

m. Import tariffs

Reports 1 and 5 cite import tariffs as an important instrument to support ZDC implementation. Applying differential import tariffs as a demand-side measure on forest risk commodities that are produced unsustainably could disincentivize their trade and consumption. This may be achieved by either lowering tariffs on sustainable commodities and/or raising tariffs on unsustainable commodities. While no clear precedent has been set for applying differential import tariffs to commodities, the existence of preferential EU tariffs for imports from certain developing countries and sustainability criteria for biofuels under the EU Renewable Energy Directive suggests that differential import tariffs are unlikely to trigger a WTO dispute, provided governments comply with WTO principles when defining sustainable and unsustainable products. A lack of a political will could be a barrier to the success and long-term resilience of differential import tariffs in markets where an increase in taxes on unsustainable commodities would be required. Moreover, differentiating between ‘sustainable’ and ‘unsustainable’ commodities will also require the full segregation and traceability of forest risk commodities throughout the supply chain. These factors, along with legislation and improvements in traceability, could restrict the overall size of and producers’ access to the sustainable commodities market, and limit its quick implementation.

n. Subsidies

The reports 1 and 5 cite the role of subsidies on ZDC implementation process. Subsidies are a form of targeted economic incentive provided by governments - or any public body - that can benefit producers or consumers through the direct transfer of funds, the provision of goods and services, or through foregone revenue. The availability and provision of soya subsidies can directly impact the profitability, and therefore the level and intensity, at which the commodity is produced. Governments may provide subsidies to farmers based on the amount of crop they produce, to keep farmers employed and food prices low. Production subsidies could be targeted at companies engaging in low impact agricultural or forestry projects, or redirected away from unsustainable conversion/production and processing activities in the supply chain to incentivize reductions in deforestation. Subsidies can also be provided to financial institutions to support either the premium payments for insurance or credit guarantees, or the interest payments on a loan. The inclusion of 'avoided deforestation' criteria in the allocation of these subsidies could ensure that they are only directed towards projects which have low impacts on tropical forests. Some of the global US$450 billion in annual agricultural subsidies could be shifted away from business-as-usual towards sustainable commodities production, however, this will require significant political will in many cases.

o. Taxes

Reports 1 and 5 mention the role of taxes as an instrument for ZDC implementation. Environmental taxes are levied with the primary aim of promoting positive environmental behavior, while environmental tax incentives, such as tax credits and tax exemptions, are reductions in the total tax payable to the government in return for improved behavior.

Positive tax incentives are generally granted to either an individual or a business and for differing purposes. For example, to support growth in the certified timber market, the government may grant tax incentives to landowners that produce certified timber. A positive tax incentive can support both the profitability of a forest commodity supply chain with low impacts on forest cover and/ or an organization's access to capital by reducing the taxes paid for both the physical inputs to (e.g. raw materials, technical assistance, etc.) and the outputs from (e.g. certified timber, carbon emissions reductions etc.) an organization's activities. This reduces the operating costs of a forest-friendly activity, thus lowering the risk that an activity will be unprofitable. Environmental taxes can also increase the costs of certain products for consumers and retailers to disincentivize

demand. For environmental taxes to be effective and resilient in reducing deforestation they must be levied as directly as possible on the drivers of deforestation; there must be a cost-effective alternative for industry and consumers (such as sustainable commodity production), requiring investment in innovation and the availability of credit to cover the costs of transition to sustainable supply chains. The tax must be enforced and efforts must be made to reduce potential leakage through international cooperation and legislation.

p. Financing incentives for farmers

The reports 1, 5 and 15 mention that financing incentives for farmers are an opportunity to support ZDC implementation. It is currently difficult for producers to obtain credit for sustainable investments, despite the existence of several rural loan programs for small to large producers. Brazil's Low-Carbon Agriculture Program of Brazil (ABC Plan) offers credit for rural enterprises who comply with environmental and sustainability requirements, it does not explicitly prohibit deforestation. Furthermore, these programs do not cover the costs of compliance with the Forest Code. The financial risk is too great for farmers to undertake on their own, and producers are hesitant to invest without land tenure and environmental regulation. Other forms of incentives may parallel credits, but these are similarly difficult to implement. This includes possible tax reductions, rural insurance, and other compensations. Beyond the public sector, financial institutions often do not include conditions for deforestation-free commodities or sustainability criteria for farmers, often lending without forest-risk safeguards in place.

Financing incentives need to be scaled up and out to reach smaller and remote producers (e.g. at the forest frontier). Companies can send market signals and use their relationships to engage the financial sector to extend credit to producers for sustainable land use. Additionally, governments have the power to shift the balance towards sustainable investments by reviewing and adjusting subsidies and fiscal incentives.

5.2.3 Key Findings

This master thesis aimed at identifying the main instruments and their challenges and opportunities in the ZDCs implementation process in order to transform multinational corporations' pledges into action with a focus on the Brazilian soy supply chain. The main RQ to be answered was: what is the missing link to transform commitments into action

and support the end of soy supply chain driven deforestation in Brazil? The sub-questions that support the main RQ were: What are the main existing opportunities, and which are the challenges faced by companies when implementing their ZDCs? Which instruments can be identified to support companies to overcome their challenges?

The findings of this study have shown that several barriers prevent companies from shifting from unsustainable towards deforestation-free practices. Common challenges include economic and technical constraints at the farm level, exclusion of smallholders', lacking capabilities of implementing transparency and traceability systems across the supply chain, incomplete internal policies and expensive certification processes. Besides that, it also includes challenges relating to land tenure, governance, weak support from financial institutions, ineffective legislation enforcement, poor data availability and lack of innovative approaches and collaborations across actors.

The results of this study clearly indicate that companies cannot succeed on their own. Involvement and collaboration across sectors and measures initiated by external stakeholders are crucial opportunities to advance on the ZDC agenda. Therefore, the missing link to the zero-deforestation soy supply chain is not related to one single or just a few drivers that can influence on the ground companies' pledges implementation. It relies on an ecosystem of global efforts and mechanisms linked to a complex network of actors that goes beyond the company and the farm levels, and which have a clear aim of influencing deforestation-free practices in all the stages of the supply chain, from farm to fork.

6 Discussion and Conclusions

Twenty-four instruments were identified in the reports that could leverage the ZDCs implementation process, grouped into internal (8 instruments) and external (16 instruments) implementation strategies. As internal strategies, it includes those that could be initiated and put into practice by the company itself along its supply chain. The external strategies, named institutions, refer to laws, regulations, policies, rules, agreements or mechanisms established by different actors that could potentially support the company in the implementation of sustainable practices.

Each instrument presented in the results section has its own characteristics in terms of effectiveness, time and cost of implementation, and limitations. This thesis was not intended to state which of the instruments or which mix of them would be more suitable to address the ZDC implementation challenge, but rather to identify instruments that could lead to pathways of change. However, what can be stated based on these findings is that the majority of the instruments presented requires a collective action to address the most challenging barriers that companies face to transform their commitments into action. This is in line with the literature, according to DIETERICHA ET AL (2015), corporate commitments are not a sufficient end and they need to be situated and understood in relation to a broader range of policy initiatives. The author also proposes the use of different instruments of incentives and sanctions to motivate holistic implementation and utilize market pressure and government rules to expand the potential on-the-ground effects beyond a company's operations on a national or regional scale.

Some of the instruments identified may be less challenging to implement than others due to less complex arrangements and also because they do not require the allocation of many resources, for example, strengthening company's internal policies and the involvement of top leadership. In addition to these, with the enhancement in institutional arrangements led by the government, some other instruments could be put into practice in the short or medium term, as it is the case of REDD+, public financing schemes for farmers and even the improvement of the soy moratorium. On the other hand, for other instruments, it will be necessary some structural and profound changes that require time and governmental initiative, for example, the enforcement of legislation, property rights and land tenure and improved public governance.

The results of this study are also in line with a previous one performed by SAJJAD ET AL (2015), which has similarly grouped the barriers to implement sustainability measures in the supply chain into internal and external categories. According to this study, the internal barriers encompass organization-related issues such as financial constraints, lack of knowledge and awareness, and inadequate support of top management. The external barriers involve forces present in the external environment, such as lack of supplier capability, inadequate consumer demand for sustainable products or services and lack of government support. The results of this thesis support and augment these findings by pinpointing specific implementation instruments as opportunities to overcome those

barriers, such as standardized and low-cost certification processes, well-designed traceability and transparency systems and the involvement of smallholders' farmers; and for the external barriers, it adds up by showing the need of improved institutional arrangements involving financial institutions, civil society, government and companies, all that are encompassed in the 16 external implementation strategies listed in the previous section.

On top of that, some of the instruments identified in this study were also discussed by other authors as tools for ZDC implementation. For example, LAMBIN ET AL (2018) highlights the importance of smallholder's inclusion. According to this study, farmers with good access to capital and technology are more likely to comply with zero-deforestation standards, further marginalizing small-scale producers, who can play an important role in both deforestation and conservation.

Government and private sector programs may also mitigate the marginalization of smallholders by offering better access to technology, information and financial resources. The findings of this thesis confirm the high relevance of smallholders' inclusion. The data revealed that for the internal implementation strategies, smallholders' inclusion is the instrument most cited in the reports as an opportunity to leverage the ZDC implementation. Among the arguments, it was mentioned in many of the reports that companies must actively work to embed incentives for those farmers within policies or through technical and financial support.

Another study also highlights the importance of improved transparency to foster implementation. According to GARDNER ET AL (2019), increased supply chain transparency can help transform the sustainability of commodity production systems. Transparency can demystify complex supply chains, and help different actors identify and minimize risks and improve conditions on the ground and inform whether and where progress is being made. This is in line with the findings of the thesis which also adds up by showing that the development of systems to establish supply chain transparency is critically important to implement a number of implementation instruments and to equitably allocate transition costs and apply incentives.

The literature, however, doesn't clearly state the gaps in the company's internal policies. This study has found that although a growing number of companies are making public ZDCs, these are not indicative of less environmental impacts as a company can meet its commitment goals without engaging in improved production methods on the ground. Due to that, this study suggests that clear internal policies and guidelines should be applied not only to the commodities they purchase but also to their investments and financial dealings with partner companies and affiliates. This instrument is key to leverage the implementation process being mentioned by half of the reports analyzed.

When it comes to the external implementation strategies, previous studies have also shown that property rights and land tenure are a crucial issue for effective ZDC implementation. LAMBIN ET AL (2018) suggests that tenure reform may help prevent negative social impacts of supply-chain interventions since unclear and insecure property rights may weaken incentives for land users and financial institutions to invest in sustainable land-use practices that reduce deforestation. This is in line with the findings of this thesis since property rights and land tenure was one of the most cited instruments in the data analyzed. On top of that, the reports also showed that such instrument is a vital enabling factor for the effective implementation of many other instruments, exerting a multiplying effect on the impacts which enhances, even more, its relevance.

Enforcement of legislation and the role of state were also mentioned in the literature as key barriers to advance on the ZDC agenda. PACHECO ET AL (2017) and LAMBIN ET AL (2018) suggest that the state has a crucial role to support overcoming many of the implementation barriers, such as the ambiguity in policy processes, the politics surrounding what is desirable, and the difficulties of enforcing regulations. LAMBIN ET AL (2018) have presented some pathways to overcome those challenges, among them the development of supportive public policies, the endorsement and reinforcement of private standards and facilitation of information sharing. The results of this thesis support these findings and add on that by showing that strong public governance is crucial to support the measures initiated by companies. Weak public governance coupled with the numerous conflicting rules and regulations related to forests create opportunities for confusion and corruption. Therefore, regardless of how effective the internal instruments are put in place by the company, they cannot achieve long-term outcomes without strong public governance.

As stated previously, this study was limited to identifying and presenting an overview of the instruments that could contribute to transforming companies' commitments into action. Therefore, it is beyond the scope of this study to perform a comprehensive assessment of each of the 24 instruments listed. Besides that, due to the lack of primary data acquired directly from the companies operating in the soy supply chain, the results cannot confirm the practical implementation feasibility of each instrument. The choice of internal instruments or the will to influence the operationalization of external instruments is related to the objectives of each company, based on the complexity of its supply chain, business partners and goals, budget availability and internal organization. Hence, further research is needed to make a full assessment of each instrument and establish its effectiveness tailored to each company case.

Based on the results of this study, it can be concluded that the deforestation-free soy supply chain in Brazil is possible, but it requires a strong focus, collective efforts, and coordination among all stakeholders involved. There are several pathways of change and each company must select what is more tangible to achieve based on its goals and limitations. As a starting point, I conclude this study by presenting three suggestions for next steps for companies that are seeking to advance on the ZDCs implementing process.

The first and most urgent one is to strengthen current commitments through clearer and more transparent internal policies and guidelines, allocating resources dedicated to implementation activities, and with a focus to engage the entire supply chain, including also internal stakeholders, from the operations to the top leadership. The second suggestion concerns escalating the scope of ZDCs across commodities and regions. This will enable reducing leakage risks and will contribute to lower deforestation in other ecosystems, such as Cerrado. And, finally, the third suggestion regards to strengthening collaboration across stakeholders. Partnerships can help to leverage agreements across sectors and provide an opportunity for companies and other actors to influence policymakers, supporting law enforcement and the development of sustainable agriculture programs for farmers.

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Date Signature