

AN ABSTRACT OF THE THESIS OF

Raúl Dancé for the degree of Master of Science in Wood Science presented on June 1, 2015.

Title: Interconnectedness of Forest Ecosystem Services, Environmental Corporate Impacts, and Corporate Social Responsibility in the Amazon rainforest.

Abstract approved:

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The ecosystem services provided by our forest resources and woodlands are multiple and diverse on all spatial and temporal levels, and include provision, regulating, cultural, and supporting services (Hanson, et al. WRI, 2008).

Human activities are proximate and direct drivers of deforestation and forest degradation. In the Latin American region, around 40 million hectares, roughly the size of Germany, of forest were converted to other uses in the last decade (FAO, FRA 2010).

This massive loss of forest resources has caused a huge concern and reaction of many governments, institutions, consumers and other stakeholders that require companies to implement responsible practices to favor the society and the environment (Porter and Kramer, 2006). Some companies are aware of their negative impacts on the environment and the potential risks for their businesses so they have taken the path of Corporate Social Responsibility (CSR) to measure, prevent, mitigate or compensate those impacts, being the Global Reporting Initiative - GRI standard the most widely adopted reporting framework (KPMG Survey of CSR, 2013).

The main goal of this research was to analyze the CSR Sustainability Reports of the top twenty-one (21) corporations in Latin America linked with the four commodities associated with Amazon deforestation (soy, beef, paper/pulp and palm oil) to assess if their CSR activities offset their impacts on environment, therefore the ecosystem balance is maintained in the Amazon rainforest.

The study presented a “Sustainability Model in the Amazon” to find interconnections among forest ecosystem services, environmental corporate impacts, and CSR activities. It was also examined the level of dependence of commodities production on forest ecosystem services; it was graded sustainability reports of each corporation to assess fulfillment with PSI and GRI; finally, it was found the connections between the environmental aspects of CSR Standard with the four categories of forest ecosystem services to assess which of them are better represented in the standard.

The findings of this research have identified that corporations have a high level of dependence for at least twelve (12) of the thirty-two (32) forest ecosystem services that are essential for commodities production. It was assessed that 70 percent of the thirty-two (32) FES were adversely affected by the economic activities and only 15 percent of them were enhanced. It was also possible to score the fulfillment of each economic sector with the GRI, obtaining the following results: Agricultural products (B); Palm oil Consumers (B+) Animal breeding sector (B+); and Plantations (A-).

This pattern suggest an increasing risk of current business practices against the environmental balance, therefore, more efforts are needed to guarantee the sustainability of the forest ecosystem services in the Amazon basin.

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Interconnectedness of Forest Ecosystem Services, Environmental Corporate Impacts,
and Corporate Social Responsibility in the Amazon Rainforest

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Raúl Dancé

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Raúl Dancé, Author

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This thesis is dedicated to the greatest inspiration that a man can have, his mother. With all my love to my dear "Chita", because my success will always be yours too. You will always be in my heart.

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Interconnectedness of Forest Ecosystem Services, Environmental Corporate impacts, and Corporate Social Responsibility in the Amazon Rainforest.

1. INTRODUCTION AND OBJECTIVES

The Amazon rainforest provides multiple ecosystem services that improve a company's ability to produce products, including clean water and air. Large corporations utilize these services, but also deplete and pollute them.

Some companies are aware of the impacts generated by their business activities and the potential risks that ecosystem change can bring on their own business. Therefore, they have incorporated Corporate Responsibility – CSR activities to offset those risks and impacts. However, many other companies are still struggling with the idea of offsetting their externalities on environment. Thus, their most common CSR response has been neither strategic nor operational but cosmetic (Porter, M. 2006).

The main goal of this research was to analyze the *Sustainability Reports* of the top corporations in Latin America linked with four commodities closely associated with Amazon deforestation (soy, beef, paper/pulp and palm oil) to assess if their CSR activities offset their impacts on environment, therefore the ecosystem balance is maintained in the Amazon rainforest.

The study presented an “Amazon Sustainability Model” in order to find interconnections among forest ecosystem services, environmental corporate impacts, and CSR reporting activities.

The theoretical background of this research focused on recognizing the forest ecosystem services that the Amazon rainforest provides, followed by the identification of the main economic activities that drive Amazon deforestation and pollution. Finally a discussion of CSR as a tool that corporations have been using to measure, prevent, mitigate or compensate their impacts on environment is provided.

By using all this information, the study presented a “Sustainability Model in the Amazon” and focused on finding the interconnectedness among *the forest ecosystem services – environmental corporate impacts – and CSR reporting activities*. For that purpose the following three objectives were set:

OBJECTIVES

- a. Assess the level of dependence that the economic sectors linked with the forest risk commodities have on four identified categories of forest ecosystem services.
Methods: ***Dependence and Impact Assessment tools. (World Research Institute)***
- b. Analyze and score the percentage of fulfillment for environmental activities that the selected corporations have reported in their Sustainability Reports according with PSI reporting procedures.
Methods: ***Pacific Sustainability Index (The Roberts Environmental Center)***
- c. Harmonize the environmental aspects of the Global Reporting Initiative – GRI Standard version G4 with four identified categories of forest ecosystem services.
Methods: ***Examine Overlap*** (Developed by researcher)

Finally, the interconnectedness among *the forest ecosystem services – environmental corporate impacts – and CSR activities* were assessed and results, discussion and conclusions were presented.

2. THEORETICAL BACKGROUND

Overview of Rainforests

Rainforests are undoubtedly one of the most diverse ecosystem types on earth; their importance lies in the different goods and services they provide to the entire planet, but at the same time, rainforest ecosystems are highly sensitive and vulnerable. Thus, we have been witnessing how their main functions have been affected by human intervention and climate change.

One hundred million years ago rainforests, temperate and tropical, covered around 12 percent of the earth's surface (about 6 million square miles or 15.5 million square km); however, less than 5 percent of Earth's land is covered with this kind of forest today (2.41 million square miles or 600 million hectares) due to natural reasons or through human intervention (TNC, 2015 and Mongabay, 2011).

The majority of tropical rainforests are found in four biogeographic realms: "the Afrotropical (mainland Africa, Madagascar, and scattered islands), the Australian (Australia, New Guinea, and the Pacific Islands), the Indo-Malayan (India, Sri Lanka, mainland Asia, and Southeast Asia), and the Neotropical (South America, Central America, and the Caribbean islands)" (Butler, R. 2007).

More than 50 percent of the world's rainforests lie in the Neotropical realm, with the Amazon biome in South America being the most representative and continuous rainforest in the world.

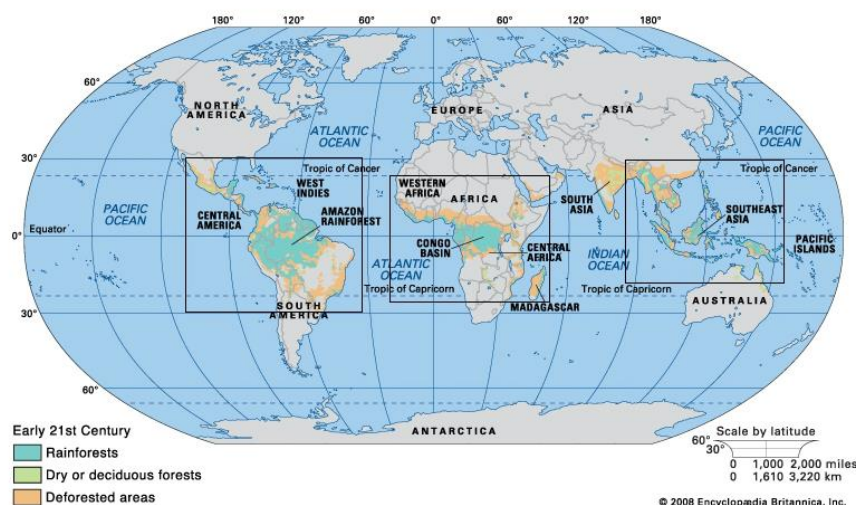


Figure 1: Tropical Rain Forest Distribution (2008, Encyclopædia Britannica, Inc.)

Along the Equatorial line (Figure 1) is where solar radiation is the most intense; heat from solar radiation leads to water evaporation, moist air rises, then it cools and condenses, and falls back to the Earth as rain. Thus, rainforests have an annual rainfall between 250-450 centimeters, or 98-177 inches, which is the equivalent of about 8-14 feet of rain per year (Marietta College, 2013).

Rainforests main functions

Temperature, humidity, altitude, and geographic location, among many other conditions, allow tropical forests to develop their main functions. Rainforests act as the world's thermostat by regulating temperature and weather patterns.

Oxygen cycle: Rainforests are responsible for 28 percent of the world's oxygen turnover (trendsupdates, 2012), sometimes misnamed oxygen production. In this process, forests capture carbon dioxide (CO₂) from the atmosphere

and through photosynthesis release oxygen that most species need to survive. For this reason, many institutions and scientists have described them as the "Lungs of the Planet."

Carbon Storage: A study of the world's carbon stocks in the 2000s assessed that after more than 30 years of continuous fossil fuel emissions, the tropical forests across Latin America, Africa, and Southeast Asia stored 247 gigatons of carbon, 193 billion tons of carbon in above ground biomass, and 54 billion tons in below ground biomass (Mongabay, 2011).

Freshwater flow: Provision and purification of fresh water at a large scale is another main function. Forests' hydrological functions result in increasing precipitation and decreasing evaporation, regulation of rivers and belowground runoff, protection of landscapes and river banks against soil erosion and landslides, prevention and mitigation of floods, enhancement of water quality and prevention of siltation reservoirs.

Biodiversity: More than 50 percent of the total plants and animals on earth live in the rainforest, (Rain tree, 2012) therefore they are considered natural reservoirs of genetic diversity, and a very broad of array of animals including mammals, reptiles, birds and invertebrates thrive in these areas. Rainforest also hold a huge variety of tree species, estimated at 3000 different species. Also fungi are very common as they depend on decomposing remains of plants and animals to feed.

Resources: For its provision functions, rainforests are also known as “the global pantry” of products and natural resources. These resources have included basic food supplies, wood and fiber for industrial materials and clothing respectively, shelter, firewood as fuel, spices and colorants, medicinal plants, exudates and other useful forest products for all those who have lived inside and outside rainforests borders.

Human habitat: Rainforests are not only home to fauna and flora, but also sustain a large number of diverse and unique indigenous cultures (Orihuela, G. 2014). The rainforest’s role of provision has no limits, nearly 90 percent of the 1.2 billion people living in extreme poverty worldwide depend on forests for their livelihoods; furthermore, fifty-seven percent of the world's forests, including most tropical forests, are located in developing countries (TNC, 2015).

Amazon Basin profile

The Amazon rainforest, also known as Amazonia, the Amazon biome or the Amazon basin is estimated to be the oldest tropical forest area in the world (RAISG 2012). It accounts for 54 percent of the remaining rainforest area on the planet and encompasses an area of approximately 7.8 million km² or 3.0 million square miles, including 12 macro-basins and 158 sub-basins, shared by 1,497 municipalities, 68 states in eight countries and one territory (Figure 2) (RAISG 2012).

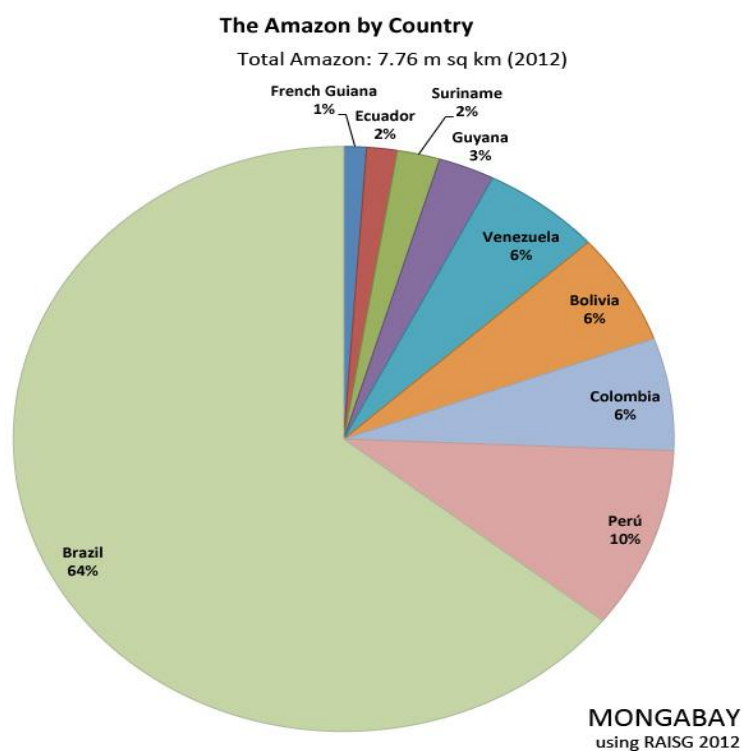


Figure 2. Amazon basin distribution: Mongabay (2011), Source: RAISG (2012)

The Amazon Biome is covered predominantly by dense moist tropical forest, with relatively small inclusions of several other types of vegetation such as savannas, floodplain forests, grasslands, swamps, bamboos, and palm forests (WWF, 2008).

The complete watersheds expand beyond the biome and sometimes include adjacent biomes such as dry forest, cerrado and puna (Mongbay, 2012). That is why, the total size and extension of the Amazon is still under discussion.

The Amazon river is 6,600 km or 4,195 miles in length, it is the largest river in the world, by volume it drains about 2,720,000 square miles in area including its 15,000 tributaries and sub-tributaries, four of which are in excess of 1,000 miles long (Smithsonian, 2015). It accounts for approximately one-fifth of the total world river flow and fresh water on the planet. For that reason, it is critical in maintaining the Earth's limited supply of drinking and fresh water.



Figure 3: Amazon: Biome & Basin (Photos and graphics © WWF)

According to the Smithsonian institute (2015), the average velocity of the Amazon River is estimated at 1.5 miles per hour which represents eight trillion gallons a day, by comparison 60 times the Nile and eleven times that of the Mississippi river.

The annual average discharge is 6,350,000 cusecs (cubic feet per second) into the Atlantic, which increases greatly at flood times, rising to over 7,000,000 cusecs.

The Amazon biome is the ecosystem with the highest concentration of living plants and animals on the entire planet, according to World Wildlife fund (2008), one in ten known species on Earth lives in the Amazon including endemic and endangered flora and fauna species. To date, some 438,000 species of plants of economic and social interest have been registered in the region, a gross approximation indicates that a single hectare (2.47 acres) contains more than 750 types of trees and 1500 other plants. (WWF, 2008).

The amazon forest contains 90-140 billion metric tons of carbon (Priority Places, WWF 2008). This amount accounts for approximately 50 percent of the total carbon stock in the world (Sassan Saatchi et al, 2011)

The Amazon supports approximately 30 million people who live and thrive across a vast region subdivided into nine different national political systems, about 9 percent (2.7 million) of its population is still made up of indigenous people including 350 different ethnic groups, more than 60 of them still remain largely isolated (WWF, 2008). We also have to consider the many millions more living far away, but still getting benefits from the Amazon's products and ecosystem services.

For the purpose of this research, three countries were considered: Brazil, Peru and Colombia. They account for 80 percent of the Amazon area. Profile of each follow:

The Brazilian Amazon encompasses all seven states of the North region (Acre, Amapá,



Amazonas, Pará, Rondonia, Roraima and Tocantins), as well as part of Mato Grosso in the Center-West region and most of the Maranhão in the Northeast region. It is a 5,016,136.3 Km² region with around 24 million inhabitants, equivalent to 59 percent of Brazil, but only 12 percent of the total population lives there.

Figure 4. Brazilian Legal Amazon. Valorização Econômica da Amazônia 1966 (SPVEA)

The Peruvian Amazon, according to the Research Institute of Peruvian Amazon (IIAP)



2015, includes the departments of Loreto, Ucayali, Madre de Dios, San Martín, Cajamarca and Amazonas (Map in green color) a total area of 782,880.55 km² or 60.91 percent of Peruvian territory with around 1.6 million inhabitants equivalent to 6 percent of the total population.

Figure 5. Peruvian Amazon Map. (IIAP) 2015

The Colombian Amazon region in the southern part of the country comprises the



departments of Amazonas, Caquetá, Guainía, Guaviare, Putumayo and Vaupés, and covers an area of 403,000 km², 35 percent of Colombia's total territory. In these departments, there is an estimated population of one million inhabitants representing 2 percent of the total Colombian population (Amazon Natural Region, 2014).

Figure 6. Colombian Amazon Map. Amazon Natural Region, 2014

Forest ecosystems: source of goods and services

An *ecosystem* can be defined as a dynamic complex community of plants, animals, microorganisms, the nonliving environment and other factors, which interact between each other in competitive, predatory or parasitic way, or for mutual beneficial reasons (Millennium Ecosystem Assessment 2005).

Human beings are part of many of these ecosystems and depend on their products and services. Human activities have added greater complexity to these ecosystems by changing their original nature, therefore more research is needed to understand the new structure, interactions and how to manage them.

According to the 2005 Millennium Ecosystem Assessment (MA) – the largest audit conducted on the conditions and trends of the world's ecosystems – *forests* are one of the ten (10) main categories (marine, coastal, marine water, forest, dryland, island, mountain, polar, cultivated and urban); these categories are not ecosystems themselves but each category contains a huge number of ecosystems.

Forest ecosystems can be defined as areas with at least 40 percent tree (canopy) cover (MA, 2005) and they contain many different types of ecosystems (fresh water, fauna, and so forth) as well as other characteristics and factors that provide a useful framework for analyzing the consequences of ecosystem change for human well-being.

Table 1. Millennium Ecosystem Assessment Forest Category definition (MA, 2005)

<i>Category</i>	<i>Central Concept</i>	<i>Boundary Limits for Mapping</i>
Forest	Land dominated by trees, often used for timber, fuelwood, and non-timber forest products	A canopy cover of at least 40 percent by woody plants taller than 5 meters. The existence of many other definitions is acknowledged, and other limits (such as crown cover greater than 10 percent, as used by the FAO of the United Nations) will also be reported. Includes temporarily cut-over forests and plantations; excludes orchards and agro-forests where the main products are food crops.

Forest ecosystems services constitute all the benefits that people can obtain from forest ecosystems. “Ecosystems goods and services represent the benefits human populations derive, directly or indirectly, from ecosystems functions” (Costanza et al. 1997).

“Services” include the tangible and the intangible benefits people obtain from ecosystems which sometimes is separated into “goods” and “services” respectively (MA, CST 2005). Beneficiaries can be at the local, regional, and/or global scale and may include future generations. For instance, a forest may provide local people with wild food, and fuelwood. At a regional level, it may prevent landslides, filter water, and offer recreation. At a global level, this forest may sequester carbon dioxide and holds rare plants with pharmaceutical properties that cure people around the world. (MA, ESR 2010).

The 1992 U.N. Forest Principles identified the multifunctional and multiservice purpose of the world's forests: *"Forest resources should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations."* (UN Forest Principals, 1992).

The ecosystem services provided by rainforests and woodlands are multiple and diverse on all spatial and temporal levels, and include provisioning, regulating, cultural, and supporting services. (Hanson, C. et al WRI, 2008).

For the purpose of this research, the forest ecosystem services classification used by Millennium Ecosystem Assessment 2005 was used, which also includes some human-modified ecosystems (e.g. agro-ecosystems) as a source of ecosystem services.

Table 2. Ecosystem Services (Millennium Ecosystem Assessment. 2005. Synthesis report Chapter 2. Ecosystems and Their Services)

<p><i>Provision Services</i></p> <p><i>Products obtained from ecosystems</i></p> <ul style="list-style-type: none"> ▪ Food ▪ Wood & Fiber ▪ Fresh water ▪ Genetic resources ▪ Bio-chemicals ▪ Medicinal products 	<p><i>Regulating Services</i></p> <p><i>Benefits obtained from regulation of ecosystem processes</i></p> <ul style="list-style-type: none"> ▪ Climate regulation ▪ Disease regulation ▪ Water regulation ▪ Water purification ▪ Pollination 	<p><i>Cultural Services</i></p> <p><i>Nonmaterial benefits obtained from ecosystems</i></p> <ul style="list-style-type: none"> ▪ Spiritual religious ▪ Recreation & ecotourism ▪ Aesthetic ▪ Inspirational ▪ Educational ▪ Sense of place ▪ Cultural heritage
<p><i>Supporting Services</i></p> <p><i>Services necessary for the production of all other ecosystem services</i></p>		
<ul style="list-style-type: none"> ▪ Soil formation 	<ul style="list-style-type: none"> ▪ Nutrient cycling 	<ul style="list-style-type: none"> ▪ Primary production

It is important to mention that “biodiversity” and “ecosystems” are closely related concepts however they are not the same. Biodiversity is defined as the variability among living organism within species, and between ecosystems (Hanson. WRI, 2008), meaning that biodiversity is not an ecosystem service itself but underpins the supply of ecosystem services.

The Millennium Ecosystem Assessment (2005) included biodiversity in the cultural ecosystem service called “ethical values” as well as in other ecosystem services as food, genetic resources, timber, biomass fuel, recreation, and ecotourism, and in the case of Sheingauz and Sapozhnicov (1988) they consider biodiversity as biospheric service together with climate regulation. Whatever is the best definition, it is unquestioning is that changes in biodiversity can influence the supply of ecosystem services.

Drivers of Deforestation and forest degradation

One of the world's great paradoxes invites us to ponder on the relationship of mutual dependence of humans and the environment: "Nature does not need people as people need nature?" (CI, 2014), for this research an accurate question may be: Do tropical forests need humans as humans need the goods and services they provide?

Whatever the answer is, for thousands of years this "mutual dependence" apparently has been going in only one direction. Humans have been using the forest resources like they were unlimited, taking more than is needed, and jeopardizing the needs of other species including future generations of humans (Clay, J. WWF 2012).

Human impacts on the natural environment have reached unprecedented levels. Almost all ecosystems have been modified by human activities through habitat loss and fragmentation, overexploitation, pollution, and so forth. More than 35% of the total earth's land area is used for agriculture and infrastructure; 40% of the terrestrial productivity has been changed by humans (Rohde, K 2013). In addition, human emissions of greenhouse gases and other pollutants have been associated with global climatic changes. As a conclusion, the level of human impact on ecosystems is massive and the consequences can be seen at a global scale.

By understanding the reasons and main causes (also called "drivers") of deforestation and forest degradation, governments and other institutions will be able to have a clear

vision of the strategies, mechanisms, policies and incentives that need to be developed to manage and preserve forest resources and their services.

Deforestation and forest degradation are two different processes of forest loss, they can be natural or human-induced (MA, EHW 2005) and can happen at the same time or the latter can encourage the former (i.e. forest clearing for timber followed by land use change for agriculture), whatever the case, it is important to determine the difference between the two:

Deforestation is defined as the conversion of forest land into other land uses such as agriculture, pastoral uses, etc. that implies the complete removal of trees and with the assumption that forest vegetation is not expected to naturally regrow in that area, on the other hand, *forest degradation* can be defined as the “thinning” of the canopy and loss of carbon in remaining forests (UCS, 2011), in this case damage is not associated with a change in land use and regrowth is expected (Hosonuma, N. et al 2012). Both contribute to global warming, pollution, threats to biodiversity and to the degradation of livelihoods of forest people.

Changes in forest ecosystems are the result of interactions among many factors such as social, ecological, economic, climatic, and biophysical, (MA 2005, EHW Chapter. 21) making it impossible to isolate a single cause due to the complex socioeconomic processes involved, and the diverse circumstances in which it occurs.

Population growth, political instability, market forces, institutional weaknesses, natural and human-induced disturbances, and many other factors may be important, (MA 2005, EHW Chapter. 21) it is clear that tropical deforestation is caused by a combination of direct and indirect drivers; these drivers interact with each other, often synergistically, and that the specific combinations of drivers vary between regions of the globe, countries, and even between localities within countries.

Table 3. Direct Drivers of Deforestations, and Forest Degradation. Adapted from (Hosonuma, N. et al 2012)

Drivers of Deforestation		Forest Degradation	
Category	Detail	Category	Detail
Agriculture (Commercial)	<ul style="list-style-type: none"> • Cropland, pasture and plantations. • International and domestic markets. 	• Timber/ logging	<ul style="list-style-type: none"> • Selective logging • Commercial • Subsistence • Legal/illegal
Agriculture (Subsistence)	<ul style="list-style-type: none"> • Permanent and shifting cultivation, by smallholders 	• Uncontrolled fires	<ul style="list-style-type: none"> • All types of wildfire
Mining	<ul style="list-style-type: none"> • All types of surface mining. 	• Livestock grazing in forest	<ul style="list-style-type: none"> • On both large and small scales
Infrastructure	<ul style="list-style-type: none"> • Roads, railroads, pipelines, dams. 	• Fuelwood/ charcoal	<ul style="list-style-type: none"> • Fuelwood • Charcoal • Local markets
Urban expansion	<ul style="list-style-type: none"> • Settlement expansion. 		

The direct drivers of forest loss are considered separately for deforestation and forest degradation, all of them are human activities or immediate action at the local level. The drivers of deforestation and forest degradation vary between countries, for instance, in the Latin American region, large-scale cattle, palm oil and soy farming are important drivers of deforestation in Brazil, Argentina and Colombia (UCS, 2011).

However, Brazil's moratoria on deforestation-linked soybeans and beef, the establishment of protected areas and indigenous lands, and Norway's support for Brazil's REDD+ program have played a huge role to control deforestation and global warming pollution. (UCS Brazil, 2011).

Logging in tropical forests is the main driver of forest degradation, however, in the Latin American region, most clearing is for land, not timber, but logging is often the first step to complete deforestation of an area (UCS, 2011). Wood use as energy is expected to diminish in the tropics in the coming decades, it has already dropped considerably. However, biofuel production could create a new source of pressure on tropical forest.

At a regional level, South America, especially the Amazon basin continues to have the largest net loss of forest, between 2000 and 2010 – about 4.0 million hectares per year of forest were converted into other uses, in the last decade 40 million hectares (5 percent of the Amazon) an area about the size of Germany, was lost (FAO, FRA 2010).

Table 4. Participation of Drivers of Deforestation and Forest Degradation (FAO, 2010)

Drivers of Deforestation	Total deforested Area (%)	Drivers of Forest Degradation	Total degraded Area (%)
- Agriculture (Commercial)	68%	- Timber/logging	74%
- Agriculture (Subsistence)	28%	- Uncontrolled fires	17%
- Infrastructure	2%	- Fuelwood/charcoal	6%
- Mining	1%	- Livestock grazing in forest	3%
- Urban expansion	1%		

According to the Millennium Ecosystem Assessment (2005, EHW Chapter. 21) indirect drivers fall into five broad categories: economic, policy and institutional, technological, cultural/ sociopolitical, and demographic. All of them are social processes such as population growth, forest policies, markets trends, etc. this matters because the agents of most deforestation today are business and social factors contribute and stimulate business decision making processes in a finite globalized world at national or global level.

International trade relates the supply and demand for commodities linked to deforestation that is dominated by a few multinational traders and retailers. The top five 'forest risk commodities' are timber, soy, palm oil, beef/leather and biofuels, and the volume and value of international demand for these products is massive. (Walker et al. 2013).

FAOSTAT reported that in 2011, the global timber trade was worth US\$246 billion, (FAO 2012), while commodity production in the tropics was valued at US\$47 billion for soy, US\$15 billion for cattle and US\$31 billion for palm oil (Oakes et al, 2012). Agriculture alone is thought to drive 80 per cent of tropical deforestation, and global shifts in diet will continue this pressure.

In summary, it can be stated, in a general sense, that the main agents of forest loss are international corporations, local companies (medium and small size) and local farmers. However, it is very difficult to pinpoint a uniform set of indirect drivers and their relative contributions that can apply generally at a global or even regional level.

Sustainable Forest Management and other initiatives

The focus of this discussion so far has been the Amazon rainforest, the goods and services it provides and the anthropogenic activities that drive deforestation and forest degradation. From now on, the study will briefly explore some economic and legal mechanisms and instruments used by Amazonian countries to guarantee the sustainable management and protection of forest lands such as forest certification schemes and payment for environmental services; then we will move into the concept of corporate social responsibility, a tool that companies are using to measure, prevent, mitigate or compensate their impacts on society and environment.

Increasing population awareness about environmental problems has stimulated Amazonian stakeholders to raise the voices and implement actions that promote the conservation and sustainable management of the Amazon basin. Among them, the governments have made certain efforts in planning and sustainable management strategies but they are still very limited. Civil society has undertaken several programs and projects with good success, as well as International cooperation and international organizations have played an important role in facilitating financial and technological resources for carrying out these activities.

During the last two decades, international tools, instruments and mechanisms have been customized to the local context and implemented by Amazonian countries to promote sustainable management practices of forest resources as well as to increase the number of protected areas within a framework of integration, articulation and decentralization of the different countries (UNEP – ACTO, 2009).

Table 5. describes a list of some economic, finance and legal instruments and mechanisms which have been used by Amazonian governments, some of them with moderate success and others have been weakened by struggle of powers and due to overlapping of responsibilities between national and local institutions that coupled with scarce financial resources and hinder a more rapid advance in its application.

Table 5. Economic, finance and legal instruments and mechanisms. (Adaptation from Galarza, E. et al 2002)

Economics	
Instruments	Mechanisms
Fiscals Instruments	Markets incentives
<ul style="list-style-type: none"> - Taxes for Pollution (effluents and emissions) - Taxes on inputs, exports, rate - Differentiated Tax - Royalties - Tax on land use - Accelerated depreciation - Subsidies & Property Taxes 	<ul style="list-style-type: none"> - Tradable effluent permits - Catch quota tradable / pollution - Tradable water participation - Tradable permits of lands - Transferable Development Rights - Certification
Cost systems	Compensation mechanisms
<ul style="list-style-type: none"> - Charges for pollution and use - Costs of access, management and protection - Tolls 	<ul style="list-style-type: none"> - Payment for environmental services - Payments for watershed services - Wetland mitigation banking - Biodiversity (species) mitigation banking - Carbon markets (regulatory and voluntary) - Clean Development Mechanisms - REDD and REDD+
Financial	
Finance Instruments	Finance Mechanisms
<ul style="list-style-type: none"> - Financial subsidies (interest rate) - Grants and Soft loans - Revolving Funds - Eco-funds, green funds - Special Funds for sectors 	<ul style="list-style-type: none"> - Mechanism of debt swap - trust Funds
Systems: Bonds, Deposits and Refunds	
<ul style="list-style-type: none"> - Environmental Bonds - Deposit-refund systems - Bonds for forest management - Bonds For forestry accidents 	

Legal / Regulatory	
Instruments	Mechanisms
Property Rights	Liabilities System
<ul style="list-style-type: none"> - Title of property: land, water rights, and mining - Rights of use: licenses, concessions - Development rights: Patents, prospecting right - Conservation Easements 	<ul style="list-style-type: none"> - legal liabilities - Liability for damage to natural resources - Environmental Insurance - Treaties

It is also fair to mention the work of various national and international organizations and conventions that have been implementing different programs, strategies and activities on issues as Biodiversity (such as Convention of Biodiversity - CB), Natural Protected Areas (such as the Convention of Natural Protected Areas, IUCN), Wetlands (RAMSAR), endangered species (CITES), Climate Change (Intergovernmental Panel on Climate Change - IPCC), and Ecosystem management (UNEP and UNDP) among others.

Among the strategies and initiatives that have had the greatest growth and acceptance for improving sustainable forest management, climate change regulations and environmental services assessment may be mentioned: forest certification, paying for environmental services such as REDD and REDD+ initiatives (Reduction of Emissions for Deforestation and Forest Degradation) and some valuation methodologies to size the willingness to pay for conserving ecosystems (IIED, 2013).

Forest Certification Schemes

According to UNECE/FAO (2009-2010), Forest certification is widely seen as the most important initiative of the last two decades to promote better forest management, by

using international standards, principals and criteria of sustainable practices in the economic, social and environment aspects. The two largest international forest certification programs are the Programme for the Endorsement of Forest Certification (PEFC) and the Forest Stewardship Council (FSC). The PEFC is the largest certification framework in terms of forest area while the FSC program is the fastest growing (UNECE/FAO 2009-2010).

The Programme for the Endorsement of Forest Certification (PEFC), created in 1999, is an international non-profit, non-governmental organization dedicated to promoting Sustainable Forest Management (SFM) through independent third-party certification. It works throughout the entire forest supply chain to promote good practices in the forest and to ensure that timber and non-timber forest products are produced with respect for the highest ecological, social and ethical standards.

PEFC is an umbrella organization. It works by endorsing national forest certification systems developed through multi-stakeholder processes and tailored to local priorities and conditions. With 36 endorsed national certification systems and more than 260 million hectares of certified forests, (PEFC Global Statistics 2014) PEFC is the world's largest forest certification system.

The Forest Stewardship Council (FSC) is a multi-stakeholder organization, it was founded in 1994 to provide an internationally recognized global certification scheme to ensure the responsible management of the world's forests. The FSC system is made

up of an ongoing chain of two certifications, Forest Management and Chain of Custody. According with FSC database (FSC Facts and Figures, November 2014), they hold more than 28,200 certificates issued in over a 110 countries. Total certified area: 183,103,140 hectares in almost eighty countries.

According to PEFC and FSC statistics, the rates of both forest certification schemes worldwide are increasing, having more than 440 million hectares and 43,000 certificates of chain of custody, however, in Latin America these figures are still very low; by November 2014, PEFC had 4.2 million hectares of certified forest in only two countries (Brazil and Argentina) and FSC had 13.5 million hectares of certified forest in 17 countries in the region, accounting for 1.6% and 7.4% of the total global certified area of each scheme respectively. (PEFC and FSC figures, November 2014)

Payment for Environmental Services

The Payment for Ecosystem Services is a voluntary incentive-based mechanism that pays landowners or government to conserve areas of biological importance. The main goal with these mechanisms is to elicit the value of the land given spatial dependencies, information asymmetry, and uncertainty of the environmental benefits, among other problems to achieve the optimal solution. (UNEP, 2008).

The Payment for Ecosystem Services has been used by businesses, public-sector agencies, and nonprofit organizations as an environmental tool to promote the conservation of ecosystems, and indirectly to reduce poverty through a payment

scheme to local landowners for land management, restoration, conservation, and sustainable use activities, in order to ensure continued supply of an ecosystem service. There are also potential risks for “sellers” (e.g. loss of rights to harvest products), therefor information is the key of successful agreements.

The feasibility that the value of ecosystem services can be economically quantifiable have encouraged many formal and informal markets to trade and invest in restoration and maintenance of wetlands, water pollution control, endangered species habitats, biodiversity loss and also greenhouse gas reductions around the world (Daily, G. 1997). The Amazon region has enormous potential to attract and capitalize those markets as a major supplier of ecological systems and the services that they provide. The key is that *“the payment causes the benefit to occur where it would not have otherwise”* (UNEP, PES A Primer, 2008).

REDD and REDD+ Initiatives

There is a global tendency for emerging markets for biodiversity and ecosystem services conservation, to be more specific, markets for greenhouse gas emission reduction, which brings trading opportunities at local and international scale, as Reducing Emissions from Deforestation and forest Degradation (REDD) for carbon storage and sequestration methods including wetland offsets.

As it was stated by the International Institution for Environmental and Development - IIED (2013) *“REDD basically involves payments to developing countries that will prevent deforestation or degradation that would otherwise have taken place”*.

Industrialized countries are the main sources of this funding through carbon trading, with the goal to offset their own emissions by transferring funds as carbon credits to developing countries.

Since deforestation accounts for approximately 17 percent of annual global greenhouse gas emissions (IPCC 2007), REDD projects may be a fast and cost effective way to mitigate emissions. However standardized methodologies, market access agreements and supporting services are needed in many regions to encourage a bigger number of investors. This may be achieved through a range of measures, with funding from the carbon market or as direct payments of developed countries governments in for forest protection and management (UNEP, TEBB, 2010).

The proposed REDD mechanism has been expanded to REDD+, which includes not only emissions reductions from curbing deforestation, but also the conservation of carbon stocks in standing forests, enhancement of forest carbon stocks, afforestation, reforestation, and sustainable use of forests (e.g. sustainable forest management).

As it was proposed by the United Nations Environmental Program in The Economics for Business and Biodiversity – TEEB (2010), REDD+ is likely to be the first internationally coordinated, biodiversity-related market of significant size and is likely to offer many valuable lessons, including how to develop economically efficient, environmentally effective and politically acceptable markets, standards, and regulations. These lessons will be important for the establishment and growth of other ecosystem markets as well.

Due to the consequences of global deforestation, REDD+ provides the opportunity for private sector actors to become part of the solution, therefore, many leading corporations are participating in REDD+ by purchasing Verified Emissions Reduction as a way to compensate their impacts on the environment and reporting this practice as one of their core activities to benefit society and environment.

According with Code Redd (2012) some benefit REDD+ provides to companies include:

- Achieve corporate responsibility goals (CSR) related with sustainable resources use and economic growth,
- Meet environmental goals by protecting the world's most valuable carbon sinks.
- Engagement with stakeholders; REDD+ investments can be leveraged to acquire new and retain existing customers, build brand loyalty and advocacy, improve employee morale and retention, and address stakeholder concerns about environmental risk management and a company's social license to operate.
- Promoting biodiversity conservation, and therefore the sustainability of business and commerce. Commitments to REDD+ can help protect biodiversity relevant to a company's operations and improve a company's social license to operate in tropical countries.

Based on the Global Comparative Study (GCS) on REDD+, undertaken by CIFOR and partners in 2012, REDD+ is a fresh approach that generates hope of significant result-based funding to address an urgent need for climate change mitigation; however, it faces huge challenges because powerful political and economic interests favour continued deforestation and degradation. Besides others things, in Latin America, what is necessary for REDD+ to be effective is to define the property rights of each actor, so as the way they benefit from REDD+.

Corporate Social Responsibility: Definition and Evolution

There are many definitions of Corporate Social Responsibility (from now on CSR). CSR focuses on long-term shareholder value by incorporating principles in nine areas: ethics, governance, transparency, business relationships, financial return, community involvement, product value, employment practices and environmental protection (Epstein, 2008).

The European Commission (2010) defines corporate social responsibility as "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis." Thus, CSR referring to a company of any size, should enhance its internal business operations while contributing to a better society and clean environment.

As for the typical activities of CSR, it depends on the size of the enterprise and its operations (Porter and Kramer, 2006). For large companies for instance, CSR should most likely be integrated with the business plan. While for small and medium companies, CSR activities will be more informal, for example, employee activities and initiatives on health and safety and labor rights, employee skills and training.

CSR can be seen from different dimensions: instrumental, political, integrative and ethical (Garriga & Melé 2004); whatever the motivation, a commitment to CSR offers companies opportunities and benefits such as costs reduction, production efficiency, customer loyalty and good reputation (Menichini 2013).

Many companies now are practicing some form of CSR, and some are making it a core of their operations (Porter and Kramer, 2006). For example, the C.A.F.E. (Coffee and Farmer Equity) practice guidelines of Starbucks is used to ensure sources of Starbucks sustainably grown and processed coffee by evaluating the economic, social and environmental aspects of coffee production (Starbucks, CSR 2013). Another good example of commitment with CSR is New Belgium Brewing, the 3rd largest regional craft brewery in Belgium and the 7th largest overall in the U.S., which integrates CSR in all aspects of the production (water and energy consumption) and commercialization processes (transport carbon footprint) of the company (New Belgium Brewing, CSR 2013).

There is an impressive history associated with the evolution of CSR. The author Archie B. Carroll traced this evolution in his article "A History of Corporate Social Responsibility". According to Carroll, CSR began to take form in the 1950s, but at that time, CSR was often referred to more as social responsibility than corporate social responsibility. Howard Bowen in 1953 defines CSR more as a corporate obligation by describing it as: "An obligation to pursue those policies, to make those decisions, or to follow those lines of action that are desirable in terms of the objectives and values of our society".

The definition of CSR expanded during the 1960s, this decade witnessed the momentous growth of the meaning of CSR, and some scholars tried to best state what CSR means. The first and most prominent writer in this period was Keith Davis (1973), who defines CSR as "the firm's considerations of, and response to, issues beyond the

narrow economic, technical, and legal requirements of the firm to accomplish social and environmental benefits along with the traditional economic gains the firm seeks".

The focus on CSR continued to accelerate during the 1970s, at that time CSR was defined as companies acting in accordance with societal demands; for corporations, social responsibility includes economic, legal, ethical and discretionary expectations that society has of them at a given point of time (Carroll, A. 1979). But it was in the 1980s, scholars were more concerned about developing some new definition of CSR, and at the same time some alternative concepts came, such as corporate social response, corporate social performance, corporate citizenship, business ethics, and so on. In the 1990s, CSR become the core concept and become the basis of other complementary concepts and themes.

The basis of what is consider to be the modern definition of CSR is from the article "Pyramid Model of Corporate Social Responsibility" by Archie Carroll (1979), a business management author and professor. According to Carroll, there are four areas that make up the pyramid of CSR: economic, legal, ethical, and philanthropic.



Figure 7. Corporate Social Responsibility Pyramid. Source: The Foundation for the School of Business at Indiana University, Business Horizons, July-August 1991.

Economic Responsibility. The core is to be profitable. It includes the obligation for business to maintain economic growth, such as maximize sales, minimize cost and provide investors with attractive returns on their investment and meet consumption needs. *Legal Responsibility* means companies must obey the rules of law set for the whole society. A company must conduct business operation within the framework of the legal requirement. Companies should obey laws and adhere to all regulations. This includes laws protecting employees, environmental and consumer laws, and so on.

Ethical Responsibility, this is the obligation to do what is right and avoid or minimize harm to stakeholders (e.g. employees, consumers, the environment). It requires companies to follow the moral rules to behave appropriately in society and going beyond the compliance with laws and regulations. And *philanthropic Responsibility* means business is expected to be a good corporate citizen, for example, to contribute financial and human resources to the community and to improve quality of life.

Overall, implementing CSR guidelines increase the competitiveness of companies by improving internal control systems and organizational structure, which bring lots of benefits (Carroll, A. 1979) that includes increasing the business market share and sales, creating shareholder value, enhancing brand awareness, attracting outstanding employees and fostering the loyalty of customers. Therefore, companies should put corporate social responsibility in a vital position when doing business.

CSR: Business Initiative and Engagement

Companies are very important actors in any society; they promote economic development by providing goods and services to the market and bringing jobs and opportunities to the community. Therefore, as active members of the society they have a fundamental role to play that should go beyond the boundaries of their business practices. This role is related with addressing the impacts, be they positive or negative that their economic activities have in the society and environment.

The recognition of businesses effects on society and environment is the basis of behavioral improvement and responsible practices. Some companies are aware of the impacts of their activities and the potential risks for their own businesses thus, they have taken the path of the Corporate Social Responsibility to measure, prevent, mitigate or compensate those impacts.

As stated by Juslin and Hansen (2003) CSR is the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society to improve quality of life. It goes beyond the legal, technical, and economic requirements of the company and is viewed differently by people having different values.

In recent years, corporate social responsibility has gradually become a leading issue in business. Heightened corporate attention to CSR has not been entirely voluntary.

Many companies awoke to it only after being surprised by public response to issues they had not previously thought were part of their responsibilities.

Porter and Kramer (2006) stated that many companies that failed to anticipate the consequences of health risk have been bankrupted by the results. Companies cannot be content to monitor only the obvious social and environmental impacts of today without taking in consideration the evolving effects of tomorrow, because they put in risk their own survival. So ensuring the health of the competitive context benefits both the company and the community.

Porter and Kramer (2006) identified that CSR has used four arguments to make their case: moral obligation, sustainability, license to operate and reputation. The moral argument suggests a duty to be good citizens (the right thing to do). This is in line with the sustainability argument that emphasizes environmental and community stewardship (the use of our resources to meet our needs without compromising the needs of future generations). While the other two arguments are more related with the notion of license or permission every company needs to operate in a community, in particular extractive companies deal with this situation where good image is for sure an important criterion.

Porter and Kramer (2006) also talk about the change in the CSR model, passing from a Responsive CSR model, to Strategic CSR practices, where companies establish specific and clear goals, which are easy to measure and monitor including an internal

prevention process that should be customized according with their own necessities and in the context that strengthen the company's competitiveness.

When value chain practices and investments in competitive context are fully integrated, CSR becomes hard to distinguish from the day-to-day business of the company. Therefore the most strategic CSR occurs when a company adds a social dimension to its value proposition, making social impact integral to the overall strategy, offering a new frontier in the positioning advantage of the company.

CSR: The role of public authorities and other stakeholders

Stakeholders in general are more aware of the impacts of companies' activities in society and environment than in the past, and consequently, this situation has caused a huge concern and reaction of many governments, civil society, consumers and even investors that require companies to show their commitment with sustainable and responsible practices to favor the society and the environment. (Porter & Kramer, 2006).

Stakeholders can be defined as the individuals or groups that have an interest in the organization and are affected by its decisions and actions (Carroll, A. 1979). The list of Stakeholders is long: board of directors, owners, customers, employees, suppliers, shareholders, government agencies, unions, political groups, the media, and others.

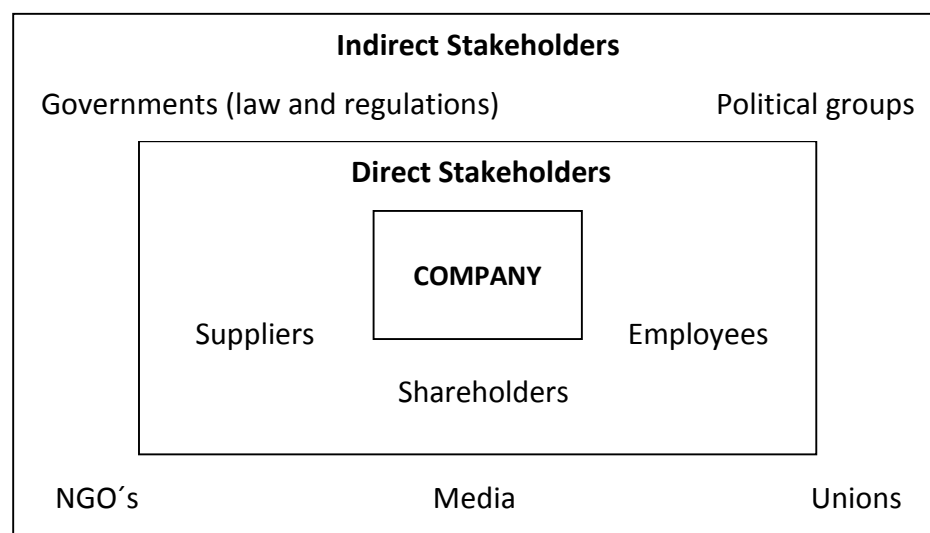


Figure 8. CSR Stakeholders. Adapted from Totally Quality Management. 2009

Within the broad spectrum of stakeholders, they can be organized in two groups depending on how close is the relationship with the company.

Direct stakeholders that have a vested interest in how the organization performs and the actions it engages in to conduct business and *indirect stakeholders* that affect the organization by taking actions to make it difficult for the organization to succeed or by supporting the organization's efforts. Figure 8 (Above) shows some of the most important ones.

Governments

When it comes to the protection of people and the environment, international and national laws and regulations enforced by governments should be in the front line, however few laws are applied at the global scale, because they are traditionally bound by national laws of limited geographical scope. In the global marketplace, where legislation tends to vary considerably from one country to another, little exists in terms of universal standards applicable to corporations.

However, a good example of international law enforcement is the European Union's law commitment to human rights and social values, although the initial goal of EU integration was to create a common market, the European Court of Justice stressed early that respect for human rights forms an integral part of the general principles of Community law. As a result, the EU does not see the creation of common markets and enhanced protection of human rights as mutually exclusive. They stated that

“Economic efficiency must be pursued together with democratic legitimacy and social justice. The EU is therefore not only concerned with the promotion of human rights by their inclusion in the creation of common markets but also with the added value human rights provide to economic and social welfare” (Davidsson, P 2002).

Alissa Mickels (2009) stated in the essay “Effectively Enforcing Corporate Social Responsibility Norms” that one way to indirectly enforce CSR norms is to hold companies accountable for reporting their activities about human rights and environmental abuse. The main idea here is that if companies are required to account for these principals, they will have less incentives to continue engaging in these kind of practices due to their fear to be exposed to customers and lose reputation.

Mickels (2009) also proposed that instead of CSR being a voluntary code of conduct that goes beyond the legal obligations of a corporation, it should become an obligatory and transparent standard at global scope, where parent companies must be liable for any kind of abuse committed by their subsidiaries, so as to reduce the amount of social and environmental harm caused by companies in any country.

Fortunately, there are an increasing number of regulations across countries due to globalization and consolidation of companies mandating the disclosure of environmental, social and governance data, adding additional pressure on companies to comply with national and international laws. However, compliance with laws and regulations should be the baseline for any company to start the CSR approach.

Non-Governmental Organizations - NGOs

As representatives of civil society, NGOs have a rightful place in the companies' stakeholder list. They have helped to spread and to engage companies with the CSR approach. Arenas et al. (2009) showed that such NGOs are recognized by other stakeholders as the primary actors in the introduction and development of CSR and that corporations perceive NGOs to be one of their primary stakeholders.

Poret, S. (2014) stated that “The role of NGOs have become more vigilant about perceived corporate duplicity; further, greenwashing poses a risk for the company of being publicly denounced by activists and can ultimately be counter-productive by damaging the firm’s reputation.”

But, despite the general idea that environmental NGOs are always antagonists to companies and economic development by making pressure on them through protests and boycotts, during the last decade, NGOs have evolved to become very organized, structured, and strategic organizations to actually work with companies to help implement their CSR initiatives.

According to the Founding Director of GreenDen Consultancy, Akhila Vijayaraghavan (2011), NGOs can help companies in many issues ranging from sustainable agriculture, fishing, packaging, supply chain management, labor issues, renewable energy, forest resources, health & safety etc.

NGOs have the unique position of being in touch with Governments, activists, consumers, and business leaders giving them an ideal perspective on difficult situations where no other can find a solution. However, according with Poret (2014) companies' desire to counterbalance the negative reputational impact of self-regulation instruments as "external assurance" is a driver of companies' involvement in partnerships with NGOs. In this sense, NGOs' activities in corporate-NGO partnerships appear to result from regulatory failures.

Consumers

Consumers have the power in the marketplace; it is through their daily purchasing decisions "to buy or not to buy" that they can send a message to companies about what they consider is an acceptable behavior. Therefore they can influence companies to assume better business practices.

A recent survey elaborated in October 2013 by Nielsen Holdings N.V. reveals that 50 percent of global consumers surveyed are willing to pay more for goods and services from companies that have implemented programs to give back to society, an increase of five points (45 percent) from 2011. Willingness to spend more with socially responsible companies increased in 74 percent of the countries measured by Nielsen. These results show a clear trend in the consumer's preference, an additional pressure on companies to assume better practices.

Investors

From the investors standpoint, using a large sample of publicly traded U.S. firms over 15 years, Ioannou & Serafeim (2010) confirmed that in the early 1990s, analysts issued more pessimistic recommendations for firms with high CSR ratings. However, in subsequent years up to 2007, analysts progressively assess these firms less pessimistically, and eventually they assess them optimistically.

According to a survey conducted in 2013 by the European Sustainable Investment Forum (Eurosif) and the Association of Chartered Certified Accountants (ACCA), the overwhelming majority of investors believe corporate social responsibility and sustainability reports and external assurance are “essential” for large companies.

For instance, Yeldar (2011) in the Accounting for Sustainability report: The value of extra-financial disclosure: What investors and analysts said”, stated that use the Global Reporting Initiative - GRI Guidelines are strongly encouraged to submit their sustainability reports to external assurance. Though assurance is not mandatory for sustainability reports, there is evidence that many analysts and investors, including investors who do not consider themselves social investors, consider assurance important and factor its presence or absence into their company analyses.

It can be concluded that there is a global tendency to request companies to improve their business practices from the governments, NGOs, consumers and investors side, this leaves a hopeful look to the future and makes us think that sustainability is not an impossible task but rather a challenge that we must assume all together.

CSR: Performance and Standards

Sustainability reporting, based on any CSR standard, is one of the main ways for a company to determine its impact on the environment. By doing so, companies present achievements in sustainable development to increase transparency and confidence in their stakeholders. Companies do so voluntarily, because it is considered necessary to spend the required resources to provide a reliable insight and control over its operations (Todorova, D. 2011).

Sustainability reporting helps organizations to set goals, measure performance, and manage change in order to make their operations more sustainable. A sustainability report conveys disclosures on an organization's positive or negative impacts on the environment, society and the economy. In doing so, sustainability reporting makes abstract issues tangible and concrete, thereby assisting in understanding and managing the effects of sustainability developments on the organization's activities and strategy.

Despite being well-intended, CSR standards and reports can favor the emergence of deceptive measurements; the problem of responsibility erosion and blinkered culture which is counterproductive of their aim of enhancing the social responsibility of the organization (De Colle et al 2012).

CSR standards have a common objective: to advance the social, ethical and environmental performance of organizations by codifying aspects of organizational

behavior. The most common international standards are: the Global Reporting Initiative – GRI, the UN Global Compact, the ISO 26000 and the OECD Guidelines for Multinational Organizations.

In recent decades, corporate attention to CSR activities and reporting has intensified. While less than 100 firms reported such information twenty years ago, by 2013 more than 6,000 companies around the world were using sustainability reports (Ioannou & Serafeim, 2014). Corporations have increased environmental activities due to the threats they cause on society and environment, however, many corporations have still struggled with the issue of the firm's responsibility to its environment, in fact, the most common corporate response has been neither strategic nor operational but cosmetic. (Porter, M. 2006)

Some companies argue that CSR reports are time consuming and costly, believing them to be so dense and so dull that no one could possibly bother to read them, thus it still a big challenge to show them in more digestible and engaging ways. Others see them as vehicles for corporate greenwash, an opportunity for companies to exaggerate their social and environmental credentials without any genuine intention to change. But, De Boer (2013) said that as time goes on, stakeholders are all becoming more adept at knowing the difference between PR spin and CSR performance.

As it was well stated by the KPMG's Global Chairman, De Boer, in the CSR reporting survey 2013, "CSR reporting is the means by which a business can understand both its

exposure to the risks of environment changes and its potential to profit from the new commercial opportunities. CSR reporting is the process by which a company can gather and analyze the data it needs to create long term value and resilience to environmental and social change". In this sense, CSR reporting should generate the maximum value both for shareholders and for other stakeholders.

In America, among the largest 100 companies (N100) in each country the CSR reporting rate has increased from 69 percent in 2011 to 76 percent in 2013 (KPMG 2013) largely due to the changes in the number of companies reporting on CSR in Latin America. Despite the dropping of the rate in Brazil and Mexico, the overall rate in the region increased. Reporting in Chile increased substantially, so as in Colombia and Peru, due partly to many companies reporting on CRS for the first time and a number of new companies coming into the list of the largest 100 companies in each country.

Table 6. CSR reporting by region (%) Percentage comparison between 2013 vs 2011. Adapted from: KPMG Survey of Corporate Responsibility Reporting 2013.

Regions	CSR reporting by region	
	2013	2011
- Americas (*)	76%	69%
- Europe	73%	71%
- Asia Pacific	71%	49%
- Middle East & Africa	61%	54%
Total	71%	64%

(*) Largely due to an increase in CSR reporting in Latin America

(**) Base: 4,100 companies (the largest 100 companies in each country)

Table 6, shows the high rates of CSR reporting in all regions suggesting that this is a standard business practice worldwide. Leading companies that still do not publish CSR reports should ask themselves whether it benefits them to continue saving some money and time by avoiding the process or whether it puts them at risk.

The real question now should be: Which is the best standard and reporting format to follow? And, which is the reporting template most appropriate to capture and measure the performance of the company in terms of social and environmental aspects? In other words, it is now about the quality of CSR reporting and the best means to reach relevant audiences. This includes assessing what is material for the business, proper engagement with stakeholders, having an honest communication strategy including openness about challenges and putting in place the underlying processes to gather and check data.

Defining companies' performance in production and financial terms are regular and highly standardized practices, however, measuring the performance of a company in terms of social responsibility and environmental sustainability remains a subject of much discussion.

One of the reasons for this is because the standards used are still too general; only one (the GRI Guidance) has a sector-specific standard approach that considers the particularities of each economic sector, but none require an independent third-party verification of compliance, in the best case an external assurance. Thus, sustainability

reports may show the positive side of the business; Porter (2006) said what this reports leave out is often as telling us what they include.

CSR is a form of corporate self-regulation integrated into a business model, therefore, reporting guidelines and standards serve as frameworks for social accounting, auditing and reporting. Crowther (2000) defines social accounting as "an approach to reporting a firm's activities which stresses the need for the identification of socially relevant behavior, the determination of those to whom the company is accountable for its social performance and the development of appropriate measures and reporting techniques and external assurance".

Among the most common CSR reporting standards, are the UN Global Compact, ISO 26000, OECD Guidelines, and the Global Reporting Initiative (GRI) guide. The GRI Guidelines are the most widely adopted reporting framework (KPMG, 2013). Following are some of the peculiarities of the four most recognized systems:

United Nations - UN Global Compact

The UN Global Compact is a strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labour, environment and anti-corruption, UN Global Compact (2014) asks companies, as a primary driver of globalization, to

embrace the principals to help ensure that markets, commerce, technology and finance advance in ways that benefit.

With over 12,000 corporate participants and other stakeholders from over 145 countries, it is the largest voluntary corporate responsibility initiative in the world (UN Global Compact, 2014).

Table 7. UN Global Compact: The Ten Principles, 2009

UN Global Compact : The Ten Principles, 2009		
Human Rights	Principle 1.	Businesses should support and respect the protection of internationally proclaimed human rights
	Principle 2.	Businesses should make sure they are not complicit in human rights abuses
Labour Standards	Principle 3.	Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining
	Principle 4.	Businesses should uphold the elimination of all forms of forced and compulsory labour
	Principle 5.	Businesses should uphold the effective abolition of child labour
	Principle 6.	Businesses should uphold the elimination of discrimination in respect of employment and occupation
Environment	Principle 7.	Businesses should support a precautionary approach to environmental challenges
	Principle 8.	Businesses should undertake initiatives to promote greater environmental responsibility
	Principle 9.	Businesses should encourage the development and diffusion of environmentally friendly technologies
Anti-Corruption	Principle 10.	Businesses should work against corruption in all its forms, including extortion and bribery

ISO 26000

The International Organization for Standardization – ISO, ISO 26000 (2010) was designed to provide guidance, rather than requirements, to companies regarding CSR practices, therefore ISO 26000 cannot be certified to unlike some other well-known ISO standards. Instead, it helps clarify the scope of CSR, and helps businesses and organizations translate principles into effective actions and shares best practices relating to social responsibility, globally. It is aimed at all types of organizations regardless of their activity, size or location. (ISO 26000, 2010)

The standard was launched in 2010 following five years of negotiations between many different stakeholders across the world, which means it represents an international consensus of representatives from government, NGOs, industry, consumer groups and labour organizations around the world that participated in its development.

According with ISO 26000: 2010, Guidance on social responsibility the benefits of using this tools could be summarized in competitive advantage, reputation, the ability to attract and retain workers or members, customers, clients and users, the maintenance of employee morale, commitment and productivity, the perception of investors, owners, donors, sponsors and the financial community, relationships with companies, governments, the media, suppliers, peers, customers and the community in which it operates among other things.

ISO 26000 addresses seven core subjects of social responsibility defined in the standard (Table 8):

Table 8. Core subjects and issues of social responsibility addressed in ISO 26000

Core subjects and issues of social responsibility addressed in ISO 26000	
Core subject: Organizational governance	Issue 1: Due diligence Issue 2: Human rights risk situations Issue 3: Avoidance of complicity Issue 4: Resolving grievances
Core subject: Human rights	Issue 5: Discrimination and vulnerable groups Issue 6: Civil and political rights Issue 7: Economic, social and cultural rights Issue 8: Fundamental principles and rights at work
Core subject: Labour practices	Issue 1: Employment and employment relationships Issue 2: Conditions of work and social protection Issue 3: Social dialogue Issue 4: Health and safety at work Issue 5: Human development and training in the workplace
Core subject: The environment	Issue 1: Prevention of pollution Issue 2: Sustainable resource use Issue 3: Climate change mitigation and adaptation Issue 4: Protection of the environment, biodiversity and restoration of natural habitats
Core subject: Fair operating practices	Issue 1: Anti-corruption Issue 2: Responsible political involvement Issue 3: Fair competition Issue 4: Promoting social responsibility in the value chain Issue 5: Respect for property rights
Core subject: Consumer issues	Issue 1: Fair marketing, factual and unbiased information and fair contractual practices Issue 2: Protecting consumers' health and safety Issue 3: Sustainable consumption Issue 4: Consumer service, support, and complaint and dispute resolution Issue 5: Consumer data protection and privacy Issue 6: Access to essential services Issue 7: Education and awareness
Core subject: Community involvement and development	Issue 1: Community involvement Issue 2: Education and culture Issue 3: Employment creation and skills development Issue 4: Technology development and access Issue 5: Wealth and income creation Issue 6: Health Issue 7: Social investment

The Organization for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises

OECD is a forum of countries describing themselves as committed to democracy and the market economy, providing a platform to compare policy experiences, seeking answers to common problems, identify good practices and coordinate domestic and international policies of its members.

The OECD Guidelines are recommendations addressed by governments to multinational enterprises operating in or from adhering countries. They provide non-binding principles and standards for responsible business conduct in a global context consistent with applicable laws and internationally recognized standards. The Guidelines are the only multilaterally agreed and comprehensive code of responsible business conduct that governments have committed to promoting (OECD, 2011).

Table 9. OECD, 2011. Guidelines for Multinational Enterprises, 2011 EDITION

Part I - OECD Guidelines for Multinational Enterprises: Recommendations for Responsible Business Conduct in a Global Context	
Preface	
I.	Concepts and Principles
II.	General Policies
III.	Disclosure
IV.	Human Rights
V.	Employment and Industrial Relations
VI.	Environment
VII.	Combating Bribery, Bribe Solicitation and Extortion
VIII.	Consumer Interests
IX.	Science and Technology
X.	Competition
XI.	Taxation
Part II - Implementation Procedures of the OECD Guidelines for Multinational Enterprises	
Amendment of the Decision of the Council on the OECD Guidelines for Multinational Enterprises	

Global Reporting Initiative (GRI)

The GRI framework is a collection of reporting guidance documents — all of which were developed through global, multi-stakeholder consultative processes — designed to assist companies in preparing sustainability reports and Environmental, Social and Governance (ESG) disclosures.

At the core of preparing a sustainability report is a focus on the process of identifying material aspects – based, among other factors, on the Materiality Principle (GRI – G4, 2014). Material aspects are those that reflect the organization’s significant economic, environmental and social impacts; or substantively influence the assessments and decisions of stakeholders.

The GRI Guidelines have been designed to harmonize with other prominent sustainability standards, including ISO 26000 and the UN Global Compact. Therefore, 78% of the largest 100 companies (N100) in each country reporting CSR using GRI Guidelines and among the world’s 250 largest companies the rate is even higher than the N100: 82% (KPMG Survey of CSR, 2013).

Table 10. Global Reporting Initiative – GRI (G4) Sustainability Report Guidelines

CATEGORIES AND ASPECTS IN THE GUIDELINES		
<i>Category</i>	<i>Economic</i>	<i>Environmental</i>
Aspects III	<ul style="list-style-type: none"> • Economic Performance • Market Presence • Indirect Economic Impacts • Procurement Practices 	<ul style="list-style-type: none"> • Materials • Energy • Water • Biodiversity • Emissions • Effluents and Waste • Products and Services • Compliance • Transport • Overall • Supplier • Environmental Assessment • Environmental Grievance Mechanisms
Category	Social	
	<ul style="list-style-type: none"> • Labor Practices and Decent Work • Human Rights • Society • Product Responsibility 	

As the GRI's G4 guidelines states, the 2013 Report seeks to be more objective, with more concise text and a greater number of infographics, presented in a detachable booklet that summarizes main management aspects and operations and can be used independently (GRI – G4, 2014).

CSR: Evolution in Latin American region

In Latin America, it can be said that the first manifestations of social responsibility (business-community) were given in the sixties with a philanthropic approach, being religious institutions such as the Christian Association of Companies Regulators of Brazil - ADCE (1965) the promoters of this process (Fundacion Avina, 2011).

In the seventies and eighties, social responsibility movements appeared in Chile as the Chilean Safety Association - ACHS (1975) focused on the quality of working life in companies, and the National Association of Colombia - ANDI (1987) based on the Social Model of Balance of the ILO. During the nineties more institutions promoting CSR emerged in different countries in the region such as Peru 2021 (1996), the Ethos Institute of Brazil (1998), CSR Action in Chile (2000), etc. (Schwalb, M. et al. 2003).

In parallel, global organizations like the World Business Council for Sustainable Development and initiatives such as the UN Global Compact promoted the creation of their national representations in different Latin American countries.

In 1997 a group of 150 representatives of companies, civil society, academia and governmental institutions from different regions of America gathered in a pioneering conference in Miami where the idea of creating a hemispheric alliance of CSRs organizations was launched, achieving the creation of the Forum Empresa network. The network in 2009 had 16 national associations as members and more than 2600 companies' associates (Fundacion Avina, 2011).

According with Fundacion Avina (2011), in South American region, Brazil has taken the lead in promoting CSR standards. Other countries have been following the this example, by participating actively in the development of indicators of ISO 26000, application of GRI and the Global Compact, among them are Mexico, Argentina, Colombia and Chile.

In Central America, CSR is a very active movement, since the formation of the Central American Integration Network (IntegraRSE) with its annual conference: ConvertiRSE, and the development of CSR indicators system (IndicaRSE) and, in 2010, formalizing cooperation among the six clusters of CSR - CentraRSE of Guatemala, FUNDEMAS of El Salvador, FUNDAHRSE of Honduras, UniRSE in Nicaragua, AED in Costa Rica and SumaRSE of Panama and the General Secretariat of the Central American Integration System (SICA) (Fundacion Avina, 2011).

In the big picture, there is a huge development of the CSR concepts in the whole region, the application of these concepts have emerged not only through the imitation of practices in developed countries, international trade regulations imported by multinationals, and social pressure, but also because there is a greater entrepreneurial and social awareness on the importance and meaning of CSR, especially in terms of sustainability (Latin Trade Magazine, 2013).

However in practice, a coexistence between philanthropy, social investment and some isolated examples of integrated management are evident across the region, some companies are still investing in projects that have nothing to do with their main

business (Latin Trade Magazine, 2013), thus there is a general agreement that there is still much to do, mainly in terms of spreading current knowledge, coordinating efforts and measuring results.

According to Latin Trade Magazine (2013), “many companies currently adopt isolated programs to the benefit of just one community, missing out on synergies. The big challenge in this becomes choosing who will coordinate the actions of the different companies. The catalyst will probably come in the form of government action or independent companies such as consulting firms or NGOs that already have the required infrastructure”.

As in the international arena the development of partnerships between companies and representatives of civil society (NGOs) is evident despite some resistance, and ideological differences on both sides. Likewise, the private and social sectors agree on demanding an active role of their governments on issues related with interaction and dialogue; the discrepancy is generated because private and social sectors generally seek incentives, while governments demand more regulation and intervention.

Whereas Latin America is positioned as an emerging market with ample opportunities for the development of sustainability, a next step is to achieve consensus regarding CSR standards that address the needs of the region and the characteristics of each economic sector and then, the challenge will be to achieve a proactive role of the private sector and governments to enhance their power of transformation towards sustainable development.

CSR in the context of the main forest risk commodities

Increasing global demand for agricultural commodities (forest risk commodities: beef, soy, palm oil, pulp/paper and biofuels), that are the main inputs of countless companies around the world, promotes land cleared and constitutes the main driver of deforestation in the Amazon. For buyers, sourcing sustainably produced commodities usually increases costs; for this reason, a vast package of economic incentives are needed; otherwise, only those businesses facing serious reputational risk and the pressure from environmental groups will be in the vanguard of change but the majority will avoid their responsibility.

A calculation based on findings of TRUCOST (2013) revealed that the loss of natural capital due to land use by the primary production and primary processing sectors is estimated to be costing the global economy US\$1.8 trillion annually.

The Intergovernmental Panel on Climate Change's fifth assessment report (AR5) in 2013 confirmed that land conversion contributes to about 10-15 percent of global carbon dioxide emissions, equivalent to the entire transport sector.

For this reason, some companies and investors are committed to action, proof of this is the new Tropical Forest Alliance, a public-private partnership between governments, civil society and the Consumer Goods Forum, whose members have set the ambitious goal of no net deforestation by 2020.

The CDP and Global Canopy Programme (2013) revealed the results of a survey launched on behalf of 184 investors with US\$13 trillion in assets. 139 companies with market capitalization in excess of US\$3 trillion answered this request, spanning a range of industry sectors and 26 different countries. The topics which are of concern to investors include: incomplete risk assessments, poor articulation of security of supply and price volatility as operational risks in securing these commodities, a lack of action to build capacity along their supply chains to deliver sustainable commodities and a lack of understanding of climate change risk.

According to CDP (2013) the most challenging topics for companies include:

- *Traceability* challenges in global commodity supply chains due to difficulties in tracing back raw materials to a specific source and the complexity and lack of transparency in supply chains. Companies are asking for help in formulating steps to improve performance and sourcing guidelines as well as developing appropriate key performance indicators for work with supply chains.
- *Certification*: Companies point to a need for the demand for certified commodities to reach a 'tipping point' in order to increase quantities and reduce price. Those in the agricultural sector look to larger companies and publicly made commitments for 2015 and 2020 by manufacturers and retailers to steer the trajectory of the market from niche to mainstream. The issue of who pays for certification is still a contentious one.
- *Regulatory uncertainty*: Legal uncertainty and lack of government action are cited as barriers to the supply of certified commodities, as well as a lack of global agreement on post Kyoto measures for protecting forests, including financial compensation mechanisms.

CSR Sustainability reporting is the tool companies have been using in order to show their commitment to society and the environment. Despite the fact that CSR reporting is still a voluntary process, the number of companies that use this tool has been increasing steadily during the last decade, thus it allows some institutions such as the

Robert Environmental Center of Claremont McKenna College to develop a benchmarking index to measure companies' performance in many economic sectors.

From 2002 to mid-2013, the Roberts Environmental Center analyzed the corporate sustainability reports of the world's largest corporations using the Pacific Sustainability Index (PSI) to measure the quality of the sustainability reporting based on a sector-specific questionnaire for companies within the same sector. The PSI does not measure any reduced impacts on environment but is a good tool to compare companies' performance within the same sector.

In 2012, the Robert Center presented the Sustainability Reporting of the World's largest companies in multiple sectors including: food processing, food retailers, beverages, household, apparel, and personal products, pharmaceuticals products among many other sectors (REC, 2012).

The top reported environmental topics included environmental vision statements, energy usage, green food purchasing, and sustainable agriculture. Green food purchasing is an extremely important topic in the food processing sector. "Green food purchasing" is defined by food purchased that comes from organic sources or sustainable farms or sustainable fisheries. Green food purchasing is both an environmental and health concern. Almost all of the reports addressed nutrition, health, and green issues, in which green food purchasing initiatives fell under both categories (REC, 2012).

In particular, one of the biggest environmental concerns is sourcing of palm oil. Palm oil is an edible vegetable oil derived from the fruit of oil palms, found mostly in the tropics of Africa, Southeast Asia, and parts of Brazil. The use of palm oil in the food processing industry has risen in the past years due to its use as a replacement for trans fats. However, palm oil production poses a significant environmental threat due to widespread deforestation. Due to these serious concerns many companies that use palm oil have reported changing their practices to be more sustainable.

52 percent of the scored companies discussed local community development initiatives and 20 percent of companies mentioned measures regarding indigenous people (REC, 2012). Companies reported a wide range of development initiatives both company sponsored and in partnership with local NGOs, such as access to drinking water, educational programs, farmer capacity building, entrepreneurship development, reforestation, and more.

With this review, we can conclude that deforestation in the Amazon has become a global problem, continuous exposure of the problem in the media has alerted not only governments and international institutions but consumers and investors, this environment creates a strong pressure on large corporations, that regardless of their motivation, are taking action on the matter to avoid that this trend affecting their own businesses. Despite the efforts and achievements, there are still many challenges to overcome such as the traceability of the origin of raw materials, certification of production processes and regulatory uncertainty.

3. METHODS AND TOOLS

Sustainability Model in the Amazon

The model presented (Figure 9) is a virtuous circle that tries to simulate an efficient mutually beneficial system, between forest ecosystem services and corporations. Corporations use ecosystem services and, at the same time, they generate impacts on them; therefore corporations use CSR to report the environmental activities they do to measure, prevent, mitigate or compensate those impacts, so that, to minimize their impacts.

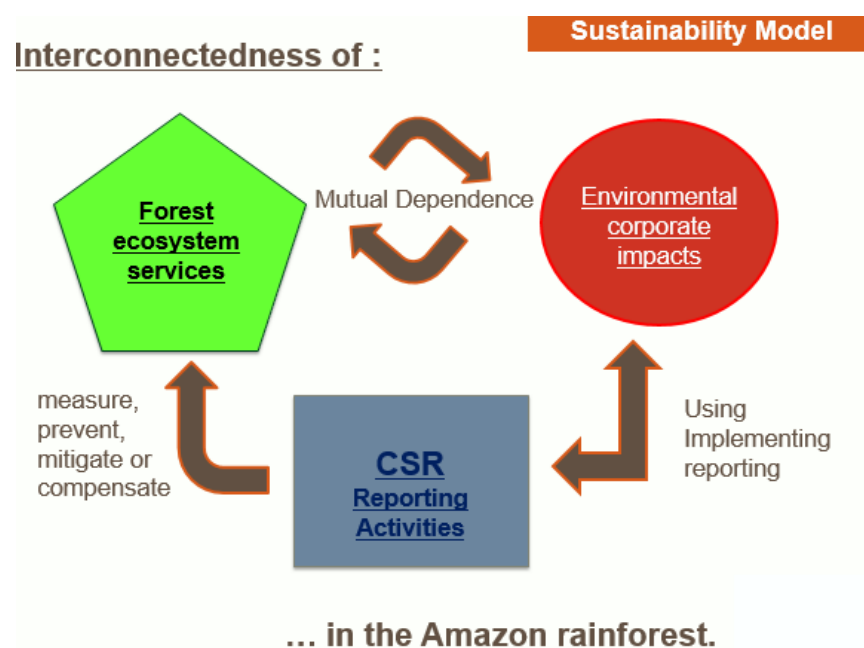


Figure 9. Sustainability Model among a. FES, b. Corp Impacts and c. CSR (GRI)

The materials collected and reviewed to develop the theoretical framework have allowed us the identification and definition of the three key elements that have contributed during the analysis of this research and constitute the basis for the proposed Sustainability Model for the Amazon basin.

a. Key Element 1: Forest ecosystem services (FES) identification. For the purpose of this research, the ecosystem services classification proposed by the *Millennium Ecosystem Assessment* - MA (2005) has been used. MA has classified the ecosystem services in four categories: *provision services* (the goods provide by forests); *regulating services* (ecosystem's control of natural processes); *cultural services* (the non-material benefits), and *supporting services* (the natural processes for the production of other services).

The four categories of ecosystem services were taken to consideration. Thirty-two (32) forest ecosystem services were identified in the context of the Amazon rainforest and detailed in the Table 11. A detailed description of each forest ecosystem service can be found in *Appendices Section*, Annex 1.

Table 11. Thirty-two (32) Forest Ecosystem Services selected from the Millennium Ecosystem Assessment. 2005. Ecosystems and Their Services.

<i>Four (04) Categories of Ecosystems Services</i>	<i>List of the thirty-two (32) Forest Ecosystems Services</i>
<p><i>Provision Services</i></p> <p><i>Products obtained from ecosystems</i></p> <p><i>Total 14 FES</i></p>	<p>Food:</p> <ol style="list-style-type: none"> 1. Crops 2. Livestock 3. Capture fisheries 4. Aquaculture 5. Wild foods <p>Biological Raw Materials:</p> <ol style="list-style-type: none"> 6. Timber and other wood fiber 7. Fibers and resins 8. Animal Skins 9. Sand 10. Ornamental resources <p>Others:</p> <ol style="list-style-type: none"> 11. Biomass fuel 12. Freshwater 13. Genetic resources 14. Biochemical, natural medicines, and pharmaceuticals.

<p><i>Regulating Services</i></p> <p><i>Benefits obtained from regulation of ecosystem processes</i></p> <p><i>Total 11 FES</i></p>	<p>Regulation of Climate:</p> <ul style="list-style-type: none"> 15. Maintenance of air quality 16. Global climate regulation 17. Regional/local climate regulation <p>Other regulating services:</p> <ul style="list-style-type: none"> 18. Regulation of water timing and flows 19. Erosion control 20. Water purification and waste treatment 21. Disease mitigation 22. Maintenance of soil quality 23. Pest mitigation 24. Pollination 25. Natural hazard mitigation
<p><i>Cultural Services (3)</i></p> <p><i>Nonmaterial benefits obtained from ecosystems</i></p>	<ul style="list-style-type: none"> 26. Recreation and ecotourism 27. Cultural heritage, spiritual values and sense of place 28. Educational, ethical, aesthetic and inspirational values
<p><i>Supporting Services (4)</i></p> <p><i>Services necessary for the production of all other ecosystem services</i></p>	<ul style="list-style-type: none"> 29. Habitat 30. Nutrient Cycle 31. Primary production (biological Material) 32. Water cycling

b. Key Element 2: According to CDP (2013), the four forest risk commodities are – soy, beef, palm oil and paper/pulp – they cause the majority of the world’s deforestation yet demand for them continues to rise. These “forest risk commodities” are the building blocks of millions of products traded globally and featured in the supply chains of countless companies.

In Latin America from the ranking of the 500 largest companies (America Economia Intelligence, 2013) 67 companies were identified that are directly linked to these commodities. From this group of companies twenty-one (21) corporations were selected whose operations are located in Brazil, Colombia and Peru. These companies account for 80 percent of the production and trade of the four forest risk commodities. (Table 12)

Table 12. Twenty-one (21) corporations (2013) linked with the four “forest risk commodities” in Amazon basin from America Economia Intelligence 500 ranking.

<i>Soy</i>	<i>Beef</i>	<i>Palm oil</i>	<i>Pulp/paper</i>
NIDERA B.V. BUNGE LIMITED. SYNGENTA A.G. CARGIL S.A. LOUIS DREYFUS COMMODITIES B.V. C.VALE COOPERATIVA AGROINDUSTRIAL COAMO AGROINDUSTRIAL COOPERATIVA	BRF BRASIL FOODS S.A. MARFRIG GLOBAL FOODS S.A. GRUPO NUTRESA S.A. NESTLÉ S.A./AG JBS FOODS LTD. ARCOS DORADOS HOLDINGS INC. (MC DONALD’S) ALICORP S.A.A.	BASF S.E. NATURA COSMETICOS S.A. UNILEVER BRASIL LTDA. PROCTER & GAMBLE BRASIL NESTLÉ S.A./AG ARCOS DORADOS HOLDINGS INC. (MC DONALD’S)	FIBRIA CELULOSE S.A. SUZANO PAPEL E CELULOSE S.A. KLABIN S.A.

c. The third key element has been as the identification of international standards for reporting of CSR activities. According to the KPMG Survey (2013), the Global Reporting Initiative (GRI) is the most widely adopted CSR reporting framework, it is also considered the most comprehensive standard for environmental issues, for that, it has been taken as reference in this study to assess the environmental activities applied by the selected corporations. (Table 13.)

Table 13. Global Reporting Initiative – GRI Environmental Aspects in the Guidelines G4

<i>GRI G4 - Environmental Aspects</i>
<ol style="list-style-type: none"> 1. Materials & Packaging 2. Energy 3. Water 4. Biodiversity 5. Emissions 6. Effluents and Waste 7. Transport 8. Overall Environmental Expenditures 9. Environmental Suppliers Assessment 10. Grievance Mechanisms

Scope and Population of the Study

The study was developed in the context of the Amazonian rainforest, where environmental issues like deforestation, water and air pollution are a priority, However for the scope of this study it has been limited to three (03) countries, three (03) economic sectors, four (04) commodities and twenty-one (21) corporations.

At country level: For the purpose of this study, three countries were considered Brazil, Peru and Colombia. Together these countries represent more than eighty (80) percent of the total Amazon biome. (RAISG 2012).

Productive Sectors selection: America Economia Intelligence (2013) identified thirty economic sectors; for the purpose of this study, three of them were selected (agriculture, animal breeding and plantations). All of them are related to deforestation and pollution of the Amazon biome (CDP 2013), and represent four specific “forest risk commodities” (beef, soy, palm oil and pulp/paper).

Geographical Location: The criterion of proximity of corporations to Amazonian forest is relevant from the perspective of direct or indirect impacts. Many of the identified corporations have their facilities (industrial plants, food processors, slaughters, headquarters, etc.) outside the borders of the Amazon basin. However, they manage to provide financial resources to a large network of suppliers all around the countries (small and medium sized farmers and livestock breeders) that ultimately deliver the raw material to the corporations’ facilities for processing and distribution to the local and international markets.

This complex web of soy and cattle farmers, plantations, food processors, transportation system and retail companies add additional challenges to control the origin of the raw materials and distribution, therefore to control the deforestation that affect the sustainability of the whole system.

Existing literature, as the research of Mcelron and Sigfried (1985), suggests that big corporations invest more financial and logistic resources in CSR reporting in comparison with small and medium size companies; these authors also stated that there is a positive relationship between company's size and CSR reporting. Seventy one percent (15) of the selected corporations followed the Global Reporting Initiative – GRI guidance for reporting, however some of them (4) do not follow any standard.

Corporations' profile

The research was focused on twenty-one (21) large corporations of Brazil, Colombia and Peru that according to the ranking made by America Economia Intelligence (2013) of the 500 bigger companies in Latin America, these companies represent between 80-85 percent of the total sales in the three identified economic sectors, Agriculture, Animal breeding, and Plantations in 2013.

Agricultural Sector:

Seven (7) companies were selected from this economic sector, in this case, all of them are located in different States of Brazil. The corporations' sales went from \$1,756 million as the minimum and up to \$14,146 million as maximum. The main products are oilseeds and grains as we can see in detail in Table 14. We were particularly interested in companies that produce / process and trade soybeans.

Table 14. Agricultural Corporations, locations, sales and main products.

Company name	Country	Location	Sales 2013 US\$/Mill	Products
BUNGE ALIMENTOS	BRA	Rio de Janeiro, Sao Paulo, Minas Gerais, Permanbuco, Parana, Distrito Federal, Mato Grosso, Bahia, Goias, Mato Grosso do sul, Piaui, Rio Grande do sul, Santa Catarina, Tocantins	14,146	Oilseeds, such as soy, corn, wheat, cottonseed, sorghum and sunflower.
CARGILL	BRA	Rondonia, Para, Mato Grosso, Mato Grosso do Sul, Goias, Parana, Bahia, Sao Paulo	10,594	Grains, oilseeds, dairy, sauces, starches and sweeteners, cocoa & chocolate, soybeans, cottonseeds and palms.
LOUIS DREYFUS COMMODITIES	BRA	Mato Grosso, Mato Grosso do Sul, Goias, Sao Paulo, Bahia, Rio Grande do Sul, Parana, Santa Catarina	5,961	Sugar, cotton, rice, coffee, soy, fertilizers, grains, and oilseed.
COAMO	BRA	Paraná, Santa Catarina, Mato Grosso do Sul. Cooperatives: Acre, Amazonas, Maranhao, Mato Grosso, Roraima, Amapa and Para.	3,321	Soybeans, fiber, maize, wheat, coffee and others.
SYNGENTA	BRA	Sao Paulo, Goias, Parana, Mato Grosso	2,715	Sugar cane, soybeans, corn, sweet corn, potatoes, vegetables, fruits among others.
NIDERA SEMENTES	BRA	Bahía, Paraná, Mato Grosso, Tocantis, Santa Catarina, Goias, Minas Gerais	1,830	Soybean, maize, corn, wheat, sunflower and sorghum seed and others.
C. VALE	BRA	Paraná, Santa Catarina, Mato Grosso, Mato Grosso do Sul, Paraguai	1,756	Soybean, corn, wheat, cassava among others.

Palm Oil Consumers:

The Palm oil is an important ingredient in countless products; many industries use it as input for production, including retailers and food services industry, as well as consumer goods and other manufacturers operating in the food, toiletries and detergents. The World Wildlife for Nature – WWF elaborated in 2013, the Palm Oil Buyers Scorecard Report to assess their business practices (Grayson, J. WWF, 2013). Some of these companies have their branches in the Amazon region. For this study, six (06) were identified; Table 15 details the list of corporations, their sales went from \$1,681 million as the minimum and up to \$6,531 as maximum.

Table 15. Palm Oil Consumers: Corporations, locations, sales and main products.

Company mane	Country	Location	Sales 2013 US\$/Mill	Products
UNILEVER	BRA	São Paulo, Minas Gerais, Pernambuco e Goiás – centros de distribuição nas regiões Nordeste, Centro-Oeste, Sudeste e Sul.	6,531	Categories of personal care, food, cleaning, refreshment (soy beverages and ice cream) and food away from home.
NESTLÉ	BRA	All over Brazil	5,767	food and beverage, nutrition, health, wellness
BASF	BRA	Bahia, Parana, Pernambuco, Rio Grande do Sul, Sao Paulo, Sao Bernardo del Campo	3,334	Oil and gas to chemicals, plastics, performance products, agricultural products and fine chemicals.
NATURA	BRA	Sao Paulo, Para, Amazonas, Bahia, Rio de Janeiro, Rio Grande do Sul / Suppliers: Rondônia, Amazonas, Amapá, Piauí, Bahia, Paraná and Rio Grande do Sul.	2,993	Cosmetics manufacturer, deodorants, perfumes, body creams, soup and other health care products
MC DONALD'S	BRA	All over Brazil	1,842	Fast food: hamburgers, fish, chicken, paper, vegetables, coffee and tea, wheat.
PROCTER & GAMBLE	BRA	Salvador do Bahia, São Paulo, and Rio de Janeiro.	1,681	Heath care, beauty and home products, perfumeries, soap, baby care: Cleaning products: detergents.

Animal Breeding Sector:

Seven (7) companies were selected from this economic sector, in this case, five companies are located in Brazil, one in Colombia and one in Peru. The corporations' sales went from \$1,842 million as the minimum and up to \$39,658 as maximum. Table 16 details the list of products of each company.

Table 16. Animal Breeding Corporations, locations, sales and main products.

Company name	Country	Location	Sales 2013 US\$/Mill	Products
JBS FRIBOI	BRA	All over Brazil	39,658	Beef, Lamb, poultry, pork, foodstuff, leather, biodiesel, collagen, animal protein
BRF FOODS	BRA	All over Brazil	13,029	Frozen meat, poultry, pork, meat foods, dairy, margarine, pasta, frozen vegetables.
MARFRIG	BRA	Goiás, Mato Grosso, Mato Grosso do Sul, Sao Paulo, Rondônia, Rio Grande	8,007	Beef, sheep, poultry, fish, processed food, cattle
NESTLÉ	BRA	All over Brazil	5,767	food and beverage, nutrition, health, wellness
GRUPO NUTRESA	COL	Barranquilla, Bogotá and Medellin	3,067	Processed meats, sausage, hamburgers, matured meats, frozen cooked meals, mushrooms
ALICORP	PER	Industries in Lima, Trujillo, and Arequipa	2,084	Processed meats, sausage, pastas, margarines, fatty products, industrial oils and balanced meals
MC DONALD'S	BRA	All over Brazil	1,842	Fast food: hamburgers, fish, chicken, paper, vegetables, coffee and tea, and wheat.

It is fair to mention that in the case of the Corporations from Colombia and Peru, it was difficult to find that their suppliers produce the raw materials in the Amazon basin, however both companies work country-wide with a huge network of suppliers, so we decided to keep them in the analysis.

Forest Plantations:

Three (3) companies were selected from this economic sector. They are major producers of pulp and paper commodity related with Amazon deforestation. The corporations' sales went from \$1,963 million as the minimum and up to \$2,953 as maximum. Table 17 details the list of products of each company.

Table 17. Plantations: Corporations, locations, sales and main products.

Company name	Country	Location	Sales 2013 US\$/Mill	Description
FIBRIA	BRA	São Paulo, Minas Gerais, Rio de Janeiro, Espírito Santo, Mato Grosso do Sul and Bahia	2,953	Hardwood eucalyptus pulp - raw material for manufacturing papers used for personal hygiene, printing and writing, and special uses.
SUZANO PAPEL E CELULOSE	BRA	São Paulo, Bahia, Espírito Santo, Minas Gerais, Piauí, Tocantins and Maranhão	2,428	The paper products are classified into four categories – coated, uncoated, cutsize and paperboard
KLABIN	BRA	São Paulo, Minas Gerais, Bahia, Parana, Santa Catarina, Permanbuco, Rio Grande Do Sul, Rio de Janeiro.	1,963	Paper and board for packaging, corrugated board packaging and industrial sacks, and also markets timber in logs.

It is fair to mention that only one of the three Corporations of this economic sector has direct activities in the Amazon basin. All of them have activities in Atlantic rainforest and Cerrado biome with a web of suppliers that provide at least 25 percent of the total raw material used in their production (75 percent own plantations). Forest Plantations is considered one of the economic sector linked with rainforest deforestation (CDP, 2013), so it was decided to keep these companies in the analysis for comparison purposes.

Methodology and tools used for the Analysis

To find the “interconnections” for the proposed Sustainability Model (figure 9) among forest ecosystem services, corporate environmental impacts and corporate social responsibility, the following proven methodologies were used:

- a. Assess the level of dependence corporations from the three selected economic sectors linked with the "forest risk commodities" have for the four identified categories of forest ecosystem services.

Methods: *The Dependence and Impact Assessment tool* (Hanson, et al. WRI, 2008) was used to assess the level of dependence and impacts of the economic sectors for the services that forest ecosystems provide.

- b. By using the CSR sustainability reports and other online documents, analyze and score corporations' fulfillment with PSI index and with the ten environmental aspects of the Global Reporting Initiative standards.

Methods: *The Pacific Sustainability Index -PSI* (The Roberts Environmental Center – REC, 2010) was used to develop a grade/score for each corporation.

- c. Harmonize the environmental aspects of the Global Reporting Initiative – GRI G4 Standards with the four categories of forest ecosystem services (FES).

Methods: *Examine overlap between forest ecosystem services and Global Reporting Initiative. (Methodology developed by researcher)*

Dependence & Impacts Assessment Tool

- a. Assess the level of dependence the three economic sectors linked with the "forest risk commodities" (i.e. soy, beef, palm oil and pulp/paper) have for the four categories of forest ecosystem services

Methods: ***Dependence and Impact Assessment tool from The Corporate Ecosystem Service Review – ESR (Hanson, et al. WRI 2008).***

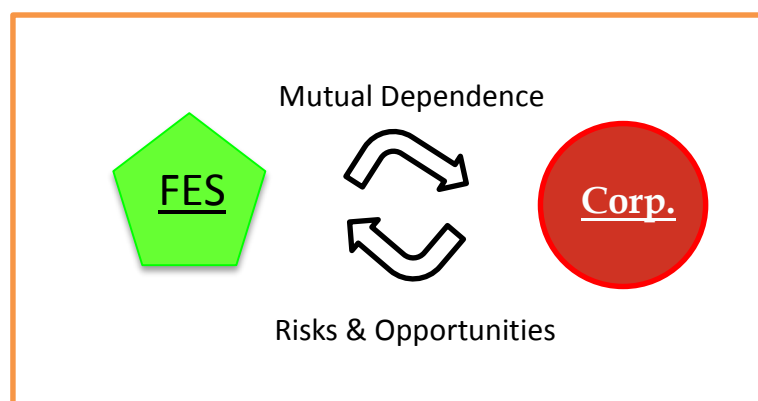


Figure 10. Dependence and Impact Assessment FES & Corp Impacts.

Businesses impact ecosystems through consumption, pollution, land conversion, and other activities. At the same time, businesses depend on ecosystems. To address the problem of finding the connection between dependence and impacts and also risks and opportunities, in 2008, the World Resources Institute (WRI), the World Business Council for Sustainable Development (WBCSD), and the Meridian Institute developed *The Guidelines for Identifying Business Risks and Opportunities Arising from Ecosystem Change* to provide corporate managers with a proactive approach to making the connection between ecosystem change and business goals.

This structured methodology helps businesses to develop strategies for managing risks and opportunities arising from their dependence and impact on ecosystems. It is a tool for corporate strategy development and can augment existing environmental management systems.

The ESR methodology consists of five steps (Figure 11):

- *Select the scope.* According to the tool the scope is very important because it defines the boundary within which to conduct the ESR. The scope could be at business unit, product, market, infrastructure project, supplier, or customer segment, among others. In this research the scope was set at sector level. (i.e. Agriculture, Animal breeding and Plantations).
- *Identify priority ecosystem services.* From the Millennium Ecosystem assessment (2005) thirty-two (32) ecosystem services relevant to corporate performance were identified (Annex 1 page 130). The company's dependence and impact on all of them was systematically evaluated.
- *Analyze trends in priority services.* It was evaluated the condition and trends of the ecosystem services in the context of the Amazon rainforest, as well as the drivers of these trends in a general way in the theoretical background (pages 7 – 20).

- *Identify business risks and opportunities.* Due to the scope of this analysis was at sector level, it did not evaluate the business risks and opportunities that might arise due to trends in the priority ecosystem services, which it is more relevant at company level.
- *Develop strategies.* It did not outline strategies for managing the risks and opportunities.

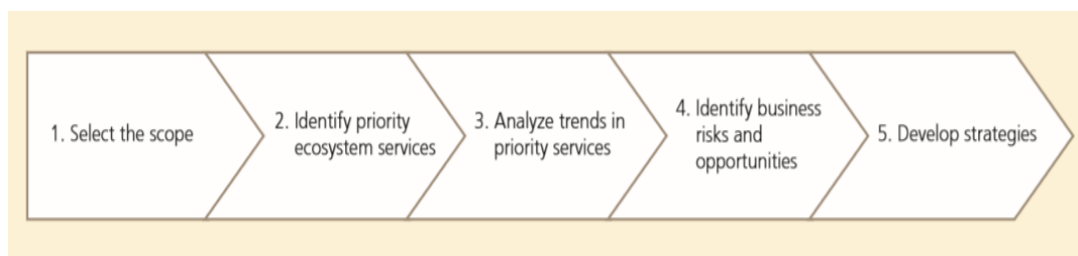


Figure 11. Steps in a Corporate Ecosystem Review (Hanson, et al.WRI 2008)

For the purpose of this research, The Guidelines for Identifying Business Risks and Opportunities Arising from Ecosystem Change was adapted and applied not at the company level but an economic sector level for identifying and determining the dependence and impacts arising from ecosystem change of the three economic sectors: Agriculture, Animal breeding and Plantations.

This tool presents a questionnaire with five straightforward questions that have to be answered for all thirty-two (32) ecosystem services that each economic sector affects in their daily activities. The first two questions address the sector DEPENDENCE on ecosystem services, the next three questions the sector's IMPACTS, and depending on the answer, they are ranked by levels as: High (●), Medium (○) and Low or none (-).

Questions:

1. Does this ecosystem service serve as an input or does it enable/enhance conditions for successful sector performance? *If "no" skip to question 3*

Answer 1: Each sector depends on an ecosystem service if that service functions as an input or if it enables, enhances, or influences environmental conditions required for successful corporate performance.

2. Does this ecosystem service have cost-effective substitutes?

Answer 2: The degree to which a company depends on an ecosystem service is a function of whether or not there is a cost-effective substitute for that service.

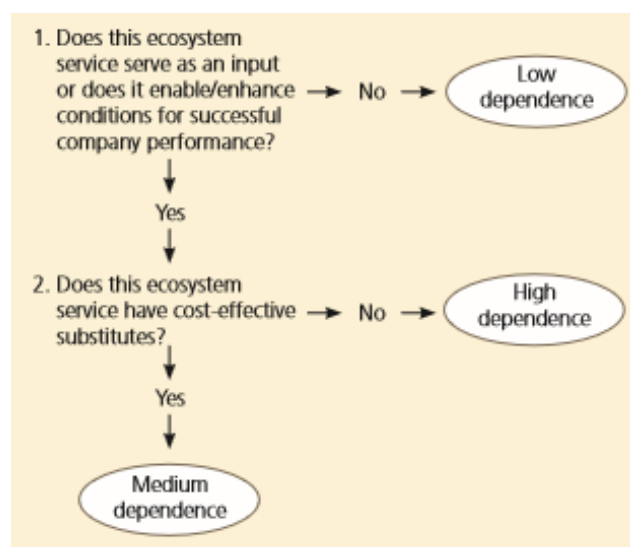


Figure 12. Flow of sector *DEPENDENCE* on ecosystem services.

Source: The Corporate Ecosystem Service Review 2008.

As is shown in Figure 13 (below), the first three columns of the Excel sheet (A, B and C) present the list of the thirty-two (32) forest ecosystem services and their definitions, all of them were analyzed under the two questions in columns E and F.

The screenshot shows an Excel spreadsheet titled "Agro ESR_dependence_impact_assessment_tool.xls". The spreadsheet is a questionnaire for assessing ecosystem service dependence and impact. It includes sections for company information, assessment scope, and a table of ecosystem services with response columns for dependence and impact.

Company Information:

- Company: Agricultural Sector
- Assessment scope: Company operations
- Product/unit/market: soybeans, grains, oilseeds, cocoa, cottonseeds, palms, rice, coffee, fertilizers, fiber, maize, wheat, sugar
- Time period: 2013

Ecosystem Services and Definitions:

Ecosystem services	Definitions	1. Does this ecosystem service serve as an input or does it enable/enhance conditions for successful company performance? If "no" skip to question 3	2. Does this ecosystem service have cost-effective substitutes?	Comments or supporting information
Provisioning				
Crops	Cultivated plants or agricultural produce harvested by people for human or animal consumption as food. Examples: grains, vegetables, fruit	Y	N	soybeans, grains, oilseeds, cocoa, cottonseeds, palms, rice, coffee, fertilizers, fiber, maize, wheat, sugar cane, oilseeds, corn, sunflower, sorghum seed, cassava, saucers, chocolate, starches and sweeteners.
Livestock	Animals raised for domestic or commercial consumption or use. Examples: chicken, pigs, cattle	N		
Capture fisheries	Wild fish captured through trawling and other non-farming methods. Examples: cod, crabs, tuna	N		
Food				
Aquaculture	Fish, shellfish, and/or plants that are bred and reared in ponds,	N		

Figure 13. Excel Sheet of sector *DEPENDENCE* on ecosystem services.

The next three questions measure the sector *IMPACT* on ecosystem services:

Questions:

- Does the economic sector affect the quantity or quality of this ecosystem service? If "no" skip to the next ecosystem service

Answer 3: An economic sector impacts an ecosystem service if it affects the quantity or quality of that service.

- Is the economic sector's impact positive or negative?

Answer 4:

Positive: The economic sector increases the quantity or quality of the ecosystem service

Negative: The economic sector decreases the quantity or quality of the ecosystem service

5. Does the economic sector's impact limit or enhance the ability of others to benefit from this ecosystem service?

Answer 5: The degree to which an economic sector impacts an ecosystem service in a manner that might pose a business risk or opportunity for itself is a function of whether or not the impact limits or enhances the ability of others to benefit from the service.

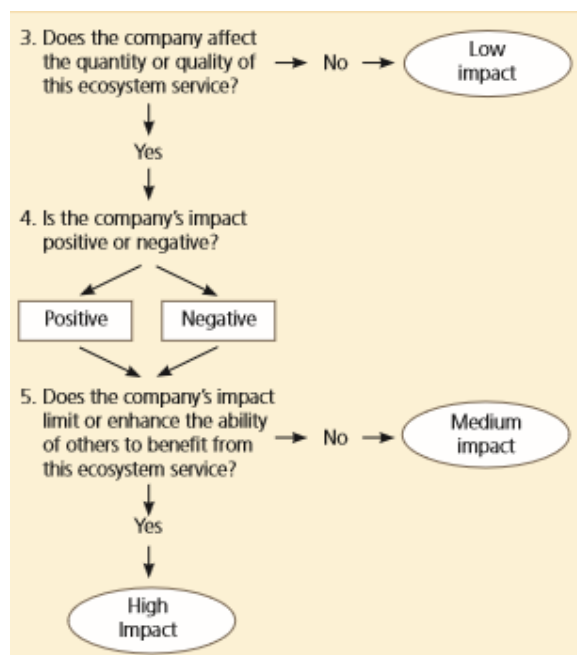


Figure 14. Flow of Company *IMPACT* on ecosystem services.

Source: The Corporate Ecosystem Service Review 2008.

In Figure 15, as before, the first three columns of the Excel sheet (A, B and C) present the list of the thirty-two (32) forest ecosystem services and their definitions, all of them were analyzed under the questions in columns I, J and K.

ECOSYSTEM SERVICES IMPACT QUESTIONNAIRE						
Company:		Agricultural Sector				
Assessment scope:		Company operations				
Product/unit/market:		soybeans, grains, oilseeds, cocoa, cottonseeds, palms, rice, coffee, fertilizers, fiber, maize, wheat, sugar				
Time period:		2013				
Ecosystem services		Definitions	3. Does the company affect the quantity or quality of this ecosystem service?	4. Is the company's impact positive or negative?	5. Does the company's impact limit or enhance the ability of others to benefit from this ecosystem service?	Comments or supporting information
Provisioning						
Crops	Cultivated plants or agricultural produce harvested by people for human or animal consumption as food. Examples: grains, vegetables, fruit	Y	+	Y	the company's impact enhance the ability of others to benefit from this ecosystem service by producing more of these products	
Livestock	Animals raised for domestic or commercial consumption or use. Examples: chicken, pigs, cattle	N		N	Agriculture and Livestock compete each other for land, water and other ecosystem services	
Capture fisheries	Wild fish captured through trawling and other non-farming methods. Examples: cod, crabs, tuna	Y	-	Y	By affecting the rivers, deforestation, pollution, a dam that changes the river flow	
Aquaculture	Fish, shellfish, and/or plants that are bred and reared in ponds,	N		N		
Food						

Figure 15. Excel Sheet of sector *DEPENDENCE* on ecosystem services.

The Dependence and Impact Assessment Tool guided us through the five dependence and impact questions for each ecosystem service and automatically develops a visual summary matrix that translates the responses provided in the questionnaire into a one-page visual chart. Users can add and subtract features from the tool in order to tailor it to meet their own needs and preferences. To download it, visit: www.wri.org/ecosystems/esr

The results of this analysis show the level of dependence and impacts each economic sector (i.e. agriculture, animal breeding and plantations) has for the thirty-two (32) forest ecosystems services. Details can be seen in *Results section and in Appendices section*, Annex 3 (a, b & c).

Score the fulfillment of CSR reports with PSI index

- b. Analyze and score corporations' fulfillment with the PSI and with the environmental aspects of the Global Reporting Initiative – GRI guidelines.

Methods: ***Pacific Sustainability Index – PSI (The Roberts Environmental Center - REC of Claremont McKenna College (CMC))***

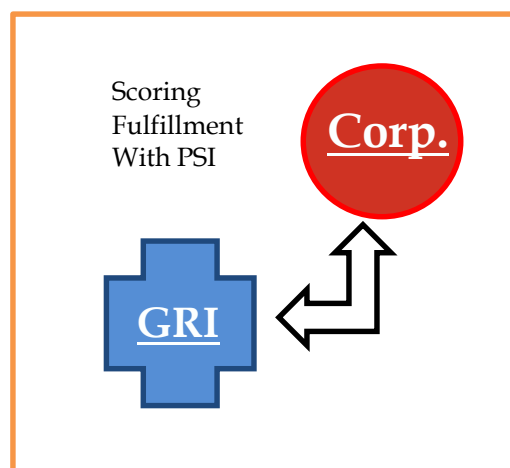


Figure 16. Environmental Corporate Fulfillment with PSI & GRI.

The Roberts Environmental Center has been the foremost analyst of corporate sustainability reporting (CSR) for almost two decades. Its mission is to provide a comprehensive and realistic understanding of today's environmental issues and the ways in which they are being and can be resolved. For that, the Center analyzes corporate online disclosures using the Pacific Sustainability Index (PSI) and publishes the results online. <http://roberts-environmental-center.cmc.edu/>

The Pacific Sustainability Index (PSI)

The Pacific Sustainability Index (PSI) uses a systematic questionnaire to analyze the quality of corporate sustainability reporting on a company level, as well as the overall industry level. (See Questionnaire details in Appendices section, Annex 2 –a. Page 134)

For the purpose of this research, a subset of the PSI was used including four (04) environmental topics for the *intents and plans* (vision, accountability, management, and environmental policies) and ten (10) more for *reporting and performance* (GRI environmental topics) to evaluate CSR reporting.

The implementation of CSR activities starts with a management decision, which must then be expressed in the vision and strategies of each company. Thus, companies have to organize and train their staff for data collection before implementing and reporting CSR activities. Tables 18 and 19 show the Environmental topics considered for the three selected sectors.

Table 18. Environmental Intent and Plans Topics. (REC, 2012)

<i>Vision</i>	<i>Accountability</i>	<i>Management</i>	<i>Environmental Policies</i>
Environmental visionary statement	Report contact person	Environmental education	Environmental policy statement
Environmental impediments and challenges	Environmental management structure	Environmental management system	Climate change/global warming
	Environmental accounting	Stakeholder consultation	Habitat/ecosystem conservation
			Biodiversity
			Green food purchasing
			Genetically modified food
			Zero waste policy

Table 19. Environmental Reporting and Performance Topics (REC, 2012)

Materials & Packaging	Energy	Water	Biodiversity	Emissions (Production or reduction)
Materials used by weight or volume	Energy consumption within the organization	Total water withdrawal by source	Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas	Direct greenhouse gas (GHG) emissions Energy indirect greenhouse gas (GHG) emissions
Percentage of materials used that are recycled input materials	Energy consumption outside of the organization	Water sources significantly affected by withdrawal of water	Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas	Other indirect greenhouse gas (GHG) emissions Greenhouse gas (GHG) emissions intensity
Extent of impact mitigation of environmental impacts of products and services	Energy intensity Reduction of energy consumption	Percentage and total volume of water recycled and reused	Habitats protected or restored (Reforestation)	Reduction of greenhouse gas (GHG) emissions
Percentage of products sold and their packaging materials that are reclaimed by category	Reductions in energy requirements of products and services		Total number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk	Emissions of ozone-depleting substances (ODS) NOX, SOX, and other significant air emissions
Effluents and Waste	Transport	Supplier Environmental Assessment	Environmental Grievance Mechanisms / Complaints	Environmental Expenditures
Total water discharge by quality and destination Total weight of waste by type and disposal method Total number and volume of significant food waste	Significant environmental impacts of transporting products and other goods and,	Percentage of new suppliers that were screened using environmental criteria, sustainable practices (avoid Palm oil)	Number of grievances or complaints about environmental impacts filed, addressed, and resolved through formal grievance mechanisms	Total environmental protection expenditures and investments by type, sustainable agriculture practices and promotion to its associations
Weight of transported, treated waste deemed hazardous and percentage of transported waste shipped internationally	materials for the organization's operations, and transporting members of the workforce	Significant actual and potential negative environmental impacts in the supply chain and actions taken	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations	
Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the organization's discharges of water and runoff		Locally grown organic food (Responsible sourcing)		

All twenty-one (21) corporations were evaluated under the Pacific Sustainability Index (PSI) on the selected environmental topics – Description of each environmental topics can be seen in *Appendices Section*. Annexes 2-a, and 2-b. (page.134-136) — and into three types of information reported: 1) intent & plans, 2) reporting, and 3) performance. Activities reported in each environmental topic were scored as follow:

1. The *Intent topics* are each worth two points;

- one (1) point for a discussion of intentions, vision, or plans, and a
- one (01) point more if company presents evidence of specific actions taken to implement each of them.

2. The *Reporting topics* are divided in two categories: quantitative (numerical data is expected) and qualitative (no data is needed) each of them worth five points:

Five (5) possible points for quantitative topics:

- one (1) point is available for a discussion,
- one (1) point for awards, industry standards, competitor performance, or if the raw data are normalized by dividing by revenue, total employees, etc.;
- one (1) point for the presence of an explicit numerical goal,
- one (1) point for numerical data from a single year, and
- one (1) point for similar data from a previous year.

Five (5) possible points for qualitative topics:

- 1.67 points for discussion,
- 1.67 points for initiatives or actions, and
- 1.67 points for perspective.

3. Two (2) *performance points* are available for each “Reporting” topic:

- For quantitative topics: one (1) point is given for comparison to the previous reporting period, and one (1) point for better performance.
- For qualitative topics it gives one (1) point for any indication of improvement from previous reporting periods, and one (1) point for perspective.

Table 20, contains all the topics considered in the scoring and the total number of possible points per each topic.

There are thirty (30) points for *Intent & Plans* divided in four (4) categories and fifteen (15) sub categories (Table 20).

Table 20. Scoring system for Environmental Intent and Plans

Environmental Topics	<i>Discussion</i>	<i>Action</i>	<i>Total possible points</i>
Intent & Plans			
Vision <i>Environmental visionary statement</i> <i>Environmental impediments and challenges</i>	2	2	4
Accountability <i>Report contact person</i> <i>Environmental management structure</i> <i>Environmental accounting</i>	3	3	6
Management <i>Environmental education</i> <i>Environmental management system</i> <i>Stakeholder consultation</i>	3	3	6
Environmental Policies <i>Environmental policy statement</i> <i>Climate change/global warming</i> <i>Habitat/ecosystem conservation</i> <i>Biodiversity</i> <i>Green food purchasing</i> <i>Genetically modified food</i> <i>Zero waste policy</i>	7	7	14
TOTAL Possible points			30

There are one hundred (100) points for *Reporting* divided in ten (10) categories plus twenty (20) points more for *Performance*, for a sum of one hundred and fifty (150) as total possible points (Table 21).

Table 21. Scoring system for Environmental Reporting and Performance

<i>GRI Environmental Topics</i>	<i>Reporting</i>	<i>Performance</i>	<i>Total possible points</i>
Materials & Packaging	10	2	12
Energy	10	2	12
Water	10	2	12
Biodiversity	10	2	12
Emissions	10	2	12
Effluents and Waste	10	2	12
Transport	10	2	12
Overall Expenditures	10	2	12
Supplier Assessment	10	2	12
Complaints Mechanisms	10	2	12
Total possible points	100	20	120

Example of a company reporting:

For instance, in Water consumption: Corporations that were able to quantify the withdraws of water per source (Intents & Plans) in every stage of the production process in cubic meters per metric ton (m3/TN) or any other units (Reporting: quantitative and qualitative) and reported the percentage of reduction or reuse of water per year in comparison with the previous year (Performance) were the ones that accumulated the most number of points for this topic.

For the purpose of this research, sustainability reports, annual reports, code of conduct and other online documents, of the selected twenty-one (21) corporations were downloaded from their main web pages and reviewed as outlined in the PSI methodology (REC, 2012).

According to the PSI methodology, it is not possible to consider for the analysis any data independently stored outside the main corporate website or available only in hard copy. If Corporation's subsidiary has its own sustainability reporting, it is possible to grant partial credit to the parent company and only when a direct link was provided in the main corporate website.

Hours of evaluation were needed to review all documents. Most of them were produced at global scope, proof of that is that one half of reports are in English language, but it was also possible to find sustainability reports in Portuguese (40 percent) and Spanish language (10 percent). The language clearly depend on the audience that the reports were directed to.

The Pacific Score Index (PSI) normalizes all the scores to the potential maximum score. The letter grades (A, A-, B+, etc.) are normalized to the total scoring possible and not to the highest company's score analyzed in the report. Table 22 contains the range of points and grades that it was used in this analysis.

Table 22. The Pacific Sustainability Index (PSI) – Scoring System

Ranges of Points	Percentage (%)	Grade
138 - 150	92 - 100%	A
125 - 138	83.3 - 92%	A-
113 - 125	75.3 - 83.3%	B+
100 - 113	66.6 - 75.3%	B
88 - 100	58.6 - 66.6%	B-
75 - 88	50 - 58.6%	C+
63 - 75	42 - 50%	C
50 - 63	33.3 - 42%	C-
38 - 50	25.3 - 33.3%	D+
25 - 38	16.6 - 25.3%	D
13 - 25	8.6 - 16.6%	D-
0 - 13	0 - 8.6%	F

For instance:

If a company obtain the maximum score of 150 point, they are divided between the total possible points 150 to get the percentage of fulfillment with PSI.

As follow:

*150/150 = 1 = 100%
fulfillment with PSI = grade A.*

Companies with scores in the highest 8.3 percent get A and any in the bottom 8.3 get F. This was possible by dividing the maximum PSI score obtained in each sector (150 points) into 12 equal parts then rounding fractional score up or down as show in Table 22. This means that A and F are under-represented compared the other grades.

Harmonizing FES with GRI-G4

- c. Harmonizing the four categories of Forest Ecosystem services (FES) with the environmental aspects of the Global Reporting Initiative – GRI Standards (G4).

Methods: Examine overlap. **(Methodology Developed by the researcher)**

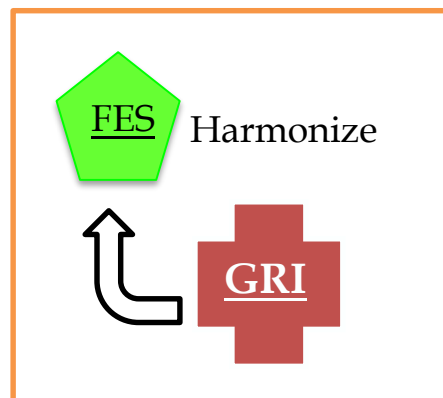


Figure 17. Harmonizing FES with GRI Environmental Standards.

The aim of GRI version G4, is simple: to help companies prepare sustainability reports that matter, contain valuable information about the organization’s most critical sustainability-related issues, and make such sustainability reporting standard practice.

A sustainability report is the key platform for communicating sustainability performance and impacts – whether positive or negative. The GRI-G4 Guidelines are the most widely adopted reporting framework, one of the reasons for that is because it harmonizes its standards with other prominent sustainability standards, including ISO 26000, OECD Guidelines and the UN Global Compact (KPMG Survey of CSR, 2013).

The environmental dimension of GRI-G4 sustainability report concerns the organization's impact on living and non-living natural systems, including land, air, water and ecosystems. The Environmental topics cover impacts related to inputs (such as energy and water) and outputs (such as emissions, effluents and waste). In addition, it covers biodiversity, supplier assessment, product and service-related impacts, as well as complaints mechanisms and overall environmental expenditures (GRI G4, 2014).

Therefore, for the purpose of this research, the environmental aspects of the GRI-G4 (2014) that contain ten (10) Environmental topics and thirty-four (34) disclosure titles were analyzed and linked with the four (4) Categories and thirty-two (32) sub-categories of forest ecosystem services - FES.

This assessment was very important to us to identify which of the forest ecosystem services – FES are better represented in the GRI-G4 standard. Thus, by the time, the sustainability reports of the selected twenty-one (21) corporations were under revision it was also easy for us, to link each corporate environmental activity with the forest ecosystems services that have been enhanced.

For better understanding of the methodology used, and example of the harmonizing process of *water and biodiversity topics* are presented in Figure 15. The details of this analysis is condensed in the *Appendices section*, Annex 4. Relation between Global Reporting Initiative – GRI (G4 2014) and forest ecosystem services – FES.

<i>Global Reporting Initiative – GRI (G4 2014)</i>	<i>Forest Ecosystem services – FES</i>
Topic: WATER	Four FES Categories
<ul style="list-style-type: none"> • Total water withdrawal by source (EN8) • Water sources significantly affected by withdrawal of water (EN9) • Percentage and total volume of water recycled and reused (EN10) 	<ul style="list-style-type: none"> • Provision (Freshwater: rivers and lakes) • Regulating (Water regulation) • Supporting (Water cycling)
Topic: BIODIVERSITY	
<ul style="list-style-type: none"> • Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas (EN11) • Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value (EN12) • Habitats protected or restored. (EN13) • Total number of IUCN Red List species (EN14) 	<ul style="list-style-type: none"> • Provision (Goods, genetic resources) • Regulating (Regulation of Climate, disease mitigation, water purification and waste treatment) • Cultural (Ethical and Spiritual Values) • Supporting Services (Habitat) (Biodiversity)

Figure 18. Example of Harmonization Methodology between GRI-G4 and FES

Figure 18 shows how two (2) environmental topics of the GRI-G4 standard as water and biodiversity (first column) and their disclosure titles (Water: EN8, EN9 and EN10) and (Biodiversity: EN11, EN12, EN13 and EN14) are linked with the four categories of forest ecosystem services (second column). In the case of water, the GRI-G4 standard requires companies to quantify total withdrawals, sources and percentage and total volume of water recycled and reused. If companies are able to measure and implement activities to have less impact on water resources they immediately will improve the *provision, regulating and supporting* ecosystem services. This methodology was used to assess all the GRI-G4 environmental topics and match them with the forest ecosystem services.

4. RESULTS AND DISCUSION

Corporation Dependence & Impacts on FES

RESULTS: Assess the level of dependence of selected economic sectors linked with the Amazon deforestation have for the four categories of forest ecosystem services.

DEPENDENCE

The results of this analysis shows the level of dependence that the three economic sectors (agriculture, animal breeding and plantations) have over the thirty-two (32) Forest Ecosystems Services - FES which serve as inputs for production or enhance conditions for successful company performance (table 23).

Table 23. Business dependence on Ecosystem Services

Key: (●) High (○) Medium (-) Low/None			
Ecosystem services	CROPS	ANIMAL BREEDING	PLANTATIONS
Provisioning			
Crops	●	-	-
Livestock	-	●	-
Capture fisheries	-	-	-
Aquaculture	-	-	-
Wild foods	-	-	-
Timber and other wood fiber	-	-	●
Fibers and resins	-	-	-
Animal Skins	-	●	-
Sand	-	-	-
Ornamental resources	-	-	-
Biomass fuel	○	○	○
Freshwater	●	●	●
Genetic resources	○	-	○
Biochemical, medicines, pharmaceuticals	○	-	-
Regulating			
Maintenance of air quality	●	●	●
Global climate regulation	●	●	●
Regional/local climate regulation	●	●	●
Regulation of water timing and flows	●	●	●
Erosion control	●	●	●

Water purification and waste treatment	●	●	●
Disease mitigation	-	-	-
Maintenance of soil quality	●	●	●
Pest mitigation	○	○	○
Pollination	●	-	●
Natural hazard mitigation	-	-	-
<i>Cultural</i>			
Recreation and ecotourism	-	-	-
Ethical and spiritual values	-	-	-
Educational and inspirational values	-	-	-
<i>Supporting</i>			
Habitat	-	-	-
Nutrient Cycle	○	○	○
Biologic material primary production	●	●	●
Water cycling	●	●	●

The dots and lines in the table 23, (●) High, (○) Medium, (-) Low/None, represent the level of dependence of each economic sector for each FES.

The ecosystem services that show the highest level of demand or dependence from the three economic sectors are *provision of freshwater, regulating services* (air quality; global, regional and local climate regulation; regulation of water timing and flows, control of soil erosion and soil quality, water purification and waste treatment, pest mitigation and pollination) and *supporting services* (nutrient and water cycle, and biological production).

Cultural Services represents the only ecosystem category that was not possible to link with any of the three economic sectors, the reason of this is because *cultural services* are the non-material benefits from the forest therefore it is not a source of inputs for production. However, the possibility that this category could be provided other services including educational, inspirational or aesthetic at a company level was not ruled out.

Table 24 contains the list of the most demanded Forests Ecosystem Services and the level of dependence that this study identified by using the Dependence and Impact Assessment tool (Hanson, et al. WRI, 2008).

Table 24. Business dependence by FES Category and Levels.

CATEGORY	HIGH LEVEL	MEDIUM LEVEL
Provision	Freshwater Animal Skins (only Animal Breeding)	Biomass fuel Genetic resources Biochemical, medicines, pharmaceuticals
Regulating	Maintenance of air quality Global climate regulation Regional/local climate regulation Regulation of water timing and flows Erosion control Water purification and waste treatment Maintenance of soil quality Pollination (only crops)	Pest mitigation
Supporting	Biologic material production Water cycling	Nutrient Cycle

An economic sector depends on a forest ecosystem service if that service functions as an input or if it enables, enhances, or influences environmental conditions required for successful corporate performance (Hanson, et al. WRI, 2008). Priority ecosystem services are those services on which the sector has a high dependence and thereby are the most likely sources of business risk to the companies.

The number of priority ecosystem services and the level of dependence for each economic sectors can be seen in table 25.

Table 25. Summary of Corporate dependence on Ecosystem Services

SECTOR	LEVEL OF DEPENDENCE			Total Number of Forest Ecosystem services
	<i>High (●)</i>	<i>Medium (◉)</i>	<i>Low/Non (-)</i>	
CROPS	12	5	16	33
ANIMAL BREEDING	12	3	17	32
PLANTATIONS	12	4	16	32

There is a *high level* of dependence for at least twelve (12) of the thirty-two (32) forest ecosystem services and a *medium level* of dependence for four (04) more of them. All three economic sectors use these FES as inputs for commodities production or they influence environmental conditions required for successful corporate performance. Therefore, it is also fair to state that without the provision of these services, corporations would be unable to continue producing commodities, or the production costs would be higher.

IMPACTS

By using the Dependence and Impact Assessment tool (WRI, 2008), it was also possible to identify those forest ecosystem services that have been affected by these industries in a positive (+) or negative way (-) in all the production, processing and distribution phases before reach the markets (Table 26).

Table 26. Business Impacts on Forest Ecosystem Services

Ecosystem services	CROPS		ANIMAL BREEDING		PLANTATIONS	
	(+)	(-)	(+)	(-)	(+)	(-)
Provision						
Crops	†					
Livestock			†			
Capture fisheries		—				—
Aquaculture						
Wild foods		—	†	—		—
Timber and other wood fiber		—		—	†	
Fibers and resins		—		—		—
Animal Skins			†			
Sand						
Ornamental resources						
Biomass fuel	†		†		†	
Freshwater		—		—	†	—
Genetic resources		—				—
Biochemical, medicines, pharmaceuticals	†					
Regulating						
Maintenance of air quality		—		—	†	—
Global climate regulation		—		—	†	—
Regional/local climate regulation		—		—	†	—
Regulation of water timing and flows		—		—	†	—
Erosion control		—		—	†	—
Water purification and waste treatment		—		—	†	—
Disease mitigation				—		
Maintenance of soil quality		—		—		—
Pest mitigation		—		—		—
Pollination	†	—		—		—
Natural hazard mitigation						
Cultural						
Recreation and ecotourism		—		—		—
Ethical and spiritual values		—		—		—
Educational and inspirational values		—		—		—
Supporting						
Habitat		—		—	†	—
Nutrient Cycle		—		—	†	—
Biologic material primary production		—		—	†	—
Water cycling		—		—	†	—

As shown in Table 26, the negative impacts (—) on forest ecosystems are considerably more common than the positives (†) ones, especially if we consider that the positive impacts came from the increase of commodities production as crops, livestock and

plantations when these commodities, at the same time, are the main drivers of deforestation and pollution of the Amazon rainforest.

The number of positive (+) and negative (-) business impacts on forest ecosystem services for each economic sectors can be seen in table 27.

Table 27. Summary of Business Impacts on Forest Ecosystem Services

SECTOR	BUSINESS IMPACTS			Total Number of Forest Ecosystem services
	Positive (†)	Negative (—)	None	
CROPS	3	22	8	33
ANIMAL BREEDING	4	21	8	32
PLANTATIONS	13	21	8	32

The crops sector impacts on four (4) of the thirty-two (32) FES in a positive way. At the same time, it impacts in a negative way on twenty-two (22) of the thirty-two (32) FES. A similar pattern happens with the Animal breeding sector, but it impacts negatively on twenty-one (21) of the total FES.

In the case of Plantations, the number of positive impacts increases up to thirteen (13), because forest plantations provide multiple ecosystem services during their lifetime before being felled, but it was also possible to identify that plantations adversely affect twenty-one (21) of the thirty-two (32) FES.

It can be possible to identify certain level of overlap between the three economic activities. They compete among themselves for two main resources: land and water.

In the case of land, farmers faces the dilemma of opportunity cost, normally leaning by the activity that provides the most benefit. However, freshwater is an irreplaceable resource that has no substitute, the problem is usually availability.

It can also be identified certain ecosystem services that are affected positively and negatively at the same time. For example, the three economic activities are aimed at the production of goods (crops, meats, biomass fuel etc.). The availability of these products reduces demand for forest products as wild foods, firewood collection, etc. (positive impact) but also deforestation affects these natural resources (negative).

Table 28. Business Positive and Negative impacts on Forest Ecosystem Services

Services Categories	IMPACTS	
	POSITITVE	NEGATIVE
<i>Provision</i>	Crops Livestock Wild foods Timber and other wood fiber Animal Skins Biomass fuel Freshwater	Capture fisheries Wild foods Timber and other wood fiber Fibers and resins Freshwater Genetic resources
<i>Regulating</i>	Maintenance of air quality Global climate regulation Regional/local climate regulation Regulation of water timing and flows Erosion control Water purification and waste treatment Pollination	Maintenance of air quality Global climate regulation Regional/local climate regulation Regulation of water timing and flows Erosion control Water purification and waste treatment Disease mitigation Maintenance of soil quality Pest mitigation

<i>Cultural</i>		Recreation and ecotourism Ethical and spiritual values Educational and inspirational values
<i>Supporting</i>	Habitat Nutrient Cycle Biologic material production Water cycling	Habitat Nutrient Cycle Biologic material production Water cycling

Table 28 shows the forest ecosystem services that are mostly affected (positive and negative) by the three economic sectors. It is important to point out that in the case of *Provision Services*, positive and negative impacts are well balanced, all the economic sectors contribute to enhancing the supply of basic products and therefore to reducing the consumption of natural species (e.g. wild food, timber, etc.).

It is not the case of *regulating and supporting services* that are heavily negatively affected by the three economic sectors but only plantations contribute with the provision of positive impacts. As it was mentioned before Plantations provide multiple ecosystem services during their lifetime, after being felled and without restoration is difficult to measure the positive impacts. And in the case of *cultural services*, none of the economic activities contribute for its enhancement but all of them adversely impact these services.

It can be stated that there is a *high level* of negative impact in almost all the thirty-two (32) identified forest ecosystem services and only some of them are enhanced by the provision or supply of new products (i.e. commodities).

Results of our analysis show strong evidence that the inequality between corporate negative impacts versus positive impacts is putting at risk the sustainability of the forest ecosystem services that the Amazon basin provide so as the business performance. If this trend continues in the following years it could be expected that the production of goods is threatened, as well as food security in markets that are served by these products.

Scoring corporations CSR reports

RESULTS: Analyze and score corporations' conformance with the PSI and with the environmental aspects of the Global Reporting Initiative – GRI guidelines.

AGRICULTURAL CORPORATIONS

Table 29 contains the scoring of seven (7) agricultural corporations that were selected for this analysis. Their sustainability reports were analyzed under each environmental topic some communicate more prolifically than others.

Table 29. Agricultural Corporations, scoring by Environmental Topics (PSI).

Topics	CARGIL	LOUIS DREYFUS	COAMO	SYNGENTA	NIDERA	C.VALE	BUNGE
Intent							
Accountability	4	4	3	4	4	4	4
Management	7	6	5	7	8	7	8
Environment Policies	9	11	8	10	13	9	12
Vision	3	3	2	3	4	4	4
Reporting & Performance							
Materials & Packaging	6	6	6	12	7	7	9
Energy	12	12	8	12	12	7	12
Water	12	12	9	12	12	7	12
Biodiversity	9	6	8	12	9	9	7
Emissions	10	12	7	9	11	6	10
Effluents and Waste	5	12	9	12	12	8	12
Transport	6	5	5	9	11	6	9
Overall Expenditures	12	8	9	8	8	8	12
Suppliers Assessment	12	7	8	9	12	8	12
Complain Mechanism	-	-	-	-	12	-	6
Over 150 Maximum Points	106	104	88	120	136	101	129
Percentage of fulfillment	71%	69%	59%	80%	91%	68%	86%

Table 30 contains the summary of the scoring per each company, they are listed in order of maximum to minimum scores and grades obtained. It was also possible to grade (B-) and quantify the percentage of fulfillment with PSI index of the Agricultural Sector as a whole (75 percent).

Table 30. Summary of scoring and grades per each Agricultural Corporation

CROPS (SOY)	SCORE	
CORPORATION	(Over 150)	Grade
- NIDERA	136	A-
- BUNGE	129	A-
- SYNGENTA	120	B+
- CARGIL	106	B
- LOUIS DREYFUS	104	B
- C. VALE	101	B
- COAMO	88	C+
Sector (%)	75%	B-

Table 31 contains a summary of the Agricultural Reporting topics in order of percentage of fulfillment with PSI and the Global Reporting Initiative – GRI G4 Standards.

Table 31. Agricultural Environmental Reporting Topics

GRI - G4 ENVIRONMENT.	Environmental Reporting & Performance Topics	Fulfillment with PSI
EN: 8-9-10	Water	91%
EN: 3-4-5-6-7	Energy	90%
EN: 22-23-24-25-26	Effluents and Waste	84%
EN: 32-33	Supplier Assessment	83%
EN: 31	Overall Expenditures	79%
EN: 15-16-17-18-19-20-21	Emissions	78%
EN: 11-12-13-14	Biodiversity	72%
EN: 1-2- 27- 28	Materials & Packaging	64%
EN: 30	Transport	60%
EN: 29-34	Complaints Mechanisms	21%

Water and Energy consumption were the topics that show higher percentage of fulfillment, consumption efficiency of these resources is part of the corporate cost recovery strategy, therefore companies dedicate special attention in good performance of them:

In fiscal 2014, we improved energy efficiency by 4.6 percent (compared to our goal of 5 percent improvement by 2015), greenhouse gas intensity 5.1 percent (exceeding our goal of 5 percent improvement by 2015) and freshwater efficiency 8 percent (exceeding our goal of 5 percent improvement by 2015). Renewables accounted for 14.3 percent of the company's energy portfolio (surpassing our goal of 12.5 percent by 2015). *(Cargill, Brazil)*

Emissions, Effluents and Waste control are some of the topics that corporations are taking more into consideration for footprint quantification and carbon neutral objectives. Corporations that have received the highest scores in these topics are those that were able to quantify their emissions in different production process and have made actions to reduce or to offset them:

Our Greenhouse Gas (GHG) emissions for 2012 were 32.626 kg CO₂e/MT but, as with the overall increase in the energy consumption index, comparison with 2013 is difficult due to the same alterations to our methodology. The overall increase results from the same combination of factors set out in relation to energy consumption. In 2012 we reported that we produced 0.041 MT/MT of waste. However for completeness of reporting and analysis, from 2013 we include wastewater in the waste index that was reduced by 71% each year. *(Louis Dreyfus, Brazil)*

Supplier Environmental Assessment is one of the most relevant activities to control the origin of the raw material, especially products coming from the Amazon biome, some companies reported their commitment with origin control by using satellite based monitoring of suppliers and by signing the Soy Moratorium:

Nidera is a signatory to the Soy Moratorium, a pact launched to prevent the marketing of soy produced in areas designated as part of the Amazon Biome. This accord is a powerful tool in the battle against deforestation, which is posing a threat to both soil quality and biodiversity and is also a major factor in climate change. Nidera has not purchased or financed soy from producers involved in the deforestation in the Amazon Biome since 2006. *(Nidera, Brazil)*

In Brazil, our work with TNC has helped farmers grow soy more sustainably since 2004. We have helped map 11 million ha of private Brazilian land in Mato Grosso and Pará using satellite-based monitoring that enables precise evaluation of producers' compliance with the Brazilian Forest Code, helping prevent deforestation. *(Cargill, Brazil)*

The Overall Investments in environmental activities made by corporations in order to improve their environmental performance is another of the topics including in reporting, the idea is to quantify the total investments made year by year. Below some of the ways how corporations reported those investments:

Bunge is investing US\$4 million in five years of joint work, suppliers from the Mid-North of Mato Grosso and West of Bahia are now receiving technical support from TNC to fully comply with the new Forestry Code and adopt best practices in sustainable farming. Environmental Investment in environmental protection and management. In 2013, we invested over R\$ 38 million *(Bunge, Brazil)*

Investing to improve grain storage and shipment Cargill's investments in storage, handling and transportation are reducing food waste and improving food security around the world. *(Cargill, Brazil)*

Biodiversity and habitat loss are the consequence of deforestation and forest degradation, most of the CSR activities reported by corporations are directed to control the origin of the raw materials, identify the high conservation value areas, restoration of riparian forest with native species and promote trainings and studies on the impact of technologies, below some reports:

As part of its environmental program, C.Vale encourages restoration of riparian forests and preservation of springs, by providing seedling and technical assistance on how to handle plants. All the wood used to generate energy comes from reforestation areas. C.Vale owns a reforestation area with 1.500 hectares and buys woods from farmers in order to provide energy to the industrial boulders and dryers of its grain elevators. *(C.Vale, Brazil)*

Biodiversity Protection: One of the focuses of attention in our GFP programs is the protection of bees and pollinators in general that are an important part in agriculture. Together with other industries, specialized researchers, producers and beekeepers, we take the initiative to promote studies on the impact of technologies and farming practices in the life cycle and production of bees. *(Syngenta, Brazil)*

Transportation of raw materials to the processing plants and goods to the markets is a source of CO₂ emissions; few companies in Agricultural sector considered this important link as a part of the whole production process, therefore is one of the Environmental topics with least percentage of fulfillment:

Green Logistics Reduce CO₂ emissions and is equivalent to a global target of Syngenta. In 2012, we began planning for we implement the concept of Green Logistics in Brazil. The process requires map and measure the CO₂ emission points, taking into account the number of freight, the mileage, cargo by volume and the number of used trucks. *(Syngenta, Brazil)*

Materials and Packaging: It was identified a low percentage of fulfillment with this topic, just few companies have reported the quantification of materials and packaging used and the way they were recycled or discarded.

The seed production units and sugarcane seedlings accounted for about 1.9 million used packaging and 22,000 wooden pallets. Most of the raw material of the packaging is recycled. In the case of pallets, the origin of wood is reforestation, and much is recovered and reused. In Paulinia plant, about 50% of the composition of the boxes used for packing products is also recycled material. *(Syngenta, Brazil)*

Complaints Mechanisms: The number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms is the one with the lowest percentage of fulfillment on almost all companies, which shows corporations' unwillingness for register environmental complaints, recognize mistakes and pay for them. The only good example found in the sustainability reports is reported here:

During this reporting period, a total of 15 grievances were reported to Nidera Channel through a dedicated website and email address: 12 from Argentina, 2 from the UK, and 1 from the Netherlands. These grievances were variously linked to irregularities and breaches of duty (54%), staff infractions (20%), labor abuses (13%), and product and sales claims (13%). None of them implied monetary damages such as fraud, theft, or anomalies with suppliers. *(Nidera, Brazil)*

PALM OIL CONSUMERS

Table 32 contains the scoring of environmental topics of six (6) Corporations consumers of Palm oil. The reason why, in this case, it was analyzed CSR sustainability reports of consumers instead of producers is because producers are medium size companies and traders that cannot be found in the ranking of 500 bigger companies in Latin America (America Economia Intelligence, 2013). Big consumers were identified from Palm Oil Buyers Scorecard (WWF, 2013). The same punctuation's methodology was used as before.

Table 32. Palm oil Consumers Corporations, scoring by Environmental Topics (PSI).

Topics	BASF	NATURA	UNILEVER	P&G	NESTLÉ	MC DONALD'S
Intents						
Accountability	4	4	4	3	4	4
Management	8	8	8	6	7	6
Env. Policies	9	11	12	9	10	10
Vision	4	4	4	4	4	4
Reporting & Performance						
Materials & Packaging	9	12	12	12	12	12
Energy	12	11	11	9	12	12
Water	12	11	11	12	12	12
Biodiversity	7	7	8	5	9	7
Emissions	12	12	12	12	12	9
Effluents and Waste	12	12	12	11	12	12
Transport	12	12	12	11	6	5
Overall Expenditures	10	12	9	5	8	8
Supplier Assessment	12	12	12	7	12	12
Complaints Mechanisms	5	12	9	5	-	-
Total possible points: 150	129	140	137	111	120	113
Percentage of fulfillment	86%	94%	91%	74%	80%	76%

Table 33 contains the summary of the scoring per each company, they are listed in order of maximum to minimum scores and grades obtained. It was also possible to grade (B+) and quantify the level of fulfillment with PSI index of the Palm oil consumers as a whole (83 percent).

Table 33. Summary of scoring and grades per each Palm Oil Consumers Corporation

PALM OIL CONSUMERS (Palm Oil)	SCORE		
CORPORATION	(Over 150)		Grade
- NATURA	140		A+
- UNILEVER	137		A-
- BASF	129		A-
- NESTLE	120		B+
- MC DONALD'S	113		B+
- P & G	111		B
83%			B+

Table 34 contains a summary of the Palm Oil Consumers reporting topics in order of the percentage of fulfillment with PSI index and GRI G4 Standards.

Table 34. Palm Oil Consumers Environmental Reporting Topics

GRI - G4 ENV.	Environmental Reporting Topics	Fulfillment with PSI
EN: 22-23-24-25-26	Effluents and Waste	99%
EN: 8-9-10	Water	97%
EN: 15-16-17-18-19-20-21	Emissions	96%
EN: 1-2- 27- 28	Materials & Packaging	96%
EN: 3-4-5-6-7	Energy	94%
EN: 32-33	Supplier Assessment	94%
EN: 30	Transport	80%
EN: 31	Overall Expenditures	74%
EN: 11-12-13-14	Biodiversity	62%
EN: 29-34	Complains Mechanisms	43%

It has verified a high level of fulfillment of the Palm oil consumers in the following topics: Effluents and waste control, water, emissions, material and packaging and energy consumption. Some of the ways, companies reports their improvements:

A 14% reduction in total indirect energy (non-manufacturing) consumption from flexible work programs and office consolidation and 82% use of ethanol in our vehicle fleet, preventing some 7,300 tonnes of CO₂e emissions. At the end of 2013, around 61% of eligible employees at our main office were working from home, which enabled us to reduce energy consumption by an estimated 2,100 GJ and emissions by 150 tonnes of CO₂e. *(Unilever, Brazil)*

By 2020, we aim to reduce our greenhouse gas emissions per metric ton of sales product by 40% compared with baseline 2002. We achieved a reduction of 33.9% in 2014 (2013: reduction of 34.1%). Since 1990, we have been able to lower our overall greenhouse gas emissions from BASF operations (excluding Oil & Gas) by 48.8% and even reduce specific emissions by 74.1%. *(BASF, Brazil)*

With the increase in production (17% growth in the volume of units produced) in 2013 absolute energy consumption grew by 5%, from 270.1 terajoules (tJ) to 284.2 tJ. However, natura obtained a reduction in relative energy consumption, which considers energy expenditure per unit produced. During the year, this indicator dropped 10%, from 436.4 kJ per unit produced to 392.2 kJ /unit produced, demonstrating improved eco-efficiency. *grl g4-en3/en5. (Natura, Brazil)*

Achieve further reduction of 20% (per unit of production) in energy consumption, CO₂ emissions, waste disposal and water consumption on the premises of P & G, leading to a total reduction of at least 50% in a decade. Also 30% increase in the use of renewable energy in our factories. • Reduce the disposal of industrial waste in landfills to less than 0.5% of inputs. • Reduce the trucking by 20% per unit of production. *(Procter & Gamble, Brazil)*

The Overall Investments in environmental activities

Specifically regarding sustainability-related investments and measures, total spending in 2013 was R\$ 127.7 million. The significant growth over the previous year was due to new projects, such as the Souline, classified under research into new technologies, and other initiatives that were reassessed and included in the company's sustainability investment matrix. *(Natura, Brazil)*

Suppliers' assessment is still a sensitive topic, however most of the analyzed companies perform well in suppliers monitoring, without a much bigger effort, many will fail to meet their own targets of 100 percent certified sourcing by 2015.

The global palm oil supply chain as it now exists may well contain illegal palm oil that has caused damage to some of the Amazon's most important protected areas. Corporations that want to guarantee their products don't contain unacceptable and illegal palm oil must insist on fully segregated certified sustainable palm oil -CSPO (WWF, 2013), and growers need to stick to this standard and buyers of palm oil need to support them. A good example of fulfillment is Unilever that achieved in 2012, 100 percent of consumption from certified sources.

Our commitment to achieving 100% sustainably sourced agricultural raw materials involves investments to ensure socio-environmental excellence criteria in the practices of suppliers of ten raw materials which, together, account for 70% of Unilever's global purchase volume: palm oil, paper and cardboard; soy; sugar; tea; fruits and vegetables; sunflower oil; rapeseed oil; dairy ingredients; and cocoa. By 2012, we had reached our target – originally set for 2015 – of acquiring Green Palm certificates (attesting the origin of palm oil) for 100% of the palm oil we consume worldwide. (*Unilever, Brazil*)

In biodiversity protection, analyzed corporations reported small number of environmental activities. This diffusion of responsibility over this important topic happens in part because it is an external topic. The implementation of environmental activities also require the allocations of financial resources outside the limits of corporations' facilities (processing plants), and also demand of additional skills that are not necessarily the expertise of the companies, therefore, they prefer to believe that *Biodiversity* conservation is off their responsibility.

ANIMAL BREEDING SECTOR

Table 35 contains the scoring of all seven (7) Animal Breeding corporations that were selected for this analysis. Their sustainability reports were analyzed under each environmental topic as presented in Tables 20 and 21 (pgs. 81-82), thirty (30) points were consider for Intents & Plans, a hundred (100) points for Reporting & twenty (20) points more for Performance, for a sum of 150 as total possible points. Table 35 also present the total score and percentage of fulfillment with PSI index.

Table 35. Animal Breeding Corporations, scoring by Environmental Topics (PSI).

Topics	JBS	BRF	MARFRIG	NESTLÉ	NUTRESA	ALICORP	MC DONALD'S
Intent							
Accountability	4	4	4	4	4	3	4
Management	6	7	7	7	7	6	6
Environment Policies	10	9	11	10	8	7	10
Vision	4	4	4	4	4	2	4
Reporting & Performance							
Materials & Packaging	7	12	8	12	12	9	12
Energy	12	12	12	12	12	12	12
Water	12	12	12	12	12	12	12
Biodiversity	5	6	11	9	6	5	7
Emissions	12	12	12	12	12	12	9
Effluents and Waste	12	12	12	12	12	9	12
Transport	9	12	11	6	6	7	5
Overall Expenditures	11	12	12	8	12	12	8
Supplier Assessment	8	8	12	12	7	5	12
Complain Mechanism	-	7	-	-	12	-	-
Total possible points: 150	113	129	128	120	126	101	113
Percentage of fulfillment	75%	86%	86%	80%	84%	68%	76%

Table 36 contains the summary of the scoring per each company, they are listed in order of maximum to minimum scores and grades obtained. It was also possible to grade (B) and quantify the level of fulfillment of the Animal Breeding Sector as a whole (79 percent).

Table 36. Summary of scoring and grades per each Animal Breeding Corporation

ANIMAL FOOD (BEEF)	SCORE	
CORPORATION	(Over 150)	Grade
- BRF FOODS	129	A-
- MARFRIG	128	A-
- G.NUTRESA	126	A-
- NESTLÉ	120	B+
- JBS	113	B+
- MC DONALD`S	113	B+
- ALICORP	101	B
Sector (%)	79%	B

Table 37 contains a summary of the Animal Breeding Reporting topics in order of the percentage of fulfillment with PSI and with the Global Reporting Initiative – GRI G4 standards.

Table 37. Animal Breeding Environmental Reporting Topics

GRI - G4 ENVIRONMENT.	Environmental Reporting & Performance Topics	Fulfillment with PSI
EN: 3-4-5-6-7	Energy	100%
EN: 8-9-10	Water	100%
EN: 22-23-24-25-26	Effluents and Waste	97%
EN: 15-16-17-18-19-20-21	Emissions	96%
EN: 31	Overall Expenditures	90%
EN: 1-2- 27- 28	Materials & Packaging	87%
EN: 32-33	Supplier Assessment	77%
EN: 30	Transport	66%
EN: 11-12-13-14	Biodiversity	58%
EN: 29-34	Complaints Mechanisms	23%

Water and Energy: The reduction in consumption of both resources means a reduction of production costs for companies, therefore, the control and efficient use of water and energy have become mandatory practices in all industries. It was observed that many Corporations in Animal breeding sector made significant investments in its industrial plants to facilitate the consumptions of clean energy sources:

The project allowed the company to reduce the use of natural resources in the production of the burger, such as a 21% reduction in water consumption, a cut of 13% in energy and an increase of 214% in the recovery of by-products, which are meant for other initiatives. *(JB, Brazil)*

In 2013, we reduced direct water withdrawals in every product category, achieving an overall reduction per ton of product of 33% since 2005. We have carried out nine water resource reviews at new facilities, bringing the global number of factories reviewed to 126. By 2015 – Reduce direct water withdrawals per ton in every product category to achieve an overall reduction of 40% since 2005. *(Nestle, Brazil)*

Effluents, emissions, and Waste control are some of the topics that corporations are taking more into consideration for sustainability reporting. Corporations that have received the highest score in these topics are those that were able to quantify their emissions and have made actions to reduce or to offset them:

JBS developed two CDM projects in Brazil in the processing facilities of Barra do Garças (MT) and Vilhena (RO), with the goal of avoiding the generation and consequent emission of methane into the atmosphere, resulting from the treatment of industrial effluents. Both projects are registered with the United Nations Framework Convention on Climate Change (UNFCCC). *(JB, Brazil)*

In general, the Scope 1 emissions decreased by around 15.8% as a result of divestments, which positively impacted the fall of wastewater treatment emissions (63% reduction) as well as biogenic emissions (62%). also recorded a reduction of emissions from transportation of materials, products and wastes. emission increases occurred in the physical-chemical processing, in view of emissions. *(Marfrig, Brazil)*

The Overall Investments made by corporations in order to improve their environmental performance, and therefore, contribute with the sustainability of the environment is other of the topics considered in this evaluation:

For 2014, 26 environmental projects are planned, with an estimated investment of R\$ 7.1 million. In addition, a new Investment Plan of US\$ 17.7 million is already in place, contemplating the new processing facilities acquired by JBS. From this amount, 83% will be for the treatment of wastewater, 2.7% for solid waste, 6.4% for air emissions from boilers, 1.5% for water treatment and the remaining 6.4% for other projects to mitigate environmental impacts. *(JB, Brazil)*

Our investments and expenses associated with the environment amounted to COP 15.442 million. *(Grupo Nutresa, Colombia)*

Materials and Packaging: Animal breeding sector shows a better percentage of fulfillment with the use, recycle and discard of materials in comparison with agricultural corporations. Companies mentioned the consumption of certified materials (e.g. FSC paper) and also the implementation of recycling programs to extend the life cycle of some materials as packaging:

To ensure proper use of resources, reduce waste and generate savings, Packaging Development area has made the reduction of plastic PET bottles used for producing oil, redesigning boxes for better use of materials, reduction weight Manty margarine pot, glass bottle change to bottle PET for packaging vanilla, among other initiatives. *(Alicorp, Peru)*

The separate collection program is increasingly present in McDonald's restaurants; the garbage separation system (waste) in the restaurants, as well as provide a reduction in the amount of waste sent to landfills, helps to raise awareness of employees and customers about the environmental importance of recycling, encouraging them to carry out the proper disposal of materials organic and recyclable. *(Mc Donald's, Brazil)*

Supplier Environmental Assessment: Amazonian Governments and environmental organizations have been conducting strong campaigns against companies that are not able to measure the origin of its raw materials, for this reason, some companies reported their commitment with origin control by using satellite based monitoring of suppliers and other tools:

Until 2014, 17.1% of spend of suppliers was signed the code of conduct for Suppliers. In addition to the code of conduct, the Supply Sustainability index (SSi) System evaluates seven criteria in supplier: sustainability, regulatory compliance, operational management, social management, environmental management, future vision and innovation. From this evaluation, we have an important framework of suppliers, which can determine from improvements in chain to the monitoring of activities. In 2014, 100% of the critical/priority suppliers were evaluated in the SSi. *(BRF, Brazil)*

In 2013, McDonald's launched a pilot project with AgroTools to map all of the Brazilian cattle farms in the McDonald's beef supply chain using satellite imagery and GPS devices. The web-based platform developed by AgroTools provides McDonald's with access to the name of the farm and city and state where it is located, as well as the quantity of animals, date of the slaughter and the specific McDonald's-approved abattoir in which those animals were slaughtered. *(Mc Donald's, Brazil)*

Transportation of raw materials to the processing plants and goods to the markets as well as people is another source of CO₂ emissions, few companies measure their impacts on air pollution due to goods transportation.

BRF acts to mitigate the negative impacts of the transport operation through the health, Safety and environment (HSE) program. The 68 largest carriers of refrigerated segment are part of the integrated Management program of Suppliers (Gif, portuguese acronym), which guides the carrier to increase its profitability and sustainability of business in a self-assessment tool later validated by BRF. In the program, 54% of participating carriers properly perform waste disposal, and 35% of the fleet was evaluated in smoke tests, with a 95% approval rating. *(BRF, Brazil)*

The Clean Transport Manual The “Clean Transport Manual,” led by NOEL – with advice from GAIA and the participation of seven transport companies for that business – aims to find efficiencies in the transport processes and the reduction of their GHG emissions. This project, conducted with the cooperation of all the links in the value chain, was published on the Grupo Nutresa and the National Association of Industrialists of Colombia. *(Grupo Nutresa, Colombia)*

The protection of *habitats and areas of high biodiversity value* is one of the most important environmental activities, however, the percentage of fulfillment with this PSI topic in Animal breeding sector is still very weak. Most of the seven (7) Corporations presented a set of random and unquantifiable activities which proves that they do not clearly understand the role they have to play to guarantee the protection of these sensitive areas:

Our perspective Nestlé is committed to developing its business in a way that safeguards natural capital and, in particular, biodiversity and ecosystem services. We have taken a proactive role in tackling deforestation, particularly in palm oil, through our work to drive traceability, our work directly with suppliers and our support for the goal of the Consumer Goods Forum to achieve zero net deforestation by 2020. *(Nestle, Brazil)*

At McDonald’s, we view protection of forests and High Conservation Value areas as important business and societal issues and believe our role is not just to avoid negative impacts, but to promote responsible production that benefits people, communities and the planet. We believe that an effective approach towards addressing deforestation will require strong collaboration between governments, civil society and the private sector. *(Mc Donald’s, Brazil)*

The Number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms is the one with the lowest level of fulfillment with PSI of almost all companies, which shows corporations' unwillingness for register environmental complaints or to recognize their mistakes and pay for them.

The same pattern was seen in the Agricultural sector:

BRF is committed to the investigation of incidents involving social and environmental impacts of its production chain. Through an internal standard for environmental communication, flows and heads are set, as well as how to answer the protester. Actions involve the factories and the corporate area of environment, and are linked to the risk mitigation strategy. *(BRF, Brazil)*

In 2013 there were no incidents or events that caused harm to the environment or decisions made by the environmental authorities that highlighted any breach of environmental regulations in the countries in which we are present. *(Grupo Nutresa, Colombia)*

FOREST PLANTATIONS

Table 38 contains the scoring of the three (3) Forest Plantation corporations that their sustainability reports were analyzed. Thirty (30) points were consider for Intents & Plans, a hundred (100) points for Reporting & twenty (20) points more for Performance, for a sum of 150 as total possible points. Table 38 also present the total score and percentage of fulfillment with PSI index and GRI environmental topics.

Table 38. Plantations Corporations, scoring by Environmental Topics (PSI).

Topics	FIBRIA	SUZANO	KLABIN
Intent			
Accountability	4	4	4
Management	8	6	8
Environmental Policies	11	10	13
Vision	3	4	4
Reporting & Performance			
Materials & Packaging	8	9	12
Energy	11	9	12
Water	7	11	12
Biodiversity	12	12	12
Emissions	12	12	12
Effluents and Waste	12	12	12
Transport	12	6	10
Overall Environmental Expenditures	10	12	12
Supplier Environmental Assessment	8	8	8
Environmental Complains Mechanisms	12	7	5
Total possible points: = 150	131	123	136
Percentage of fulfillment	87%	82%	91%

Table 39 contains the summary of the scoring per each company, they are listed in order of maximum to minimum scores and grades obtained. This economic activity is the one that shows the highest grade (A-) and percentage of fulfillment (87 percent) in comparison with other economic sectors. It can be speculated that part of the

reason of this is because forestry sector has a long history of bad reputation, it is consider for many the main driver of the deforestation of the Amazon rainforest. Therefore, corporations have made a huge efforts to improve that image. Another advantage could be that all Plantation corporations have passed, long time ago, for forest certification processes that include silvicultural activities, the control of legality and biodiversity loss, and many other issues.

Table 39. Summary of scoring and grades per each Plantations Corporation

PLANTATIONS (PULP)	SCORE		
CORPORATION	(Over 150)		Grade
- KLABIN	136		A-
- FIBRIA	131		A-
- SUZANO	123		B+
	87%		A-

Table 40 contains a summary of the Plantation reporting topics in order of the percentage of fulfillment with PSI and the environmental topics of GRI G4 Standards.

Table 40. Plantations Environmental Reporting Topics & Fulfillment

GRI - G4 ENVIRONMENT.	Environmental Reporting & Performance Topics	Fulfillment with PSI
EN: 15-16-17-18-19-20-21	Emissions	100%
EN: 22-23-24-25-26	Effluents and Waste	100%
EN: 11-12-13-14	Biodiversity	100%
EN: 31	Overall Expenditures	94%
EN: 3-4-5-6-7	Energy	90%
EN: 8-9-10	Water	84%
EN: 1-2- 27- 28	Materials & Packaging	82%
EN: 30	Transport	78%
EN: 32-33	Supplier Assessment	70%
EN: 29-34	Complains Mechanisms	67%

Environmental Topics

Emissions, Effluents, and Waste

Reduce by 91% the amount of solid waste at landfills by decreasing from 60 kg per ton of pulp in 2011 to 5 kg per ton of pulp in 2025: reduction in the generation of waste by the mills and reuse of waste in the soil. Benefits: reduction of the impacts and risks caused by industrial landfills, increase in ecoefficiency of the company's production processes, reduction in costs for the disposal of waste and substitution of supplies. *(Fibria, Brazil)*

Since 2011, we have been offering the market a portfolio of papers with their carbon footprints offset. This means that all GHG emissions during their life cycles are offset through carbon credits acquired in the market. *(Suzano, Brazil)*

Biodiversity

Promote environmental restoration in 40 thousand hectares of own land, between 2012 and 2025, with native species and stimulate the natural regeneration of native species. Benefits: enrichment of fauna and flora, including endangered species, in the Atlantic Rainforest and the Cerrado biomes. Expansion of environmental services – carbon capture and water availability and quality, among others – areas whose original features have been altered due to human activity. *(Fibria, Brazil)*

At our Forestry unit, we have allocated over 317,000 hectares to Permanent Preservation Areas (APP), Legal Reserves (RL) and other areas, which signifies that 39% of our areas are allocated to environmental conservation. During the year, we concluded a Biodiversity Conservation macro plan. The initiative covers the Atlantic Forest, Cerrado, Caatinga and Legal Amazonia biomes. *(Suzano, Brazil)*

The Overall Investments

In 2012, we invested more than R\$19 million in operational improvements that can reduce the impacts of our activities and more than R\$10 million in monitoring and conservation of natural resources, as well as the restoration and continuation of environmental education projects, among others. *(Suzano, Brazil)*

In 2013, the Company invested R\$ 23.93 million in initiatives and technologies to protect the environment. The main accomplishments of the last year were: Treatment of ash from the recovery boiler at the Otacilio Costa Plant (SC), in which R\$ 7.8 million was invested; start of project to collect and burn Diluted Non-condensable Gases (DNCG) at the Monte Alegre Plant (PR), with an investment of R\$ 3.4 million; and Improvements to the effluent treatment plant at the Monte Alegre Plant (PR), with investments of more than R\$ 600 thousand *(Klabin, Brazil)*

Water and Energy:

The Company constantly makes investments to improve its processes and make the best use of this natural resource. At the Otacilio Costa Plant (SC), for example, less than 28 m³ of water were used for each ton of paper produced, a rate that represents a reduction of 54% in comparison with 2009 and was achieved after the introduction of a project to optimize refrigeration in the production process. *(Klabin, Brazil)*

increasing net capture from 5.5 million tCO₂eq, in 2011, to 11.1 million tCO₂eq, in 2025, through: increase in forest areas (eucalyptus plantations and native reserves) and restoration with native species of degraded pasture areas. Benefits: reducing atmospheric concentrations of greenhouse effect gases *(Fibria, Brazil)*

Materials and Packaging:

The initiative involves nearly 4,000 recyclable material collectors from 80 recycling cooperatives and reduces pressure on landfills in metropolitan areas, with the potential to remove more than 37 million long-life packages from circulation. *(Suzano, Brazil)*

Transportation

With the utilization of the cabotage model to ship its production, reduction of emissions for transport of the same quantity of paper is 91% less compared to road transport. *(Klabin, Brazil)*

Supplier Environmental Assessment

Fibria's Integrated Management Policy is in full compliance with the requirements of Forest Stewardship Council®, and CERFLOR Forest Management Principles and Criteria NBR, CERFLOR Chain of Custody. In order to ensure that these objectives are met, in all wood procurement procedures, the company shall perform internal risk assessments regarding all suppliers of forestry products, in compliance with FSC-STD-40-005 and NBR 14790 standards. *(Fibria, Brazil)*

Complaints Mechanisms

Social Dialogs, take place in São Paulo and are an opportunity for the company to talk to many local players in order to identify the positive and negative social and environmental impacts resulting from our activities in the region. Additionally, we collaborate with the municipality's sustainable development, the development of partnerships and the fostering of social and environmental initiatives; *(Suzano, Brazil)*

Harmonizing FES with GRI-G4

RESULTS: Harmonizing the four categories of Forest Ecosystem services (FES) with the environmental aspects of the Global Reporting Initiative – GRI Standards (G4).

For the purpose of this research, the GRI Standard in its version G4 (2014) that contains ten (10) Environmental topics and thirty-four (34) disclosure titles (ENs) were analyzed and linked with the four (4) categories of the forest ecosystem services (FES) and with its thirty-two (32) sub-categories. The details of this analysis is summarized in the *Appendices section*. Annex 4. Table 41 shows a summary of the harmonization between GRI-G4 and the forest ecosystem services.

Table 41. Harmonization between GRI-G4 and Forest Ecosystem Services.

GRI - Environmental Standard		Ecosystem services
EN-G4	Environmental Aspects	Service required or enhanced
EN: 1-2- 27- 28	1. Materials & Packaging	1. Provision service
EN: 3-4-5-6-7	2. Energy	1. Provision, 2. Regulating
EN: 8-9-10	3. Water	1. Provision, 2. Regulating, 3. Cultural, 4. Supporting
EN: 11-12-13-14	4. Biodiversity	1. Provision, 2. Regulating, 3. Cultural, 4. Supporting
EN: 15-16-17-18-19-20-21	5. Emissions	2. Regulating
EN: 22-23-24-25-26	6. Effluents and Waste	2. Regulating, 4. Supporting
EN: 30	7. Transport	2. Regulating
EN: 32-33	8. Supplier Assessment	1. Provision, 2. Regulating, 3. Cultural, 4. Supporting
EN: 29-34	9. Complaints Mechanisms	1. Provision, 2. Regulating, 3. Cultural, 4. Supporting
EN: 31	10. Overall Expenditures	1. Provision, 2. Regulating, 3. Cultural, 4. Supporting

Table 42 contains a different way to harmonize the forest ecosystem services (FES) with Environmental Aspects of GRI – G4. In this case, it was possible to relate the kind of forest service with each of the ten (10) environmental topics of GRI-G4.

Table 42. Harmonizing the FES with GRI-G4 Environmental Aspects.

Forest Ecosystem Services (FES)	GRI - Environmental Aspects related with FES	# GRI topics in FES	Percentage (%) over 10 topics
1. Provision	1. Materials & Packaging, 2. Energy, 3. Water, 4. Biodiversity 8. Supplier Assessment 9. Complaints Mechanisms 10. Overall Expenditures	7	70%
2. Regulating	2. Energy, 3. Water 4. Biodiversity 5. Emissions, 6. Effluents and Waste, 7. Transport 8. Supplier Assessment 9. Complaints Mechanisms 10. Overall Env. Expenditures	9	90%
3. Cultural	3. Water, 4. Biodiversity 8. Supplier Assessment 9. Complaints Mechanisms 10. Overall Env. Expenditures	5	50%
4. Supporting	3. Water, 4. Biodiversity 6. Effluents and Waste 8. Supplier Assessment 9. Complaints Mechanisms 10. Overall Env. Expenditures	6	60%

Provision services account with seven (7) of the ten (10) environmental topics of GRI-G4 standard or 70 percent represented. Regulating services contains 90 percent of the ten (10) environmental topics. Thus, it is possible to argue that these two categories of FES are the most evident and well represented in the GRI-G4 Standard, therefore the ones that corporations report more frequently.

It is not the same case of *cultural and supporting* forest ecosystem services, these two categories are included in 50 percent and 60 percent respectively of the ten (10) environmental topics of GRI-G4 standard, therefore they are not so evident and corporations do not report nor include environmental activities so frequently.

Table 43 shows the environmental topics which presented the best percentage of fulfillment by analyzed economic sectors, and the forest ecosystem services categories that are enhanced by corporations' environmental activities.

Table 43. Environmental Topics with best fulfillment per each Economic Sector

Economic Sector	Environmental Topics with best Fulfillment	Forest Ecosystem Services enhanced
Crops (Soy)	Water, Energy, Effluents & Waste, Supplier Assessment and Emissions	Regulating, Provision and Supporting
Consumers (Palm Oil)	Effluents, Water, Emissions, Materials & Packaging and Energy	Regulating and Provision
Food (Beef)	Energy, Water, Effluents & Waste, Emissions and Overall Expenditures	Regulating and Provision
Plantations (Pulp/paper)	Emissions, Effluents & Waste, Biodiversity, Overall Expenditures and Energy	Regulating and Supporting

The Global Reporting Initiative – GRI G4 Standard is a very solid reporting tool that require companies to present evidence of the activities that contribute to address their environmental impacts. *Regulating and provision services* are the ones with higher percentage of fulfillment with PSI and environmental topics of GRI, but *supporting* and especially *cultural services* are the ones with lowest consideration.

It is therefore clear that companies focus their efforts on reporting activities that are directly linked to the categories of *regulating and provision* rather than with *cultural and supporting* services that are not so obvious in the standard. The GRI standard should make a greater effort to highlight these services as they are an essential part of the environmental services that forests provide.

5. CONCLUSIONS

Interconnections identified

Interconnection # 1.

Assess the level of dependence the three economic sectors linked with the "forest risk commodities" have for the forest ecosystem services.

From the socio-ecological system perspective, the results obtained in the assessment of the level of mutual dependence of commodities production and forest ecosystem services allow us to conclude that from now this "mutual" dependence has been improving only corporations' performance and only few forest ecosystem services.

This pattern suggested that companies do not see FES as inputs to improve their production performance. They do not put FES in the same level as labor, machinery, technology or fertilizers, FES are just taken for granted. Therefore they are rarely reflected in decision-making and they are under threat. This statement is also corroborated by Muller, A. et al (2015) TEEB for Agriculture & Food.

This research was identified that the selected three economic sectors have a *high level* of dependence on at least twelve (12) of the thirty-two (32) forest ecosystem services and a *Medium level* of dependence on four (04) more of them.

At the same time, it was also possible to assess that 70 percent of the thirty-two (32) forest ecosystem services were adversely affected by business activities and only 15 percent of them were enhanced. These business practices suggests an increasing risk for the own companies, therefore, more efforts are needed to guarantee the sustainability of the Amazon rainforest system that is described in this model.

All three economic sectors use forest ecosystem services as inputs for commodities production or to influence environmental conditions required for successful corporate performance. Some of these services, such as freshwater, air quality or climate regulation, are irreplaceable; therefore, it is fair to state that without the provision of these natural services, in the near future, corporations would be unable to continue producing commodities at the same rate as now or production costs would be higher.

Ecosystems degradation poses a number of risks to corporate performance as well as creates new business opportunities. This was also stated by Hanson, et al. (2008), companies often fail to make the connection between the health of ecosystems and the business bottom line.

By gathering and analyzing environmental data, corporations have the opportunity to understand their exposure to the risk of environmental changes and customize their strategies to profit from new commercial opportunities (Boer, Y. KPMG, 2013); therefore they could create long term value and resilience to environmental change. In this sense, CSR activities should generate the maximum value for both shareholders and society.

Interconnection # 2.

Analyze and score corporations' fulfillment with the PSI and with the environmental aspects of the Global Reporting Initiative – GRI guidelines

The main goal of this research was to analyze the CSR reports of the top twenty-one (21) corporations in Latin America linked with the four commodities associated with Amazon deforestation (i.e. soy, beef, paper/pulp and palm oil) to assess if their CSR activities reduce and offset their impacts on the environment and therefore maintain the ecosystem equilibrium of the Amazon rainforest.

The sustainability reports of these corporations were scored and the results obtained reveal the average economic sector fulfillment with PSI index and with the ten (10) environmental topics of the GRI G4 standard: Crops, especially Soy (B) 75 percent of fulfillment; Palm Oil Consumers (B+) 83 percent, Animal Breeding, especially Beef (B+) 79 percent; and Plantations for Pulp/paper (A-) 87 percent.

The methodology and tools (PSI) used to obtain these results do not allow us to assess if the scores obtained compensate the same percentage/level of corporation's impacts on environment, therefore further research is needed to define a methodology that allows us to reach more definitive conclusions.

In this sense, it was possible to identify limitations in the use and control of CSR standards. This tool allows corporations to develop their own units of measurement

of impacts, but there is not a harmonization of units and minimum percentages of reduction of impacts per year, so that, fulfillment with the standard depends on the free will or willingness of each company.

This non-certified system (i.e. CSR) becomes very flexible in setting goals and times, which does not guarantee mitigation and compensation of environmental impacts on time. It was not possible for this study to determine whether 100 percent of fulfillment with PSI and GRI of the CSR standard ensures the sustainability in our Amazon rainforest model.

CSR is a voluntary system, which shows willingness of some companies of being regulated by stakeholders. Corporations' motivations to engage with CSR are multiple, instrumental, political, integrative and ethical (Garriga & Melé 2004); whatever the motivation, many companies have invested in CSR activities just before economic performance was compromised or to avoid reputational risks.

Without real economic incentives (coming from Governments or other sources), only those businesses facing serious reputational risk have chosen to be in the vanguard of change. But the vast majority of buyers won't get a visit from activists groups and will remain outside any regulated schemes.

Either mandatory or voluntary, CSR standard would need an independent third-party verification system to ensure fulfillment of the planned activities.

Interconnection # 3.

Harmonizing the environmental aspects of the Global Reporting Initiative – GRI Standards (G4) with the forest ecosystem services (FES).

It can be concluded that the Global Reporting Initiative – GRI G4 Standard is a very solid reporting tool that requires companies to present evidence of the activities that contribute to reduce and offset their environmental impacts. If the tool is applied properly, corporations should be able to measure their impacts and plan a set of environmental activities to compensate them.

The results of the harmonization between GRI-G4 standard and forest ecosystem services (FES) revealed that *regulating and provision services* are the services with higher integration in the GRI (90 percent and 70 percent respectively) and *supporting and cultural services* the ones with lowest relation with GRI (60 percent and 50 percent respectively.)

It is therefore clear that companies focus their efforts on reporting activities that are directly linked to the categories of *regulating* and *provision* rather than with *supporting* and *cultural* services that are not so obvious in the standard. The GRI standard should make a greater effort to highlight these services as they are an essential part of the environmental services that forests provide.

The environmental topics with best percentage of fulfillment with PSI index and GRI environmental topics were: Efficiently use of energy and water; control of emissions,

effluents and waste; use of materials and packaging recycling. All of them contribute with improvements in the following forest ecosystem services: regulating, provision and supporting services.

Suppliers' assessment is still a sensitive topic. Commodities supply chain, as it now exist, may well contain illegal raw materials that has caused damage to some of the Amazon's most important protected areas. Therefore more efforts from corporations and governments are needed to verify the origin of raw materials and to promote certification processes.

The protection of *habitats and areas of high biodiversity value* is one of the most important environmental topics considered in the GRI Standard, however, the fulfillment with this topic is still very weak. Corporations presented a set of random and unquantifiable activities which proves that they do not clearly understand the role they have to play to guarantee the protection of these sensitive areas nor to offset their impacts on biodiversity. The GRI standard should make an effort to define new guidelines and a clear set of activities that companies can implement.

Final conclusions:

The Sustainability Model, proposed for this study relies on the fact that environmental CSR activities performed by corporations reducing and offsetting their negative impacts on forest ecosystem services to ensure the equilibrium of the whole system.

However, our sustainability model is a qualitative model; it counts the number of forest ecosystem services that corporations depend and impact on, but does not quantify the level of those impacts on environment. Additionally, it counts the number of forest ecosystems services that are being compensated at some level, but the percentage of fulfillment with PSI and GRI environmental topics do not measure the level of compensation for these impacts.

The information analyzed and the results obtained make us think that the percentage of fulfillment with PSI and GRI environmental topics do not provide enough information to allow us to conclude that this balance is possible.

Market trends suggest that demands for these forest risk commodities is going to increase in the following year, therefore more efforts are needed to engage the whole supply chain to ensure the provision of these commodities and the sustainability of the Amazon rainforest

It can be concluded that there is a global tendency coming from governments, institutions, consumers and other stakeholders that request companies to improve their business practices, this leaves a hopeful look to the future and makes us think that sustainability of the model is not an impossible task but rather a challenge that we must assume all together.

6. LIMITATIONS

Several limitations were identified during this research, they were classified in:

Tools Applicability:

Dependence and Impacts tool: The Guidelines for identifying business risks and opportunities arising from ecosystem change (Hanson, et al. WRI, 2008) was adapted for this study. The methodology recommends that efforts have to be made to use the tool at company scale, business unit, or market strategy development. However, for the purpose of this analysis it was done at economic sector level. Thus the results obtained could be too general to be apply in specific cases.

The companies that were analyzed do not necessarily depend or impact all categories of forest ecosystem services that were identified per each economic sector, but it is certainly a good approximation of reality. As part of future studies it is suggested that this analysis should be done case by case, company by company, to achieve a greater level of detail in results.

The Pacific Sustainability Index (PSI) based its analysis in corporate online disclosures; for the purpose of this research, sustainability reports and other documents of the selected twenty-one (21) corporations were downloaded from their main web pages; the PSI methodology excludes data independently stored outside the main corporate website or available only in hard copy. However, the Robert Environmental Center

produces a draft report before publication and encourage all companies to provide feedback, so they can put out additional new online materials within the publication timeline, so the Center could incorporate the new information into its analysis.

It was not possible to produce a draft report and make it available for companies' review, so analysis was based in available information that sometimes were pretty old. It is fair to say that if some company sees the results of this research could argue that it wasn't be notified and maybe the current reality of the company is not reflected in the results obtained.

Data collection and information Analysis.

It is important to remember that the analysis of this study was conducted based on information produced by the same corporations that were analyzed, which by definition could be biased. On the other hand, it was not possible for this research to verify the real compliance with all the environmental activities reported, this is a serious limitation for any kind of study that use documents that were not verified by an independent third party.

A major limitation of this study was to not have detailed information on the origin of raw materials consumed by corporations. This information is not available online, and in many cases, the range of action of corporations and their network of suppliers across each country had to be infer, to link them with potential sources that could be contributing with Amazon deforestation. This was not only a limitation of our study,

but monitoring of suppliers is a common problem for companies in Amazonian countries and very few make an effort to perform a proper due diligence.

Another major limitation of this study was not having updated and first-hand information; our analysis was based on secondary sources (online) and several companies have outdated information in their websites. This situation could have been resolved through surveys. For future studies are recommended to send a survey that allow the quantification of corporate impacts and to clarify some activities.

7. FURTHER RESEARCH

The purpose of this study was mainly exploratory, therefore future research is needed to reach a higher level of detail in results.

The sustainability model of corporate impacts on the Amazon rainforest, can be presented in different ways and new variables can be added, which can strengthen the interconnections this study found.

This study defined the idea that environmental CSR activities performed by companies to offset their negative effects on forest ecosystem services could ensure the equilibrium of the model. However, the information analyzed and the results obtained make us think that the percentage of fulfillment with the PSI index and GRI do not provide enough information to allow us to conclude that this balance is possible.

From the perspective of the scores obtained by each company and the average for each economic sector, it can be conclude that they are all passing grades, and there is a corporate commitment to keep improving environmental activities in the future, however a couple of questions could be used for further research:

- Could it be say that these scores guarantee the sustainability of forest ecosystems?
- Do the scores should be closer to 100 percent (A) of fulfillment to be acceptable?

As part of future studies it is suggested that this analysis should be done case by case, company by company, to achieve a greater level of detail in results. It is also recommended to send a survey and organize interviews with Corporations' managers and other experts. Survey will be used for data collection and for better quantification of impacts of companies, the interviews to clarify some activities and results.

When assessing companies that may promote rainforest deforestation, it must be considered the analysis of their supply chain and be able to identify:

- Disclose information of company's footprint on tropical forest, and how to monitor its impact on tropical forests over time, and the assessment of whether it poses a risk to its business operations.
- The commitment of the company and its suppliers with international standards for sustainable production of agricultural commodities or sustainable management.
- The company report on the implementation of its commitments to reduce tropical deforestation.

8. APPENDICES

Annex 1. Adapted from the reports of the Millennium Ecosystem Assessment, 2005.

Definition of Ecosystem Services			
Service	Sub-category	Definition	Example
Provision services			
Food	Crops	Cultivated plants or agricultural produce harvested by people for human or animal consumption as food	<ul style="list-style-type: none"> Grains Vegetables Fruits
	Livestock	Animals raised for domestic or commercial consumption or use	<ul style="list-style-type: none"> Chicken Pigs Cattle
	Capture fisheries	Wild fish captured through trawling and other non-farming methods	<ul style="list-style-type: none"> Cod Crabs Tuna
	Aquaculture	Fish, shellfish, and/or plants that are bred and reared in ponds, enclosures, and other forms of freshwater or saltwater confinement for purposes of harvesting	<ul style="list-style-type: none"> Shrimp Oysters Salmon
	Wild foods	Edible plant and animal species gathered or captured in the wild	<ul style="list-style-type: none"> Fruits and nuts Fungi Bush-meat
Fiber	Timber fiber	Products made from trees harvested from natural forest ecosystems or non-forested lands	<ul style="list-style-type: none"> Industrial round-wood
Biomass fuel		Biological material derived from living or recently living organisms – both plant and animal – that serves as a source of energy	<ul style="list-style-type: none"> Fuelwood and charcoal Grain for ethanol production, Dung
Fresh water		Inland bodies of water, groundwater, rainwater, and surface waters for household, industrial, and agricultural uses	<ul style="list-style-type: none"> Freshwater for drinking, cleaning, cooling, industrial processes, electricity generation, or mode of transportation
Genetic Resources		Genes and genetic information used for animal breeding, plant improvement, and biotechnology.	<ul style="list-style-type: none"> Genes used to increase crop resistance
Bio-chemicals, natural medicines and pharmaceuticals		Medicines, biocides, food additives, and other biological materials derived from ecosystems for commercial or domestic use	<ul style="list-style-type: none"> Echinacea, ginseng, garlic Paclitaxel as basis for cancer drugs Tree extracts used for pest control
Regulating services			
Air quality regulation		Influence ecosystems have on air quality by emitting chemicals to the atmosphere (i.e., serving as a “source”) or extracting chemicals from the atmosphere (i.e., serving as a “sink”)	<ul style="list-style-type: none"> Lakes serve as a sink for industrial emissions of sulfur compounds Vegetation fires emit particulates, ground-level ozone, and volatile organic compounds
Climate regulation	Global	Influence ecosystems have on global climate by emitting greenhouse gases or aerosols to the atmosphere or by absorbing greenhouse gases or aerosols from the atmosphere	<ul style="list-style-type: none"> Forests capture and store carbon dioxide Cattle and rice paddies emit methane
	Regional and local	Influence ecosystems have on local or regional temperature, precipitation, and other climatic factors	<ul style="list-style-type: none"> Forests can impact regional rainfall levels

Definition of Ecosystem Services			
Service	Sub-category	Definition	Example
Regulating services			
Water regulation		Influence ecosystems have on the timing and magnitude of water runoff, flooding, and aquifer recharge, particularly in terms of the water storage potential of the ecosystem or landscape	<ul style="list-style-type: none"> Permeable soil facilitates aquifer recharge River floodplains and wetlands retain water – which can decrease flooding during runoff peaks – reducing the need for engineered flood control infrastructure
Erosion regulation landslides		Role vegetative cover plays in soil retention	<ul style="list-style-type: none"> Vegetation such as grass and trees prevents soil loss due to wind and rain and prevents siltation of water ways. Forests on slopes hold soil in place, thereby preventing
Water purification and waste treatment		Role ecosystems play in the filtration and decomposition of organic wastes and pollutants in water; assimilation and detoxification of compounds through soil and subsoil processes	<ul style="list-style-type: none"> Wetlands remove harmful pollutants from water by trapping metals and organic materials Soil microbes degrade organic waste, rendering it less harmful
Disease regulation		Influence that ecosystems have on the incidence and abundance of human pathogens	<ul style="list-style-type: none"> Some intact forests reduce the occurrence of standing water – a breeding area for mosquitoes – which can lower the prevalence of malaria
Pest regulation		Influence ecosystems have on the prevalence of crop and livestock pests and diseases	<ul style="list-style-type: none"> Predators from nearby forests – such as bats, toads, and snakes – consume crop pests.
Pollination		Role ecosystems play in transferring pollen from male to female flower parts	<ul style="list-style-type: none"> Bees from nearby forests pollinate crops
Natural hazard regulation		Capacity for ecosystems to reduce the damage caused by natural disasters such as hurricanes and to maintain natural fire frequency and intensity	<ul style="list-style-type: none"> Mangrove forests and coral reefs protect coastlines from storm surges Biological decomposition processes reduce potential fuel for wildfires
Cultural services			
Recreation and ecotourism		Recreational pleasure people derive from natural or cultivated ecosystems	<ul style="list-style-type: none"> Hiking, camping, and bird watching Going on safari

Ethical values		Spiritual, religious, aesthetic, intrinsic, “existence,” or other values people attach to ecosystems, landscapes, or species	<ul style="list-style-type: none"> ▪ Spiritual fulfillment derived from sacred lands and rivers ▪ Belief that all species are worth protecting regardless of their utility to people – “biodiversity for biodiversity’s sake”
Supporting services			
Nutrient cycling		Role ecosystems play in the flow and recycling of nutrients (e.g., nitrogen, sulfur, phosphorus, carbon) through processes such as decomposition and/or absorption	<ul style="list-style-type: none"> ▪ Decomposition of organic matter contributes to soil fertility
Primary production		Formation of biological material by plants through photosynthesis and nutrient assimilation	<ul style="list-style-type: none"> ▪ Algae transform sunlight and nutrients into biomass, thereby forming the base of the food chain in aquatic ecosystems
Water cycling		Flow of water through ecosystems in its solid, liquid, or gaseous forms	<ul style="list-style-type: none"> ▪ Transfer of water from soil to plants, plants to air, and air to rain

Annex 2 - a. Description of the Environmental Topics of the Pacific Sustainability Index (*The Questionnaire*)

<i>Vision</i>	<i>Discussion</i>	<i>Initiatives/actions</i>
Environmental visionary statement	Includes a clear visionary statement expressing an organizational commitment to good environmental performance.	Include measures to fulfill that commitment.
Environmental impediments and challenges	Impediments and challenges faced by the organization in attempting to realize its environmental vision and commitments.	Include measures to overcome them.
<i>Accountability</i>	<i>Discussion</i>	<i>Initiatives/actions</i>
Report contact person	Identifies the person specifically designated to answer questions about the report or sustainability issues. Investor relations or public relations contact representatives are not valid contacts for this question.	To facilitate such contact, i.e. providing email address, phone number, or a link for feedback and questions.
Environmental management structure	The organization's environmental management structure or staffing.	Include identification of individuals currently holding the staff positions.
Environmental accounting	Environmental expenditures.	Include detailed accounting of such expenditures.
<i>Management</i>	<i>Discussion</i>	<i>Initiatives/actions</i>
Environmental education	Efforts to promote environmental education and awareness of employees, the general public, or children.	Taken to provide such education.
Environmental management system	Includes a statement of adoption of ISO 14001 or other formal environmental management system.	Include information on the extent to which the system has been implemented.
Stakeholder consultation	Consultation and dialogue with stakeholders about the organization's environmental aspects or impacts.	Include identification of specific consultation activities.

<i>Environmental Policies</i>	<i>Discussion</i>	<i>Initiatives/actions</i>
Environmental policy statement	Includes a formal statement of the organization's environmental policy or plan.	Include a description of how the policy is being implemented.
Climate change/global warming	The organization's position on climate change and/or global warming.	Include measures taken by the organization to decrease its contribution to climate change.
Habitat/ecosystem conservation	The organization's position on conserving natural ecosystems and habitat.	Taken to increase conservation of natural ecosystems either associated with or separate from the organization's business activities.
Biodiversity	The organization's position on biodiversity.	Taken by to the organization to foster biodiversity.
Green food purchasing	About preferential purchasing of ecofriendly (non-polluting, recycled, recyclable, etc.) products.	Taken to implement such purchasing.
Locally grown organic food	The company has implemented a program to encourage the use of locally grown organic food	The company has a numerical goal for the percentage of locally grown organic foods used and a stated time frame for achieving it.
Genetically modified food	Discussion of the company's position or policy on genetically modified food	
Zero waste policy	The city has adopted a formal Zero Waste plan	The plan has resulted in a decrease in the city's volume of waste going to landfills and incinerators.

Annex 2 - b. The Global Reporting Initiative (GRI) Environmental Standards 2014, G4 2014.

CATEGORY: ENVIRONMENTAL	
ASPECT: MATERIALS	
<ul style="list-style-type: none"> • G4-EN1 • G4-EN2 	<ul style="list-style-type: none"> • Materials used by weight or volume • Percentage of materials used that are recycled input materials
ASPECT: ENERGY	
<ul style="list-style-type: none"> • G4-EN3 • G4-EN4 • G4-EN5 • G4-EN6 • G4-EN7 	<ul style="list-style-type: none"> • Energy consumption within the organization • Energy consumption outside of the organization • Energy intensity • Reduction of energy consumption • Reductions in energy requirements of products and services
ASPECT: WATER	
<ul style="list-style-type: none"> • G4-EN8 • G4-EN9 • G4-EN10 	<ul style="list-style-type: none"> • Total water withdrawal by source • Water sources significantly affected by withdrawal of water • Percentage and total volume of water recycled and reused
ASPECT: BIODIVERSITY	
<ul style="list-style-type: none"> • G4-EN11 • G4-EN12 • G4-EN13 • G4-EN14 	<ul style="list-style-type: none"> • Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas • Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas • Habitats protected or restored • Total number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk
ASPECT: EMISSIONS	
<ul style="list-style-type: none"> • G4-EN15 • G4-EN16 • G4-EN17 • G4-EN18 • G4-EN19 • G4-EN20 • G4-EN21 	<ul style="list-style-type: none"> • Direct greenhouse gas (GHG) emissions (Scope 1) • Energy indirect greenhouse gas (GHG) emissions (Scope 2) • Other indirect greenhouse gas (GHG) emissions (Scope 3) • Greenhouse gas (GHG) emissions intensity • Reduction of greenhouse gas (GHG) emissions • Emissions of ozone-depleting substances (ODS) • NOX, SOX, and other significant air emissions
ASPECT: EFFLUENTS AND WASTE	
<ul style="list-style-type: none"> • G4-EN22 	<ul style="list-style-type: none"> • Total water discharge by quality and destination

<ul style="list-style-type: none"> • G4-EN23 • G4-EN24 • G4-EN25 • G4-EN26 	<ul style="list-style-type: none"> • Total weight of waste by type and disposal method • Total number and volume of significant spills • Weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel Convention Annex I, II, III, and VIII, and percentage of transported waste shipped internationally • Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the organization's discharges of water and runoff
ASPECT: PRODUCTS AND SERVICES	
<ul style="list-style-type: none"> • G4-EN27 • G4-EN28 	<ul style="list-style-type: none"> • Extent of impact mitigation of environmental impacts of products and services • Percentage of products sold and their packaging materials that are reclaimed by category
ASPECT: COMPLIANCE	
<ul style="list-style-type: none"> • G4-EN29 	<ul style="list-style-type: none"> • Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations
ASPECT: TRANSPORT	
<ul style="list-style-type: none"> • G4-EN30 	<ul style="list-style-type: none"> • Significant environmental impacts of transporting products and other goods and materials for the organization's operations, and transporting members of the workforce
ASPECT: OVERALL	
<ul style="list-style-type: none"> • G4-EN31 	<ul style="list-style-type: none"> • Total environmental protection expenditures and investments by type
ASPECT: SUPPLIER ENVIRONMENTAL ASSESSMENT	
<ul style="list-style-type: none"> • G4-EN32 	<ul style="list-style-type: none"> • Percentage of new suppliers that were screened using environmental criteria
<ul style="list-style-type: none"> • G4-EN33 	<ul style="list-style-type: none"> • Significant actual and potential negative environmental impacts in the supply chain and actions taken
ASPECT: ENVIRONMENTAL GRIEVANCE MECHANISMS	
<ul style="list-style-type: none"> • G4-EN34 	<ul style="list-style-type: none"> • Number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms

Annex 3 - a. Ecosystem Dependence & Impact Assessment for Agricultural Sector

Key

- High + Positive impact
- Medium - Negative impact
- Low ? Don't know

AGRICULTURAL SECTOR

Ecosystem services		DEPENDENCE	IMPACT
Provisioning			
Food	Crops	●	● +
	Livestock		● -
	Capture fisheries		● -
	Aquaculture		● -
	Wild foods		● -
Raw materials	Timber and other wood fiber		● -
	Fibers and resins		● -
	Biomass fuel		● +
	Freshwater	●	● -
	Biochemical, natural medicines, and pharmaceuticals	●	● -
Regulating			
Regulation of Climate	Maintenance of air quality	●	● -
	Global climate regulation	●	● -
	Regional/local climate regulation	●	● -
	Regulation of water timing and flows	●	● -
	Erosion control		● -
	Water purification and waste treatment	●	● -
	Maintenance of soil quality	●	● -
	Pest mitigation	○	● -
	Pollination	●	● +/-
Cultural			
	Recreation and ecotourism		● -
	Ethical and spiritual values		● -
	Educational and inspirational values		● -
Supporting			
	Habitat		● -
	Nutrient Cycle	○	● -
	Primary production (biological Material)		● -
	Water cycling	●	● -

Annex 3 - b. Ecosystem Dependence & Impact Assessment for Animal Breeding Sector

ANIMAL BREEDING SECTOR		Key ● High + Positive impact ○ Medium - Negative impact Low ? Don't know	
Ecosystem services		DEPENDENCE	IMPACT
Provisioning			
Food	Crops		● -
	Livestock	●	● +
	Capture fisheries		● -
	Aquaculture		● -
	Wild foods		● +/-
Raw materials	Timber and other wood fiber		● -
	Fibers and resins		● -
	Animal Skins	●	● +
	Biomass fuel		● +
	Freshwater	●	● -
Regulating			
Regulation of Climate	Maintenance of air quality	●	● -
	Global climate regulation	●	● -
	Regional/local climate regulation	●	● -
	Regulation of water timing and flows	●	● -
	Erosion control		● -
	Water purification and waste treatment	●	● -
	Disease mitigation		● -
	Maintenance of soil quality	●	● -
	Pest mitigation	○	● -
	Pollination		● -
	Natural hazard mitigation		
Cultural			
	Recreation and ecotourism		● -
	Ethical and spiritual values		● -
	Educational and inspirational values		● -
Supporting			
	Habitat		● -
	Nutrient Cycle	○	● -
	Primary production	○	● -
	Water cycling	●	● -

Annex 3 - c. Ecosystem Dependence & Impact Assessment for Plantation Sector

PLANTATIONS SECTOR

Key

- High
- Medium
- Low
- + Positive impact
- Negative impact
- ? Don't know

Ecosystem services		DEPENDENCE	IMPACT
Provisioning			
Food	Crops		
	Livestock		
	Capture fisheries		● -
	Aquaculture		
	Wild foods		● -
Raw materials	Timber and other wood fiber	●	● +
	Fibers and resins		● -
	Animal Skins		
	Sand		
	Ornamental resources		
	Biomass fuel		● +
	Freshwater	●	● +/-
	Genetic resources	○	● -
	Biochemicals, natural medicines, and pharmaceuticals		
Regulating			
Regulation of Climate	Maintenance of air quality	●	● +/-
	Global climate regulation	●	● +/-
	Regional/local climate regulation	●	● +/-
	Regulation of water timing and flows	●	● +/-
	Erosion control	●	● +/-
	Water purification and waste treatment	●	● +/-
	Disease mitigation		
	Maintenance of soil quality	●	● -
	Pest mitigation	○	● -
	Pollination	●	● -
	Natural hazard mitigation		
Cultural			
	Recreation and ecotourism		● -
	Ethical and spiritual values		● -
	Educational and inspirational values		● -
Supporting			
	Habitat		● -
	Nutrient Cycle	○	● -
	Primary production (biological Material)	●	● -
	Water cycling	●	● -

Annex 4. Relation between Global Reporting Initiative – GRI (G4 2014) and Ecosystem services – MA (2005)

Global Reporting Initiative – GRI (G4 2014)		Forest Ecosystem services – FES	
ASPECT: MATERIALS		Ecosystem Service is required or enhance	
<ul style="list-style-type: none"> • EN1 • EN2 	<ul style="list-style-type: none"> • Materials used by weight or volume • Percentage of materials used that are recycled input materials 	<ul style="list-style-type: none"> • Provision 	<ul style="list-style-type: none"> • Food, Biological raw materials, biomass fuel, water ,genetic resources, biochemical materials
ASPECT: ENERGY			
<ul style="list-style-type: none"> • EN3 • EN4 • EN5 • EN6 • EN7 	<ul style="list-style-type: none"> • Energy consumption within the organization • Energy consumption outside of the organization • Energy intensity • Reduction of energy consumption • Reductions in energy requirements of products and services 	<ul style="list-style-type: none"> • Provision • Regulating 	<ul style="list-style-type: none"> • Biomass fuel • Maintenance of air quality Global climate regulation Regional/local climate regulation • Maintenance of air quality Global climate regulation Regional/local climate regulation
ASPECT: WATER			
<ul style="list-style-type: none"> • EN8 • EN9 • EN10 	<ul style="list-style-type: none"> • Total water withdrawal by source • Water sources significantly affected by withdrawal of water • Percentage and total volume of water recycled and reused 	<ul style="list-style-type: none"> • Provision • Regulating • Supporting 	<ul style="list-style-type: none"> • Freshwater: rivers and lakes • Water regulation • Water cycling
ASPECT: BIODIVERSITY			
<ul style="list-style-type: none"> • EN11 • EN12 • EN13 • EN14 	<ul style="list-style-type: none"> • Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas • Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value • Habitats protected or restored • Total number of IUCN Red List species 	<ul style="list-style-type: none"> • Provision • Regulating • Cultural • Supporting Services Biodiversity 	<ul style="list-style-type: none"> • Goods, genetic resources • Regulation of Climate, disease mitigation, water purification and waste treatment • Ethical and Spiritual Values • Habitat
ASPECT: EMISSIONS			
<ul style="list-style-type: none"> • EN15 • EN16 • EN17 • EN18 • EN19 • EN20 • EN21 	<ul style="list-style-type: none"> • Direct greenhouse gas (GHG) emissions (Scope 1) • Energy indirect greenhouse gas (GHG) emissions (Scope 2) • Other indirect greenhouse gas (GHG) emissions (Scope 3) • (GHG) emissions intensity 	<ul style="list-style-type: none"> • Regulating 	<ul style="list-style-type: none"> • Maintenance of air quality Global climate regulation Regional/local climate regulation

<ul style="list-style-type: none"> • Reduction of (GHG) emissions • Emissions of ozone-depleting substances (ODS) • NOX, SOX, and other significant air emissions 	
ASPECT: EFFLUENTS AND WASTE	
<ul style="list-style-type: none"> • EN22 • EN23 • EN24 • EN25 • EN26 <ul style="list-style-type: none"> • Total water discharge by quality and destination • Total weight of waste by type and disposal method • Total number and volume of significant spills • Weight of transported, imported, exported, or treated waste deemed hazardous • Identity, size, protected status, and biodiversity value of water bodies and related habitats affected by discharges of water and runoff 	<ul style="list-style-type: none"> • Regulating • Supporting • Biodiversity <ul style="list-style-type: none"> • Water purification and waste treatment • Disease mitigation • Maintenance of soil quality • Water regulation • Nutrient Cycle • Primary production (biological Material) • Water cycling • Habitat
ASPECT: PRODUCTS AND SERVICES	
<ul style="list-style-type: none"> • EN27 • EN28 <ul style="list-style-type: none"> • Extent of impact mitigation of environmental impacts of products and services • Percentage of products sold and their packaging materials that are reclaimed by category 	<ul style="list-style-type: none"> • Provision <ul style="list-style-type: none"> • Food and biological raw material, freshwater
ASPECT: COMPLIANCE	
<ul style="list-style-type: none"> • EN29 <ul style="list-style-type: none"> • Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations 	
ASPECT: TRANSPORT	
<ul style="list-style-type: none"> • EN30 <ul style="list-style-type: none"> • Significant environmental impacts of transporting products and goods and materials for the organization's operations, and transporting members of the workforce 	<ul style="list-style-type: none"> • Regulating Service <ul style="list-style-type: none"> • Maintenance of air quality • Global climate regulation • Regional/local climate regulation
ASPECT: OVERALL	

<ul style="list-style-type: none"> • EN31 • Total environmental protection expenditures and investments by type 	<ul style="list-style-type: none"> • Regulating • Supporting • Biodiversity • Maintenance of air quality Global climate regulation Regional/local climate regulation, water purification and waste treatment, disease mitigation, maintenance of soil quality • Nutrient Cycle Primary production (biological Material) Water cycling • Habitat
ASPECT: SUPPLIER ENVIRONMENTAL ASSESSMENT	
<ul style="list-style-type: none"> • EN32 Percentage of new suppliers that were screened using environmental criteria • EN33 Significant actual and potential negative environmental impacts in the supply chain and actions taken 	<ul style="list-style-type: none"> • Biodiversity
ASPECT: ENVIRONMENTAL GRIEVANCE MECHANISMS	
<ul style="list-style-type: none"> • EN34 Number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms 	

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