Preliminary Report

TEEB

for business
Brazil

CONSERVAÇÃO INTERNACIONAL
Brasil

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COORDINATION
Helena Pavese (coordinator) – Conservation International
Paula Ceotto – Conservation International
Fernando Ribeiro – Conservation International

TECHNICAL TEAM
PwC Brazil: Carlos Rossin (coordinator), Rogério Gollo, Flávia Yumi Takeuchi, Cecília Michellis, Heloisa Garcia da Mota, Marina Parisi and João Mello

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UNEP – WCMC
CNI

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I Graficci Comunicação e Design

TRANSLATION
Cecilia Barsk

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This report is based on the TEEB project (The Economics of Ecosystems and Biodiversity), a global study that discusses the necessity to consider the value of Biodiversity and Ecosystem Services (BES) in economic assessments.

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01 Introduction

Introduction

Key messages

The "TEEB for the Brazilian business sector" is based on the global study "TEEB – The economy of ecosystems and biodiversity. Report for the business sector" (hereafter "Global TEEB – business"). The objective of the report is to offer an overview of dependencies and impacts of businesses on Biodiversity and Ecosystem Services (BES), as well as to identify the risks and opportunities that Brazilian businesses are subjected to in light of the main trends in this area.

Biodiversity plays an important role in the growth and sustainability of businesses, which in turn should contribute to the preservation of this natural capital. This report is the result of the increased recognition of existing linkages between Brazilian economic development and the value of biodiversity and ecosystem services for businesses. This document identifies Brazilian trends that will influence and guide BES management and how the business sector will play a key role in preserving BES in Brazil.

This chapter introduces the reader to themes that will be discussed throughout the report, starting with a presentation of concepts related to the Economics of Ecosystems and Biodiversity, the objectives of the document and the approach used in constructing TEEB for the Brazilian business sector.

Report context

The Economics of Ecosystems and Biodiversity - TEEB is a global study prompted by the environment ministers of the G8 countries and the five largest developing economies, which highlights the necessity of considering the value of Biodiversity and Ecosystem Services (BES) in economic approaches. With regards to the business sector, the main conclusions of the study underscore the following:

- Many services provided by ecosystems are disregarded in financial and investment analyses, which results in decisions that progressively degrade the environment and could cause serious social and economic costs;
- Decision-makers should take into consideration the costs and benefits of ecosystem services. One of the ways to do this is to attribute a monetary value to services provided by ecosystems. This entails using tools and methodologies that have been developed to "decipher" the tangible and intangible values of nature in monetary terms. However, these valuation methods and tools are still incomplete and at times controversial. Significant advances have been made, but it is still necessary to define which BES monetary valuation methods and approaches should be incorporated into decision-making;
- Conventional steps to measure the economic performance of countries such as Gross Domestic Product (GDP) or investment performance (discount rate) still do not reflect the stock of natural capital and the flow of ecosystem services, resulting in a lack of recognition of the value of BES to businesses;
- Developing systems that account for the impact and dependency of BES on businesses is essential to changing attitudes throughout the value chain. Standards and methodologies to account for and report such externalities should be developed both in the international and national spheres.

TEEB intends to evaluate the economic impacts of biodiversity loss and offer concrete responses to deter the decline of ecosystems. A specific report for the business community was launched in 2010, called "TEEB – the economics of ecosystems and biodiversity. Report for the business sector" (hereafter Global TEEB-business). Utilizing the approach adopted by the Global TEEB, this report "TEEB for the Brazilian business sector" identifies the trends and opportunities for Brazilian business activities, integrating the social, environmental and economic contexts in which they operate.

In contrast to specific environmental indicators that are already part of current business management systems — such as water, energy and waste — the complex relationship between BES and business is still a challenging concept for most Brazilian companies. Therefore, it is necessary to offer clarification on: how business is impacted by and depends on BES; how business impacts BES; how BES is critical for business; and how businesses can manage risks and opportunities. In order for Brazilian businesses to position themselves strategically in relation to BES, they should adopt a medium and long-term vision that takes into account the importance of natural capital. Natural capital — the limited stocks of physical resources found on Earth — is one of the most relevant indicators of Brazilian biodiversity potential, as well as of economic and social value to society and business.

This text offers information to guide businesses, government and society on how to recognize, understand and internalize the benefits associated with the strategic management of BES for businesses, including:

- Anticipating national norms and policies;
- Better understanding of brands and products by consumers and diminishing reputational risks;
- Minimizing environmental liabilities and reducing financial risk;
- Lowering production costs through the more efficient use of natural resources;
- Development of products and establishing new markets;
- Improving operations and business management systems;
- Engaging and strengthening value chain.

Uniting business with biodiversity and ecosystem services management will be one of the great challenges over the coming years, which is why the United Nations proclaimed 2010-2020 the Decade on Biodiversity. In this context, the current report follows yet another important event for international negotiations related to this topic: the United Nations Conference on Sustainable Development, Rio+20, held during 2012 in Rio de Janeiro. The objective of the conference is to renew political commitment to sustainable development through an evaluation of the progress and weaknesses in implementing decisions adopted by the main summits on the topic.

Objectives

The Global TEEB consists of a series of reports with distinctive objectives that cater to different target audiences:

- TEEB for ecologists and economists: tackles the challenges of valuing ecosystem services, as well as issues related to economic discounting. It aims to quantify the costs of inaction and examine the macroeconomic dimension of ecosystem services loss;
- TEEB and TEEB for international, national and regional policy makers: defines directives for decision makers with the aim of promoting sustainable development and the conservation of ecosystems and biodiversity. The guide includes an outline of subsidies and incentives, methods of national accounting, cost-benefit analysis and methods for implementing instruments such as Payments for Environmental Services (PES);
- TEEB for the business sector: provides information and tools for improving practices related to biodiversity for businesses, focusing on managing risks and opportunities and the measurement of impacts caused by businesses on BES;
- TEEB for society: aims to promote public awareness of the contributions of BES to human well-being and also of the impacts caused by individuals, identifying areas where each citizen can contribute to positive change.

The general objective of "TEEB for the Brazilian business sector" is to draw attention to the importance of BES to the business sector and to provide guidance on the strategic management of related risks and opportunities. Furthermore, this document aims to present to a national and international audience how Brazilian businesses have advanced in the development of commitments, targets and strategies for BES management. The report is divided into seven chapters with specific objectives, as presented in Table 1 below.

Table 1: Specific objectives of "TEEB for the Brazilian business sector"

REPORT STRUCTURE	SPECIFIC OBJECTIVE
Chapter 1 Introduction	General objectives of the document and the current context on which they are derived.
Chapter 2 Brazil, a global power in natural capital	Present the importance of Brazilian biodiversity, the socio-economic context in the country and the main trends related to BES to a national and international audience.
Chapter 3 Business, Biodiversity and Ecosystem Services	Explain the importance of BES to the business sector; explore impacts and dependencies and how loss of biodiversity and degradation of ecosystem services can impact businesses.
Chapter 4 Risks to the business sector	Demonstrate how degradation of BES can cause operational, regulatory, market, financial and reputational risks to businesses.
Chapter 5 Business opportunities	Identify and present new business opportunities related to conservation and sustainable use of BES.
Chapter 6 Including BES in strategic business management	Outline the main steps to including BES in the business activities of firms, with specific examples of Brazilian initiatives.
Chapter 7 Conclusions and recommendations	Summarize the main conclusions of each chapter and present opportunities for overcoming challenges and maximizing opportunities of sustainable BES management.

The report is a product of the first phase of the project "TEEB for the Brazilian business sector", headed by Conservation International in partnership with the United Nations Environment Programme (UNEP) and the World Conservation Monitoring Center (UNEP-WCMC). The project relies on sponsorship from enterprises of great relevance in the Brazilian and global business community, namely Vale, Natura, Monsanto and Santander.

Assumptions

The Global TEEB report proposes an economic approach to value ecosystem services as well as the intangible values associated with these services, namely social and cultural. Given the Brazilian context, the assumptions of this report are:

- This study focuses on risks and opportunities associated with the impacts of and dependencies on BES by Brazilian business. In order for management of BES to make headway in Brazil, it is essential that businesses understand not only the impacts of their activities, but also how they depend on BES. The recognition of the associated dependencies and impacts allows organizations to adopt a long-term perspective, not only based on currently perceivable risks, but also on those that are difficult to predict, such as impacts from climate change, population growth and increased shortages of natural resources. Whenever possible, Brazilian cases are presented to illustrate the given concepts and directives;
- The risks and opportunities for the Brazilian business sector are based on the Global TEEB. The Global TEEB provides guiding directives on the subject from a global perspective, and this report considers the Brazilian context. For a greater understanding of the global context and concepts, please refer to the international report available at: http://www.teebweb.org;
- Ultimately, business actions to preserve biodiversity in Brazil should take into consideration the opportunities and challenges of adopting a BES management system. It is not always possible to conduct business activities without impacting BES, the same way it is not always possible to promote BES conservation without impacting business operations. This paradigm permeates environmental discussions; nevertheless this report seeks to integrate both views in order to adopt a long-term perspective in which BES maintenance will be considered a basis for developing business activities.

Approach

This report argues that businesses must understand the associated dependencies and impacts on BES, and should design a strategy to manage the risks and opportunities through the strategic inclusion of BES in business processes.

The document recognizes that BES is a multifaceted topic that could cover a wide range of topics, including: technical directives for biodiversity valuation; tools and methodologies for integrating BES in business; implications of intensified regulation; and the geopolitical characteristics of biodiversity conservation in Brazil. However, in order to adopt a strategic position, businesses must first understand their impacts and dependencies on BES and the related risks of biodiversity loss on business

operations. Based on this broader vision, Brazilian firms that follow TEEB guidelines can implement responsible biodiversity management.

This approach was selected through the development of the study that highlighted the main expectations: identification of the main motivating factors for integrating BES in business; realization of a benchmark for Brazilian businesses; and identification of the main risks and opportunities associated with BES in Brazil.

This report seeks to promote the adaption of the principal global trends on a national scale, maintaining the focus on aspects related to BES. The trends and scenarios presented take into consideration contributions from Brazilian businesses and specialists.

The document was developed using a literature review of the main articles published nationally and internationally on BES in the business sectors dealt with in this study. Semi-structured interviews were conducted with various businesses and specialists on how to implement BES management in Brazil and its importance to business activities. It is important to clarify that detailed sectoral analysis on BES is not part of the scope of this report; however, perspectives on the main relations with some sectors of the Brazilian economy were included:

- Agriculture and Pulp & Paper
- Oil & gas and chemicals
- Cosmetics and Pharmaceuticals
- Mining and Construction
- Financial institutions
- Retail

The sectors were grouped according to similarities in their relations of dependence and impact on BES, although these may be present in different scales and contexts. The related dependence and impacts of business on BES will be more clearly explained in Chapter 3 of this report.

02

Brazil, a global power in natural capital

Brazil, a global power in natural capital

Key messages

Brazilian biodiversity represents a natural heritage of great importance nationally and internationally: Ever since the country's economy was driven by Brazilwood (Caesalpinia echinata), the value of Brazilian biodiversity products has been recognized. With close to 20% of global biodiversity, Brazil possess the highest biological diversity in the world, distributed among the Amazon, Cerrado, Caatinga, Atlantic Forest, Pantanal and Pampa biomes.

Brazilian efforts to conserve biodiversity are internationally recognized: Brazil has reduced the Amazon's deforestation rate to the lowest level since satellite observations began in 1988 as part of its efforts to establish targets for the Convention on Biological Diversity (CBD). Furthermore, significant advances can be observed in policy-making related to BES.

Despite these advances, growth in Brazil over the past decade will increase pressures on biomes of great importance to the country's biodiversity: In the past decade, the Brazilian economy has grown at a rate of 5% per year. The population is also growing, especially in the northern and midwestern regions where the Amazon and Cerrado biomes are located. Understanding of the potential and the causes of biodiversity loss in these regions is very important to the strategic planning of businesses operating in the area. Historically, the Atlantic Forest (home of Sao Paulo) was the biome most affected by the growing Brazilian economy, as this is where most of Brazilian industries are concentrated.

Socio-economic growth should be coordinated with environmental conservation actions: It is essential that economic and demographic growth in the country be compatible with environmental preservation in order to guarantee the maintenance of BES benefits over the long term, thus protecting the quality of life of the population and prolonging the development of the business sector.

This chapter outlines the importance and state of Brazilian biodiversity, highlighting how Brazil has interacted with international agendas, such as the CBD and the necessity of making economic growth and biodiversity conservation in Brazilian biomes compatible.

Brazilian biodiversity

Brazil is home to some of the greatest natural assets in the world, which provide part of its natural wealth and include important biomes not only for climate stability but also for global biodiversity.

With its endemic species[1] in the Pantanal, Atlantic Forest and the Amazon, Brazil is the country with the greatest terrestrial biodiversity—between 15% and 20% of the 1.5 million species on Earth (1) occur in Brazil. Brazil also has the richest flora and fauna in the world, with 103 thousand plants and 43 thousand animals. That is between 19% of the known plants on earth and between 8 and 10% of animals. (2)(3)

The Map of Brazilian Biomes, created by the Brazilian Institute of Geography and Statistics (IBGE) in partnership with the Ministry of the Environment (MMA), reconstituted the state of vegetation at the time of discovery and thereby defined the territorial division of Brazilian Biomes (Image 1 below). (4)

Image 1: Map of Brazilian Biomes.

According to this map, the largest biome in Brazil is the Amazon Forest and the smallest is the Pantanal, which together occupy more than half of the 8,514,876.599 km² that compose the Brazilian territory[2]. The Atlantic Forest and the Cerrado are among the world's biodiversity *hotspots*[3] , areas with high levels of biodiversity and where conservation actions should be prioritized[4]. The Atlantic Forest, located mainly along the country's coast, has suffered the greatest level of degradation primarily due to the removal of species with a high economic value such as Brazilwood (see Box 1 below). (5)

[1] Species limited to a certain region, or native to that region. Michaelis, 2012. Modern dictionary of the Portuguese language.
[2] The Amazon biome occupies 49.29 percent of the national territory, and the Pantanal biome, 1.76%.
[3] Term created by the Englishman Norman Myers in the 1980's. A hotspot is defined as an area with at least 1,500 endemic plant species and that has lost more than ¾ of its original vegetation.
[4] The Amazon has the largest reserve of biological diversity in the world, however, more than ¼ of its original vegetation remains.

Box 1: Recognition of the economic value of Brazilian biodiversity is part of history

The logging of Brazilwood for the extraction of pigments to produce dyes and later for the creation of musical instruments was responsible for the first economic cycle in Brazil. Due to the high commercial value of this tree endemic to the Atlantic Forest, an estimated 300 tons annually of this product was extracted during the first two decades following the discovery of Brazil.

After a few unsuccessful attempts to contain the smuggling of this tree, in 1602 the Portuguese Crown established the "Statute on Brazil wood" which declared a death penalty for anyone who logged the tree without a royal license, thus leading the way for new laws and regulations to avoid the disorderly exploration of wood until the end of the 19th century, largely ineffective in most cases. As such, Brazilwood was the first product that attracted the attention of Europeans and other countries to Brazil, and its economic importance to the colonizers was responsible for the first legislation that included environmental protections in the national territory, as well as lending its name to the country. (6).

This rich biodiversity of Brazil provides a series of relevant environmental services, the real significance of which is explained in Box 2 below:

Box 2: Some important definitions

Biodiversity: according to the CBD, biodiversity is the "variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems."

Ecosystem services: according to the Millennium Ecosystem Assessment (7), ecosystem services are defined as "benefits that people receive from ecosystems," which can be classified as: provision, regulation, support and cultural, as demonstrated in the below table. According to the Global TEEB, the concept of ecosystem services describes the flux of value generated for human society based on the state and quality of natural capital.

TYPES OF SERVICES		EXAMPLES
Provision	Services related to products obtained from ecosystems	Water
		Fibers
		Fuel
		Food
Regulation	Benefits obtained from regulation of ecosystem processes	Water purification
		Climate regulation
		Disease control
		Flood control
		Pollination
Support	Services necessary for the production of all other ecosystem services	Nutrients cycling
		Soil formation
Cultural	Intangible benefits obtained from ecosystems	Aesthetics
		Culture
		Education

The progress of international environmental agendas and environmental policy in Brazil

Given the importance of Brazilian biodiversity and the related ecosystem services, a growing number of initiatives, movements and international agreements related to environmental protection are being pursued by both the public and private sectors in Brazil. One of the most relevant events for the BES discussion at a global level was the United Nations Conference on Environment and Development (UNCED) held in June 1992 in Rio de Janeiro. The summit meeting, also known as ECO92, resulted in the establishment of some of the most important international agreements for the environment: the Convention on Biodiversity Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC), which brought with it innovative models such as the Clean Development Mechanism as established by the Kyoto Protocol[5].

In parallel, Brazil advanced its own initiatives aimed at including BES in the planning of public policies; in particular, management of protected areas, monitoring of biome plant cover, integrated landscape management, sustainable forest management, forest product value chains, sustainable agricultural production and the conservation of threatened and over-exploited species. Despite having made significant advances when compared to other developing countries, there are still economic and political barriers that complicate the implementation of some already existing policies, such as the Forest Code and the regulation of emerging themes such as the creation of market mechanisms and financial incentives for BES conservation.

Governmental actions related to BES are guided by targets and commitments taken even before the ratification of the CBD by Brazil in 1994. The CBD established a first set of targets for the 2002-2010 period. In light of these targets, in 2006, Brazil defined 51 national biodiversity targets for 2010, although having attained full compliance of only two of them[6], it was a learning process crucial for the next steps taken by the Ministry of the Environment (MMA). Today, Brazil is considered one of the few countries in Latin America that has officially adopted a National Biodiversity Strategy. Some of the main programs, policies and projects aimed at biodiversity conservation in Brazil include:

- National Program on Biological Diversity (PRONABIO).
- Brazilian National Policy on Biodiversity (PNB);
- National Project on Biodiversity (PROBIO)[7];

[5] International treaty which established a GHG emission reduction targets for developed countries through 2012, with the aim of containing global climate change.
[6] Targets achieved included an easily accessible and permanent database of species and a 25% reduction in the number of hotspots in all biomes.
[7] The main results of PROBIO included the National Action Plan for Biodiversity (PAN-Rio) and the construction of a Map of Priority Areas for Conservation and Sustainable Use.

- National Commission on Biodiversity (CONABIO)[8];
- National Project of Integrated Public-Private Actions for Biodiversity (PROBIO II)[9];
- Brazilian Fund for Biodiversity (FUNBIO)[10];
- National Fund for the Environment (FNMA)[11];
- Ecological ICMS[12].

Positive initiatives related to an increase in Conservation Units[13] (CUs) have also been registered. The main trends are outlined in Box 3 below.

Box 3: Conservation Unit Trends in Brazil

According to the Environment Ministry's Fourth National Report to the CBD, conservation areas are expected to increase, especially in the Amazon. The total protected area grew from 8% to 17% of the national territory between 2006 and 2010, but still has not reached the CBD targets. To entirely reach the national target for 2010 in all biomes, Brazil needs to increase the size of protected area by 20% of the continental area or 30% of the national jurisdiction.

The Brazilian government target includes a 30% conservation area in the Amazon and 10% of the other biomes, which it aims to achieve through the creation of CUs that will be established based on the Map of Priority Areas for Biodiversity Conservation (2004, updated in 2007) (5). It is important to highlight that targets for the Amazon region presented by Brazil to the CBD surpassed those proposed by the Convention (10% of total protected).

Furthermore, it can be noted that the percentage of municipalities that relied on a specific agency to manage the environment increased significantly and there were positive experiences of decentralized management (7). Despite the existence of important challenges to the structuring of municipal agencies in all Brazilian municipalities, the Fourth National Report to the CBD claims that due to this increase there is also a consequent increase in municipal Conservation Units.

Conservation Units in Brazil play an important role in the national economy. According to a study by UNEP-WCMC (8), the set of environmental services provided by Conservation Units generate economic contributions that when monetized significantly surpass the sum earmarked by public administrations to maintain the National System of Nature Conservation Units (SNUC). In addition, the study estimates that the creation and maintenance of Conservation Units in Brazil prevent the emission of at least 2.8 billion tons of carbon at a conservatively estimated monetary value of R$ 96 billion.

In 2010, during the Conference of the Parties (COP) of CBD in Japan, two important agreements were established:

- Nagoya Protocol, an agreement that ensures the access and redistribution of benefits related to biodiversity;
- Aichi Targets, composed of 20 global biodiversity targets, primarily to revert losses of biodiversity and its associated services in all countries between the period 2010-2020.

In response to the Nagoya Protocol and the Aichi Targets, the Ministry of the Environment presented a Brazilian strategy for 2020 with targets that are being discussed in a process called **"Dialogues on biodiversity: constructing a Brazilian strategy for 2020"** (9), coordinated by the MMA, the International Union for Conservation of Nature (IUCN), WWF-Brazil and the Institute

[8] CONABIO is a collegiate body composed of representatives from government and civil society institutions, responsible for the implementation of the main directives of the National Policy on Biodiversity.
[9] PROBIO II is a project in the implementation phase that seeks to mainstream biodiversity and its institutional consolidation.
[10] FUNBIO is an independent entity created in 2004 which administers projects aimed at the conservation and sustainable use of biodiversity across national territories.
[11] FNMA functions as financing agent for the National Policy on Environment and already applied around R$ 230 million to initiatives that promote conservation and sustainable use of natural resources.
[12] Tax on Operations related to the circulation of merchandise and service provision related to inter-state and inter-municipal transport and communication (ICMS). Ecological ICMS is an instrument adopted in 14 states to weigh the criteria for transferring a proportion (25%) of ICMS owed to municipalities, as defined by the National Constitution and independently defined in each state. The part of ICMS distributed to municipalities that do not maintain CUs is reduced, and therefore could be a factor of compensation as well as an incentive. Also, in various states, this weighing is not restricted merely to biodiversity but also includes basic sanitation and other environmental themes.
[13] as defined by Law n° 9.985, of 18 July 2000, a Conservation Unit consists of "territorial space and its environmental resources, including jurisdictional water and relevant natural characteristics, legally instituted by the Government, with objectives of conservation within defined limits, under a specific administrative regime with adequate guarantees of protection".

for Ecological Research (IPE). This is a first step for Brazil to internalize the Aichi Targets by establishing implementation instruments such as a national plan, sectoral plans, national biodiversity targets and financial support mechanisms. Furthermore, the document also elaborates on the importance of integrating national development agendas with BES.

Finally, the United Nations Conference on Sustainable Development, Rio+20, held in Rio de Janeiro in 2012, marks the 20the anniversary of the United Nations Conference on the Environment and Development (Rio-92). The objective of the conference was to renew political commitment to sustainable development, through an evaluation of the progress and shortcomings in the implementation of decisions adopted by the main summits on the subject, focusing on two primary themes: 1) green economy in the context of sustainable development and poverty eradication, and 2) the global institutional framework for sustainable development.

A developing country: how economic growth in Brazil influences BES

At the same times as it is recognized for its biodiversity wealth, Brazil also stands out in the international arena due to its economic development. During the first decade of the 21st century, Brazil went from being in 9th place to 6th place among the largest global economies. While most counties sought to recover from the 2008 economic crisis, the Brazilian Gross Domestic Product grew by 7.5% in 2010. During this period, the Brazilian economy pulled almost 30 million people out of a poverty and enabled upward mobility of an additional 40 million into "class C," or the "new middle class" (10). Additionally, the Brazilian economy is expected to grow above the global average until 2020 (11). To promote this growth, the Government created Accelerated Growth Programs (more information in Box 4), which resulted in the construction of large public works and other development activities primarily in the northern and midwestern regions of the country, where the important Amazon, Cerrado and Pantanal biomes are located.

Box 4: Accelerated Growth Programs

The Federal Government's Accelerated Growth Program (PAC) was launched in 2007, encompassing a set of economic policies aimed at prioritizing investment in infrastructure in areas such as sanitation, housing, transport, energy, and water resources. To implement the PAC works, both private and public investments were sought for the recuperation and construction of infrastructure to further national growth, generating jobs and improving income distribution.

Tax cuts from PAC reached R$ 42 billion between 2007 and 2009, and are estimated to reach R$ 24.1 billion in 2010. Advances were made in credit policy, in bidding and contracting of services. BNDES raised credit approvals by 129% and disbursements by 167% between 2006 and 2009. For the infrastructure of PAC projects, clearances went up by 84% between 2007 and 2009, and the share of total investment of GDP went from 16.4% to 18.7%.

PAC 2, the second phase of the project, aims for investments in the urbanization of slums (favelas) and in environmental sanitation, and will also prioritize works related to paving roads, drainage and slope retention, revitalization of hydrographic basins and increased access to electric energy.

From 2011 – 2014, the government estimates investments into the program will be R$ 1,586.4 million (12).

The 2010 Brazilian Demographic Census also presents evidence that the greatest average demographic growth rates over the past decade took place in the northern and midwestern regions, reaching 2.09% and 1.91% respectively, indicating significant net migration since birth rates of the existing population did not differ substantially from the national average. The northern region exhibited growth in Gross Domestic Product (GDP) above the national average between 1995-2007, a 73.6% increase compared to the 35.8% average of the other Brazilian regions. The second largest GDP growth over the same period took place in the midwestern region. Examples include the state of Mato Grosso (MT) with a 110% increase and the Amazon state (AM) at 96%. Given the expansion of economic activities in these regions, it is important that Brazilian businesses consider the necessity of incorporating BES in their strategic management, as demonstrated by the case in Box 5, which summarizes a plan that seeks to consolidate business operations located within the Legal Amazon.

Box 5: Amazon Directives: Strategic planning by Camargo Correa construction company

After a strategic planning study, the Camargo Correa construction company identified that the areas where its operations will intensify over the coming years include the northern, midwestern and northeastern regions. These regions are characterized as environmentally sensitive areas within the Amazon, Caatinga and Cerrado biomes. In addition to environmental issues, these regions have experienced intensified population growth above the national average. Thus, the construction company's activities may also effect the local communities.

Upon recognizing the importance of responsible operations in these areas, the company created a document to guide its operations. To draft the document, the operational and administrative areas of the business gathered in workshops and working groups to discuss, among other topics:

- **Risks and opportunities of operating in these areas;**
- **How to operate responsibly in these areas;**
- **How to train teams to operate in these areas; and**
- **What information is relevant to managers and collaborators allocated to projects in these areas.**

This constructive participation resulted in a document that establishes social and environmental responsibility criteria and commitments with regards to the company's operations: The Amazon Directives.

Processes of urbanization, industrialization and economic growth are related to an increased demand for energy, food and consumer goods. Many of these activities depend on natural resource extraction and ecosystem services.

The main factors causing biodiversity loss and ecosystem degradation include a combination of environmental (direct) variables, such as climate change and nutrient deposits, and socio-economic variables (indirect) such as demographic growth, political circumstances, habits and local culture. Table 1 outlines the relationship between socio-economic and environmental factors that cumulate in environmental degradation and biodiversity loss, based on information from the Fourth National Biodiversity Report (5).

Table 1: Relationship between activities and their relevance to biodiversity loss in Brazil

SOCIO-ECONOMIC FACTORS	**ENVIRONMENTAL FACTORS**
These activities:	**Result in:**
Infrastructure and settlement (especially roads). Large projects (for example, mining and energy). Production of commodities and agricultural products (agricultural expansion). Settlement processes and demand for land: induced by government (through for example settlements), real estate speculation, land grabbing, etc. Water and soil pollution from urban centers and agricultural (herbicides, fungicides, insecticides) and industrial (mining, oil and gas) activities. Difficulties in transforming potential opportunities of native habitats into real economic gains. Hunting for consumption, incidental capture and conflicts with humans. Commercial hunting.	Habitat loss for reproduction, migration, etc. Habitat degradation and ecological imbalance. Population fragmentation or isolation and loss of genetic variability. Invasive species, diseases, competition, and hybridization. Reduction in effective populations.

Source: Fourth National Biodiversity Report

Historically, pressure on ecosystems has resulted in plant cover loss in Brazilian biomes, such as the Atlantic Forest which saw more than 70% of its area removed, as seen in Table 2.

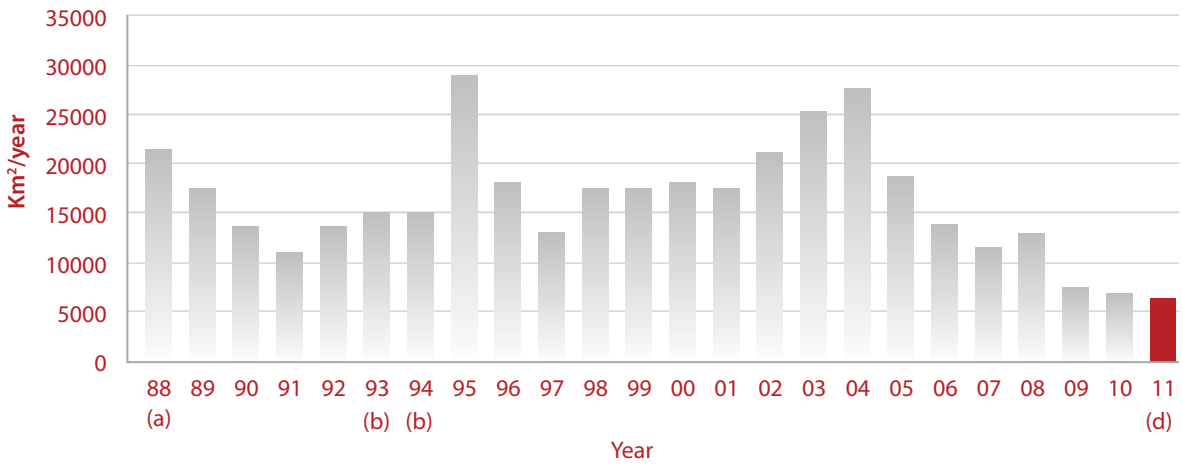
Table 2: Results of monitoring non-Amazon biomes through the Project for Monitoring Deforestation in Brazilian Biomes via Satellite[14]

BIOME	TOTAL AREA IN KM²	AREA LOST IN %			TOTAL AREA LOST IN KM²	ANNUAL PLANT LOSS RATE % (Between 2008 and 2009)
		2002	2008	2009		
Amazon	4,196,943	14.84	17.46	17.63	739,928	0.17
Caatinga	826,411	43.38	45.39	45.92	379,488	0.23
Cerrado	2,047,146	43.67	47.84	48.22	983,392	0.37
Atlantic Forest	1,103,961	75.62	75.88	75.90	837,685	0.02
Pampa	177,767	52.76	53.98	54.12	95,958	0.18
Pantanal	151,113	12.35	15.18	13.3	22,938	0.12

Source: Adapted from: Brazilian Institute of Geography and Statistics (IBGE). Sustainable Development Indicators, 2010 (13)

Brazil is seeking to reconcile economic growth with the adoption of sustainability concepts, having recorded a decrease in deforestation rates for the Amazon biome (image 2) as demonstrated by the deforestation monitoring programs implemented by the government[15].

Image 2: Deforestation rates in the Brazilian Legal Amazon since monitoring began in 1988, in km² per year



Source: National Institute for Space Research / Program for Monitoring Deforestation PRODES

Thus, based on this relationship between socio-economic development and ecosystem alterations, public and private strategic planning should seek to coordinate common objectives in order to best ensure sustainability. These actions should not only conserve Brazilian biodiversity, but primarily maintain the positive economic development in the country and the continuity of business activities.

Sustainable Development: the impact of biodiversity loss on the economy

The previous section addressed how economic development impacts BES in Brazil. However, it is important to reinforce among Brazilian businesses the understanding that BES loss will not only have consequences on the environment, but also on the prosperity and sustainability of business activities.

A study developed by the CBD estimates that US$ 300 billion per year would be necessary to save the planet's biodiversity, including the sustainable management of agriculture, forests, sweet water and coastal and marine ecosystems. This sum corresponds to ten times more of what is currently spent by governments, industries and NGOs on biodiversity protection. Brazil

[14] Information available at: http://www.ibge.gov.br/home/geociencias/recursosnaturais/ids/default_2010.shtm.

[15] Among deforestation monitoring programs, the PRODES Methodology stands out. It consists of a systematic survey done since 1988 which presents estimates of annual gross deforestation rates in the Amazon, i.e., accumulated value, based on the detection of deforestation as clear-cutting above 6,25 hectares. This estimate is made through LANDSAT/CBERS satellites that produce images, vector maps and tables.

is home to the greatest tropical forest cover in the world, mainly focused in the Amazon region and encompassing close to 12% of the entire global forest cover (1).

Based on this study, it is possible to infer that biodiversity conservation in Brazil could exceed 36 billion dollars per year (12% of the 300 billion forecasted by the above cited study), which represents approximately 0.9% of the Brazilian GDP[16]. For comparative purposes, the Ministry of the Environment budget for 2011 for conservation programs was R$ 3.3 billion (14). However, the study proposes that the additional cost should not be covered exclusively by governments, but also by businesses and society as a whole, including through intensified public-private partnerships and payments for environmental services mechanisms (15).

On the other hand, not adopting any additional actions according to the Global TEEB could result in costs in the order of US$ 2 to 4.5 trillion per year globally.

Other studies calculate the economic value of ecosystem services on the planet at around 33 trillion dollars, of which nutrients cycling is the highest valued ecosystem service, corresponding to US$ 17 trillion (more than half of the total). Close to 40% of the total value of services are provided by terrestrial ecosystems, and forests contribute to services valued at 4.7 trillion, such as nutrients cycling, raw materials, climate regulation and erosion control (1).

Similar studies have been carried out for specific ecosystem services such as the maintenance of water resources. A loss in Biodiversity and Ecosystem Services also results in deteriorated water quality, which could elevate investments necessary for treatment (more information in Box 6 below).

Box 6: Water – the ecosystem service that is attracting the business sector

The *Water Resources Group* (16) conducted a detailed analysis of current socio-economic activities and their impacts on global water resources. The study assessed the global demand for water as a function of GDP and population growth, and concluded that demand for water resources could lead to a supply shortage estimated at 40% for 2030, which represents a risk to businesses. Brazil is expected to grow above the global average and consequently will demand a greater quantity of water resources (17).

The capacity of rivers within the Brazilian territory represents 12% of global water resources. However, despite the large quantity of water resources, the country exhibits a heterogeneous distribution of water marked by areas and regions with low availability, which indicates context of potential conflicts over the use of water resources over the coming decades, especially in Brazilian regions characterized by low economic development such as the northeast.

Another characteristic that sets Brazil apart is the fact that 14% of the Brazilian energy matrix is composed of hydroelectricity (in the electricity matrix, energy generated from hydroelectricity represents close to 80% of the total). Furthermore, the Decennial Plan for Expansion of Electric Energy intends to invest in increasing these types of ventures, whose operations have direct impact and dependence on water resources.

The same study predicts that the State of Sao Paulo alone will demand 20 billion m3 of water in 2030, given that the current demand is just above 18 billion m3. To eliminate shortages in four regions of the State of Sao Paulo, the study predicts an annual cost of 18 billion dollars. This sum, although high, is still 75% less than the investment necessary in the event that no action is taken to reduce water consumption by 2030.

Given the importance of this topic, water is already on the environmental agenda of the Brazilian government. The most relevant regulations on the topic include the National Plan for Water Resources and the National Policy for Water Resources. These instruments, approved by the National Council for Water Resources in 2006, implemented charges for water use. Mechanisms such as a charge for water use establish a value for charges and compensations through negotiations and quantitative economic methodologies, but overall current water consumption charges are still underestimated.

In line with the above mentioned case, some firms recognize that water provision is one of the most relevant ecosystem services for Brazilian businesses, along with managing Greenhouse Gas (GHG) emissions (18). There is an expectation that water management could be "the next carbon," with an even greater potential because from a business perspective its relevance to business operations is more tangible and shortages would result in direct impacts on productive activities[17].

[16] Value of GDP in 2011: R$ 4.143 trillion.
[17] On the other hand, it is important to understand that climate change is one of the environmental factors that will affect the availability of water resources.

The relationship between BES loss and water shortages involve complex environmental dynamics, scarcely noticeable through traditional methods of business management that involves, among other things, measuring consumption, adopting measures to reduce and reuse water and mitigation measures such as treatment of effluents. Studies suggest that the loss of plant cover directly impacts the regional and global water cycle. The following box discusses how a loss of ecosystem services provided by the Amazon Forest could affect the main urban centers in the southeastern region of the country.

Box 7: Flying rivers – the importance of the Amazon Forest for climatic regulation in the south of the Amazon Forest

There is already existing scientific knowledge of air masses that originate in the Amazon Forest and are transported to other regions, influencing humidity levels as well as rainfall patterns. Since 2007, Professor Eneas Salati has been studying this phenomenon with his team of scientists.

The studies carried out under the coordination of professor Salati demonstrate significant influences by the Amazon hydrological cycle on the Rio Prata basin, the hydrographic basin that extends through Brazil, Uruguay, Bolivia, Paraguay and Argentina. The Rio Prata is the second largest basin in Brazil and stretches across the southern and southeastern regions.

The routes of the flying rivers cross the states of Goias, Santa Catarina, Mato Grosso, Parana, Sao Paulo and Minas Gerais. Initial results from the project, which is not yet concluded, demonstrate that the volume of water vapor transported by these air masses can reach the same order of magnitude as the Amazon river flow rate (200,000 m3/s). To emphasize the importance of preserving the Amazon hydrographic basin and its links with other climates and basins, the study also recommends emphasis on education.

The loss of BES in the Amazon implies not only indirect losses, but also direct economic losses such as that cited in Box 8 below.

Box 8: Estimating the cost-benefit of deforestation in the Amazon

A study carried out by the Institute for Applied Economic Research (IPEA), based on value methodologies and calculating the cost of deforestation in the Amazon, noted the cost to be US$108.1 per hectare per year, when taking in to consideration the extraction of resources, environmental services and the future value of genetic resources among other factors[18].

The study utilized various cost benefit analyses of deforestation in the Amazon, combining studies that calculated the value from the direct use of the forest (wood, non-wood products and ecotourism), indirect use (carbon storage), option value (bioprospecting) and existence value[19]. Discount rates of 10%, 6% and 2% were applied to these values. Despite some uncertainties, the study concluded that if local landowners in the Amazon received US$ 108.1 per hectare per year, we would be close to enabling sustainable use of a large part of the Amazon region, as presented in the below table.

SHARE OF COST	US$/ha/ year
Discount rate	**10% a.a.**
Direct use value	**37.7 (35%)**
Wood products	28.5
Non-wood products	0.2
Ecotourism	9
Indirect use value (carbon storage)	**18 (17%)**
Option value (bioprospecting)	**21 (19%)**
Existence value	**31.2 (31%)**
Total	**108.1**

The calculations demonstrate that the existence value of the Amazon would be proportionally greater than the other values presented in the above table, at approximately US$ 31.20/ha. This implies that international compensation instruments could be implemented with the sole objective of preserving the Amazon Forest, thus generating monetary incentives for preservation.

In addition to economic value, an interesting perspective on this issue relates to the public motivation for making payments for the existence value of the forest. In greater detail, the study presents research by various scientists on how residents in the United Kingdom and Italy were willing to pay for the conservation of between 5 and 20% of the total Amazon area in 1999. Among the

[18] See environmental valuation methods in Appendix III of this document.
[19] For study of currently available valuation methods, please see "TEEB Ecological and Economic Foundations in Environment and Development Economics", available at: http://www.teebweb.org/EcologicalandEconomicFoundation/tabid/1018/Default.aspx.

motivations given by interviewees, more than 50% agreed that the future of the Amazon was a global problem, 50% considered the impacts on climate change caused by deforestation, 33% worried about future generations and 17% worried about maintaining biodiversity.

Although the sample utilized was limited, it is possible to identify that the Amazon Forest has a value to the public(19).

With regards to the direct forest use values generated by the study, it is possible to claim that the benefits from preservation of the Amazon exceed the costs of deforestation from a global perspective, that is, when the interests of society are accounted for in the valuation process.

The conclusion of the study highlights that *"in order for deforestation losses in the Amazon Forest not to cause damages to local communities and at the same time encourage sustainable forest use, it is necessary to create market mechanisms or international compensation schemes that value the environmental services of the forest, which are captured by the global population as a whole".*

It is important to emphasize that the socio-economic divergences between countries also imply unequal use of our natural heritage. Data from the *Global Footprint Network* demonstrate that more than 80% of the global population lives in countries where natural resource consumption is greater than the generative capacity. These countries rely on the excess resources concentrated in the so-called ecological creditors, countries that consume less bio capacity than they have to fulfill their needs. This pattern can also be observed inside a large country such as Brazil, where a large part of natural resources and ecosystem services are consumed in regions with the greatest economic development. For example, the southeastern region is the main energy consumer in the country but is not home to the country's energy generating ventures, which according to the Decennial Plan for Energy Expansion should be concentrated in the northern region. In turn, the construction and operation of these ventures is frequently linked to BES loss in local vicinities. The same relationship can also be perceived on an international level, where developing countries assume a large share of environmental impacts through the export of agricultural products, mining resources and other raw materials to developed countries.

This relationship is not always well known, because traditionally used economic indicators such as the GDP do not reflect the dependence of business activities on BES. Brazil, for example, is in 84th place on the Human Development Index

(HDI) rankings, but is considered the sixth-largest global economy. A study developed by the *International Human Dimensions Programme on Global Environment Change* (UNU-IHDP) proposes an indicator of natural wealth that considers environmental aspects. According to this new indicator Brazil grew by 3% since 1990, in contrast to the 34% when considering only GDP, since this growth took place at the cost of depleting forest stocks, mineral reserves and fossil fuels.

In addition to this new indicator, there are various incentives to integrate socio-environmental aspects into growth and development assessments of countries, such as "Green GDP" (Box 9 below). This is an indicator that takes into account environmental consequences; that is, environmental costs caused by economic growth as calculated by the standard GDP. The calculation includes, in addition to the commonly used economic and social criteria and data, national ecological heritage. The inclusion of this indicator will hopefully move countries to start valuing the services provided by ecosystems and incorporate them into the accounting of the sector. Thus, Green GDP could represent a joint indicator for economic processes, environmental sustainability and well-being in society (20).

Box 9: The State of Rio de Janeiro and Green GDP

A legal project under negotiation in the State of Rio de Janeiro proposes that GDP calculations be reformulated (20). The new calculation would include national ecological heritage, or rather the loss of environmental assets such as forests, waters and biodiversity would be discounted from the monetary value of the wealth generated. This way, the indicator would demonstrate that economic development cannot occur at the cost of natural capital. The opinion of some specialists, however, is that adopting this practice in an isolated manner could cause a loss in competitiveness compared to other states and countries, and as such negotiations on a federal or international level is necessary.

The UN Division for Statistics, which defines methodologies and norms associated with the calculation of National Accounts, has included the standardization of National Environmental Accounts since the 1990's. However, the majority of developing countries have not adhered to the proposed changes. Some developed countries have already developed national accounts that incorporate environmental variables. This is not a recent initiative, but it did recently gain fame through the proposal to include biophysical indicators as complements to economic indicators. Green GDP *per se*, which implies the deduction of environmental costs from GDP, is not considered politically viable despite many proposals for its adoption (21).

The presented examples seek to illustrate that losses of Biodiversity and Ecosystem Services have direct and measurable impacts on the economy. However, these impacts will be felt unequally across society, depending on the dependence of humans and organizations on BES.

The next chapter will present which ecosystem services are the most important for each sector and how of the related dependence and impact of businesses will influence activities.

03

Business, Biodiversity and Ecosystem Services

Business, Biodiversity and Ecosystem Services

Key messages

Businesses impact and depend on BES: businesses benefit to a greater or smaller extent from biodiversity and related ecosystem services, through the supply of resources, cycling of nutrients and maintenance of hydrological cycles. This dependence is also responsible for alterations of ecosystems, with impacts on BES as a consequence. This dependence generates both opportunities and risks for businesses, which is why businesses should incorporate BES in their strategic management.

Brazilian business leaders already recognize sustainability and BES from a strategic perspective: There are already initiatives aimed at improving BES management in Brazilian businesses, although most of these actions are still isolated, and as such it is necessary to better understand the dependence and impact in order to integrate BES management with business in a strategic and long term manner.

The impact and dependence of businesses on BES vary across sectors: the management of risks and opportunities at firms depends on a careful analysis of dependence and impact between the sector and BES. For sectors with a direct link, such as agro-forestry, it is much simpler to decipher which ecosystem services are of greatest strategic value. Sectors with an indirect link to BES, such as finance or retail, need a better understanding of their supply chain to understand their relationship with BES.

Consumer demand for socially and environmentally responsible products is a global trend that influences the decisions of business leaders: in Brazil, the theme is widely understood by consumers, but only 15% of Brazilians declare themselves willing to compensate businesses that exhibit good sustainability practices. The expectation of business leaders is that awareness among Brazilian consumers will grow over the coming years.

The main association between the business sector and biodiversity take the shape of associated dependence and impacts on the services provided by ecosystems. In accordance with the type of activity that a firm engages in, this link could be direct or indirect and present to a greater or lesser degree risks and opportunities for business activities. In this chapter, the impact and dependence of some Brazilian business sectors on BES will be presented. The objective is to demonstrate the importance of understanding these linkages for the strategic management of firms, whose knowledge could be deepened through the utilization of analysis and tools that identify risks and opportunities related to BES. This will be presented in the chapters that follow.

Nature (in favor) of business: associated dependence and impact between businesses and BES

"Businesses cannot function if ecosystems and the services that they offer – such as water, fibers, food, soil and climate – are degraded and imbalanced".

World Business Council for Sustainable Development

Businesses in all sectors, to a greater or lesser degree, benefit from ecosystem services, such as the supply of agricultural resources, nutrient cycling and maintenance of hydrological cycles. As such, there is a dependence of businesses on BES. This dependence generates alterations in ecosystems, with impacts on BES as a consequence. Such alterations to ecosystems, whether derived from the actual activity of a firm and/or from its value chain or from natural dynamic processes, will also have implications for the operations of the business sector as the services on which they depend alter.

Businesses have already implemented actions such as engineering studies, new technologies and processes that reduce impacts or initiatives to promote sustainability throughout the value chain. However, they should deepen their understandings of their impact and dependence on BES, as well as the risks and opportunities to which they are subjected in order to determine strategies that are more applicable to individual situations. A BES loss will have a long term impact on the global economy, which consequently will impact prices, business models and access to natural resources.

The study "The Millennium Ecosystem Assessment" (MEA) outlines the ecosystem services that have been most altered over the past decades due to anthropogenic influences, as presented in the below image.

Image 3: Assessment of anthropogenic alterations of ecosystem services (modified from TEEB for Business)

PROVISIONING SERVICES		
Food	Crops	↑
	Livestock	↑
	Capture fisheries	↓
	Aquaculture	↑
	Wild foods	↓
Fiber	Timber	+/-
	Cotton, silk	+/-
	Wood fuel	↓
Genetic resources		↓
Biochemicals, medicines		↓
Water, freshwater		↓

REGULATING SERVICES	
Air quality regulation	↓
Climate regulation - global	↑
Climate regulation - global and local	↓
Water regulation	+/-
Erosion regulation	↓
Water purification and waste treatment	↓
Disease regulation	+/-
Pest regulation	↓
Pollination	↓
Natural hazard regulation	↓

CULTURAL SERVICES	
Spiritual and religious values	↓
Aesthetic values	↓
Recreation and ecoturism	+/-

Legenda: ↑ globally enhanced ↓ globally degraded
Source: Adapted from the Millennium Ecosystem Assessment *cited* TEEB Global..

According to this study, 15 of 24 ecosystem services exhibited global deterioration. Only 4 showed global improvements: agriculture, agricultural products, forest products and climate regulation. In this context, the MEA identified the main challenges for businesses with regards to relations of dependence and impact:

- Water scarcity.
- Climate alterations.
- Habitat alterations.
- Loss of biodiversity and spread of invasive species.
- Excessive exploration of oceans.
- Nutrient overload.

All alterations could to a greater or lesser degree affect business activities, depending on the ecosystem services that have the greatest link to Brazilian businesses. Table 3 presents some examples of these links.

Table 3: Dependence between BES and the business sector

ECOSYSTEM SERVICES:	RELATED SECTORS (DIRECT USE)	RELATION WITH PRODUCTION PROCESS	MAIN IMPACT(S) DUE TO LOSS AND DEGRADATION OF BES
Supply: water, fibers, fuel and food.	All	- Raw material consumption.	- Resource scarcity. - Increasing prices of raw materials in the supply chain
Supply: of genetic resources, especially for agrobiodiversity	Cosmetics and Pharmaceuticals, Agriculture, pulp & paper	- Prospecting for the discovery of new uses and development of new products and technologies. - Research and development in biotechnology for genetic improvement in cultures and modern commercial products. - Conservation of resources for research related to themes such as biology, ecology, palaeontology, anthropology and archeology.	- Resource scarcity. - Loss of agricultural productivity. - Contamination of water resources.
Regulation: water purification.	All	- Human, animal, agricultural, industrial and energy consumption.	- Increased operational costs due to catchment and treatment of water.
Climate regulation: carbon storage and regional climate regulation (climate processes, for example the water cycle).	All	-Soil use and settlements. -Raw material consumption. - Emission of greenhouse gasses.	- Altered rainfall patterns and local climates, effect on optimum conditions for agriculture and animal farming. - Risks of material losses due to floods and droughts.
Regulation: Pollination.	Agriculture and Pulp & Paper	- Agricultural production of food and biofuels.	- Loss of agricultural productivity.
Regulation: disease control, especially related to agro-forestry activities.	Agriculture and Pulp & Paper	- Maintenance of agricultural production.	- Loss of agricultural productivity.
Cultural: traditional knowledge of medicinal resources.	Cosmetics and Pharmaceuticals	- Medicinal plant use as source of substances to fabricate medicines and cosmetics.	- Diminished variety of inputs for commercializing new products.
Support: nutrient cycling and soil formation.	Agriculture and Pulp & Paper	- Soil use and occupation.	- Loss of productivity and productive areas. - Increased cost due to inputs to correct soil. - Decreased quality of water resources from erosion and sedimentation.

Source: prepared by authors

Sustainable business: how and why Brazilian businesses incorporate BES in their strategic management

The inclusion of BES in businesses strategic management plans depends on factors such as the perceptions of business leaders and consumers, which may vary in accordance with global and national perspectives.

Perceptions of business leaders

According to the study *Biodiversity and Business Risks* prepared by PwC (22), 53% of CEOs in Latin America and 45% in Africa worry that biodiversity loss could negatively affect growth prospects for their businesses, as compared to 11% in Central and Eastern Europe.

A global study realized by *McKinsey* (23) demonstrates that close to 60% of executives see biodiversity more as an opportunity than as a risk to businesses. They identified a series of opportunities, such as strengthening the reputations of businesses with environmentally conscious stakeholders and developing new ideas and products derived from natural resources that promote biodiversity conservation.

On a national scale, Brazilian businesses are approaching BES management in various ways:

- Including BES protection in philanthropic projects, though without necessarily considering strategic links with business activities.
- Developing voluntary or compulsory mitigation programs that address biodiversity impacts.
- Engaging senior management and key business units with the objective of creating awareness of strategic BES management among decision-makers.
- Implementing pilot programs that generate value for the business through biodiversity conservation, in particular for the creation of new products, marketable environmental assets and the inclusion of BES in business accounting.

According to the Dom Cabral Foundation, a Brazilian learning center for executives, entrepreneurs and public administrators, environmental management in Brazilian businesses has evolved over time. Initially businesses implemented short term management limited to legal compliance. As a second step businesses began adopting voluntary practices and ultimately developed strategic environmental agendas identifying risks and opportunities related to operations (24). The same logic can be applied to BES management, since Brazilian businesses find themselves in various phases as outlined in Table 4.

Table 4: Main perceptions of BES by Brazilian businesses

PHASE	DESCRIPTION	EXAMPLES OF MANAGEMENT TOOLS USED BY BUSINESSES
Mitigation of impacts	The first and most traditional step adopted by firms relates to managing impacts caused by business activities on biodiversity.	Environmental impact studies. Best production practices such as cleaner production, sustainable agriculture and programs for mitigating impacts on biodiversity.
Understanding dependence	The second and more recent phase integrates the importance of biodiversity as a basis for business development.	Adopting corporate strategies such as water management in areas with a water deficit and sustainable management of natural resources (e.g. fishery and forestry products).
Generating value	A new trend is materializing where firms seek to add value to their activities through biodiversity conservation, especially in the creation of new products, marketable environmental assets and the inclusion of BES in business accounting.	Green exchange in Rio de Janeiro. Carbon credits. Product certification.

Source: prepared by authors

A survey by the Brazilian Institute of Public Opinion and Statistics IBOPE (2011) (25) of 400 Brazilian business leaders demonstrates that the main motivating factors for adopting sustainable actions include complying with regulations, aggregating value to business image, adapting to market tendencies, fulfilling expectations of civil society and satisfying consumer demands. In addition, the research revealed that:

- 70% of interviewed subjects expressed that their clients seek to know if businesses engage in sustainable practices, especially for the industry and service sectors;
- 3% is the average expenditure of businesses on sustainability, most of which is spent exclusively in the environmental area;
- 71% of interviewees considered sustainability practices when selecting suppliers;
- 68% of businesses promote reduced emissions of carbon and other greenhouse gases;
- 66% of businesses have a formal environmental policy;
- 64% highlight sustainability in the business image or its products;
- 43% invest in renewable energy use;
- 8 of every 10 businesses that implement sustainability actions have a strategic plan, with the main objective of decreasing direct impacts of activities on the environment.

The above cited research does not only consider BES but rather the broader scope of sustainability. The inclusion of BES in the sustainability context can be observed in another study of 21 Brazilian firms (18), as seen in Table 5. The research explored business leader's perceptions of sustainability trends as a priority for business in Brazil. The question posed to firms was: "Which of these initiatives would most impact your business?"

Table 5: Research on initiatives related to sustainability in 13 sectors[20] of the Brazilian economy

THEME	NUMBER OF CITATIONS	INDICATED AS MOST RELEVANT
Transparency	17	12
Water	14	10
GHG Emissions	14	7
De-materialization[21] ("Green Information Technology" and virtual business)	10	6
Environmental Services	5	4
Organics and Natural	3	1
Biodiversity	2	0

Source: Adapted from Ideia Sustentável, 2011

Thus, BES can be directly or indirectly related to initiatives that will influence the sustainability of Brazilian businesses. The recognition of this trend has rendered important initiatives aimed at identifying ways to promote strategic BES management for firms. The Brazilian private sector is mobilizing to develop initiatives that seek to increase awareness of businesses and the general public for sustainability, and establish targets as outlined in Image 10, which highlights three of the main current initiatives. In addition to these initiatives, it is worthwhile to remember the "Dialogues on Biodiversity" cited in chapter 2, that aim to reconcile the private sector, NGOs and the government in developing a national strategy to achieve the Aichi Targets and implement Brazil's strategic biodiversity plan.

[20] Sectors that participated in the study included food and beverage, agribusiness, bank, consumer goods, electronic, energy, pharmaceutical, infrastructure, mining, petrol-chemical, products and services and retail.

[21] The Union for Ethical Bio-trade (UEBT) carried out a study of consumers in various countries which found that Brazilian consumers' understanding of biodiversity is relatively advanced in comparison to countries such as the United Kingdom, Germany, France and the United States, as demonstrated by the following image (28) .

Box 10: Business Movement for Conservation and Sustainable Biodiversity Use, Thematic Chamber on Biodiversity and Biotechnology (CTBIO), and Thematic Environmental Council (COEMA)

The Business Movement for Conservation and Sustainable Biodiversity Use is an inter-sectoral movement that unites various firms with the intent of mobilizing the business sector to engage in BES management by promoting dialogue between the public and private sectors to improve the legal framework and existing regulation, with participation and support from civil society organizations (26). By the end of 2010, more than 60 businesses and institutions adhered to MEB[22]. Representatives organized in plenary sessions and committees developed governance documents for the Movement and represented MEB at events and meetings in the public and private spheres to discuss biodiversity, such as the Conference of the Parties (COP-10) in Nagoya.

Another important initiative for BES management in the business sector is the Thematic Chamber on Biodiversity, organized by firms associated with the Brazilian Business Council for Sustainable Development (CEBDS). This thematic chamber emerged to promote social and economic development while at the same time preserving biodiversity. Its creation within the scope of the Brazilian Business Council for Sustainable Development is representative of the growing importance that society and businesses are attributing to biodiversity. In 2010, CEBDS members committed to seek a link between business activities and biodiversity and to improve knowledge of how these issues relate to their businesses, through the analysis and selection of tools that enable better management in this area. In the long term, CTBIO expects its members to gain skills and knowledge of management strategies and biodiversity and environmental services valuation methodologies.

The Thematic Environmental Council (COEMA) (27) is one of the thematic councils of CNI (National Confederation of Industry) with the objective of formulating directives and strategies that serve as basis for CNI's decision making and political, economic and social positioning in the environmental area. COEMA is responsible for: accompanying and guiding actions by industrial firms to protect the sector image in all issues related to environmental performance and management, especially through promotion and adoption of ISO norms; formulating lines of actions to increase competitiveness of industries based on environmental preservation; stimulating eco-efficiency practices; promoting debates with environmental specialists and authorities on environmental licensing, environmental control and quality, biodiversity and forests, treatment and disposal of residues, among others; and following tendencies and impacts related to environmental issues in the National Congress.

Perceptions of consumers

Consumer perceptions of the importance of incorporating BES in firm management is of utmost relevance to motivate the implementation of this issue in organizations, since consumers have the power to manipulate markets by selecting products and services that best fulfill consumer needs and are consistent with personal principles.

[22] Launched in 2010, the founding members of MEB include Alcoa Aluminium S.A., Natura Cosmetics S.A., Vale S.A. And Walmart Brasil Ltda., the Brazilian Association of Business Communication (ABERJE), Conservation International Brazil (CI-Brasil), the Center for Sustainability Studies at the Getulio Vargas Foundation (FGVCes), The Brazilian Biodiversity Fund (Funbio), The Amazon Institute of Man and the Environment (Imazon), the Ipê Institute for Ecological Research, the Ethos Institute for Businesses and Social Responsibility, the Union for Ethical Biotrade e World Wildlife Fund For Nature Brazil - WWF-Brasil.

The *Union for Ethical Bio-trade* (UEBT) carried out a study of consumers in various countries which found that Brazilian consumers' understanding of biodiversity is relatively advanced in comparison to countries such as the United Kingdom, Germany, France and the United States, as demonstrated by the following image (28)[23].

Image 4: What do consumers know about subjects related to biodiversity?

Fonte: Union for Ethical Biotrade (30)

Despite understanding the topic, research carried out by the Monitor for Corporate Social Responsibility (2009) (18) highlights that the majority of Brazilian consumers still do not apply sustainability criteria when selecting products. However, this perception could be important to reach specific niches in the market. Of the consumers interviewed:

- 59,3% are indifferent: did not adopt criteria of sustainable business conduct when selecting products, valuing instead price and market affinity;
- 15,2% are remunerative: prefer to reward sustainable businesses and try to induce change among manufacturing firms;
- 10,2% are on the fence: that is, consider sustainability issues but do not apply these criteria when acquiring products;
- 8,2% are retaliatory: avoid buying products and criticize businesses to third parties or divulge information about BES practices considered inadequate;
- 7,1% are ethical: that is, they use their power to reward or punish with the intention of contributing to stimulate positive change in businesses.

A look at business relationship with BES: sectoral reflections and trends that could impact Brazilian firms[24]

Despite regulation and public perceptions being factors that encourage firms to adopt BES management, it is important that they also realize that their business operations can suffer negative impacts in the event of ecosystem alterations.

To do this, it is necessary to understand the elements of biodiversity and ecosystem services with which the sector and firm interacts. This is possible through specific studies and the use of appropriate methodologies and tools, which will be outlined in Chapter 6 of this report.

[23] The percentage of interviewees that recognize topics related to BES is displayed in green and the percentage of interviewees that know the correct definition of biodiversity is presented in blue.
[24] Some sectors were analyzed jointly, as relations of impact and dependence were considered similar.

Next, some sectors of the Brazilian economy and their impact and dependence on BES will be presented and discussed, with the intention of suggesting ideas of how managers should analyze BES from a strategic management viewpoint. Sectors were grouped based on similarities in their direct relations of impact and dependence on BES, although magnitudes may differ. Throughout the next chapters, risks and opportunities will be discussed in conjunction.

Agriculture and Pulp & Paper

Agriculture is one of the main economic activities in the country and was the sector with the highest growth during the past decade, exhibiting annual growth of 3.59% over the 200 to 2010 period, using GDP as reference (29). The primary Brazilian agricultural products include corn, soy, sugar cane, rice, cotton, wheat, coffee and oranges. The products with the greatest growth perspective in Brazil over the coming years are cotton, soy, sugar cane and forestry for paper and cellulose.

Agriculture is recognized as one of the economic activities that presents the strongest link to BES. Economic and population growth in Brazil raises the challenge to increase productivity without contributing to accelerated biodiversity loss and ecosystem fragmentation. Studies carried out by the Ministry of Agriculture, Livestock Farming and Supply (MAPA) estimate that the increased production will be accompanied by an increased productivity. Production of grains for example, should increase 23% by 2021, while the productive area will only increase by 9.5% (30).

Agricultural production depends on the availability of water, soil fertility, nutrient cycling, biological pest control, climate regulation and pollination. A classic example is the importance of bees for agriculture and forestry, as they are essential pollinating agents for activities in these sectors, which could be affected by the pollution and alterations of habitats. It is estimated that damages from an absence or reduction of services provided by bees in global agriculture could reach 189 billion dollars (Global TEEB). Seeking to better understand this dependence and the associated risks, Brazil is part of an international project called "Conservation and management of Pollinators for Sustainable Agriculture through an Ecosystem Approach", an initiative by the United Nations Food and Agriculture Organization (FAO) that began in 2010. With financing from the Global Environment Fund (GEF), $R 3.5 million will be channeled to the project (GEF-pollinators) involving researchers from Embrapa and Brazilian universities to study the pollination deficit in the main Brazilian crop cultures that depend on this service (soy, cotton, apples, cocoa, coffee, nuts, tomato etc)[25]. In regards to dependence on BES, Brazilian biodiversity has given rise to economically important species such as cassava, peanut, pineapple, cocoa and cashew among others, whose continued productivity depends on the establishment of gene banks and samples from native ecosystems (31).

The sector's main environmental impacts occur from the use and occupation of land and the clearing of plant cover in Brazilian biomes, which can cause erosion, introduce exotic species and affect the quality of provision services such as water through the use of pesticides and fertilizers on soils. The conversion of large areas of the Amazon forest and the Cerrado into soy production and livestock farming are examples of this. As such, the sector has great opportunities to maintain and even increase productivity while at the same time preserving ecosystems by investing in biotechnology research that focuses on reducing the water consumption of cultivated crops, reducing the use of pesticides and other chemical products and increasing productivity without expanding planted areas.

The below Box summarizes a case where Monsanto do Brasil Ltda., an American multinational firm in the agricultural sector, recognizes the importance of BES to its business activities and started to encourage conservation projects in the Atlantic Forest and Cerrado biomes.

Box 11: Produce and Conserve Program: how Monsanto interacts with its value chain to promote biodiversity conservation

Monsanto and the NGO Conservation International (CI-Brasil) began a partnership in 2008 to invest US$ 13 million over five years in environmental preservation projects in the Atlantic Forest and Cerrado biomes. The objective was to develop practical actions to combat illegal deforestation and species extinction, as well as promote compliance with existing environmental laws related to agriculture in these regions.

The partnership operates in the Northeastern Biodiversity Corridor (Atlantic Forest) and the Jalapao-East Bahia Biodiversity Corridor (Cerrad0). These regions were selected because they are biodiversity hotspots -- among the 34 areas identified by CI with the richest fauna and flora, and at the same time among the most threatened in the world, with 75% or more of original plant covers cleared. Project resources are

[25] www.polinizadoresdobrasil.org.br

used to map rural properties in order to encourage producers to comply with the Forest Code, to support scientific research that identifies existing biodiversity in target areas, and to further the establishment of Conservation Units, through studies of threatened species protection and consolidation of biodiversity corridors[26].

Also in 2011, an agreement was signed with the Environment Secretary in the municipality of Luís Eduardo Magalhães, in the state of Bahia, a region rich in biodiversity, to launch the LEM APP 100% Legal campaign that aims to transform the "capital of Brazilian agribusiness" into the first Brazilian municipality with all its Permanent Preservation Areas (PPAs) in compliance with environmental law. The campaign offers technical and scientific support to rural producers and traditional communities that volunteer to restore their degraded areas. Registered landowners receive visits from technical staff that diagnose areas, as well as recommendations for the best restoration techniques.

The pulp & paper sector depends on BES due to its land-use for the cultivation of eucalyptus or pine, used as raw material for paper production. According to estimates by the Brazilian Association of Cellulose and Paper (Bracelpa), paper production in 2012 should reach close to 9.8 million tons. In turn, export revenues should amount to US$ 7.2 billion, which represents a 6.4% increase as compared to 2010. The European Union was the main importer of Brazilian cellulose and provided 46% of export revenues for this product, followed by China and North America, at 25% and 19% respectively. With regards to paper, Latin American countries remained the primary market and accounted for 56% of export revenues, followed by the European Union and North America at 18% and 10% of export revenues respectively (32).

The main ecosystem services on which the sector depends are soil and climate regulation, as well as supply services of wood, fibers and water. The main BES relation of the sector is through forestry which provides raw material for paper production. In the production of paper, water is an important provision service for sector operations.

Among the activities of the Agriculture, pulp & paper sectors that could impact BES, the most significant include the introduction of exotic species, land use conversion, altered soil composition and the use of chemical products. These activities relate to the following impacts: erosion and compression of soils, agrochemical exposure of water bodies and animals and habitat conversion. These impacts, which could be minimized through adequate management, can threaten the provision of ecosystem services on which the sectors depend, as well as result in higher agro-forestry production costs.

On the other hand, agroforestry systems can favor some ecosystem services through the maintenance of forested areas (as compared with degraded areas), such as improved soil fertility and erosion control, the protection water resources and carbon absorption. Furthermore, the planting of forests with sustainable management could reduce the pressure on native forests. Thus planted forests could contribute to maintaining the conservation areas mandated by law (PPAs and LRs) (33), depending on the legal demands advocated by each Brazilian state.

Oil & gas and chemicals

The oil and gas sector represents an important portion of the Brazilian economy. Last year, the country increased its diesel consumption by 11.2% and gasoline consumption went up by 19.4%. Today, diesel oil represents 50% of consumption for the Brazilian transport sector, resulting in a 17.5% increase in the production of petroleum between 2010 and 2011 (34). Furthermore, the recent discovery of the pre and post-salt reserves off the Brazilian coast greatly influences national energy planning and will have an important bearing on the environment. Beyond its energy role as a combustion agent, there are also more noble uses for the product in for example the chemical industry.

The chemical industry operates in the production of two main types of products: chemicals for industrial use (organic and inorganic products, resins and elastomers, among others) and for final use (fertilizers, agricultural pesticides, paints and varnishes). The Brazilian chemical sector had 2009 turnarounds of close to R$ 200 billion, representing around 2.6% of the Brazilian GDP (35).

[26] Ecological corridors are large extensions of forest ecosystems considered priority for the conservation of biological diversity in Brazil, through the integration of public and private Conservation Units through selected "ecological corridors". The executive secretary of the Ministry of the Environment coordinates a project to establish ecological corridors in Brazil since 2002 (www.corredoresecologicos.ba.gov.br).

Given that the largest share of Brazilian oil exploration is done on offshore platforms, the sector's most significant influence on species diversity is through interactions with marine ecosystems during exploration activities and petroleum production, such as carrying out seismic studies, drilling, construction, production, maintenance and transport (Global TEEB).

With regards to onshore exploration, the most significant activities are in the Brazilian Legal Amazon such as the Amazonas and Solimoes wells – the second largest gas reserve in the country with 52.8 billion m^3 of estimated reserves. The chief opportunity of the sector in the region is in natural gas exploration, with petroleum production being of lesser relevance[27]. To drain the gas and supply regional municipalities in an efficient manner, the construction of gas pipelines is an issue that has stirred debate on the socio-environmental viability of this type of development in the Amazon, such as the case of the Urucu-Coari-Manaus pipeline which totals more than 600 km in length. The exploration of oil and gas and construction of pipelines result in impacts on BES such as erosion and sedimentation of water bodies, clearing of plant cover in exploration areas and along pipelines and roads, as well as indirect impacts such as attracting new economic activities and people to the region, and risks of accidental spills.

When extracting oil and gas, the industry impacts both aquatic and terrestrial ecosystems, and could threaten flora, fauna and species diversity, especially in the Amazon region and marine ecosystems. Operation risks, such as leaks, could bring negative impacts to human well-being through contamination of agricultural lands as well as cause significant species and marine ecosystem losses, such as mangroves and Amazon wetlands. Petroleum activities and the extraction of gas are considered the fourth most significant factor causing marine ecosystem degradation, after fishing activities, diffuse pollution and maritime transport (36). Marine and coastal biodiversity resources are not only important from a food source perspective, but also by representing an elevated genetic heritage. There are reef areas, which although being considered poor in nutrients, are home to thousands of species and constitute some of the richest communities on the planet. Thus, the main interactions of the sector with BES are related to investments to mitigate and compensate for impacts on biodiversity and ecosystem services needed to maintain activities and natural resources that surround these regions.

One example of the environmental impact of these activities was the oil spill on April 20th 2010 in the Mexican Gulf on the British Petroleum (BP) platform. An explosion on the platform triggered the spill of hundreds of millions of liters of petroleum

[27] www.petrobras.com.br

into the ocean, considered the greatest disaster of its type in history (37). The costs of environmental impacts and indemnities to those affected by the accident may are estimated at around US $ 21 billion (38).

The chemicals sector depends mainly on the supply of raw materials and water, as well as on the regulation of soil erosion and fertility. This sector's supply chain, inputs and raw materials to transformation industries, should also be part of the analysis of other sectors such as pharmaceutical and cosmetics, agriculture and construction.

The sector's main impacts include pollution of water bodies and degradation of marine environments. Due to the high risks this sector poses to society and the environment, it is estimated that US$ 3.9 billion will be invested in projects related to maintenance, process improvements, safety, environment and updating old equipment over the next few years.

Box 12: Oil and gas exploration in Abrolhos, Bahia

The Abrolhos region, an area of 56,000 Km2, is home to some of the most highly prioritized marine biodiversity conservation areas in the South Atlantic, due to its high rates of endemism and species wealth. Various species of Brazilian corals can be found in this region. In 2003, the National Petroleum Agency (ANP) offered some concessions, during the fourth round of bidding, of blocks for exploration in the Abrolhos region. Studies carried out by Conservation International and partners on the impacts of oil exploration in the region, highlighted the great fragility and importance of the ecosystems in the area. These studies served as the basis for an initial proposal to exclude 162 of the 243 blocks located in mangroves, seaweed banks and reefs. At a second stage, through a precautionary measure conceded on the eve of the auction, the remaining 81 blocks were excluded by the federal justice system. Currently, bidding and exploration of any block located within a 60 km radius of the National Marine Park (Parnam) in Abrolhos is prohibited (39).

Cosmetics and Pharmaceuticals

The Brazilian production sector that encompasses the pharmaceutical industry turns over US$ 10 billion per year, and is currently the fourth largest pharmaceutical industry in the world (CBME, 2011). The Brazilian personal hygiene, perfumes and cosmetics industry alone grew from R$ 4.9 billion in 1996 to R$ 27.3 billion in 2010 (40), an average annual growth of 10.5% over the past 15 years. According to data from the Brazilian Association of the Personal Hygiene, Perfumes and Cosmetics Industry (ABIHPEC) there are 1,596 firms in the sector, of which only 15 are large or have annual net revenues above R$ 100 million, representing 70% of the sector's total revenues.

It has been estimated that between 25 and 50% of global sales figures for the pharmaceutical industry relate to the use of genetic resources (41). In Brazil, medicines based on plants represent approximately a 7% share of the market (5). However, factors such as lacking knowledge of biological and genetic heritage, as well as difficulties in obtaining licenses to develop new products impede the growth in this sector.

Both sectors are greatly dependent on the provision services of ecosystems, especially the utilization of inputs that stem from phytogenetic elements, which in turn depend on the ecosystem regulation and support services that surround them. Both sectors depend on the supply of raw materials from BES to a greater degree than other sectors, especially in the production of bio-medicines and new cosmetic product lines. To these industries, access to genetic resources from BES both for prospecting activities related to new products and in obtaining raw materials, will be a competitive factor in the market.

However, impacts stem mainly from the exploration of genetic resources by industries. The location of installations or characteristics of the production process also impact biodiversity and ecosystems and must be implemented in an adequate manner, with special attention to the pollution of water bodies and ground water contamination through the disposal of waste.

The main challenge related to BES for the two sectors is to overcome the scarcity of natural resources and maintain production and bioprospecting without increasing impacts on biodiversity, and improving product life-cycle efficiency (Global TEEB).

Box 13: Sustainable use of products and services from Socio-biodiversity – the experience of Natura

Natura's experience of utilizing inputs from Brazilian biodiversity in its products for over ten years is an example of the potential of these resources for the generation and distribution of wealth based on traditional knowledge in Brazil. The Natura Ekos line is one of the most important business platforms for the company and embodies sustainable biodiversity use.

The firm developed a production model that involves relationships with supply communities, which are organized into cooperatives and associations in various municipalities in Brazil, especially in the Amazon region. Production chains are established with these communities that implement fair pricing, to compensate for the use of genetic heritage and traditional knowledge. This production model generates income for hundreds of families and promotes regional development and environmental conservation.

In 2011, the company involved 32 supply communities of 3,235 families, representing a 40% increase in the number of families involved in the process compared to the previous year. This advance is part of a strategy to strengthen transactions with the supply communities and expand the social benefits generated by the business. With regards to resources destined for the communities (which involves primarily the amount paid for the supply of inputs and the associated redistribution of benefits from the access to genetic heritage and traditional knowledge), R$10 million was invested in 2011, a 15% increase in comparison with 2010.

The firm seeks to foment discussions on the sustainable use of products and services from socio-biodiversity and establish a new legal framework for access to biodiversity which favors the sustainable use of national genetic heritage and the associated traditional knowledge.

A large share of the supply communities are in the Amazon. Recognizing the importance of this ecosystem for the development of a new sustainable business platform, Natura selected the region as a priority territory for future expansions and launched the Amazon Program in 2011. The program expects to turn over R$ 1 billion by 2020 and moved R$ 64.8 million in the region in 2011.

In this manner, Natura seeks to associate its brand with the creation of sustainable development initiatives in the region and be a pioneer for new business focused on socio-biodiversity and the valuation of traditional knowledge and cultures in the region, through a three-pronged approach: science, technology and innovation; sustainable production chains and capacity building.

Mining and Construction

Brazilian mineral production in 2011 was estimated at US$ 50 billion, a 28% increase when compared to 2010, signalling significant growth for the sector. The main exported products in terms of revenues are: iron, kaolin, tin, gold, niobium and copper. Mineral aggregates (sand, gravel and clay) are also important to the Brazilian economy and the increased infrastructure investments for the 2014 World Cup and the 2016 Olympics ensure adequate demands for aggregates until 2022 (42).

The construction sector is one of the sectors that presented the highest growth in Brazil, especially with regards to large developments and ventures. In 2009, the sector included 64 thousand firms, employing 2 million people and generating net revenues of R$200 million (43).

The Mining and Construction sectors' dependence on BES are expressed mainly through provision services such as water, timber and mineral resources; and impacts are related to habitat loss through plant cover clearing, alterations to geological characteristics and the emission of greenhouse gases. These impacts are concentrated during the implementation phase of developments, with the main impact being plant suppression.

Continuous demand for mineral resources and economic growth imply that the Amazon could possibly be one of the areas most highly impacted by these sectors, according to data on population growth. The location of installations and the characteristics of the production process may impact biodiversity and ecosystem services in the following manner:

- Pollution of water bodies and groundwater contamination due to inadequate disposal of solid and effluent wastes;

- Removal of native vegetation;
- Landscape alterations;
- Conflicts over land use.

Additionally, both mining and construction activities can cause biodiversity and ecosystem impacts related to building access roads, as well as linear structures (railways, pipes, etc) necessary to support operations and logistics. The building of these structures can result in fragmentation and isolation of habitats in varying proportions and consequently in breaking natural connections of fauna and flora, which endangers small areas that become isolated. Similarly by creating these isolated areas, the new borders become potential points of entry for invasive species that modify and degrade original ecosystem structures. Constructing this type of infrastructure may also cause alterations in the flux and course of rivers. Despite the largest impacts occurring during the installation of roads and transportation structures, logistical operations in these locations represent risks related to transporting dangerous products and materials, which can cause contamination and toxicity of species and ecosystems (44).

With the intention of compensating for these impacts, large Brazilian businesses are already developing a series of actions focused on recovering degraded areas, including restoration and conservation actions in prioritized areas for Brazilian biodiversity. In some cases, such activities could aggregate value to biodiversity and minimize or compensate, even if only partially, the impacts from operations. Box 14 illustrates one of these initiatives realized by the Camargo Correa Group.

Box 14: Economic benefits from reducing plant suppression for the Camargo Correa construction company

The Camargo Correa Group is one of the largest business conglomerates in Brazil. Initially established as a construction company, the Group expanded and diversifies its businesses and is now active in different sectors of the economy, such as engineering, cement, energy and transport concessions, footwear, shipping, real estate and steel.

In Brazil, the construction sector is growing, given the demand for infrastructure investment in the country has grown in pace with economic expansion and population growth. Considering the peculiarities of the sector with regards to BES, the greatest business opportunity for firms is in minimizing impacts during the implementation of ventures through engineering studies and strategic planning before project initiation.

In 2011, the Group developed a Carbon Management Plan, where various opportunities to reduce emissions were identified. Based on the GHG emissions inventory for the company, activities involving the removal of vegetation were considered relevant to reduce emissions. By adopting a new activity model, the Camargo Correa construction company managed to reduce vegetation removal considerably, in some cases achieving up to a 30% reduction in vegetation suppression authorized by environmental authorities. The construction company estimated savings of up to R$25,000 per hectare and the project has the potential to reduce the total emissions of the company by up to 22%.

Another example of a business initiative to conserve land is the creation of the Private Natural Heritage Reserves (PNHRs) by the firm Vale, with the objective of protecting species and forest remnants. This initiative will be outlined in greater detail in Chapter 6.

Outro exemplo de iniciativa empresarial para a conservação de áreas foi a criação de Reservas Particulares do Patrimônio Natural (RPPNs) pela empresa Vale, com o objetivo de proteger espécies e remanescentes florestais. Essa iniciativa será abordada com mais detalhes no Capítulo 6.

Financial institutions

Financial institutions have a responsibility to minimize the environmental damage caused to biodiversity and ecosystem services, due to their responsibility in providing financial resources for ventures, works and projects that could have significant impacts on BES. The financial sector incurs reputational risk when financing developments with great potential environmental impacts, and operational risk when financing projects that could be damaged or even wiped out due to environmental fragility, such as the installation of a hydroelectric plant in a region subject to reduced water availability as a function of climate change. On the other hand, the sector plays a crucial role in stimulating and implementing special conditions for project credit that seek to increase sustainability in the productive system, such as low impact technologies.

Different interest groups have requested more effective actions from these entities due to their great responsibility in the financial viability of projects, developments and ventures, which could have significant impacts on BES. We should take into consideration that financial institutions depend on economic growth and in the event that this is not accompanied by efficient BES management, impacts from the loss or degradation of biodiversity can affect business interests directly or indirectly. Examples include downturns in the economy or in specific economic activities due to natural resource scarcity, losses and damages caused by increased conflicts over the use and access to BES and changed consumption patterns in developed countries.

A series of initiatives are being developed for financial institutions to conserve BES:

- *Principles of Responsible Investment* (PRI): network of international investors that work together to put the Principles of Responsible Investment into practice. The principles were created by the investment community and reflect how environmental, social and corporate governance issues could affect investment portfolios, and how these in turn should be considered by investors in order to fulfill their duties. The objective of this initiative is to support investors by sharing best practices and facilitating collaboration and management of a variety of work flows (45).
- The Natural Capital Declaration is a declaration by the financial sector to demonstrate their commitment to Rio+20 and to work to integrate natural capital criteria in their products and services for the 21st Century. This declaration is the first with this objective and is only open to CEOs of financial institutions, with the intention of being a measure of best practices for these institutions (46).
- Equator Principles: consist of a management structure of credit risk to determine, evaluate and manage environmental and social risks in the operations of large projects. These principles are adopted voluntarily by financial institutions and are applied when project costs exceed US$ 10 million (45). This initiative is related to the B4B program, presented in Box 15.

Box 15: Banks and biodiversity

The Equator Principles: the *World Wildlife Fund* (WWF) and the *Business & Biodiversity Offsets Program* launched a training program called *Biodiversity for Banks* (B4B) in 2011, a workshop to assist banks in incorporating the value of biodiversity and ecosystem services in decision-making, involving 20 banks in 15 countries. The B4B program is structured to help financial institutions to overcome the challenge of incorporating risks associated with biodiversity in financing decisions and bank lending practices. Banco do Brasil will host the group's first workshop in Brazil in 2012.

Possible actions for financial institution with regard to BES are very similar to those applicable to climate change, such as[28]:

- Avoid financing projects responsible for increasing biodiversity loss and degradation;
- Condition project financing on a mitigation plan that presents tools to reduce socio-environmental impacts of operations and services;
- Encourage development and use of green technologies;
- Disclose the impact of climate change in reports to investors and stakeholders;

[28] Adapted from *What banks must do to combat climate change? and Corporate Governance and Climate Change for the Banking Sector*

- Asses risks of projects that include BES topics; ;
- Create multilateral funds for investment in environmental conservation projects;
- Create internal policies and strategies;
- Finance projects that involve biodiversity conservation;
- Participate and operate in the carbon and biodiversity offset markets: *trading and brokerage*.

Retail

The trade in vehicles, fuel and textile products, such as clothing and shoes, and supermarkets are the largest retail segments in Brazil. Firms that operate in retail have an indirect relationship with BES, mainly through the value chain. The retail sector is unique in that it is responsible for the demand for products that have direct links to biodiversity in their manufacturing processes. Furthermore, it is the retail sector that enjoys the greatest proximity to the final Brazilian consumer and is capable of influencing the decision-making of consumers in relation the products and brands linked to sustainability. Thus, issues related to biodiversity are associated essentially with the reputation and public image of a business, creating a bond between the responsibility of a business and the sectors that it finances or acquires inputs from, beyond the final consumer.

The main impacts relate to pollution of soil and water bodies from the disposal of packaging and other wastes, as well as impacts to soil, water and air due to the transport of merchandise, especially road transport. Box 16 illustrates an initiative by the publisher Editora Abril to define its relation of dependence and impact on BES.

Box 16: Socio-environmental Table by Editora Abril

Abril is one of the largest and most influent communication and education groups in Latin America. In the search for engaging stakeholders in the sustainability theme, it constructed a map that details the materials and processes involved in the production, impression and distribution of magazines. Thus, the map – called the Socioenvironmental Table – presents information on the raw materials and the production lines chosen, with the aim of creating the lowest possible negative impact on the environment and society. The magazines *NATIONAL GEOGRAPHIC Brasil*, *SUPERINTERESSANTE* and *NOVA ESCOLA* have already published the Socioenvironmental Table with the following information:

- **Consumption of paper, ink, energy and packaging;**
- **Number of collaborators involved in the edition's production and distribution of issues; and**
- **Waste generated by the production of issues, including GHG emissions.**

This work is being studied for continuous improvement and may be extended to all magazines published by the Abril Group (47).

Another interesting case is that of multinational retail firm Walmart, which engaged its supply chain to include BES related criteria in the Point to Point Sustainability Project (outlined in Chapter 5).

Environmental trends that could affect different sectors in Brazil

The dependence and impact between businesses and BES should not be analyzed in isolation. Several other factors influence the link between businesses and biodiversity. The following chapters outline how trends related to BES can generate risks and opportunities for businesses. Ecosystem alterations will mainly affect businesses in the following ways:

- Reduced provision of ecosystem services important to operations, causing reduced productivity that could culminate in market or business loss;
- Increased costs related to utilizing ecosystem services and material inputs for operations, due to increased scarcity and increased conflicts over resource use;
- Intensified regulation and demands by stakeholders (society, clients, shareholders and government, etc) with relation to sustainable use and BES conservation in business activities;
- Establishment of new consumer strategies and sustainable use of natural resources, in addition to a quest for business opportunities related to BES.

The following chapter addresses business risks given the main trends related to BES.

04

Associated risks – loss and degradation of BES

Associated risks – loss and degradation of BES

Key messages

Biodiversity loss and ecosystem degradation should be considered in conjunction with other factors: Economic growth, natural resource shortages, climate change, energy insecurity and changing consumer preferences are some global tendencies that will influence how BES is evaluated by businesses.

Biodiversity loss and degradation of ecosystem services will have direct impacts on business operations: The agricultural sector, for example, could be negatively impacted by climate change with losses of up to R$ 7.4 billion in 2020 that could reach R$ 14 billion by 2070. Cosmetic and pharmaceutical sectors could be impacted in the long term since they utilize resources that stem from biodiversity.

The need to expand energy supply in increasingly sensitive regions could result in operational and reputational risks for Brazilian businesses, such as activities developed in the pre-salt layers and the large hydroelectric developments in the Amazon. The absence of guiding directives, both on behalf of businesses and the government, for the sustainable development of these sensitive regions could cause significant losses to biodiversity.

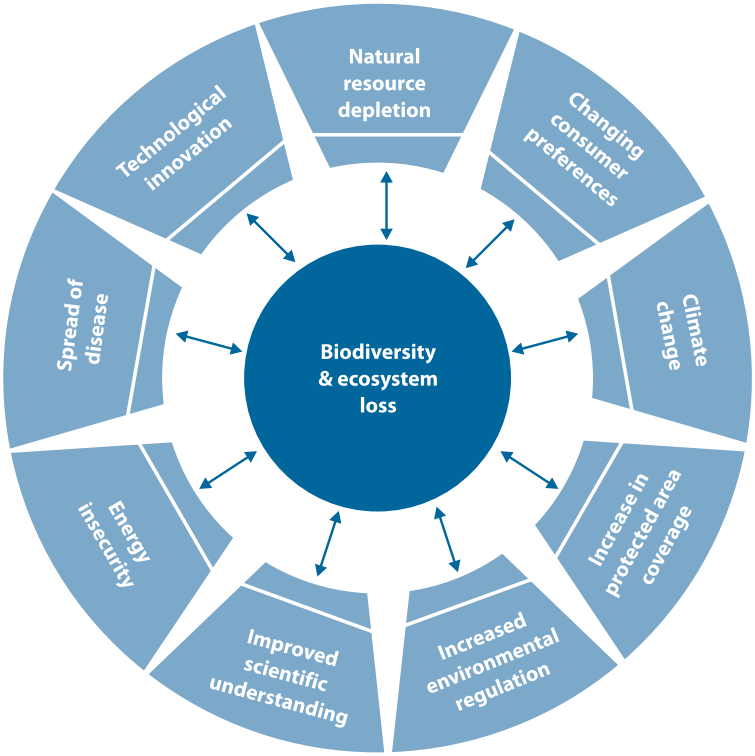
There is a trend to intensify the application of laws and policies in Brazil with direct or indirect relations to biodiversity and ecosystem service conservation: business could be affected by legislation implemented in the future, resulting in increased costs and investments. This is especially the case for federal and state regulation related to climate change mitigation, payments for environmental services, the forest code, bio-security and access and redistribution of benefits related to biodiversity.

Risks of biodiversity loss and ecosystem service degradation to businesses could be linked to both the direct impacts of business operations on biodiversity as well as to dependence by a firm. This chapter presents the main risks related to BES in Brazil, while the opportunities will be addressed in the following chapter.

Trends and risks associated with BES

The main risks considered in this study come from the global trends related to Biodiversity and Ecosystem Services loss identified by Global TEED. These tendencies are presented in the below image and are highly relevant based on their relations with the business sector:

Image 5: Trends that affect biodiversity loss



Source: Adapted from Global TEEB 2011

Through risk management systems, businesses are able to trace, analyze and monitor new interconnections and tendencies, generating a competitive advantage for firms.

Loss of quality, depletion or scarcity of ecosystem services and natural resources

Resource scarcity can cause reduced or more costly inputs for business operations or increased costs due to unpredictable, restricted and rationed supplies and resource use. This risk is already felt by Brazilian businesses that recognize that access to resources will be more difficult in the future, especially in the case of water and timber.

The main economic risks derived from resource scarcity have been estimated as: price increases for raw materials in the supply chain (e.g. water, timber) due to biodiversity loss and ecosystem service degradation; increased operational costs from catchment and treatment of water and other resources; impact of ecosystem service degradation on value chain and or business activities.

Increased coverage of protected areas

Brazil has assumed targets under the Convention for Biological Diversity (CBD) to protect 30% of the Amazon biome and 10% of the other Brazilian biomes through Conservation Units. In total, CUs grew from 8% to 17% of Brazilian territory between 2006 and 2010, and to achieve targets proposed to CBD it will be necessary to increase this area by 20% on the continental territories and 30% of national jurisdiction, given the necessity for greater protection of the Exclusive Economic Zone. Businesses will need to work regionally or locally with their partners, regulators and NGOs to ensure that operations are compatible with the creation, implementation and management of the protected areas.

Improved scientific knowledge

One of the main challenges to include strategic management of BES in businesses is the necessity of increasing transparency, knowledge, measurements and reporting on of the impact and dependence of businesses on biodiversity. Furthermore, it is necessary to promote greater understanding of endemic and exotic species. Businesses play a fundamental role in this process, especially through Research & Development, a process of generating and managing information on biodiversity related to business activities. These questions demand that businesses implement procedures for measuring, managing and produc-

ing reports on BES management. According to Brazil's Fourth National Report to the CBD, the lack of scientific knowledge is a factor that leads to biodiversity loss. The greater the understanding is of species and their interactions with ecosystems, the more opportunities there are to develop conservation methods that are integrated with business strategies.

Technological innovation

Despite technological innovation being predominantly an opportunity, it can in some cases cause risk scenarios for businesses because using a new technology with a smaller biodiversity impact can bring uncertainties. Some technologies and resource management systems have significant environmental gains, however the complex interactions of ecosystems could result in a loss of genetic diversity or in other ways threaten ecosystems. Brazilian examples include the development of biotechnology, incentives of economic extractivist models in the Amazon, and the use of wind energy, among others, that could bring about positive as well as negative effects on the environment.

Box 17: Socio-environmental benefits of biotechnology could be profitable for Brazilian agriculture

Studies suggest that (48) the use of biotechnology in Brazilian agriculture could result in the following environmental benefits over the first ten years: a decrease in the volume of sweet water equivalent to the annual supply of the cities Recife and Porto Alegre; reduced atmospheric emissions of CO2 equivalent to almost 22 million trees; a reduction in fuel burning in the amount needed to fill up 465 thousand diesel vehicles; and a reduction of 120 thousand tons of pesticides on Brazilian farmlands.

The study was based on a survey of 396 rural landowners across Brazil on the socio-environmental and economic benefits of genetically modified crops currently approved in the country – soy, corn and cotton.

The planting of transgenic corn for example, was widely popular among producers since it enabled large savings on inputs. For example, farmers saved the equivalent of 2.7 thousand tons of agricultural chemicals in the 2009/2010 harvest. In addition to reducing inputs, the adoption of biotechnology to corn crops will enable a 49.5 million hectare reduction in the area planted with this grain over the next ten years; and for cotton and soy, up to 9.3 million hectares could be spared.

According to the United Nations Food and Agriculture Organization (FAO), the world needs the capacity to produce food for 9 billion people by 2050. On a planet with diminishing availability of productive areas, biotechnology becomes an important alternative to ensure more efficient harvests that utilize fewer pesticides.

The introduction of genetically modified organisms is positive as they are more productive and resistant, and because they reduce the world's hunger problem. However, there are many controversies. There is a possibility that these grains could have an incalculable impact on biodiversity, through the introduction of new genotypes, elimination of species, exposure of individuals to new diseases, reduction of genetic diversity and interruption of nutrient and energy recycling.

Greater environmental regulation

As a consequence of increased environmental degradation and current social problems, organizations are being held accountable by society for their environmental, social and economic impacts of their activities. Changes to the way businesses approach sustainability essentially depend on external (related legislation and regulation) and internal (integration of strategy or principles and purposes of business) stimuli. There is a trend towards intensified legal and political reforms in Brazil either directly or indirectly related to the conservation of biodiversity and ecosystem services, especially for the following areas:

- Biodiversity targets: Decree no 4.339/2002, establishes the National Policy on Biodiversity operated through the 2011-2020 Strategic Plan for Biodiversity. The objective of this initiative is to establish Dialogues on Biodiversity and produce a new national strategy to achieve the Aichi Targets and implement the plan in Brazil;

- Climate change: Law no 12.187/2009, established the National Policy on Climate Change (PNMC) and voluntary emissions reduction targets through sectoral plans, the main ones being related to combating deforestation in the Amazon and Cerrado biomes;
- Payments for Environmental Services (PES): Legal project no 792/2007, aims to institute the National Policy on Payments for Environmental Services. Payments for Environmental Services (PES) are already envisioned in Law no 9.985/2000 (SNUC) although this matter has not yet been effectively regulated;
- Water resource management and charges for water use: Law no 9.433/1997, establishes the National Policy on Water Resources that seeks to establish mechanisms to maintain ecosystems related to the regulation of water resources, including through economic instruments such as paying for water use, which could be utilized as a reference for establishing PES mechanisms.
- Forest Code: Law no 4.771/1965, establishes the Forest Code that is currently under revision, which may impact biodiversity and business operations.
- Access to genetic resources, traditional knowledge and redistribution of benefits: Law no 11.105/2005 establishes safety norms and monitoring mechanisms for activities that involve genetically modified organisms and is relevant for the business sector, and Provisional Measure no 2.186-16/2001 which is currently in force but not regulated deals with the redistribution of benefits, traditional knowledge and safeguards for how to attribute value of traditional knowledge to indigenous people, *quilombola* communities, rubber tappers, riparian communities and *caicaras*.
- Creation of mechanisms such as environmental markets: Legal Project no 195/2011 on REDD+, which aims to create the Certificate for Reducing Emissions from Deforestation and Forest Degradation (CREDD), representing one ton of avoided carbon dioxide equivalent (1tCO2e), thus establishing rights on carbon or private property of air and the possibility of launching the new commodity of the so-called "low-carbon economy".
- Waste management: Law no 12.305/2010, instates the National Policy on Solid Wastes that could have direct implications on BES conservation as it seeks to reduce impacts on ecosystems and encourage life-cycle analysis of products.

One of the main regulations to have been followed closely by the private sector, especially the agricultural sector, relates to the revision of the Brazilian Forest Code, presented in Box 18.

Box 18: The Forest Code and its revision proposal

Discussions about revisions to the Forest Code mainly refer to Permanent Preservation Areas (PPAs) and Legal Reserves (LR), that have the broad function of conserving BES whether they are located on private land or not.

The Brazilian Forest Code, instated by Law nº 4.771 on September 15th 1965, established that PPAs include the margins of rivers, water courses, lakes, lagoons and reservoirs, tops of mountains and slopes with elevated declivity, whether covered or not by native vegetation, with the environmental function of preserving water resources, landscape, geological stability, biodiversity, genetic flows of fauna and flora, protect soils, and ensure the well-being of the human population. These are areas considered more sensitive and suffer risks of soil erosion, flooding and landslides. The removal of native plant cover in these areas can only be authorized in cases of publicly or socially beneficial developments, or activities with potentially low environmental impact (Ministry of Agriculture, Livestock Farming and Supply – Mapa, 2011).

The Legal Reserve is an area located within the boundaries of properties or rural land tenures where original plant cover should be maintained. This area fills the function of ensuring the economic sustainability of natural resource use, provide conservation and rehabilitation of ecological processes, promote biodiversity conservation and offer habitats for wild fauna and native flora. The size of this area varies in accord to the region where the property is located. In the Amazon, PPAs should constitute 80% of properties and Cerrado properties located inside the Legal Amazon should maintain 35%. The remaining biomes require Legal Reserves of 20% (Ministry of Agriculture, Livestock Farming and Supply – Mapa, 2011).

A 2010 study estimates that PPAs and LRs on private lands in rural areas cover 12% and 30% respectively of national territory, that is, more than double the area currently covered by Conservation Units. Close to 40% of PPA areas would be deforested and 16.5% of LRs (5). According to a study produced by the Institute for Studies on International Commerce and Negotiations (ICONE), there are 64.8 million hectares to be recomposed as PPAs and LRs, equivalent to 24% of the total area under production in the country (49).

A new proposal for the Brazilian Forest Code is being voted on. Various proposals have been presented and suffered alterations. The main discussion points include extending APP areas and Legal Reserve percentages which could impact not only BES conservation, but also businesses that need to adopt to the new Code.

Accompanying and participating in the formulation of policies related to biodiversity is one of the priority initiatives for the private sector. The trend towards creation of new regulatory mechanisms and the intensification of already existing ones demonstrates that businesses should amplify their efforts to ensure legal compliance with remediation, mitigation and compensation for damages to biodiversity29. In this context, Payments for Environmental Services constitutes an economically interesting mechanism. Despite limited extension in Brazil, these payments need to be promoted by businesses with governments and academia to ensure that they are based on scientific knowledge and become efficient in preserving BES. Charges for water use could serve as a basis for establishing payments for services related to biodiversity and ecosystems, with the values charged probably being determined in accordance with stakeholder negotiations and based on the value of BES.

The Business Movement for Conservation and sustainable Use of Biodiversity (MEB) implemented a study related to Brazilian legislation on biodiversity, produced by the Doria, Jacobina, Rosado e Gondinho Advogados Associados law firm. The research included international norms and federal and state laws on the topic, especially for states in the northern region of the country (50).

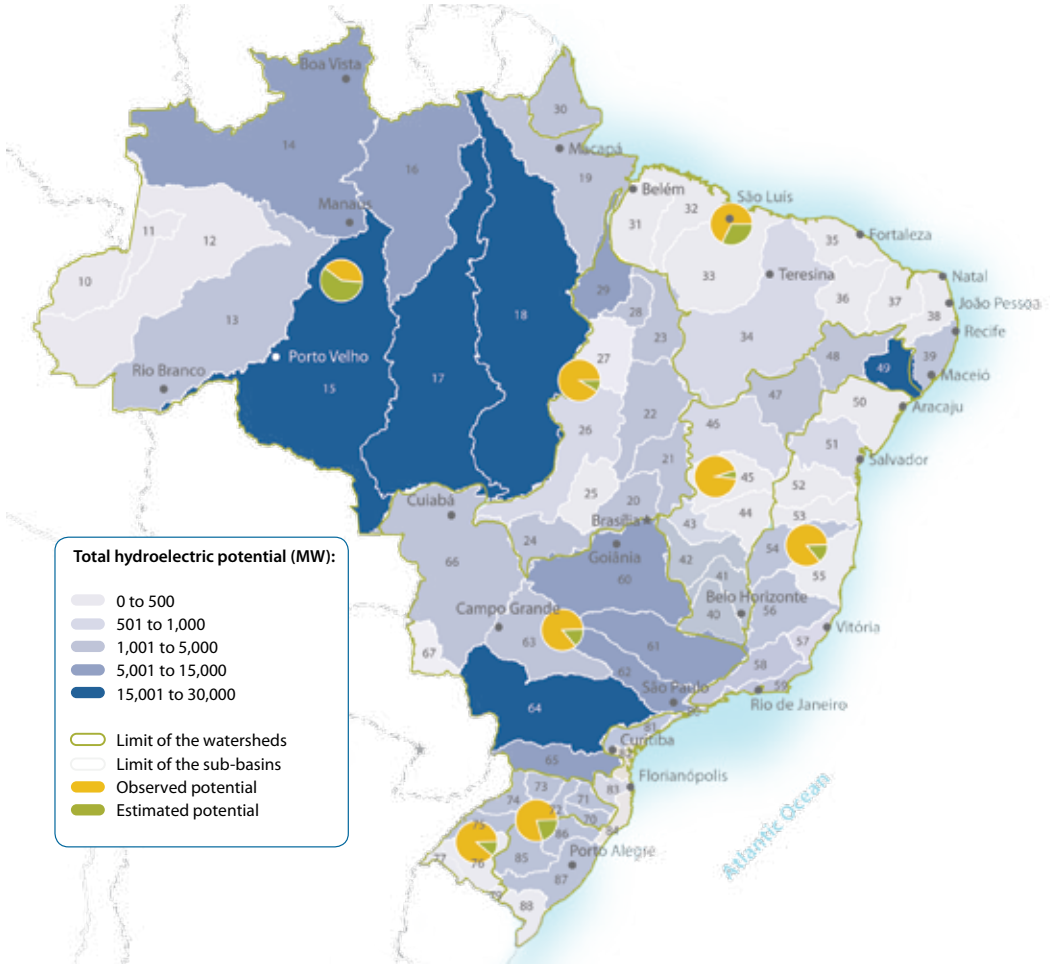
Energy insecurity

Brazil is recognized for having an energy matrix with one of the greatest percentages of energy from renewable sources; according to the 2011 National Energy Balance, 45% of the matrix is composed of renewable energy sources, whereas the global matrix is composed of only 13% renewable energy sources. According to the Decennial Energy Plan (until 2019), the main investment areas include petroleum, natural gas and hydroelectricity. Increased demand for energy results in developments located in operating environments that are increasingly technically challenging (for example, deep sea as in the pre-salt

[29] Some examples of compensation measures currently applied in Brazil include: Taxes, (Ecological ICMS, Ecological IPTU, etc), charges (charging for water use, Fees for Environmental Control and Monitoring and Licensing Fees), compensations (environmental compensation and compensations for exploring mineral resources), and royalties (oil and natural gas).

case and water resources in the Amazon region) for energy businesses. Brazilian hydroelectric potential, for example, consists of close to 260 GW and estimates show that approximately 78% of Brazilian hydroelectric potential is located in the Amazon River basin. The following image presents the hydrographic sub-basins with the greatest potential.

Image 6: Brazilian hydroelectric potential by hydrographic sub-basin – as of March 2003



Source: CENTRAIS ELÉTRICAS BRASILEIRAS - ELETROBRAS.
Information system for Brazilian hydroelectric potential – SIPOT. Rio de Janeiro, Apr. 2003..

Activities in these sensitive areas imply increased political, social and economic risks. Another issue relevant for Brazil is the production of biofuels that could intensify conflicts over land use and impacts on food production. Forecasts in the Decennial Energy Plan imply that biofuels production should double by 2019, especially for ethanol.

Spread of diseases and exotic species

Climate change and the introduction of exotic species are the main aspects that could affect the spread of diseases, which could impact sectors such as agriculture and forestry. In practice, the frequency and concentration of extreme events (rain, drought, frost and strong winds) has intensified. In forestry, periods of drought have become longer and more pronounced, aggravating water stress and the risk of plagues and diseases.

The introduction of some exotic species into unaccustomed ecosystems is one of the causes of biodiversity loss in Brazil, which is why government entities at both state and federal levels have already presented plans for combating invasive species.

A survey concluded by PROBIO in 2005 registered 171 invasive species in Brazil, of which 63 (37%) are animal species and 108 (63%) are plant species (5). The future outlook holds that this number for terrestrial environments could either increase by 35% or decrease by 15%, depending on programs implemented, while for marine environments this number is from 3.3 to 0.5 new species per year (5).

Climate Change

Risks associated with increased extreme climate events, sea level rise, increased water stress and droughts will drastically alter the availability of ecosystem services on which all businesses depend. For example, a loss of natural tourism attractions, such as coral reefs, due to alterations in temperature and acidity of oceans, or reduced agricultural productivity from growing water shortages. One of the sectors most affected by climate change will be agriculture, as demonstrated in the below study.

Box 19: Embrapa study of the impact of climate change on agricultural productivity

The Brazilian Business for Agricultural Research (Embrapa) conducted a study on the impacts of climate change on Brazilian agriculture in 2008, evaluating the country's main crops. Based on 2007 zoning, scenarios were simulated for 2010, 2020, 2050 and 2070. Some of the main results presented in the study (51) indicate that all crops, with the exception of cassava, may be negatively impacted by climate change in the following manner:

- ***"Global warming could compromise food production, resulting in losses starting at R$ 7.4 billion in 2020 with the possibility of reaching R$ 14 billion by 2070.***
- ***Soy is expected to be the most affected crop. In the worst case scenario losses could reach 40% in 2070, the equivalent of R$7.6 billion.***
- ***Arabica coffee is expected to lose up to 33% of low risk areas in Sao Paulo and Minas Gerais, despite possibilities of increasing production in the south.***
- ***Corn, rice, beans, cotton and sunflower will suffer steep reductions of low risk areas in the northeast with significant production losses.***
- ***Cassava will experience general gains in low risk areas, but severe losses in the northeast.***
- ***Sugar cane crops could double over the next decades."***

Pressure from consumers to internalize sustainability criteria

Business reputation is one of the main risks currently felt in the Brazilian business community. Increasingly the reputation of a business is linked to good practices in relation to biodiversity. Incentives by media and civil society, such as changing consumer preferences for products with smaller ecosystem impacts could demand new attitudes of businesses. Thus, firms should mainly invest in transparency and communication on how environmental issues and BES are incorporated in business management. Changes could occur to reporting standards to include relations of impact and dependence on biodiversity.

Brazilian business leaders recognize that this trend will increase over time (18). Brazilian organizations have already adopted protocols for sustainable public procurement or protocols for suppliers, but only a small percentage of Brazilian consumers (including governments) are predisposed to reward firms that adopt sustainable practices. Thus, it is important to increase consumer awareness of the importance of BES in order for products to include BES-related externalities and remain competitive in the market.

The trend to incorporate BES in decision-making is also affecting investors, who are becoming more discerning. Financial institutions are adopting environmental principles and safeguards in the approval of credit, or creating new products that encourage sustainable projects such as the Equator Principles (see box 20).

Box 20: BES-related voluntary requirements and commitments by financial institutions in Brazil

Here are some examples of voluntary requirements and commitments assumed by financial institutions in relation to BES:

- **In 2009, the National Bank for Economic and Social Development (BNDES) started demanding guarantees from frozen goods retailers that they do not purchase beef from deforested areas, through an environmental directives program.**
- **MMA and five Brazilian banks signed the Green Protocol, adopting commitments to require sustainable practices for loan guarantees (52).**
- **The National Monetary Council Resolution (CMN) of the Central Bank demands documentary proof of environmental compliance, among other prerequisites for farming financing in the Amazon biome ("Resolution CMN BACEN no 3.545 DOU de 03/03/08)";**
- ***Banco do Brasil* began requiring in June 2011 that clients adopt the Federal Program for Environmental Compliance of Rural Properties, *Mais Ambiente* (More Environment) or proof of Legal Reserve registration in order to approve rural credit.**

Sectoral risks to Brazilian businesses

Many times responsibility for conservation and/or degradation of Biodiversity and Ecosystem Services is not clear and, as such, businesses neglect risks related to BES degradation in their decision-making.

Industries such as extractives, forestry, agriculture and fishery, are greatly affected but all sectors are exposed to some type of risk related to BES loss.

Risks could have consequences on business operations, including legal compliance, reputation, market loss, or financing risks. The importance and influence of these risks will vary according to the sector and region of a given firm, as demonstrated in image 7.

Image 7: Risks related to BES

		SECTORS MOST LIKELY TO BE AFFECTED						
		Primary Industries	Utilities	Consumer Goods	Consumer Services	Industrials	Financials	Technology and Business Services
CATEGORY	**RISKS**							
Operational (the day-to-day activities, expenditures and processes of the company)	Increased scarcity or costs of inputs; Reduced quality of inputs	●	●	●	●	●		
	Reduced output or productivity	●	●	●				
	Disrupition to business operations	●	●	●	●	●	●	●
	Suply chain risks			●	●	●		
Regulatory and legal (the laws, government policies and court actions that can affect corporate performance)	Restricted access to land and resources (extraction moratoria, permit or license suspension, permit denial)	●	●					
	Litigation (fines, lawsuits)	●			●			
	Lower quotas	●						
	Pricing and compensation regimes (user fees)	●	●			●		
Reputational (the company's brand, image or relationshipwith customers, the general public and the other stakeholders)	Damage to brand or image; Challenge to "license to operate"	●	●	●	●	●	●	●
Market and product (product and service offerings, customer preferences, and other market factors than can affect corporate performance)	Changes in consumer preferences	●		●	●			
	Purchaser requirements	●		●				
Financing (cost and availability of capital from investors)	Higher cost of capital; More rigorous lending requirements	●	●				●	

Source: Adapted from Global TEEB

The following sections will present an outline of sectoral risks based on the Brazilian context:

RISK	DESCRIPTION
AGRICULTURE AND PULP & PAPER	
Reduced productivity due to climate change.	Climate change will impact the majority of Brazilian crops (for more details, see Box 16)
Reduced productivity due to loss in ecosystem services	The case of producers in the state of Sao Paulo recording the death of a large number of bees is one example of a risk associated with productivity loss (53). Studies also demonstrate that the existing low diversity in forest pine plantations could cause decreased resistance to environmental stress. It has been estimated that certain pests could affect planted areas and reduce forestry productivity by 10%, generating impacts equivalent to R$ 888 million per year for the sector – using the average revenues for 1008 and 2009 as baseline (41). According to Embrapa, close to 50 exotic invasive species of mites, bacteria, fungi, nematodes, insects and viruses already affect agricultural and forestry production; and furthermore there are 104 species with potential negative impacts on the future of agriculture (5). Loss of ecosystem services could also cause increasing operational costs due to growing irrigation needs, use of inputs to correct soils, among others.
Loss of reputation due to introduction of exotic species, biotechnology and deforestation.	Some crops of great importance to Brazil, such as sugar cane, coffee, rice, soy, oranges, cocoa and wheat are foreign species. As such, the greatest risk of introducing exotic invasive species is related to ornamental use (5). Agriculture faces a great challenge of effectively communicating potential impacts of products on the environment, whether these stem from the introduction of exotic species, biotechnology or agricultural expansion.
Regulatory risks.	Law nº 11.105/2005, which establishes safety standards and monitoring mechanisms of activities that involve genetically modified organisms, is relevant to the sector. The possibility of fines should also be noted, such as in cases of water contamination from agricultural chemical products.
OIL & GAS AND CHEMICALS	
Loss of reputation from environmental risks of business operations.	The main activities of the oil and gas sector are located in coastal and marine areas. This inherent aspect of the oil industry in Brazil could result in operational risks, as well as regulatory and reputational risks. Cases of oil spills and the discovery of the pre-salt reserves that require drilling and exploration at increasing depths generate growing pressure on environmental institutions in Brazil due to the risks involved.
Regulatory risks.	Pre-salt Law no12. 351/2010 established that part of the resources from extraction in the production chain of oil and gas will be channeled to National Climate Change Funds. Also, the sums of fines from oil spells are on the increase.
COSMETICS AND PHARMACEUTICALS	
Diminishing natural resources	The cosmetics and pharmaceuticals sectors are direct users of biodiversity, and as such a BES loss reduces the potential for new products in the long run, as well as those presently used. Despite the great potential of Brazilian biodiversity, only a limited number of resources (genes or species) are used in the production of cosmetics and pharmaceuticals, making it difficult to estimate the impact of a loss in genetic and species biodiversity on businesses.
Regulatory and reputational risks from misappropriation of traditional knowledge.	Legislation related to the redistribution of benefits from cultural knowledge and patent registration is relevant to business planning, however there are still judicial insecurities around issues related to access to genetic resources and biodiversity, which is the reason why the number of patent applications related to biodiversity components is growing timidly. Provisional Measure no 2.186-16/2001 that is currently in place, though not yet regulated, deals with the redistribution of benefits and traditional knowledge and establishes safeguards of how to attribute value to the traditional knowledge of indigenous populations, quilombola communities, rubber tappers, river populations and caicaras. Since its foundation, the Commission for Genetic Heritage Management (CGEN) has published various Technical Guidelines and Resolutions for the adequate implementation of the Provisional Measures. By mid-2009, more than 200 projects soliciting access to genetic heritage and/or associated traditional knowledge were approved by the Council (5). However, the lack of regulation could impose considerable risks to business reputations with regards to misappropriation of traditional knowledge. According to the National Institute of Industrial Property (INIPI), (18) out of the main 120 inputs used in the pharmaceutical industry, 75% were revealed by traditional knowledge. Furthermore, the majority of biotechnological patent applications made in Brazil is solicited by foreigners: in July 2010, INPI registered 1,296 patents, of which only 15% were from Brazilian researchers and 51% were researchers from the United States

RISK	DESCRIPTION
MINING AND CONSTRUCTION	
Loss of reputation due to impacts caused.	Mining exhibits smaller dependence on ecosystem services as compared to other sectors, but has significant impacts on Biodiversity and Ecosystem Services. This could imply reputational risks, especially for projects located in sensitive regions such as the Amazon.
Regulatory risks.	The expectation is that the environmental licensing process will incorporate new restrictions and requirements in relation to BES. Additionally, for the mining sector, requirements associated with the recuperation of degraded areas could be more rigid with regards to BES recovery.
Operational risks.	With increasing degradation of ecosystems, access to certain areas considered important for conservation could be restricted and the degradation of ecosystem services could result in the unfeasibility of operations in certain locations (water availability, for example)
FINANCIAL INSTITUTIONS	
Risks to reputation and image.	The majority of solutions to environmental issues today require large financial investments, as well credit provided by financial institutions that could end up responding for damages caused by their indirect responsibility.
RETAIL	
Risks to reputation and image.	Issues related to biodiversity are essentially associated with the reputation and public perception of a business, linking the responsibility of a company to the sectors that it finances or receives inputs from.
Risks from losses in supply chain.	There is a risk of instability or increase of costs in the supply chain due to a loss of BES, especially for critical products such as wood and other non-wood forest products such as heart of palm, acai, babassu nuts, palm fiber, mate, carnauba, para nut, among others. These risks are aggravated by the difficulty of consolidating organized supply chains and establish mechanisms that guarantee a fair and competitive price, as well as the sustainable extraction of resources. Retail firms can contribute significantly to strengthening these chains through voluntary actions.
Regulatory risks.	The legal project Law of Environmental Labeling determines that businesses should display their impacts on product labels, and the National Solid Waste Policy (Law no 12.305/2010) obliges Brazilian businesses to consider the entire life-cycles of products. An interesting example is the prohibition of plastic bag use in the municipality of Belo Horizonte and in the state of São Paulo, which has implications for a large share of businesses in the sector.

Business opportunities associated with BES

05

Business opportunities associated with BES

Key messages

Opportunities associated with strategic BES management include cost reduction through environmental business variables, the development of new products and markets, the creation of new businesses and access to new sources of revenues.

Sectors such as agriculture, cosmetics and pharmaceuticals can benefit from revenues stemming from new products that utilize biodiversity as raw material or inspiration for development through biomimicry.

The main opportunities for sectors such as mining, construction, oil and gas are concentrated around diminishing risks and costs associated with the strategic management of BES, such as the rational use of natural resources and reduced generation of wastes and residues.

Consumer behavior and market competitiveness are determining factors that motivate new business with a focus on BES: Although there are business opportunities in this area, firms still operate primarily based on the perceptions of their clients and final consumers.

For decision-makers it is important to understand the economic implications of loss and degradation as well as the opportunities linked to BES. Business opportunities of an innovative kind will be available to leaders that assume a proactive attitude and recognize scenarios of risk and opportunity related to their business lines.

Main opportunities related to BES

Brazil is a mega-diverse country home to large forested areas and environments of international relevance, the Amazon being the greatest representative of this category. In parallel, the country has enjoyed a decade of strong economic growth, despite an international economic crisis. The combination of an expanding economy and conditions favorable to natural resource availability fosters the development of businesses with lesser impact on BES. Some sectors have identified and explored significant competitive advantages, such as renewable energy, biofuel production, improved agricultural productivity and exportation of certified paper and cellulose.

Although many firms are conscious of the risks associated with losses in Biodiversity and Ecosystem Services, they do not effectively recognize the opportunities associated with conservation and sustainable use. Given the Brazilian context, the inclusion of BES in business could generate new operational, regulatory, reputational, market, product and financial opportunities.

The economics of ecosystems and the reduction of costs through businesses' environmental variables.

A better understanding of how BES can be incorporated in business, results in improved management and business decisions related to the use of natural resources and opportunities in the supply chain.

Brazilian firms are already familiar with the concept of cleaner production (P+L) which involves the adoption of engineering, technological and process solutions capable of increasing efficiency and consequently reduce impacts on BES. At the same time, it provides elevated quality, lower costs of inputs and improved productivity results.

It is also possible to identify opportunities to reduce costs associated with improving ecosystem services, such as the role of wetlands in filtering and purifying water or the role of vegetation in protecting against floods, as demonstrated by the case study of the Cultivating Good Water Program, developed by Itaipu Binacional and outlined in Box 21.

Box 21: Cultivating Good Water Program

Recognizing the necessity of sustainable natural resource use coupled with growing demands for goods and services, Itaipu Binacional, the largest hydroelectric company in the world in energy generation, redefined its strategic planning in 2003 to align with the "Cultivating Good Water" program. The program emerged through a vision that "the same water that is the source of energy generation, is also the water that brings life to the lake, ensuring income for fishermen that live in surrounding areas; that fertilizes the fields, a source of sustenance to many families; that supplies cities; that generates health and bring equilibrium to the environment".

Cultivating Good Water operates in the management of the hydrographic basin of the 29 municipalities of Parana 3. Actions range from recuperation of micro-basins and the protection of riparian forests and biodiversity to spreading values and information that contribute to educating citizens in conceptualizing the ethic of care and respect for the environment.

This initiative demonstrates that the costs of maintaining protected areas are in fact investments to conserve and maintain natural capital.

Improved reputation, attracting new clients and reaching new niche markets

Reputation and brand management is essential to firms. Adopting socio-environmental criteria in firm purchasing decisions generates opportunities to differentiate the brand, as well as contribute to a more balanced environment and influence the supply chain to produce more efficiently and sustainably. Communicating these activities is crucial in order to improve reputation, attract new clients and create new market niches. Certified products that guarantee traceability, use of inputs that are less damaging to BES and more efficient production processes that utilize low impact technologies also represent opportunities for businesses to manage their reputations, diversify their products and create and/or enter new markets.

The market for certified, locally grown or responsibly sourced products is growing in Brazil, nevertheless consumer awareness is still low. There are few people who are willing to pay for environmental attributes, and thus there is ample space for development. Base sectors such as agriculture (organics) are the ones with the greatest difficulty in identifying these market niches. "Green" products are gaining market share, but still only marginally, such as organics that exhibit annual growth of 20% but still only represent less than 2% of the market (5).

An example of a certified product that has been growing exponentially is certified timber. FSC certifications over the past two years have seen annual growth of 25% in custody chain certificates. Brazil has close to 6,515,790 FSC certified hectares (54) and 83 valid certificates for forest management and custody chains. The Forest Certification Program (Cerflor) is a Brazilian initiative that seeks to confer a "green seal" of good practices to the forestry sector and has already certified approximately 2,248,700 hectares (41). Comparatively, the total area of planted forests is 6.8 million hectares, according to the Brazilian Forest Service (55).

The UNEP coordinates a project together with the European Commission and the Federal Ministry of Germany to promote environmental labeling. Labeling involves tools to analyze life-cycles in order to assess environmental aspects of the production chain for different industrial processes. In Europe, the label has been in existence since 1992 and is known as "The Flower". Businesses that adhere to its criteria can utilize the logo in the format of a flower on their packaging, thus identifying their positive actions related to environmental management. More than 900 firms have adopted the label, that together have a market turnover of approximately € 1 billion, including countries from the European Union, the United States, Canada, Australia, Japan and Thailand.

In Brazil, a study by the Ministry of Commerce and Development and the pilot project involved one of the main exporting firms in the pulp & paper sector. For this firm, acceptance in the international market is a strategic issue for the management of business activities. The production of Brazilian paper was analyzed starting with the forestry activities that supply the raw materials for the sector and ending with the final product. The study not only intended to identify environmental aspects and impacts in the chain, but also to identify how adequate management of these factors could benefit firms, to motivate adoption of similar initiatives.

The interest for certified products is also growing in Brazil. A survey done in 2009 by *Green Brands Global Survey* reported that 73% of Brazilians plan to increase their spending on green products and services and 28% of them are willing

to pay up to 30% more for green products and services. Another study identified that 48% are willing to pay 10% more for green products.

Development of new products and technologies

Opportunities to develop new products include "green products", that is, those involving certifications, biotechnology, clean technologies or systems for sustainable natural resource extraction (56). Businesses may benefit from revenues that originate from products that sustainably use biodiversity as raw material or as inspiration for product development through technological innovation, especially for the agriculture, cosmetic and pharmaceutical sectors.

Native Brazilian species exhibit great potential for the development of new products such as medicines, vitamins, genetic basis for biotechnology and ornamental plants, among others, keeping in mind the importance of creating incentives to leverage sustainable business activities and reduce barriers and restrictions related to access to such products (31). The National Project for Integrated Public-Private Actions for Biodiversity (PROBIO) developed the project Plants for the Future between 2005 and 2007, which identified 755 priority species with potential for commercial use, that are currently being utilized regionally.

Another example of use of these species is the production of plant oils that can be used in the food industry as well as in the cosmetic, pharmaceutical and biofuel industries. Nevertheless, it is important to emphasize that large-scale production of biofuels could have impacts on land use and occupation. In order to organize the sustainable expansion of sugar cane production in Brazil, Agro-ecological Zoning aims to provide technical support in the formulation of public policy through the use of sustainable land use planning.

As mentioned previously, organic or certified products gain market share to the extent that consumer habits change. Pressure from consumers demanding products and services that are healthier and are produced in manners that respect socio-environmental aspects, is of utmost relevance to propel market transformation.

Changes in consumer habits move towards convenience, practicality, reduction of quantity and reduction of time to the acquisition and preparation of food on behalf of consumers.

Another opportunity is the development of products adapted to environments with less resource availability. For example, seeds adapted to water scarce environments and developed through biotechnology.

Biomimicry is a technologically innovative area, although it depends on high investments in research. This technology deals with taking advantage of the physical, biological and chemical characteristics of organisms, acquired through survival and adaptation to the environment, to develop new products. In Brazil, the Technological Institute of Parana (Tecpar) developed a shape skate of bamboo for Cisco. The Institute relied on the flexibility functions and resistance of bamboo, which is up to five times more resistant than wood.

Furthermore, with a growing awareness of the need to reduce impacts on BES, there will also be space to develop new technologies and products that reduce degradation, restore ecosystems or increase the efficiency of ecosystem services use. One example is the creation of green polymers, built from renewable raw materials such as corn, sugar cane, cellulose, chitin and others.

Developing new markets

Although still very new, the development of markets for ecosystem services, such as trading high quality water, certification of sustainable products, carbon markets, wetland banking and threatened species banking, are latent and exhibit growth potential. Wetland and threatened species banking can be understood as a location where resources are restored, established, enriched and/or preserved with the goal of offering compensatory mitigation for the impacts of a given activity.

Firms that own large forested areas could become beneficiaries of PES mechanisms and thus capture new revenue flows from environmental assets such as carbon, water and biodiversity credits. However, PES has greater potential to benefit Conservation Units, small rural producers or suppliers of ecosystem services, and large firms in traditional sectors are more likely to fit the role as potential contributors.

It is possible that national and state policies for climate change will create markets for the commercialization of carbon. In that case, Brazilian businesses can participate in projects to reduce emissions and sell carbon credits on regulated voluntary markets.

According to information from *Ecosystem Marketplace* in the Vision 2050 Report by CEBDS, global compensations for biodiversity and payments for environmental services could exceed 17 billion in 2020, as can be observed in table 6:

Table 6: Ecosystem markets

MARKET FOR ECOSYSTEM SERVICES	CURRENT DIMENSION	POTENTIAL DIMENSION BY 2020	POTENTIAL DIMENSION BY 2050
Certified forest products	US$5000 million		US$50000 million
Certified agricultural products	US$ 42 mil million	US$210000 (10% growth rate per year between 2012 and 2020)	US$900000 (5% growth rate between 2020 and 2050)
Forestry that complies with GHG emission targets		US$5 to US$5000 million	0 a US$5000 million
Forestry with voluntary carbon capture	US$21 million	US$10 million	US$ 10 million to US$5 million
Compensation according to biodiversity	US$ 3400 million	US$ 10000 million	US$20000 million
Voluntary biodiversity compensation	US$ 10 to 17 million	US$100 million (given firm adoption of concept)	US$ 400 million
Payments for Environmental Services measured by government in favor of biodiversity	US$ 3000 million	US$ 7000 million	US$ 15000 million
Voluntary payments for the management of hydrographic basins	US$ 5000 million	US$ 2000 million	US$ 10000 million
Payments for Environmental Services by governments in favor of hydrographic basins	US$ 5200 million	US$ 6000 million	US$ 20000 million
Genetic resources	US$ 15 to US$ 30 million	US$ 100 million	> US$ 500 million

Source: Adapted from *Forest Trends & Ecosystem Marketplace*, 2008 (57)

According to the World Bank, Brazil has the potential to reduce up to 6.2 Giga tCO2e through forestry projects by 2030. Close to 20 projects are being developed on national territory which considering the average price for forestry credit at US$ 2.9, this results in nearly US$ 1.8 trillion dollars of REDD+ credits. Nevertheless, there are still judicial uncertainties related to ownership of this type of credit in Brazil and possible conflicts over land use limit the potential of this market. The demand for these credits is still weak and depends on specific regulation on an international, national or state scale. Some factions defend the creation of multilateral funds, such as the World Bank's *Biocarbon Fund*, to strengthen the demand for these credits in the market.

The following box presents an example of one of the REDD+ projects developed in Brazil.

Box 22: Experiences with REDD mechanisms in Brazil – the case of project Surui

The Reducing Emissions from Deforestation and Forest Degradation (REDD+) mechanism aims to contribute to reducing deforestation and the emission of greenhouse gases (GHG) through financial incentives.

One initiative that is gaining recognition in the national and international spheres is the development of REDD projects by the indigenous tribe Paiter-Surui. The project began in 2004 with support from the Kaninde Association for Environmental Defence, *Aguaverde*, and the United States Agency for International Development (Usaid), as a reforestation project to recover degraded areas.

In 2007, the Surui leader Almir Surui approached the Forest Trends Communities and Markets Program to seek support for the project. After some negotiations a Memorandum of Understanding was drafted and signed, that described in detail the responsibilities and expectations of various organizations related to the REDD project, including: Metareilá Association, Forest Trends, Kaninde Association for Ethno-environmental Defense, Amazon Conservation Team (ACT Brazil), Amazon Institute for Conservation and Sustainable Development (Idesam) and Brazilian Fund for Biodiversity (Funbio).

The main challenges encountered include finding compatibility between international market mechanisms and the realities of indigenous populations and guaranteeing ownership of carbon credits. As such, the project relies on strengthening the ability of the Paiter-Surui to reduce deforestation and creating a lasting REDD program.

The Amazon Institute for Conservation and Sustainable Development (Idesam) is working with the Paiter-Surui community to develop a conservation and sustainable development project in their villages. Conservative estimates based on initial analyses imply that the project will avoid approximately 7 million tons of CO_2 equivalent (tCO_2e) between 2009 and 2038 (58).

Marketable environmental assets such as carbon are considered opportunities mainly by NGOs and governments, with the potential of being applied as compensation for legal reserves, credits for reverse logistics and renewable energy. Businesses consider such mechanisms from a long term perspective, which still lacks the necessary regulation and security to attract investments on a meaningful scale. Furthermore, the sale of specific BES credits is still a distant reality due to the need for better understanding the dynamics of ecosystems and the relations of impact and dependence. The Green Development Initiative is a pilot initiative to adapt the concept of carbon credits to biodiversity.

Box 23: *Green Development Initiative*: Green Development Mechanism[30]

The Green Development Initiative (GDI) is an international response to the CBD, which seeks to establish mechanisms similar to the Clean Development Mechanism (CDM) and an international carbon market.

The GDI Council consists mainly of representatives from ministries of various countries and NGOs, and is working to develop certification standards for "biodiversity credits" in order to facilitate the involvement of the private sector in conservation initiatives.

Hopes for a future global biodiversity market are still subject to uncertainty. However, regional systems are emerging, especially those linked to governments as "compensation for impacts" from projects. As the case of water, some specialists believe that establishing regional markets has greater potential in the case of biodiversity, since given the specific characteristics of ecosystems, compensation cannot be done in any region but rather should be realized in a similar ecosystem.

In Brazil, some businesses with large landholdings of forested areas have already expressed interest in the accounting of potential ecosystem assets, such as stocks of water, carbon, biodiversity and ecosystem services provided. These assets could be commercialized on markets created by regulation, such as the Green Exchange of the State of Rio de Janeiro.

[30] www.gdm.earthmind.net

Box 24: Rio's Green Exchange (BVRio)

The Green Exchange is an unprecedented project in Brazil, which aims to develop a market for environmental assets in order to promote a green economy in the State of Rio de Janeiro. This is the first carbon market in Brazil, but it also includes other commodities such as: industrial effluents, forest planting and waste. BVRio is a non-profit civic association and was structured to involve various sectors of society, such as businesses, NGOs and scientists or individuals involved in environmental finance. Also, the exchange relies on thematic discussion chambers to strengthen environmental issues in negotiation spaces.

As a result of the creation of these markets, new business opportunities could emerge and consequently also new businesses. Some activities are fundamental to structuring markets for environmental services, as outlined in the below table.

Table 7: Business activities that support markets for ecosystem services

ACTIVITY	FUNCTION	RELEVANT SECTORS
FINANCE		
Project financing and banks	Providing investment capital to commercial projects for ecosystem services	Capital and investment banks, risk capital, businesses seeking to compensate for their impacts
Fund creation and management	Establishing and managing funds for ecosystem services and management of investment fund profiles	Investment fund managers and investment fund consultants
Brokerage	Relationship between buyers and sellers and facilitation of trade in credits and ecosystem services	Brokers and consultants
GOVERNMENT		
Monitoring	Collection and analysis of data on ecosystem services to improve accounting and price transparency	Environmental consultants, NGOs and research institutes
Registration service	Comparison and organization of ecosystem assets and transactions	Financial information service firms
Certification	Third party verification of project performance with regard to certifications	Environmental consultants, NGOs and certifiers
Validation and verification	Verification of business plan and project performance according to market standards	Accredited verifiers
PROJECT DEVELOPMENT		
Project instigators	Planning, ensuring financing and development management of projects that involve ecosystem services	Land owners, land management firms and construction companies
Project technical support	Technical development and support for ecosystem service projects	Environmental consultants, NGOs and research institutes
Market intelligence services	Supply of information on status and trends in markets for ecosystem services	Suppliers of specialized information, news and intelligence agents, exchange markets and banks
Market strategy services	Interpretation of market information and consultation on market strategy	Strategic consultants and brokers
Insurance services	Provision of coverage for losses not covered by insurance and to reduce project risks	Insurance companies
Legal services	Consulting on legal issues related to projects and tradable rights	Law firms

Source: Adapted from Global TEEB

Opportunities by business sector

Sectors that utilize biodiversity in products, such as cosmetics, pharmaceuticals and agriculture, have greater opportunities to benefit from BES management through the development of new products. Involving the value chain is an opportunity for all sectors. In agriculture for example, increasing production efficiency among small and medium landowners or creating

differentiated markets for sustainable products is an option to involve the vale chain. For mining and construction, involving the supply chain affects primarily timber suppliers. In the cosmetic and pharmaceutical industries, the access redistribution of benefits related to biodiversity resources it eh main factor to be considered. Financial institutions on the other hand, form partnerships to offer specific credit for environmental compliance of suppliers to large retail chains.

The creation of supply chains with lesser impact, or that values products related to BES, is a great business opportunity for all sectors. However, it also presents difficulties when trying to integrate socio-environmental values with the logic of large firms and global competitive markets. Overall, operating in the supply chain involves interacting with small and medium organizations and, in cases where products are related to biodiversity, this could also include traditional or extractive-based communities.

Box 25: Inclusive business and BES

Sustainable use of biodiversity could be an important driver of development and social and economic inclusion for traditional communities and peoples as well as an opportunity for firms to invest in "inclusive business" and strengthen their social ventures involving low-income groups as outlined in the below image.

Inclusive business related to BES encompasses mainly activities such as fishing and plant extraction, especially babassu nuts, palm fiber, yerba mate, acai, Brazil nuts, carnauba wax, coagulated rubber and heart of palm. According to statistics, the non-timber extractive-based segment in Brazil involves around 90 thousand people and corresponds to 0.48% of raw material production at a value of approximately R$ 480 million.

Studies in Brazil demonstrate that successful business strategies for sustainable biodiversity use and social inclusion involve forming commercial alliances and partnerships between large businesses and associations or local groups responsible for the management and production of products. Beyond fostering the establishment of commercial channels, these partnerships provide technical and administrative support, especially during the first years of operations, and long term credit or grants from bilateral or multilateral international entities, foundations NGOs, among others.

Technical and credit assistance are essential for overcoming the main barriers faced by small businesses and groups that utilize biodiversity as raw material, including informality, lack of organization, uncertain property rights of common goods (biodiversity and traditional knowledge), difficulty in attaining quality standards, volumes, deadlines and consequently to ensure adequate remuneration.

There are various examples of this type of experience, such as the "Caras do Brasil" (Faces of Brazil) program by the Pao de Acucar group, the largest retail chain in Brazil which involves 70 suppliers organized as cooperatives, associations and micro-firms in the provision of decorative items, domestic utensils, non-perishable goods and hygiene articles. Initiatives such as those developed by Natura, Monsanto and Walmart are examples of the potential of involving the value chain in managing BES, especially including small businesses and traditional communities (56) (31).

A figura 8 ilustra as principais oportunidades por setor.

Image 8 outlines the main opportunities by sector

CATEGORIES	INDICATIVE BES OPPORTUNITIES	INDICATIVE MARKET SECTORS WITH BES OPPORTUNITIES					
		Biological Resource Based Industires	Extractive Industires	Consumer Goods	Consumer Services	Health Care	Financials
Operational (day-to-day activities, expenditures and processes of the company)	Increased quality, decreased costs of inputs	●		●	●	●	
	Increased output or productivity	●					●
	Sustainability of business operations	●	●				
	Suply chain opportunities			●	●	●	
Regulatory and legal (laws, policies, court actions that can affect performance)	Lower transitions cost in anticipating new policies		●				●
	Mitigation of risk due to environmental disaster		●				●
Reputational (brand, image, relationship with stakeholders)	Improvement to brand or image	●		●	●		
	Attract new consumers			●	●	●	
	Reach new niche markets			●	●	●	
Markets and products (factors that can affect corporate market performance)	Changes in consumer preferences	●			●	●	
	Purchaser requirements	●		●			
Financing (cost and availability of capital)	Attract growing SRI investment	●	●	●	●	●	

Source: Adapted from Global TEEB

As demonstrated, opportunities related to BES management differ in each sector based on how each one depends on and relates to biodiversity. The sections that follow contain some information on the Brazilian context with regards to the main opportunities presented by the Global TEEB for the different sectors:

AGRICULTURE AND PULP & PAPER	
Research and Development (R&D) in biotechnology.	Biotechnology will be important for increasing productivity and meeting growing demands for food. Brazil is the second largest producer of biotechnology, which will be important to increasing productivity and fulfilling growing demands for food, and can thus minimize the impacts of agriculture on BES because of the higher productivity and reduced consumption of water, fuel and pesticides. In addition to increased productivity, biotechnology could aid agriculture and forestry in adapting to environments with greater resource scarcity through the identification of plants that depend on less water and nitrogen or that are adaptable to saline soils.
Adoption of environmental certificates and sectoral protocols	Environmental certifications and protocols have emerged from the demand of certain parties interested in adopting environmental criteria in business activities. Furthermore, they may also contribute to standardizing corporate management processes. There could be more than one applicable certification (such as organic and biodynamic, among others) with effects that vary depending on the criteria applied (more flexible or more strict) and geographic scope (international, national or regional) Currently, the agriculture, pulp & paper sectors have the greatest opportunities for certifying products. The most common certification for these sectors is the Forestry Stewardship Council (FSC) that already issued close to 770 certifications (FSC), mainly for firms that export (41). For the agriculture sector, round tables and sectoral associations that involve businesses and governments are of particular importance in establishing protocols for sustainable production practices such as the Green Cane Protocol (SP state), and Café Gourmet, among others. Beyond the agricultural sector, there are three commonly used certificates for marine products, with the Marine Stewardship Council (MSC) certification being the most utilized. These certifications aim to certify sustainable fisheries management.
Engaging suppliers with the aim to consolidate sustainable chains.	The rise of business models that seek to promote sustainable practices along the entire value chain, by offering differentiated remuneration to producers that adopt best practices or credit lines that benefit such producers, is an important opportunity. For example, the Ministry of the Environment and BNDES created a credit line for small livestock farmers in the Amazon that supply meat to large chains.
Organic agriculture and best agricultural practices.	Brazilian organic agriculture grows at an annual rate of 20%, but still only represents less than 2% of the market. As consumer habits change, the demand for this type of product is expected to grow. Furthermore, sustainable practices such as crop rotation, agroforestry systems and direct planting have the potential to expand. According to the Brazilian Program for Low Carbon Agriculture developed by the Federal Government, there is a possibility of recovering 15 million hectares of pasture land and implanting 4 million hectares of systems that integrate Crop-Livestock-Forest and 5.5 million hectares for biological nitrogen fixation use.
OIL & GAS AND CHEMICALS	
Developing environmentally friendly products.	Consumers have increasingly been demanding differentiated attitudes from businesses and their products or services. The Braskem initiative to produce green polyethylene is an example of this type of opportunity. Braskem is a business in the petrochemical and chemical industry that stands out globally as the largest producer of thermoplastic resins in the Americas.
Greater demand for energy sources with low environmental impact.	One market to be explored is that of alternative energy sources such as biomass, Small Hydroelectric Plants, wind and solar energy, in order to diversify the energy matrix. The National Energy Plan estimates 4.1% average growth until 2030, which implicates a significant rise in the national demand for energy. Even so, Brazil has more than 50% renewable energy in its matrix. According to MME, the objective is to maintain the proportion of renewable sources despite increasing demands.
Environmental management practices that minimize biodiversity impacts.	The petroleum, gas and chemicals sector present a lesser degree of dependence on biodiversity resources and consequently the main opportunities concentrate around minimizing the risks and costs associated with strategic management of Biodiversity and Ecosystem Services, such as the rational use of natural resources and generating less waste.
Improving reputation.	A better understanding of the relations between the sector and Biodiversity and Ecosystem Services could contribute to improving communication and transparency of information on the impacts of the sector on Biodiversity and Ecosystem Services Firms that adopt a proactive attitude in relation to including BES in business could benefit from an improved image as role models in the use and production of fuels and related products
COSMETICS AND PHARMACEUTICALS	
Using Brazilian biodiversity to develop new product.	For the cosmetics sector, many business opportunities are related to the creation of specific product lines that represent the differentials of Brazilian biodiversity, especially by taking advantage of the biological diversity of Brazilian biomes. An example of this is the existence of approximately 22 plant oils and dyes in the cosmetics industry that are produced from plant essences from the Amazon such as from acai, andiroba, babassu, cupuacu, Brazil nut, etc. Herbal remedies in Brazil currently represent close to 22 billion dollars, and the market grows at an annual rate of 12%. This corresponds to around 7% of the pharmaceutical market, currently generating 400 million dollars per year. There is thus great potential to explore and utilize native Brazilian species and more than 650 species with economic value have already been identified in the Brazilian Legal Amazon[31]. Merely 20 products represent more than 60% of revenues from herbal remedies bought in pharmacies, However, there are some barriers with regards to registering and commercializing these products, because patent applications for the invention of products and processes derived from genetic heritage and traditional knowledge must be accompanied by certifications of origins and authorized access. Activities involving supply chains are related to directives for selecting suppliers and also the involvement of communities that interact with ecosystems from which the businesses are benefitting.

[31] United Nations Environment Program – World Center for Monitoring Conservation (UNEP-WCMC). 2011. Overview of relations between biodiversity, ecosystem services and the private sector.

MINING AND CONSTRUCTION	
Sustainable environmental practices minimize impacts on biodiversity.	As with the oil and gas sector, the mining and construction sectors exhibit lesser degrees of dependence on resources from biodiversity, which is why the primary opportunities are concentrated around minimizing risks and costs associated with strategic BES management, such as the rational use of natural resources, energy and reduced generation of wastes and effluents. The main opportunities for the sector include: - engineering studies to evaluate project alternatives that promote a reduction in affected areas or configurations and locations that minimize environmental impacts and costs; - reducing costs of recovering degraded areas through the realization of studies that contribute to process efficiency gains; - adoption of cleaner production strategies (reduce, reuse and recycle); - measurement (in monetary terms) of avoided costs and gains from minimizing impacts and definition of business alternatives. For example, maintaining undisturbed areas and remnants as well as reducing the consumption of inputs such as fuel. -compliance of the International Finance Corporation's Performance Standard 6 -Biodiversity Conservation and Sustainable Management of Living Natural Resources
Engaging the supply chain.	The supply of timber is a critical component both for the mining chain as well as to the industrial production of cast iron and in construction. Thus, developing programs that build capacity and encourage the establishment of industrial plants that supply timber from sustainable origins represents an opportunity for the sector.
FINANCIAL INSTITUTIONS	
Commercialization of environmental commodities	Transforming water, biodiversity and carbon into commodities is a growing trend and the financial market could have a positive impact in attributing value to these goods, although this could result in prices that may not consider all benefits offered by ecosystem services. However, it is necessary to consider that there should be progressive phases of including environmental externalities in the financial market. The marketing of environmental assets is a positive trend, although it is necessary to have regulation in place that establishes limits, given a medium to long term perspective. In Brazil, an example of this type of initiative is the Rio Green Exchange.
Investment funds for BES related activities	Creation of new credit lines, bonds and specific funds aimed at new businesses related to BES management, environmental inputs, the acquisition of equipment, projects or systems that reduce impacts on BES.
RETAIL	
Improving reputation	Issues related to biodiversity are essentially associated with the reputation and public image of a business, thus creating links between the responsibility of a firm and the sectors that it finances or acquires inputs from.
New environmentally friendly products.	A strategy of businesses in the retail sector is to resort to innovation as a way to aggregate value to "green" products and discover new market segments. Furthermore, other factors can be included in this strategy, such as the employment of biodegradable formulas, recycled packaging, increased use of refills, and use of plant inputs.

Including BES in the strategic management of businesses

06

Including BES in the strategic management of businesses

Key messages

Good business planning requires business to increasingly consider the role of BES in their operations: Adequate internal systems to identify, monitor and measure BES are needed for decision-making, to assess industrial impacts of different biodiversity components as well as the relation of dependency between business activities and intangible biological processes.

The process of including BES in business goes through several steps: identifying impacts and dependencies, analyzing risks, measuring and monitoring, adopting mitigation and adaptation measures, and reporting. Some Brazilian businesses have already begun mapping their relations of dependence and impact that are of crucial importance in identifying and managing risks and taking advantage of new opportunities.

Of special importance are Brazilian multi-sectoral initiatives to deepen knowledge of BES and establish commitments and targets for the private sector: some Brazilian initiatives include the Business Movement for Biodiversity (MEB), the Dialogue on Biodiversity and the Technical Chamber on Biodiversity and Biotechnology (CTBIO).

The concept of valuing BES should be expanded in Brazil and adopted not only during licensing procedures and environmental compensation, but in operational activities and management systems as a whole.

Integrated reporting is one of the main trends for businesses in the future: Integrated reporting combines financial and sustainability reporting, thus offering information on the financial, environmental and social performance of a business and demonstrating how these factors relate. The main advantage of adopting an integrated report is to allow shareholders and stakeholders to identify how business commitments to sustainability are contributing to a sustainable strategy that generates value in the long term.

One of the challenges with incorporating BES in business management is the adoption of methodologies for including BES in business activities, such as the standardization of concepts, objectives and methods: various tools, methodologies and standards are available for the inclusion of BES in business. Each one of these tools rely on specific purposes, such as the identification of relations of impact and

dependency, the valuation of ecosystem services, reporting and best management practices, among others. However, these tools need more extensive track records in order to substitute others that are more acceptable internationally and nationally. Many methodologies are international and require a regional database in order to allow their strategic adoption on behalf of Brazilian businesses.

The objective of this chapter is to provide firms with a brief step-by-step guide of how to incorporate BES in their businesses, utilizing examples of Brazilian initiatives to illustrate how these concepts can be implemented or amplified.

Some initiatives to conserve biodiversity have emerged from the business community, especially aimed at complying with legal requirements, but there are also other joint actions of a voluntary character that have been developed by businesses in partnership with other organizations. Such initiatives bring useful contributions to environmental conservation, despite being separated from the strategic vision of the firm, given that these actions generally are not developed from performance evaluations and impact management, for which a greater alignment between environmental sustainability and economic sustainability is necessary. To strengthen the return of activities developed by firms, both from a reputational and an economic perspective, BES related operational strategies that are aligned with business activities must be developed. For this to happen, a commitment to systematically approach BES should be incorporated in the corporate governance of the organization – the system through which decisions of all organizations are taken and implemented.

In order for a BES conservation project to make sense for a firm's activities and represent an important long term strategy, it is important to identify the ways in which a business depends on BES and its related impacts. The greatest challenge in defining projects related to strategic BES management is to clearly establish the objectives, because there are various distinct motivations and incentives for the systematic inclusion of BES in business, such as:

- Evaluating better alternatives for implementing ventures taking into account sustainability of the territory (ex. Engineering projects that cause less environmental impact);
- Effective participation of environmental requirements in the proposal and negotiation process, in order to permit an adequate management of the impacts generated by projects;
- Supporting the implementation of better practices for operating in sensitive ecosystems (for example, protecting strategic areas for the provision of ecosystem services demanded by operations);
- Improving environmental management and reducing operational costs through greater resource use efficiency, supported by operational decisions (for example, selection of more sustainable production technologies);
- Identifying areas of high relevance for conservation or of great risk for BES management in areas of interest to operations;
- Supporting the implementation of payments for environmental services supplied by the remnants located at the surroundings of operations and other strategic areas;
- Utilizing economic valuation as an instrument to create awareness of the general public and business decision-makers;
- Implementing strategies to manage BES that seek to diminish risks to operations, given prospects of future scarcity of raw materials and ecosystem services that could cause increased costs and affect the viability of products;
- Developing new products and identifying business opportunities compatible with observed trends in BES, considering also the applications of biotechnology and development of new products and patents (for example development of crop species that are more resistant to arid climates);
- Evaluating reputational risks of each project and taking decisions that consider maintaining good relations with local communities and authorities;
- Anticipating regulatory frameworks related to BES, preparing for new demands and reducing operational risks and costs;
- Assessing business performance based on established targets related to the conservation and sustainable use of BES;
- Increasing transparency in supplying information to investors, who are increasingly interested in the environmental performance of businesses;
- Generating new revenues through biotechnology, new products and patents;
- Preparing to access demanding markets, especially abroad;
- Drafting reports that allow stakeholders to identify the business' commitment to sustainability and how this contributes to a sustainable strategy to create value in the long term.
- Following trends to obtain relevant certifications for products (such as FSC).

It is important to identify the motivating factors of a firm prior to initiating strategic BES management, because this guides the selection of tools and methodologies appropriate to the desired objectives (see appendix III).

The Global TEEB presents some central action points for including biodiversity and ecosystem services in the business sector:

- Step 1. Identify the impacts and dependencies of your business on biodiversity and ecosystem services (BES)
- Step 2. Assess the business risks and opportunities associated with these impacts and dependencies
- Step 3. Develop BES information systems, set SMART targets, measure and value performance, and report your results
- Step 4. Take action to avoid, minimize and mitigate BES risks, including in-kind compensation ('offsets') where appropriate
- Step 5. Grasp emerging BES business opportunities, such as cost-efficiencies, new products and new markets
- Step 6. Integrate business strategy and actions on BES with wider corporate social responsibility initiatives
- Step 7. Engage with business peers and stakeholders in government, NGOs and civil society to improve BES guidance and policy

Step 1 – Identify the impacts and dependencies of your business on biodiversity and ecosystem services (BES)

In some cases, firms may not have a very clear understanding of the impacts and dependencies from BES, and consequently education and corporate training are important to demonstrate the values case, ensure the involvement of business units at different levels, clarify concepts and principles, and present examples of tools to be utilized. In 2001, the *World Business Council for Sustainable Development* published the *Guide to Corporate Ecosystem Valuation* (CEV) (59), which presents directives on how to include BES in business management, as well as tools available for assessing risks and opportunities, valuing ecosystem services and examples of international cases.

Recognizing the importance of educating the private sector on issues related to BES, Brazilian businesses have organized into multi-sectoral and thematic discussion groups. Initiatives that stand out include the Brazilian Business Movement (MEB), the Technical Chamber on Biodiversity and Biotechnology (CTBIO) and the business sector group contributing to drafting the Brazilian biodiversity conservation targets for the 2011-2020 period, with the Federal Government (Aichi Targets).

Beyond raising awareness, a commitment to proactive management by the business sector depends on a more substantiated decision process which reveals the objectives for including BES in business management and if these will generate relevant, measurable, achievable and opportune results to the organization. For this to take place a more detailed analysis is necessary, as will be addressed in this chapter.

Some Brazilian businesses are initiating this assessment with the identification and assessment of dependencies and impacts of business activities on BES, using tools such as the Corpo*rate Ecosystem Services Review* (ESR) developed by the *World Resources Institute*. The objective of this evaluation is to identify priority ecosystem services for the business. Through a questionnaire, ESR generates a matrix identifying the main impacts and dependencies of the business on BES.

One of the challenges of this step is the fact that large corporations encompass a wide variety of activities and different levels of dependencies and impacts. Therefore, it is important to establish criteria for determining relevance and limits to the evaluation before applying tools, thereby defining the boundary of the evaluation - if only part of business activities or the entire value chain should be included. To identify "boundaries" to the assessment, Global TEEB suggests an approach that considers the intersection between "relevance" and "control". As such, business units and activities should be mapped, prioritizing ones that exhibit great potential impacts of strong dependence on biodiversity, whose organization involve substantial levels of control.

Box 26: Votorantim intends to value and monitor biodiversity

Votorantim Industrial is a privately owned Brazilian business that encompasses Votorantim Participações which contracts operations in activities such as cement, mining and metals (aluminum, zinc and nickel), steel, paper and cellulose, orange juice concentrate and electricity generation. With operations in 24 countries, Votorantim Industrial registered net revenues of R$ 23.3 billion in 2010.

In 2010, Votorantim assumed a commitment to map biodiversity in the regions where the group operates. Within five years the firm aims to develop general practices as well as value and monitor biodiversity in its operating environments, but admits that the lack of a widely accepted methodology for mapping and taking inventory of biodiversity complicates the work. Therefore, the firm established partnerships with institutions such as the Brazilian Business Council for Sustainable Development (CEBDS) and other businesses, in order to join forces to find efficient and relevant ways to map and conserve/preserve ecosystem and biodiversity resources.

Step 2 – Assess the business risks and opportunities associated with these impacts and dependencies

After defining the boundaries and indentifying the impacts and dependence of the firm, it is necessary to carry out a risk analysis, with costs and complexity varying based on:

- The types of risks included in the evaluation (as seen in Chapter 4)[33];
- The tools and methodologies applied.

There are specific methodologies and guides for analyzing risks and opportunities related to BES (see Appendix III), however it is worth emphasizing that this analysis could also be done using evaluation methodologies specific to the environment. There is not a unique tool or a specific stage of the process for evaluating risk, but different tools can be utilized. Examples include the Corporate Ecosystem Services Review (ESR), which provides a process oriented assessment; the *Integrated Biodiversity Assessment Tool* (IBAT), which helps visualize data on BES, *Artificial Intelligence for Ecosystem Services* (ARIES) and I*ntegrated Valuation of Ecosystem Services and Tradeoffs* (InVEST)), which provide modeling or scenario planning.

Even simple analysis could help a firm to prevent the main risks and identify opportunities, as long as experienced professionals in both the business sector and BES related issues are consulted. The participation of various business units and departments also helps in identifying the main risks as well as in highlighting opportunities, due to specific experiences of each with its given activities. An evaluation of the level of risk should be done to determine the function of responsibility and severity of potential problems and the financial implications of the specific risk to the business.

Risk assessment is an important step for involving upper management and to motivate a change in attitude. These findings can assist in organizing and refining the objectives to be achieved by including BES as well as facilitating the selection of adequate tools to develop a BES information system within the organization, as explained in the next step.

Box 27: Biodiversity management at Tractebel Energia S.A.

***Case:* Biodiversity management at Tractebel Energia S.A.**

Tractebel Energia is a private firm in the Brazilian electricity sector that seeks to meet socio-environmental demands related to the 22 plants that it operates, which include hydroelectric, Small Electrical Plants, Thermoelectric and Wind plants, distributed across 12 Brazilian states. The firm is part of the Business Sustainability Index portfolio of BM & FBOVESPA for the 7th consecutive year and has certified environmental, health and safety and safety management systems for more than 95% of the energy generated in 2011, in addition to publishing annual performance reports.

Internally, management is done by environmental professionals that operate locally in decentralized locations in accordance with the corporate Environment Area, which defines and aligns operational strategies. A sustainability committee composed of professionals from various areas of the firm supports upper management decision-making in relation to questions of social responsibility and non-obligatory environmental actions. A short, medium and long term risk analysis is carried out annually, associated with a comprehensive assessment of environmental issues.

The firm depends directly on the utilization of natural resources for the operation of business activities and understands that biodiversity conservation and good community relations are fundamental for the acceptance of its products and the sustainability of its business.

The main programs related to biodiversity include partnerships with stakeholders, such as surrounding communities, learning institutions, local environmental agencies, Hydrographic Basin Committees, in particular to:

- **Monitoring of fauna and ichthyofauna present in Plant vicinities and hydro-electrical reservoirs;**
- **Agreements with environmental agency (Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) to create and release fingerlings in rivers that contribute to reservoirs belonging to the firm;**
- **Nurseries for the production, planting and donation of native forest specie seedlings (in 2011 more than 385 seedlings were planted and donated);**
- **Conservation of springs;**

[33] Currently perceived regulatory risks and operational risks (e.g. increased costs of catchment and treatment of water due to erosion processes) could be more easily evaluated in a first instance. However, organizations should consider the possibility of extending this evaluation to include long term risks such as resource scarcity and climate change.

- Donating resources to biodiversity conservation programs and supporting the creation of Conservation Units in the region of operations;
- Research and Development projects aimed at conserving species threatened with extinction, renewable energy and controlling pollution.

Step 3 – Develop BES information systems, set SMART targets, measure and value performance, and report your results

After identifying the main risks and opportunities, firms have sufficient information to define a strategic plan. This plan, according to the Global TEEB, should cover the following aspects:

- Planning of limits, scope and materiality (already defined in the previous step);
- Principles, objectives and targets that are **S**pecific, **M**easureable, **A**chievable, **R**elevant and **T**ime Bound
- Systems for measuring and monitoring performance.

Indicators and tools are established with the objective of revealing information that supports decision-making in the organization. Are objectives being achieved? Has BES management offered a return on investment?

Some international businesses have established objectives, targets and indicators based on the "Net Positive Loss" concept, also known as No Net Loss (NNL). The concept of ecological neutrality proposes the measurement of firm impacts and the adoption of measures to prevent, mitigate or compensate for these impacts so that the net result for the environment is zero.

This concept is highly innovative and similar to compensating for greenhouse gas emissions. It should be noted that it is necessary to measure the impacts of a firm on the environment in order to reduce and compensate for it. Experiences obtained from climate change management could be favorable to the development of mechanisms that incorporate BES in business in this context. However, there are still no entirely consolidated and accepted methodologies for measuring impacts and dependencies on BES, as is the case for greenhouse gas management, and a metric for measuring impacts on biodiversity has also not been defined, such as tons of carbon equivalent (tCO2e) in the climate change context.

One of the benefits of establishing objectives and targets based on the Net Positive Loss concept is to define parameters for compensation that is compatible with the degree of impact caused, for example when establishing environmental compensations.

However, compensating for impacts may not be the main motivation for a business to adopt BES information systems. As mentioned, it is important to identify the motivating factors and objectives prior to initiating strategic BES management, as this guides the selection of tools and systems. The Global TEEB cites four possible BES information systems (60):

1. Systems that link BES information and conventional environmental accounting systems: such as integrating BES information with already existing management systems and internal accounting procedures such as budgets etc.);
2. Systems that seek to incorporate BES into capital investment decisions;
3. Systems that permit the collection and utilization of information at the product level (e.g. Life-Cycle Analysis (LCA);
4. Systems for reporting and information gathering at group level (e.g., Standards for financial and BES accounting, public and integrated reports, *Global Reporting Initiative, Carbon Disclosure Project* etc.).

Firms can implement systems that seek to fulfill all objectives or only some of them.

1. Systems that link BES information to conventional accounting systems

Information on biodiversity at Brazilian firms is generally dispersed across various corporate and operational departments, without an integrated system. This data should be integrated into the planning, budget and decision making systems of firms. This could include decisions on both old and new products, internal or outsourced production, process improvements and price policies, such as in the example of the cosmetics firm Natura, presented in Box 29.

The Global TEEB is very flexible in relation to different possibilities and even considers traditional environmental management indicators, such as the generation of waste and water consumption, as ways to "link BES to conventional systems of environmental accounting". An example of a tool that links BES information to conventional accounting systems is Environmental Management Accounting (EMA) (see Appendix III).

Box 28: Natura – sustainable supply chains: the real value of sustainability

Established in 1969, Natura is the largest Brazilian producer of cosmetics, and leader in the direct sales sector. In 2011, they registered net revenues of R$ 5.5 billion from operations in Brazil, Latin America, Mexico and France.

In partnership with international consultants, Natura evaluated the existence of processes for the supply area globally and concluded that socio-environmental issues, such as selection criteria and development of supply chains, was still limited in large corporations that generally only focus on the basic fulfillment of legal compliance.

Thus, in 2011, Natura initiated the Sustainable Supply Chain Strategy, based on an innovative methodology that allows Natura to consider the value of socio-environmental criteria in the selection of suppliers (so-called socio-environmental externalities) and establish development plans for a more sustainable production chain.

This was possible through the development of an evaluation process that attributed financial values to socio-environmental aspects prioritized by Natura, applicable both in the selection process as well as in developing supply relationships. Upon establishing rules for the valuation of each criteria, cost was considered along with the real impact to society. For example, in the case of carbon, instead of considering the cost of currently marketed credits (mitigation approach), the assessment aimed to establish the real impact of emissions on society by including additional costs to public health and agriculture etc.

The development of this methodology began with a global consulting project with A.T. Kearney, while seeking international references on topics linked to TEEB. The first step was to understand the social and environmental aspects most relevant to Natura, defined jointly with stakeholders and represented in the materiality matrix. For the 2009-2010 period Natura selected: biodiversity, impact of products, greenhouse gases, quality of relations, education and water.

Once the initial concepts were determined, 50 suppliers (16 supply chains) were invited to workshops in order to jointly evaluate socio-environmental impacts. Ultimately, the following topics were prioritized: Environmental: 1) CO_2, 2) Water consumption and 3) Solid wastes; Social: 4) Education, 5) Training, 6) Work safety, 7) Social inclusion and 8) Direct community investments.

Through a round of negotiations, each supplier was briefed on which specific inducing factors to focus (with questions that vary from traditional price competition to new targets for CO2 emissions through technological change, logistics, among others). An example includes a paper supplier that proposed the alternative of delivering in an industrial unit with a cleaner energy matrix upon seeing his proposal negatively impacted by its CO_2 emissions.

The new methodology was incorporated both in the process of selecting suppliers (Strategies for Sustainable Supply) and the process of supplier development. The process was implemented in 60% of the supply base (16 chains), with benefits of R$ 1 million for short term socio-environmental aspects (4% improvement) and a medium term expectation of another R$ 3 million (an additional 13%).

2. Systems that seek to incorporate BES into capital investment decisions

Systems supply information that enable decisions to be taken on which investments to make, through the incorporation of environmental externalities in techniques of commercial valuation, such as Discounted Cash Flow (DCF) and Internal Rate of Return (IRR), indirect valuation, among others. This could be done through a monetary valuation of impacts and dependencies on BES and including these values in the Net Present Value of the discounted cash flows (DCF/NPV). Another possibility would be to consider lower discount rates to enable not so attractive investments, but that presents a long term benefit to society. However, there are discrepancies on the importance of intangible benefits related to BES that complicate their inclusion in investment analysis.

The economic values of ecosystems depend on local and social contexts and can be determined through environmental valuation methods such as the Dose-Response Method (MDR), the Replacement Cost Method (RCM) and Methods of Avoided Costs (MCE), among others (see Appendix 111)[34].

This type of valuation is still rare among Brazilian businesses and entails expensive and complex studies, primarily carried out by the scientific community. BES valuation studies implemented by firms in partnership with academia are generally linked to the licensing of large developments, with the objective of guiding the establishment of compensatory and mitigation efforts or for planning payment for environmental services structures. The following box presents a situation in which information on BES was included in the investment and project viability analysis.

Box 29: Remediation Program in the Guanabara Bay in Rio de Janeiro, Brazil

A study developed by the Inter-American Development Bank (IDB) in the Guanabara Bay in Rio de Janeiro, estimated the viability of a remediation program based on the value of environmental services offered to more than 5 million inhabitants in the Guanabara Bay. The study presents a real case of applying environmental valuation to an investment decision and demonstrates the utilization of methods such as marginal productivity, contingent valuation, travel cost and avoided costs. The results of the environmental assessment are presented below:

ENVIRONMENTAL GOOD OR SERVICE	METHOD	RESULT
Increase supply and regularization of water supply	Defensive spending	US$ 109.7 million in PV*
Diminish waste through rational water consumption	Marginal productivity	US$ 158.5 million in PV*
Residential sanitation	Contingent valuation and transfer of functions	US$ 12.73/family/month
Environmental recovery of rivers	Contingent valuation	US$ 7.30/family/month
Environmental recovery of beaches	Various (contingent valuation, travel cost)	US$ 0.15 to 6.50/family/month
Remediation of fishing sector	Marginal productivity	US$ 10.9 million/year
Increased tourism demand	Marginal productivity	US$ 6.7 million/year
Decreased flooding	Avoided costs	US$ 10.3 million in PV*

*PV Present value discounted at a rate of 11% p.y. Source: adapted from Seroa da Motta, R. Manual para Valoração Econômica de Recursos Ambientais. IPEA/MMA/PNUD/CNPQ. 1997

Box 30 outlines a valuation study implemented by Vale, the second largest mining company in the world, with an emphasis on the production of iron and nickel, and the largest private company in Latin America. From this initiative, Vale sought to demonstrate that the costs of maintaining protected areas are in reality investments in conservation and maintenance of natural capital.

Box 30: Valuation studies in the Vale Natural Reserve

A valuation study was carried out of ecosystem services provided by the Private Reserves of Natural Heritage (Minas Gerais), in partnership with Conservation International – Brazil. The ecosystem services selected were: plant carbon stock, soil conservation (based on economic calculations of maintaining fertility and preventing erosion), water resources and environmental assets with potential for direct use (species with known timber uses). For water resources, the conservation value was calculated as the value of the service provided by the reserves and estimated for one of the RPPNs (Private Natural Heritage Reserves) and the annual monetary value of "water provision". The monetary valuation of this service was calculated for RPPN Corrego Seco, which is important to the water supply for the city Itabirito. According to data from the Autonomous Service for Water and Sewage (SAAE), Corrego Seco supplies close to 70% of the water to the city, and is located within the Vale RPPN, along with its spring and the SAAE water catchment station.

[34] In addition to appendix III, to study currently available valuation methods, we recommend reading "TEEB Ecological and Economic Foundations in Environment and Development Economics", available at: http://www.teebweb.org/EcologicalandEconomicFoundation/tabid/1018/Default.aspx.

ECOSYSTEM SERVICES	ESTIMATED VALUES
Carbon	R$ 11.825.684,53
Soil regulation (fertility)	R$ 23.336,63
Soil regulation (protection against erosion)	R$ 6.771.250,34
Water use (RPPN Córrego Seco)	R$ 3.785.155,80

This valuation study is also being developed for the Vale Natural Reserve (Linhares/Espírito Santo) in partnership with the *Lawrence Berkeley Laboratory* (University of California) and with contributions from other researchers from national and international institutions. In developing the study, both use (direct and indirect) and existence values of the Reserve are being considered. Among the items suggested for use value, the following are being investigated: recreation, scientific aspects (education and research), seedling production (from seed provision to the production of seedlings ready to be planted), pollination (considering the existence of agricultural crops around the Reserve), carbon stock in the soil and plants, provision and purification of water, soil protection and local climate regulation. To assess existence value, the wealth of species and ecosystems in the Reserve will be considered, with special attention to rare groups and those threatened with extinction.

Despite advances in the development and application of techniques and practices of BES valuation, it is still necessary to refine and adapt these practices to the business context, in order to provide valuable information to firms, and consequently government and society work together to ensure the minimization of risks related to BES loss.

3. Systems that permit the collection and utilization of information at the product level

Life Cycle Analysis (LCA) assesses how business activities (environmental interventions) result in impacts on the environment (among them, biodiversity) that in turn cause damage to ecosystems and human beings. LCA techniques should be expanded and refined to allow businesses to evaluate BES through the life-cycles of products and value chains, because LCA is limited to assessing dependence on ecosystem services and more focused on the impact of businesses on BES (60).

In Brazil, LCA studies are being done by many different corporations. There is LCA software, but with limitations due to the lack of a regional data base, since most analyses are carried out by contracting specialists and consultants (60).

Box 31: Espaço ECO Foundation – LCA analysis

The Espaco ECO Foundation (ECO Space Foundation) emerged as an initiative by BASF, a firm in the chemicals sector, to transform an area recently acquired by the firm into an environmental education center for collaborators, and became an independent entity in 2005. Established in the region of the Cinturao Verde Biosphere Reserve in the State of Sao Paulo, the Espaco ECO foundation seeks to assist businesses, civil society, NGOs and universities to incorporate sustainability concepts into strategic decision-making. The Foundation has already applied LCA techniques to more than 20 Brazilian businesses, utilizing the following tools:

MaisMenos Eco-efficiency Analysis developed by BASF in 1996 and promoted by the Espaco ECO Foundation – Eco-efficiency Analysis is an evaluation of product, process or service that considers the entire life-cycle, that is, from the extraction of raw materials to final disposal.

SEEbalance® - MaisMenos Socio-efficiency Analysis – a more complete tool for measuring sustainability as it assesses, beyond the environmental and economic impacts considered in eco-efficiency analysis, social aspects such as the number of collaborates, work accidents, organizational risks, investments in training and personal development, diversity, among others.

Like Eco-efficiency Analysis, this tool displays results in a matrix that allows a clear visualization of the most socio-efficient alternative among those evaluated.

4. Systems for reporting and information gathering at group level

To implement reporting systems on a corporate level, it is recommended that a business have policies and procedures related to BES in place and monitors performance in relation to these policies. The main initiatives on a corporate level seek to include BES in financial analysis and decisions and in the drafting of public reports.

To include BES in financial analysis, the integration of financial accounting norms and BES is necessary, that is, that the accounting books of a business consider not only its financial assets and liabilities, but also environmental and social ones. This enables stock exchange and securities regulators to evaluate the materiality of BES in business reports through so called "Integrated Reports", which is one of the main trends for businesses in the future.

Some Brazilian businesses have already participated in roundtables that aim to integrate both accounting components, such as the workshop held in 2011 by the *International Integrated Reporting Council* (IIRC). However, this is a long term strategy as it relies on the progressive implementation of BES valuation in the financial market and also on the standardization of accounting for ecosystem services. Furthermore, new accounting rules should be adopted by firms on a global scale to avoid competitive losses between firms and countries. For example, if Brazilian businesses discount the loss of environmental assets from the value of its activities, while Chinese firms do not do the same, the previous will suffer competition losses on the international market.

The current main initiatives to include BES in accounting include:

- Evaluation of direct costs through BES management: aims to evaluate financial benefits obtained through good practices that minimize impacts on biodiversity;
- Inclusion of BES in analysis that supports decision-making (e.g. including considerations of impact and dependence on BES in operational procedures, investment analysis, purchase or acquisition of goods and services);
- Accounting for environmental assets, that is, the quantification of natural resources and ecosystem services available in a given area.

These practices are adopted mainly by businesses that operate in specific sectors: "there are recognized rules of accounting valuation applied to stocks of land, timber, agricultural products, cattle or other "inventory" items to attribute value to transactions, assets or liabilities", such as a forest or natural resource management company.

Another type of results reporting widely diffused in Brazil is the *Global Reporting Initiative* (GRI) tool. The GRI report model is currently the most widely used in the world and was created with the objective of establishing best practices for sustainability reports, being composed of a set of directives and indicators to communicate information on the social, environmental and economic performance of organizations. GRI presents specific directives for the reporting of information related to biodiversity, which are presented in box 33:

Box 32: Global Reporting Initiative Biodiversity indicators

GRI Environmental Indicators (EN) applied to Biodiversity (61)[35]:

"EN11 Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas.

EN12 Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas.

EN13 Habitats protected or restored.

EN14 Strategies, current actions, and future plans for managing impacts on biodiversity.

EN15 Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction list."

There are a variety of tools and processes for measuring and evaluating dependencies and impacts of businesses on BES and incorporate this information in environmental accounting, investment decisions and business reporting. However, a deeper understanding of the relationship between economic value and species diversity is needed, as well as of the importance of a complementary relationship between business activities and BES.

[35] Beyond environmental indicators, the GRI protocol also addresses indicators specific to different sectors (sectoral complement).

Step 4 – Take action to avoid, minimize and mitigate BES risks, including in kind compensation ("offsets") where appropriate

Businesses can adopt one or more of these strategies to manage and reduce risks of biodiversity loss (60):

- **Prevention** – includes "red signal" policies, when businesses abstain from executing operations in areas with high biodiversity and ecosystem value (example: ecological economic zoning that restricts areas for sugar cane plantation);
- **Good management practices** – includes developing biodiversity action plans, maintaining risk registers, seeking sustainable and ecological supply chains and defining contingency plans (see below Box);
- **Investment** – includes acquiring eco-efficient technologies and allocating resources sufficiently to maintain natural capital;
- **Safety** – includes recognizing certification schemes, use third-party verification and develop internal systems for quality and control (e.g. Life Certification);
- **Involvement of interested parties** – includes establishing partnerships with research organizations, NGOs, industrial associations and governments, as well as getting involved in local communities and promoting transparency (e.g. participation in multi-sectoral movements such as Dialogues on Biodiversity)

In relation to initiatives to mitigate impacts of BES on businesses, the main actions taken by Brazilian firms include:

- Recuperation or minimization of degraded areas;
- Sustainable agriculture and agriculture management programs;
- Creation and maintenance of protected areas in Brazil;
- Cleaner production, that is, initiatives to reduce, reuse and recycle or engineering studies to identify the alternative with the least impact on biodiversity;
- Promotion of sustainable value chains;
- Certifications for sustainability or adoption of sustainability protocols;
- Research and technology, especially biotechnology;
- Commercialization of species of economic interest (for example buriti, açaí and cupuaçu);
- Redistribution of benefits from traditional knowledge and biodiversity;
- Funds and credit lines for sustainable projects.

In addition to mitigating impacts, businesses could opt to compensate for them by purchasing environmental assets such as carbon, water and biodiversity credits.

The below box illustrates an example of the evolution of management practices for biodiversity conservation. Five decades ago, the factors that motivated the creation of preserved areas were not strategically evaluated, considering the value of ecosystem services, and today this type of assessment is part of business management.

Box 33: Creation of Vale Natural Reserve

In 2011, Vale initiated projects to value protected areas belonging to the firm located in the Iron Quadrangle of Minas Gerais and the northern part of Espirito Santo.

The Vale Natural Reserve (Linhares/ES) is a private protected area owned by Vale. Located in the northern part of Espirito Santo, it constitutes an extremely important biological area for the conservation of Atlantic Forest biodiversity, as established by the Ministry of the Environment, and is also part of the World Natural Heritage Site of the Costa do Descobrimento, created by UNESCO.

The Reserve was established based on a gradual process of land acquisition, initiated by Vale (known as Companhia Vale do Rio Doce (CVRD) in that era) in 1955. The objective of the firm at the time was to establish a stock of timber for production that would be utilized to supply the Vitoria-Minas railroad (EFVM). This is still the route used by the outflow of products originating from the Minas Gerais Iron Quadrangle to the Tubarao Complex located in Vitoria (ES), from where it continues to other regions in Brazil and to other countries.

With the objective of getting to know the area under its responsibility, Vale initiated a forest inventory of the Reserve in 1963. The natural resources in the area were processed and utilized, as the exploration of forest resources and planting of eucalyptus were part of the plan. Studies carried out after the fact, however, show that the production of dormants would not bring large economic returns. This finding, coupled with evidence that the forests in the region were disappearing rapidly, led to Vale declaring the area protected in 1973. In that year, the reserve assumed its current dimensions, a block formed by 103 properties totalling approximately 22 thousand hectares.

Currently, this area represents one of the main remnants of the forest in Espirito Santo, and it corresponds to almost 5% of the forested area of the state. Almost 3,000 species of plants, 1,500 insect morphospecies, 27 fish species, 66 amphibians, 69 reptiles, 380 birds and 110 mammals have already been catalogued in the area. Based on studies carried out up to now, more than 100 species and two new botanical types have already been discovered from botanical material gathered on the Reserve. Research continues. Based on its activities in developing methodologies and technologies for the sustainable use of natural resources, incentives and support for the development of scientific knowledge and realization of actions to protect biodiversity, the Reserve received the title of "Advanced Outpost of the Atlantic Forest Biosphere Reserve" by UNESCO in 2008. This title reinforces its importance for conservation of the biome's flora and fauna, demonstrating also its relevance as a model for management.

Step 5. Grasp emerging BES business opportunities, such as cost-efficiencies, new products and new markets

Biodiversity and ecosystem services offer opportunities for all sectors as demonstrated in the previous chapter. The following steps can assist in the identification of new business opportunities:

- Determine if there is sufficient technical capacity within the organization to identify opportunities or if it is necessary to resort to outside assistance;
- Carry out benchmark studies in relation to competitors or firms that stand out in the development of new products related to BES;
- Identify if the organization could benefit from any of the opportunities listed in the previous chapter or identified in the benchmark;
- Develop a strategy to evaluate the main opportunities, including potential, scale and technical and economic viability, as well as means of implementation and possibilities of involving the supply chain or other industries;
- Implement programs to facilitate identified opportunities;
- Communicate actions and initiatives, ensuring the success to stakeholders and clients;
- Promote the establishment of policies or sectoral programs to remove potential regulatory barriers associated with these new products and markets.

The below Box contains the example of the Centroflora Group that identified new business opportunities related to biodiversity.

Box 34: The Centroflora Group

The Centroflora group was founded in 1957 and is currently the South American leader in the production and development of plant extracts for the pharmaceutical, cosmetic and food industries. The group's differentiator is the formation of partnerships with agricultural production communities that produce various plant species, thus facilitating the access to raw materials and guaranteeing quality standards.

Some examples of success includes the partnership between Centroflora and the Ache Laboratory to develop the first herbal remedy that seeks to promote ethical values such as social inclusion in Brazil, Acheflan, and a partnership with Natura for the creation of a new product line for anti-aging treatment based on Jambu and passionflower, known as Chronos. (62).

Step 6. Integrate business strategy and actions on BES with wider corporate social responsibility initiatives

Many business opportunities are related not only to biodiversity management and conservation, but also to social responsibility. Programs to create awareness of BES, as well as preserve areas that exhibit cultural value, or economic importance to communities and stakeholders of a firm, strengthen the results of BES management for firms, as in the cases of Monsanto and Natura presented below.

Box 35: Monsanto investments in biotechnology solutions bring results to the value chain

The community in Catuti (Minas Gerais) worked with the public and private sectors to recuperate the main economic activity in the region – cotton production.

Since 2006, a community agriculture project has been implemented in the municipality of Catuti in the northern part of the state of Minas Gerais in order to resume cotton production in the city. The northern part of Minas Gerais used to be a large producer of cotton. During the 1990's, pests ravaged plantations and substantially damaged cotton sales produced in the region. The project advised by COOPERCAT (Cooperative for Cotton Producers in Catuti) with support from Monsanto allowed recuperation of the local economy by cultivating cotton using the Bollgard® technology, resistant to pests and of greater productivity, which increased competitiveness.

The project resulted in a 40 arrobas[36] per hectare increase in productivity in 2006, and 230 arrobas per hectare in 2009. Furthermore, the community (basically composed of family producers) benefited economically by raising the price of seed cotton by 150%.

This giant leap in productivity was responsible for increasing the quality of life of producers and for reviving the economy in the city. In addition to Monsanto, the project also involved the Brazilian Association of Cotton Producers (Abrapa), the Minas Gerais Association of Cotton Producers (Amipa), the municipality of Catuti, the Minas Gerais Syndicate of Spinning and Weaving Industries, the Minas Gerais Cotton Incentives Program, the State Secretariat of Agriculture and the Technical Assistance and Rural Extension Institute (Emater).

Families were assisted by investments from the Ministry of Agriculture, Livestock and Supply (MAPA).

Step 7. Engage with business peers and stakeholders in government, NGOs and civil society to improve BES guidance and policy

Risks related to biodiversity loss and ecosystem degradation do not impact firms in isolation, but rather on a regional scale. These factors, among others, suggest that programs that aim to promote BES conservation should take into consideration the possibility of joint action among businesses, governments and society. Additionally, sectoral or value chain integration could avoid overlapping responsibilities and lack of coordination. In Brazil, some priority initiatives to engage interested parties include:

- **Mobilization and definition of an inter-sectoral agendas to determine objectives and targets related to BES:** defining priorities of operations, existing interrelations between sectors in value chain and co-responsibility for impacts on BES, such as the National Confederation of Industry (CNI), presented in Box 37;

[36] Unit of weight equivalent to 12 kilograms

- **Standardization of methodologies and tools for the inclusion of BES in business:** in the case of BES valuation, there still are no widely consolidated and accepted methods for determining impacts and dependencies, and a universally accepted measure for biodiversity impacts is still not defined, in contrast to the case carbon, in which the metric tons of carbon equivalent (tCO2e) is internally accepted;
- **Dialogue with the government to carry out strategic studies with the aim of ensuring that development does not jeopardize the support capacity of ecosystems and direct business actions:** as observed, the main development frontiers are the Amazon (mining, construction, agriculture) and the Brazilian Coastal Zone (oil and gas). It is important that the government adopt strategies, such as Strategic Environmental Assessment (SEA), Ecological Economic Zoning (EEZ) and the systematic collection of regional data on biodiversity to clearly define the levels of intervention permitted in these environments;
- **Dialogue with the government on regulation and laws related to BES:** especially in the case of payments for environmental services which should include ample participation from the private sector in establishing metrics and targets to be achieved by these instruments, including technical and scientific foundations that ensure the effectiveness of such instruments for BES conservation.

Box 36: Strategic industry map includes program related to biodiversity

In 2005, the National Confederation of Industry (CNI) included in its strategic planning a project specific to biodiversity, given that various industrial processes depend on clear rules that encourage the investment in sustainable activities related to biodiversity. The objective of the project is to participate in the formulation of policies on the sustainable use of biodiversity from various aspects: access to genetic resources and redistribution of related benefits, permanent preservation areas, legal reserves, technology transfers, among others. Relevant recent activities include:

- **Drafting of national sub-targets within the scope of the Strategic Plan of the Convention on Biological Diversity (CBD), through an initiative called "Dialogues on Biodiversity: Constructing a Brazilian Strategy for 2020";**
- **Launching the TEEB initiative (The Economy of Ecosystems and Biodiversity) for the Brazilian business sector.**

Furthermore, the main topics debated during meetings on the theme include: altering the legal framework for access to genetic resources and the forest code, as well as discussions and forming opinions on legislative propositions (environmental services, labeling of biodiversity products, managing licenses for research and access to biodiversity).

Another example of integration is the case study presented in box 38 which demonstrates how Fibria operated on a regional level to promote a program to conserve BES, in partnership with several government agencies, the private sector and civil society.

Box 37: Partnerships ensure success of the Vale do Paraiba Ecological Corridor

Fibria is a Brazilian firm with a strong global market presence in forest products, whose activities are based in a 1.2 million hectare forest area, of which 403 thousand hectares are dedicated to conservation of native ecosystem. Through cooperation with the government, society and private entities, Fibria has acted to ensure the conservation of water resources in the region where it operates.

The program being developed in the "Vale do Paraiba Ecological Corridor" is coordinated by the Vale do Paraiba Ecological Corridor Association (ACEVP), a non-governmental, non-profit organization that through public and private partnerships seeks to restore 150 thousand hectares of forests in the Sao Paulo state portion of the hydrographic basin of Paraiba do Sul river, aligning the initiative with social, cultural and educational development in the region.

With the objective of reconstituting the Atlantic Forest and preserving cultural aspects of the region, the Vale do Paraiba Ecological Corridor project was conceived in 2006 through initiatives by Fibria, SOS Atlantic Forest, the Ethos Institute and the Oikos Institute. In 2007, AMCE Sustainable Businesses gave form to this idea and new partners, such as the Tomie Ohtake Institute and Banco Santander, also joined the group.

The planting of trees is done with the aim of creating ecological corridors that link Serra do Mar and Serra da Mantiqueira. The connection between conservation areas and natural areas facilitates the dispersion of species and the recuperation of degraded areas, thus reconciling biodiversity conservation and socio-environmental development in the region.

The Vale do Paraiba Ecological Corridor will link conservation units to other natural areas, enabling a connection between them, and thereby facilitating the dispersion of species and re-colonization of degraded areas, which will result in both biodiversity conservation and environmental and socio-economic development in the region.

07

Conclusions and recommendations

Conclusions and recommendations

Biodiversity conservation will be an important challenge for the sustainability of businesses

Managing BES is important for economic and social development, especially in a country with such a rich natural heritage as Brazil. Brazil is currently recognized for good environmental practices such as the use of renewable energy, , the positive results from efforts to reduce deforestation rates and the creation of protected areas.

Furthermore, there have been important advances in public policy with the intent of promoting international agreements and commitments, such as the Aichi Targets, and the definition of national targets and regulations. Nevertheless, there are still uncertainties of how the country's growth will be reconciled with environmental issues, given that growth prospects put pressure on Brazilian ecosystems due to increased demands for energy, food and natural resources. This is why multi-sectoral initiatives to implement policies to conserve biodiversity are so important.

What businesses can do

Some Brazilian business initiatives demonstrate the concerns of the sector through interactions with different sectors to establish shared commitments in the search for the best solutions related to BES, and in order to integrate different perspectives so that the benefits from biodiversity management reach society as a whole, promoting quality of life, economic growth and social development. This is the objective of the Business Movement for Conservation and Biodiversity Use and the Dialogues on Biodiversity project, which produce examples of how the private sector can interact with the public sector and participate more actively in the environmental agenda of the country.

BES management in the Brazilian business sector is evolving

Firms should evaluate their dependence on BES in order to manage risks, take advantage of opportunities and at the same time ensure conservation and sustainable use of these resources. Disregard for these links can in some cases lead to the degradation of ecosystem services, consequently threatening the provision of associated services to firms. Thus, it is important for impacts on BES to be mitigated in order to avoid environmental losses, as well as losses to the business sector. Upon identifying and understanding dependence, BES can be incorporated in corporate strategic management and new opportunities may emerge.

Awareness of these links is growing among Brazilian firms, that are approaching BES from a strategic business perspective, whether through the efficient use of provisional ecosystem services (that act as different types of inputs for business operations) or investments in the conservation of high conservation value areas such as the Atlantic Forest and the Amazon Forest.

In some cases this link is direct, as is the case for the agricultural sector whose operations are very clearly related to regulation, support and provision ecosystem services; or indirect in the case of financial institutions.

However, as a general rule for many Brazilian firms, BES management is not included in business administration, which implies a necessity to evolve the understanding of how businesses depend on BES. This will be fundamental for the implementation of planning, investment and actions to preserve and conserve BES in line with the objectives of each business.

How businesses can operate

The dependence and impact between BES and firms vary according to sector and types of activities. However, broadly speaking, these links can be discovered through an understanding of the following factors:

- Ecosystem services on which business operations depend;
- Impacts of business operations on ecosystems;

- Trends that will affect BES in the short, medium and long terms and how these affect business activities;
- Regulation related to BES that could affect business activities;
- The impact and dependence of BES on the firm's value chain.

This information is the basis for identifying the business risk associated with a BES loss in strategic management, and also reveals the main opportunities for generating new business or anticipates trends that impact business activities in the medium and long term.

To expand BES management in Brazil, organizations can follow the directives recommended by the Global TEEB to include BES in decision-making on business investments, namely:

- Expand understanding of motivational factors behind BES management;
- Present values: materialize risks and potential revenue generation from BES;
- Define concepts, tools and methodologies;
- Promote corporate training and education;
- Reward good practices and the inclusion of "externalities" related to BES in environmental accounting.

To expand awareness of relations of dependence and impact, firms should apply specific tools that correspond to the objectives behind including BES in corporate management.

Environmental regulation in Brazil is a key factor to stimulate business activities related to BES

Brazil currently has a large quantity of environmental legislation related to the protection and conservation of biodiversity, such as the National System of Conservation Units Law (SNUC), the National Policy on Climate Change and legal projects related to Payments for Environmental Services (PES). These legislations exercise important roles in business decision-making, but at times they may not act as incentives for action in the business sector.

Biodiversity conservation by firms, especially for ventures related to large-scale projects such as construction and mining, begins with the licensing process and the execution of Environmental Impact Assessments (EIA) as dictated by Brazilian legislation. Today, a lot of information on species in Brazilian biomes can be derived from a database of information from EIAs of different types of projects.

On the other hand, imminent legislation such as the legal projects related to PES could economically affect firms by demanding payments for the use of services not currently charged for[37]. For this reason, greater concern can be observed among firms as they implement evaluations of ecosystem services considered strategic for business activities. Additionally, for firms that maintain RPPNs, valuing ecosystem services provided by units could aggregate value to conservation initiatives and contribute to a BES related business strategy.

BES regulation serves as an incentive for firms to understand the importance of strategically approaching BES in business management.

A legal understanding aids in the drafting of contingency plans and the identification of risks and opportunities. An example of this is the evolving concern of some firms that maintain areas of permanent protection and legal reserves without knowing all the benefits provided through the maintenance of these areas. Today, the use of valuation tools for ecosystem services allows these areas to be considered of great value to businesses, whether the value be monetary or not; contributing to the recognition of the importance of maintaining areas to protect, for example, water resources used by neighboring communities or by the actual firm.

Risks and opportunities related to BES derive from common trends

Trends that affect biodiversity and business activities can be seen as risks and opportunities, depending on the context in which the business operates. For the business sector, the following trends stand out:

- Reduced provision of ecosystem services important to the business (example: pollinators) result in reduced productivity and loss of market share
- Costs of ecosystem services and materials that are utilized in the operations of businesses as inputs, may increase and/or decrease as a result of growing scarcity;

[37] Some Brazilian states are already charging for water use, as outlined in the SNUC Law. However, with a PES Law, charges would be intensified and thus representing a greater financial impact on firms.

- Intensified regulation and stakeholder (society, clients, shareholders, government etc.) demands for accountability related to business activities and BES conservation;
- Emergence of new business opportunities related to BES.

Currently, risks and opportunities related to BES can be categorized in three different ways:

- Risks and opportunities with already known implications to firms and that already influence decision-making. Example: the importance of developing biotechnology so that agricultural sector can optimize production and maintain productivity on par with demand;
- Risks and opportunities already known to the business sector, but with uncertainties in the tools and methodologies needed for proper management. Example: water provision, which is recognized as a priority factor for environmental management; although there are methodologies for this type of management, there is still a need for further developments to ensure higher effectiveness in the accounting and preservation of this resource;
- Risks and opportunities that still raise uncertainties about implications to firms. Example: markets for environmental assets and opportunities for the business sector to operate in this sphere.

The main risks and opportunities relate to the sectors that exhibit direct dependence on various ecosystem services, such as the case of agriculture and pulp & paper, cosmetics and pharmaceuticals. These sectors, the management of risks and opportunities could focus on reducing the consumption of inputs, upgrades and improvements to process efficiency, as well as using biodiversity through bioprospecting and the generation of new products or brands related to Brazilian biodiversity. One example of this case is Natura's Ekos product line which utilizes elements from Amazon biodiversity in its production.

On the other hand, base industries such as mining and construction sectors could implement management of risks and opportunities with a greater focus on mitigating impacts and seeking for voluntary and compulsory compensation alternatives[38], given the nature of business activities. In this case, benefits from BES are related to operational security (access to areas of interest and availability or maintenance of ecosystem services) and to improved communication about business operations, such as transparency of activities with society.

Another sector that will find ample business opportunities is retail, given that Brazilian customers are becoming more and more attentive to value chains and the origins of products that they consume, leading to increased needs for product traceability.

Opportunities related to participation in new markets, such as the market for carbon or biodiversity credits, are applicable to all sectors.

Trends related to biodiversity should take social aspects into consideration

In Brazil, indigenous and low-income communities that still have limited access to basic resources could continue to depend on biodiversity for income generation. Thus, there are great opportunities for the business sector to reconcile environmental and socio-economic aspects of biodiversity, through for example inclusive business[39].

Population and economic growth promote changes in locations that affect life-styles and consumption of natural resources. This also results in conflicts that could negatively impact both biodiversity and business sector activities.

How businesses can operate

The successful management of BES is only possible if socio-economic development is aligned with environmental actions. Consequently, businesses often encounter opportunities to combine social investments or social corporate responsibility strategies with investments in preservation and conservation of biodiversity.

For example, the CBD established a redistribution of benefits related to knowledge and culture to communities from which industries such as those from the cosmetics and pharmaceutical sectors benefit from ecosystem services. One practical example of this occurred in Brazil when Natura developed a project that resulted in better relationship with (and direct benefits to) communities where they operate.

However, one of the clearest ways of taking action is in support of conservation projects, especially those that reduce emissions by utilizing avoided deforestation methodologies (REDD++). These projects integrate the capture of greenhouse gas emissions, with the recuperation and conservation of priority biodiversity conservation areas and the involvement and provision of benefits for the socio-economic development of communities.

[38] Federal law n° 9.985/2000, which establishes the National System of Nature Conservation Units and Federal Decree n° 4.340/2002, establish compulsory environmental compensation in Brazil. Environmental compensation consists of the legal obligation of all ventures that cause significant environmental impacts to support the implementation and maintenance of Conservation Units. The value of compensation is based on the total expected costs of implementing the venture, starting at 0.5%.

[39] Inclusive business are economically profitable and socio-environmentally responsible initiatives that seek mutual benefits by incorporating low-income communities into the value chain. The empowerment of low-income communities for the sustainable use of forest resources such as nuts, oils, fruits etc, is already taking place in Brazil.

""There can't be successful enterprises in failed societies".
Stephan Schmidheiny – Swiss entrepreneur and millionaire, founder of the Business Council for Sustainable Development[40]

This phrase offers an important reflection of how conservation and preservation of the environment is intrinsically linked to the way that people recognize the value of BES, whether tangible or intangible. This assertion is valid for communities that live in forests, often without access to technology and the consumer goods of the Brazilian middle class, as well as for small and large rural landowners and even for public and private sector decision-makers that benefit from BES to a greater extent and need to prepare to act responsibly in whichever ecosystem that firms operate.

[40] In 2009, the international magazine Forbes called Stephan Schmidheiny "the Bill Gates of Switzerland".

Appendixes

Appendix I – List of Collaborators

Nome	Institution
Adriana Reis	FSC Brasil
Alexandre Vianna	Vale
Ana Carolina Srbek	Vale
Fernanda Gimenes	CEBDS – Business Council for Sustainable Development
Daniela Lerda	PADMA
David Canassa	Votorantim
Fernando Andrade	Construtora Camargo Corrêa
Frineia Rezende	Votorantim
Gabriela Burian	Monsanto
Gil Anderi da Silva	USP – University of São Paulo
Helena Carrascosa	São Paulo State Secretariat of the Environment
Joshua Bishop	*IUCN - International Union For Conservation of Nature*
Kalil Farran	Construtora Camargo Corrêa
Karina Aguilar	Natura
Linda Murasawa	Santander
Luiz Felipe Campos	Vale
Mariano Cenamo	Idesam – Amazon Conservation and Sustainable Development Institute
Rebeca Knijnik	Suzano Papel e Celulose S.A.
Ricardo Sampaio	Construtora Camargo Corrêa
Ronaldo Seroa da Motta	IPEA -- Instituto de Pesquisa Econômica Aplicada
Sonia Chapman	Espaço Eco Foundation
Tatiana Camargo	Editora Abril
Thales Crivelli Nunes	Samarco
Walter de Simoni	Green Economy Superintendent, Rio de Janeiro State Secretariat of the Environment
Wilson Cabral de Sousa Junior	Technological and Aeronautical Institute

Appendix II - Checklist including BES in strategic business management

The following checklist was adapted from the "TEEB – The Economics of Ecosystems and Biodiversity. Report for the Business Sector", considering the first steps of BES management for firms. Some tools presented below still have not been adapted for Brazil and businesses do not yet address them. However, they could be used as references. Many of these instruments differ by scale (local or corporate); by geographical region (data availability in Brazil); by sector; by implementation cost; or by objective (e.g. establishing scenarios, identifying risks or valuing ecosystem service). For firms that seek to further study these methodologies, more information is available in the *New Business Decision-Making Aids in an Era of Complexity, Scrutiny, and Uncertainty Tools for Identifying, Assessing, and Valuing Ecosystem Services BSR's Ecosystem Services, Tools & Markets Working Group*, that bring comparative analysis of the main existing tools.

Step 1 – Identify impacts and relations of dependence of your business on biodiversity and ecosystem services.

☐	Internal team and upper management are involved and were trained on how to include BES in business?
☐	An initial reflection has taken place of objectives for including BES in business?
☐	Expertise and necessary resources exist to identify relations of impact, dependence and to analyze of risks and opportunities associated with BES in the firm?
☐	The analytical limits of the value chain to be considered have been defined[41][42][43]? Which units of the business will be included? (Consider: (a) locations and installations: physical areas where the firm implements its operations and that directly affect BES, including subsidiaries; (b) products: product concept and raw material inputs; and production processes.) Which suppliers will be included? Which clients will be included? Are logistics and transport included?
☐	The firm already recognizes the impacts and relations of dependence of business activities on Biodiversity and Ecosystem Services (BES)? Will recognized tools be utilized? Have the most relevant ones been selected? Is there a trend of declining or difficult access to natural capital? How could this decline affect business? (Example: increased cost on behalf of suppliers or regulation related to use, such as rationing)?

Tools and initiatives that could assist during this step

***Guide to Corporate Ecosystem Valuation* (CEV):** guide with directives and tools available for valuing BES and examples of international cases. Assists firms in defining objectives for BES inclusion in business and in understanding the process of valuing biodiversity and the available methodologies.

***The Corporate Ecosystem Services Review* (ESR):** structure for assessing dependencies, risks and opportunities. Assists in initial qualitative mapping of main relations of impact and dependence.

***Natural Value Initiative* (NVI):** structure for evaluating dependencies, risks and opportunities. Tool for initial qualitative mapping of main relations of firm with BES.

Step 2 – Evaluate risks and opportunities of activities associated with impacts and relations of dependence.

☐	Will it be necessary to resort to consultancy and specialist recommendations to identify the main risks and opportunities?
☐	What methodologies to assess risks and opportunities will be utilized? These methodologies: (a) are in compliance with national and international standards?; (b) permit integration with risk analysis methods of the firm?; (c) exhibit transparent parameters?; and (d) allow a low-cost evaluation?
☐	Have the main risks and opportunities been identified? Considering the following risks and opportunities, is the organization particularly exposed to any of them?[44] Is the risk/opportunity directly related to end-activities of the firm (relation of dependence)? • Can the risk/opportunity cause a significant alteration to Biodiversity and Ecosystem services (relation of impact)? • BES issues are relevant to the firm as a whole or only to specific operations/regions/products? • Will the firm need to significantly reduce impacts on biodiversity? • Could new regulation, taxation, subsidies and markets for BES force a business to bring into consideration BES impacts (e.g. imposing remediation or compensation measures, pollution restrictions, production capacity or total production)? • Identified risks or opportunities could affect the growth of my firm? • Could the organization have a comparative advantage in relation to its competitors in the market?
☐	Is it possible to estimate the risks and opportunities to which the firm is exposed? • Regulatory: fines; execution costs of environmental studies; costs of complying with current or future regulations; costs for delaying licensing related to BES; costs of legal actions related to biodiversity. • Operational: increased operational costs resulting from shortage of ecosystem services on which the firm depends and that could become scarce; declining sales or production problems. • Reputation: could adverse publicity related to BES affect the reputation or brand of the firm? • Financial: environmental harm could affect business revenues, now or in the future (for example, alterations in real estate value due to environmental degradation).

Tools and initiatives that could assist during this step

Equator Principles: directives for assessing risks of projects. Performance Standard 6 of the International Financial Corporation (IFC) on the Biodiversity Convention and Sustainable Management of Natural Resources (Equator Principles) detects the possibility of realizing projects or investment in high risk areas and define a series of measures to be adopted to minimize risks in the case of projects of a value greater than US$10 million.

***Integrated Biodiversity Tool* (IBAT):** data collection tool. Developed to offer rapid and easy access to the most important sets of national data on a precise scale, which indicates critical habitats, both protected and not protected, however the quality of local data is limited.

Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST): tool for modeling and constructing scenarios. Utilizes a combination of data sets, preloaded or defined by the user, to model the distribution of ecosystem services in areas of interest. At the moment, the tool exists as a complement to the popular software package Geographic Information Systems (GIS) by ESRI (Environmental Systems Research Institute). The software quantified the ecological assets of a region and estimates values based on default global data, although using local data is recommended for strategic decision-making. A second phase should be applied when the most relevant territories have been determined.

***Artificial Intelligence for Ecosystem Services* (ARIES):** tool for modeling and constructing scenarios. Could be used to map complex chains. Firms interested in utilizing the tool should pass through a complex process of data collection and collaboration in order to conduct analysis with this tool.

Business & Biodiversity Offsets Program (BBOP): structure for developing compensation strategies beneficial to businesses interested in balancing their impacts on BES.

[41] TEEB – The Economics of Ecosystems and Biodiversity. Report for the Business Sector

[42] Biodiversity Management Manual for Businesses

[43] Methods developed by the Global Business Council for Sustainable Development (WBCSD) and the World Resource Institute (WRI, 2008) for Ecosystem Services Revision (ESR), cited in TEEB – The Economics of Ecosystems and Biodiversity. Report for the Business Sector

[44] Consult specialists

Step 3 – Develop information systems for BES, establish SMART targets, measure and value performance and report results.

☐ Have objectives and targets been established for priority issues?
Have objectives been validated or do they rely on the participation of areas responsible for establishing planning actions?

☐ Has the firm established systems to measure and monitor performance?
Is it possible to integrate BES in existing environmental management systems such as: reevaluation of aspects and impacts, procedures and indicators; tools such as EIA/RIMAS and other environmental studies linked to the licensing process?
Have accounting management systems been integrated: inclusion of relevant information on BES in the drafting of budgets, control and decision making. Is it possible to modify decisions on new or old products, internal or outsourced production, improvements in processes and price policies, based on impacts and dependence on BES?
Has information been gathered at product level: does the firm intend to use LCA techniques?
Is there information at group level: does the firm intend to generate reports or public declarations on relations to BES?
Will management and data collection be executed locally or for the project or at corporate level?

☐ Are tools available that permit the incorporation of BES in the business management system (e.g. management, evaluation of risks and opportunities, measurement, valuation, reporting)?
Does the organization rely on the necessary prerequisites to apply these tools (e.g. is it possible to geo-reference the **impacted area to be evaluated by the study)**?
Can the tool be adapted given the local context or region?
What are the expected results (e.g. indicator for evaluation targets)?
What is the **relevance** of the selected tools and indicator to the organization?
- Are they linked to objectives and targets established during strategic planning?
- Can they influence decisions made based on the financial statements, operations or reputation of the firm?
- Can they add reputation of the firm in relation to stakeholders (e.g. facilitate the process of transparency)?
- Can they result in the identification of new products or services for the firm?

Tools and initiatives that could assist during this step
In addition to those already mentioned, the following stand out:
Life Cycle Analysis (LCA): tool for evaluating impacts caused by firm activities to ecosystems. Various approaches have been examined by the Life Cycle Analysis Initiative by UNEP/SETAC (http://lcinitiative.unep.fr) and some can estimate the percentage alteration to ecosystem diversity or fraction of eliminated species in a given area.
***Economic Management Accounting* (EMA):** tool for assessing the direct costs of environmental flows. This tool seeks to transform environmental information measured in physical units, such as cubic meters of water consumed or tons of waste generated into "monetary" units which are then utilized in decision-making on different products or investment alternatives. That is, it seeks to put a "price" on industrial byproducts (such as pollution and waste), emphasizing the costs of materials converted into non-marketable waste and emissions. Interesting for firms that aim to quantify monetary impacts of external environmental pressures (for example, taxes, standards, quotas).
***Global Reporting Initiative* (GRI):** international standard for creating corporate sustainability reports. Relies on certain indicators to report information on biodiversity.
***International Integrated Reporting Council* (IIRC):** initiative to develop methods that allow for the creation of "Integrated Reports" that combine financial with sustainability reports, offering basic information on financial, environmental and social performance of a firm and demonstrating how these factors relate.

Step 4 – Measures to avoid, minimize and mitigate risks of BES loss, including offsets where possible.

☐ What are the main activities related to BES management at the organization?

☐ Do activities exceed compulsory demands?

☐ What resources are currently invested in BES management at the organization?

☐ Do these actions result in any type of return to the firm that could be valued in financial terms (e.g. cost reductions, revenues)?

☐ Is there a forecasted budget for implementation of actions?

☐ Did firm include BES in financial decision analysis?

☐ What are the main interested parties involved in the implementation of actions related to BES?

☐ Is it possible to form partnerships?

☐ Does it involve relations with clients or specific client segments?

☐ What are the channels for promoting these actions?

Tools and initiatives that could assist during this stage
Certification Life - *Lasting Initiative For Earth*: certification for governance model and best practices in relation to biodiversity conservation.

Other available tools

Applicable to all sectors

- *Ecosystem Valuation Initiative*
- *Living Planet Index*
- *Performance Standard Six (PS6) on Biodiversity Conservation and Natural Resources Management*
- *The Sustainable Forest Finance Toolkit*
- *Wildlife Trusts Biodiversity Benchmark*

Sectoral

- Forest Footprint Disclosure Initiative
- Stewardship Index for Specialty Crops
- The Keystone Centre - Field to Markets Alliance for Sustainable Agriculture
- Roundtable on Sustainable Palm Oil
- Roundtable on Sustainable Biofuels
- Energy and Biodiversity Initiative
- ICMM Good Practice Guidance for Mining and Biodiversity
- IPIECA/API Oil and Gas Industry Guidance on Voluntary Sustainability Reporting
- WBCSD Cement Sustainability Initiative
- IAS 41 - Fair value to standing timber

Water:

- Water Footprint Network
- Global Water Tool do WBCSD

Appendix III – Methods of environmental assessment

METHODS OF ENVIRONMENTAL ASSESSMENT	DESCRIPTION
Production function methods -Marginal productivity (MPM)	MPM: objective to estimate monetary value of varying environmental attributes (for example, of modified quality of water) through calculating the associated reduction in productive activities (in the example, the harm caused by pollution from ventures, affecting the quality of environmental resources).
Revealed preference method - Travel Cost method (TCM) - Hedonic price method (HPM)	TCM: based on the demand functions of families and individuals for places of environmental value, estimating the costs incurred in order to arrive at location. Costs range from expenditures on travel to general expenditures to prepare for travel. Central idea: establish the relation between benefit provided (enjoyment) and monetary costs of travel: if the trip was "worthwhile" it is because the benefit is at least equal to the cost. HPM: the value of properties varies according to environmental variables that affect prices. This method estimates how much an individual is willing to pay to live in locations with different environmental attributes (distance from factories and airports, proximity to beaches and privileged views etc).
Expressed preference method - Contingent Valuation Method (CVM)	CVM: seeks to directly measure the variation in well-being of individuals based on a qualitative or quantitative variation of environmental goods. The method surveys how much individuals would be willing to pay to obtain improvements to well-being.
Dose-response method (DRM) Replacement Cost method (RCM) Avoided Cost Method (ACM)	MDR: establishes statistical correlations and variation for an environmental parameter that reflects a change in quality (dose) and the consequent effect on the variable utilized to measure impacts on production or human well-being (response). As such, this method seeks to estimate how much impact is caused by a variation in stock (quantity) or flow (quality) of an environmental resource, measured in physical units, in the production of a good or service with market prices. RCM: estimates the cost of restoring or replacing a damaged environmental resource, with the objective of reestablishing the quality or quantity of the original resource before damage occurred. ACM: cost incurred to avoid environmental damage is adopted as a way to estimate the value. That is, this is not a direct valuation of environmental harm *per se*, but rather an estimate of how much should be spent to maintain an environmental resource, both from a quality and quantity perspective.
Energy valuation method	Energy is the capacity necessary for an ecosystem to produce a resource, whether that be energy, material, nature service or human service. This energy can be transformed into monetary values.
Opportunity cost method (OCM)	OCM: main method currently used for environmental valuation in Brazil. The opportunity cost represents the estimated value of lost revenues due to not utilizing a given area for economic activity, in virtue of conservation benefits.

Appendix IV – Environmental monitoring systems of the main Brazilian biomes

Data on plant cover in the various biomes and ecosystems serve as a reference for BES management for the government, however in the business sphere it is important to understand that deforestation data vary according to the monitoring system utilized. Results from the plant cover monitoring programs in the six Brazilian biomes over the past decade are presented below.

Box 38: Programs to monitor and control deforestation[45]

Special Data and Geographic Information Systems (GIS) are important components of most valuation tools for ecosystem services. Thus, the main programs for monitoring and controlling deforestation in the Amazon, Cerrado and Atlantic Forest are:

Amazon

DETER: system that supports oversight of deforestation in the Amazon and publishes a monthly Deforestation Alert map for areas above 25 hectares (http://www.obt.inpe.br/deter/)

PRODES: more precise, this system publishes information on deforestation once per year and measures annual rates of clear cutting since 1988, based on increments greater than 6.25 hectares (http://www.obt.inpe.br/prodes/).

IMAZON: civil society monitoring http://www.imazongeo.org.br/imazongeo.php

Atlantic Forest

INPE in partnership with SOS Atlantic Forest publishes an atlas of deforestation for the biome www.mapas.sosma.org.br.

Cerrado

-MMA/IBAMA – Program of Satellite Monitoring of Brazilian Biomes, 2008

-Federal University of Goias, through its Laboratory for Image Processing and Geo-processing (LAPIG), published a first evaluation of the state of original plant cover in the biome.

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