UNDERSTANDING THE IMPACTS OF THE 2007-08 GLOBAL FINANCIAL CRISIS ON BRAZIL'S FOREST SECTOR: A QUALITATIVE STUDY

Natalia Pigato Canova

Department of Natural Resource Sciences
McGill University
Montreal, Quebec, Canada

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ABSTRACT

Economic downturns are known to affect the management of natural resources and the environment. Although statistics and industry figures have revealed some impacts of the 2007-08 Global Financial Crisis (GFC), its dynamics and long term consequences for forest management, particularly in the context of South America, are unknown. Using qualitative research methods, combining grounded theory and case study analysis, this research aimed to better understand how the GFC impacted sustainable forest management (SFM) in Brazil through the experiences and perceptions of highly knowledgeable stakeholders. This was done with a view to providing a more holistic and integrated perspective on the GFC and to inform future policy and management processes. Findings from this study indicate that the GFC interacted with other political, social and environmental phenomena to produce both negative and positive impacts on SFM in Brazil. Negative impacts included: 1) restrained production of forest-based products; 2) declines in exports; and 3) reduced investments in non-market driven socio-environmental projects. Conversely, opportunities associated with the GFC included: 1) realizing competitive advantages in the plantation sector; 2) restrained deforestation in the Amazon Basin resulting from increased risk aversion and a decline in timber demand; and 3) support for third-party forest certification to maintain access to risk-averse markets. Traditional forest-based communities that often operate within informal economies were not seen as being heavily impacted by the GFC. This study represents a first step towards improving our knowledge on the relationships between economic downturns and sustainable forest management in Brazil.

RÉSUMÉ

Les ralentissements de l'activité économique sont connus pour affecter la gestion des resources naturelles. Bien que les statistiques et les données du domaine industriel ont revélé certains impacts de la Crise Globale Économique (CGE), ca dynamique et conséquences à long terme pour la gestion des forêts, en particulier en Amérique du Sud, sont inconnus. En utilisant des méthodes de recherche qualitatives, tout en combinant la théorie enracinée et l'étude de cas, cette recherche a pour objectif de comprendre comment la CGE a affecté la gestion soutenable des forêts au Brésil, au travers des expériences et perceptions de dépositaire bien informés. Ces méthodes ont été choisi pour donner une approche plus holistique et pour intégrer les perceptions sur la CGE dans le but d'informer les politiques futures et les procédures de gestions. Cette recherche montre que la CGE a interagit avec d'autre phenomene politique, sociales et environementales pour produire des effets positifs et negatifs sur la gestion soutenable des forêts au Brésil. Les impacts négatifs incluent: 1) une production resserrée de produits dérivés des forêts; 2) déclins des exports; et 3) investissements reduits dans les projets socio-économiques non visé au marche. Réciproquement, les avantages associés avec la CGE incluent: 1) réaliser des avantages compétitifs dans le secteur de forêts plantées; 2) déforestation retenu dans le bassin de l'Amazone resultant de l'aversion au risque et de la baisse de demande de bois et 3) support de tiers pour la certification forestière pour mantenir l'accès au marche. Les communautés forestières traditionnelles qui opèrent des économies informalles n'ont pas été autant touché par la CGE. Cette étude représente une première étape afin d'améliorer notre connaissance sur les relations entre récession économiques et la gestion soutenable des forêts au Brésil.

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THESIS STYLE AND CONTRIBUTIONS OF CO-AUTHORS

This is a manuscript-based thesis. As a result, some necessary repetition may occur between chapters. Literature is cited within each of the sections. Chapter 1 provides an overview of the research context, including a brief background on the dynamics of the 2007-08 Global Financial Crisis (GFC), and presents the motivation behind the study and the conceptual methodological framework. Chapter 2 explores and contrasts stakeholder perspectives on the impacts of the GFC on Sustainable Forest Management (SFM) in Brazil using the State of Pará, in the Amazon Basin, as a case study. This Chapter has been prepared as a manuscript and submitted to the journal *Ecological Economics*. Chapter 3 focuses on the impacts of the GFC on Brazil's forest plantations sector and has been prepared as a manuscript and submitted to the journal *International Forestry Review*. Although Chapter 1 is not targeted for submission to a journal, it will likely contribute to the manuscripts arising from Chapters 2 and 3.

In Chapters 2 and 3 the candidate is the senior author. I was responsible for the planning, research design, data collection and analysis as well as logistics and fund acquisition.

I wish to acknowledge the important support and guidance of the co-author in Chapter 2 and 3, Dr. Gordon Hickey as he has deeply contributed to the conceptual and theoretical development of the study at every stage as my research advisor and he will continue to provide guidance and feedback in the publication of the resulting manuscripts.

ACRONYMS AND ABBREVIATIONS

ABRAF	Associação Brasileira dos Produtores de Florestas Plantadas - Brazilian Association of Producers of Plaanted Forests
CCM	Constant Comparison Method
GEC	Global Environmental Crisis
GFC	Global Financial Crisis
FAO	United Nations Food and Agriculture Organization
FSC	Forest Stewardship Council
IFT	Instituto Floresta Tropical – Tropical Forest Institute
IMAZON	Amazon Institute of the People and Environment
INPE	National Institute of Spatial Research
IPI	Tax over Industrialized Products
NTFP	Non-timber Forest Products
PEFC	Programme for the Endorsement of Forest Certification schemes
RIL	Reduced Impact Logging
SFB	Brazilian Forest Service
SFM	Sustainable Forest Management
REDD	Reduced Emission from Deforestation and Degradation
UNCED	United Conference on Environment and Development
WCED	World Commission on Environment and Development
WWF	World Wildlife Fund

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CHAPTER 1. GENERAL CONTEXT AND MOTIVATIONS OF THE STUDY

1.1. Context

Internationally, there has been increasing concern surrounding the linkages between economic development and the environment (Bartz and Kelly, 2008; Grossman and Krueger, 1994; Kuznets, 1963; Stern et al., 1996). For example, in the early 1970's a number of studies began to indicate that human interactions with natural resources were leading humanity towards a global environmental crisis (Helfrich, 1971; Moncrief, 1970). Since the Brundtland Report [World Commission on Environment and Development (WCED), 1987], an extraordinary number of studies have worked towards explaining and understanding this environmental crisis, suggesting a myriad of ideas and strategies to deal with these challenges and mitigate the threats to natural resources (Barbier, 2010; Ehrlich and Ehrlich, 1991; Pearce et al., 1989; Redclift, 1984; Santos, 1999).

Sustainable development is a concept based on multidisciplinary approaches, involving social equity, economic growth and environmental protection, and it has been broadly adopted by organizations and governments internationally since the 1992 United Nations Conference on Environment and Development (UNCED) (Stanley, 1992). Sustainable development aims for the pursuit of the world's current needs, without compromising the ability of future generations to meet their needs (WCED, 1987).

Sustainable Forest Management (SFM) is one of the strategies underlying the societal goal of sustainable development (see the Statement of

Principles for Sustainable Management of Forests in Agenda 21). Since Agenda 21, SFM concepts have been relatively well defined (Hickey, 2008) and many countries have engaged in efforts to develop criteria and indicators (Rice et al., 2001) to monitor and manage the sustainability of forest-based production at a range of scales (Hickey and Innes, 2008). SFM has been defined by the Food and Agriculture Organization of the United Nations (FAO) as an activity that: "*aims to ensure that the goods and services derived from the forest meet present-day needs while at the same time securing their continued availability and contribution to long-term development. In its broadest sense, forest management encompasses the administrative, legal, technical, economic, social and environmental aspects of the conservation and use of forests. It implies various degrees of deliberate human intervention, ranging from actions aimed at safeguarding and maintaining the forest ecosystem and its functions, to favouring specific socially or economically valuable species or groups of species for the improved production of goods and services"* (FAO, 2010).

1.1.1. Sustainable Forest Management in Brazil

Brazil is a major player in SFM as both the largest producer and consumer of tropical timber in the world (Tonello et al., 2008). It also has the second largest area of forest in the world, which provides a wide variety of goods and services locally, regionally and internationally [Brazilian Forest Service (SFB), 2010]. It has been well documented that forest products in Brazil have historically been harvested using careless and exploitative techniques, often neglecting the environmental and social aspects of forest

management (Barreto et al., 1998; Holmes et al., 2000). As with all countries, defining and implementing SFM is extremely complex, requiring difficult cultural changes and significant industry and government investment over time.

In Brazil, the term 'sustainable forest management' is often used to describe Reduced Impact Logging (RIL), which refers to a set of management practices that focus mainly on timber production and on timber companies as the main actors in sustainable forest management. RIL is a series of harvesting guidelines that aim to "protect advanced regeneration from injuries, to minimise soil damage, to prevent damage to non-target species and to protect critical ecosystem processes" (Ros-Tonen et al., 2008). It offers a less damaging solution than conventional logging practices, while continuing to meet rising global demand for tropical timber. Although social aspects are being increasingly incorporated, particularly labour conditions and the effects of timber production on the surrounding communities, the focus of RIL is still on timber production and reducing the impacts of this process (Ros-Tonen et al., 2008). However, SFM expands the scope of RIL to include all the social, environmental and economic aspects associated with forest management, governance and the inclusion of stakeholders (Ros-Tonen et al., 2008).

Attempts to introduce SFM in Brazil began in the 1960s, with the creation of the Brazilian Forestry Code (1965). This Code focused on RIL and required a management plan to harvest any area in the Amazon Basin. Several amendments have since been made to the Code, however, despite its existence, reduced impact forest management techniques are still poorly adopted in the

country. In 1978, eight countries in the Amazon Basin, including Brazil, signed the Amazonian Cooperation Treaty in Brasilia with the aim to promote the rational exploitation of natural resources in their respective parts of Amazonia while maintaining the balance between economic growth and conservation (Carazo, 1997). The Treaty was therefore a precursor to the concept of sustainable development in the region. Following the discussions over forests at UNCED (1992) (Rice, 2001), in 1995, at the city of Tarapoto in Peruvian Amazonia, the Brazil government signed the "Tarapoto Process" which defined a total of 12 criteria and 77 indicators to monitor and manage SFM in the Amazon Basin, with distinctive objectives for the management unit, national and global levels (Carazo, 1997). Following this, in an attempt to avoid deforestation and forest degradation, the Brazil government approved, in 2006, Law 11.476, which regulates the management of public forests, requiring compliance with several criteria to ensure the protection of social and environmental forest values. Approximately 75% of the Brazilian Amazon forests are publicly owned, managed as conservation units and indigenous lands (30%) and areas of 'undefined use' (45%) (Godoy, 2006). Within these 'undefined use' areas, agricultural and cattle ranching expansion, illegal harvesting and illegal land occupation have driven high deforestation rates and ecosystems degradation (Godoy, 2006). The Law for the Management of Public Forests (Law n^{o} 11.476) was implemented in response to the expansion of agricultural frontiers, the lack of an enforced command and control system, and a lack of public resources in the Ministry of Environment to manage public forests (Godoy, 2006), allowing private organizations to manage these areas. Apart from regulatory initiatives, third-party forest certification (Innes

and Hickey, 2005), has also become an important voluntary mechanism to promote SFM in Brazil.

Strategies to promote SFM and balance conservation objectives while producing timber-based products in Brazil involve both native and plantation forestry.

1.1.1.1. Brief Overview of Native Forests in the Amazon Basin

The Amazon Basin is a natural forest biome occupying an area of 6.4 million km^2 across nine South American countries and Brazil encompasses 63% of its total area (4 million km^2) (Pereira et al., 2010). It is a very important natural forest area for the provision of ecosystem goods and services, including regulation of climate and precipitation, biodiversity preservation, provision of timber and non-timber products, among others (Reyer, 2009).

The Amazon biome also accounts for 49% of Brazil's territory (SFB, 2010) and in addition to its importance for conservation and the provision of environmental services, the Brazilian Amazon is home to 24 million people (Pereira et al., 2010), who often rely on forest resources for their livelihoods. SFM is considered the ideal activity to be performed in this region (Banerjee et al., 2009).

1.1.1.2. Brief Overview of Forest Plantations in Brazil

Forest plantations are composed of trees established through planting or the deliberate seeding of either native or introduced species (FAO, 2006). These forests are essential for providing forest goods and services

internationally (Carle and Holmgren, 2009) while mitigating the pressure on native forests. Approximately 6.8 million hectares in Brazil are covered by forests plantations (SFB, 2010). These forests, which have single species, uniform planting densities, even ages and short rotation cycles, are managed for commercial purposes and are often owned by large scale firms. According to the Brazilian Forest Service (2010), forest plantations account for 1.3% of the total forested area in the country, with *Eucalyptus* and *Pinus* species representing 93% of this plantation area. The plantation sector plays an important role in the domestic economy [Brazilian Association of Producers of Planted Forests (ABRAF), 2010] and it is highly export-oriented, representing 3.6% of Brazil's total exports of US$ 5.6 billion in 2009 (ABRAF, 2010).

1.1.2. The 2007-08 Global Financial Crisis

The Global Financial Crisis (GFC) that began in 2007 in the United States' financial system affected economies worldwide. Several forces have been identified as drivers of this GFC, including human greed and market failure (Foster and Magdoff, 2009; Nilsson, 2009; Roberts, 2008). Authors have argued that the GFC resulted from the tremendous economic growth that the world experienced over the preceding 30 years, which led to a systematic failure of the global financial system (Goodhart, 2008; Reinhart and Rogoff, 2009). This growth was driven by an abundance of credit, exorbitant consumption, and a lack of strict regulation of the financial market (World Bank, 2009). In addition, transference of risks (lenders no longer being responsible for the risks and transferring it to third-parties) increased credit exponentially. As a result, excess credit, stable inflation, low rates of interest

and perceived macroeconomic stability led to leveraged loans and increased extreme consumption and risk taking (White, 2006). Loans were packaged into complex and risky mechanisms (Roubini, 2009), which, driven by globalization and the influence of financial agencies, were disseminated all over the world (Roach, 2009). Therefore the collapse of this system had multiplicative effects spreading through the global financial system.

The US subprime crisis has often been identified as triggering the GFC. Roberts (2008) reported how the American Congress, in 1992, forced the Federal Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac) to increase mortgages to low and moderate income borrowers, causing housing prices to double within a period of five years. Attracted by enlarged mortgages, investments in new housing increased significantly (Nilsson, 2009). Ultimately, the subprime lending practices were unsustainable and the housing market 'bubble' burst (Gjerstad and Smith, 2009), generating huge losses for the financial system. This triggered other "bubbles to burst" such as real estate businesses, mortgage and loans, credit cards, car loans, government borrowing, hedge funds, industrial loans, among others (Roubini, 2009).

Although developing economies were initially sheltered from the worst elements of the crisis, as capital flows to these countries began to slow, bank lending was restrained and foreign investment declined (World Bank, 2008). The effects of the GFC worldwide, and in particular developing countries, raised significant concerns about the potential negative impacts on the environment and natural resources (Elliott, 2011; Nilsson, 2009). This view is driven by an understanding that in times of economic downturn,

environmental protection issues tend to be neglected or abandoned (Elliott, 2011). Therefore, it is likely that SFM initiatives and forest-based production processes in Brazil were impacted by the GFC, as investment and capital were restrained (see ABRAF, 2010), but very little is known about how stakeholders in the forest sector perceived and experienced the impacts of the crisis.

1.2. Motivations for the Research

When I started this research (2009), the dynamics and long term consequences of the 2007-08 GFC were largely unknown. Only limited studies have since been conducted on the impacts of the GFC on the environment and natural resource management (Elliott, 2011). Pagiola et al. (2000) recognized that research on the environmental consequences of financial crises is often constrained by data limitations, particularly with respect to accurate measurement over time of factors such as land use, forest cover, and local pollution impacts. Nevertheless, research on past crises has shown a strong relationship between economic downturns and environmental degradation (Sunderlin et al., 2001; Sunderlin and Pokam, 2002).

To date, reports examining the impacts of the 2007-08 GFC have primarily focused on the forestry industries and trade of forest-based products, particularly in Asia and Africa (Chipeta and Heath, 2009; Ma et al., 2009; Tieguhong et al., 2009), suggesting: 1) a reduction in exports from producing countries resulting from the decreased purchasing power of the main timber importers such as the USA and the European Union; 2) the shutdown of small- and medium-sized forest enterprises and increased unemployment and social

instability in forest areas (Ma et al., 2009); 3) higher reliance on Non-Timber Forest Products (NTFP) for employment and income, thereby increasing the pressure on some species (Tieguhong et al., 2009).

Reports assessing the impacts of the GFC in Latin America have been limited to the effects on forest plantations, particularly focusing on trade and production data (ABRAF, 2010; CIFlorestas, 2009; Faleiros, 2009; Tomaselli, 2009). Although highly informative, these reports have not addressed the potential impacts on tropical native forests in Latin America, particularly in the Brazilian Amazon, nor the perspectives and experiences of the stakeholders involved in forest management. Studies on the impacts of economic crises on the environmental and social dimensions of sustainable forest management are lacking.

Understanding stakeholder experiences and perspectives is a common approach in social science research where 'empirical reality is seen as the interpretation of meaning' by the researcher (Suddaby, 2006). It is conducted with the aim of making knowledge claims about how individuals interpret reality, not necessarily about an objective reality (Suddaby, 2006). This research aimed to engage stakeholders to more deeply understand their perceptions of, and experiences with, the impacts of the GFC on Brazil's forests. This was done with a view to providing a more holistic and integrated perspective on the crisis, and inform future policy and management processes (Cortner, 2000). Furthermore, financial and economic crises are often happening at different scales (Foster and Magdoff, 2009; Mishkin, 1996) and occur in approximately 10-year cycles (Nilsson, 2009). This study aims to

enable forest managers to better understand recent trends and the prospects for sustainable forest management during future crises.

1.3. Research Question and Methodology Overview

1.3.1. Research question and objectives

The main objective of this study was to better understand the impacts of the GFC on the forest sector in Brazil through the experiences and perspectives of highly knowledgeable and diverse stakeholders.

The broad research question that guided this study was: *"How has the 2007-08 Global Financial Crisis impacted sustainable forest management in Brazil?"* In order to answer this exploratory research question, two distinct components of Brazil's forestry sector were examined: 1) the native forests in the Amazon Basin; and 2) the forest plantation sector. Specific objectives are described in the following results chapters.

1.3.2. Methodology overview

Using a qualitative approach, this study aimed to uncover new knowledge about how people 'think and feel' about the impacts of the GFC rather than making judgments about whether those thoughts and feelings necessarily match reality (Pope et al., 2000). Furthermore, following a qualitative research strategy allowed us to: 1) go beyond initial conceptions of the crisis, often provided by figures and statistical data, to generate deeper insights or a conceptual framework; 2) gain a holistic overview of the context, including its dynamics and its explicit and implicit themes and interactions;

and 3) explain how “insiders” understood and took action in response to the circumstances brought about by the GFC (Miles and Huberman, 1994).

This research followed an interpretivist paradigm, which is a strategy based on qualitative and inductive traditions that recognizes the interpretative processes of the researcher conducting the study (Glaser and Strauss, 1967; Lowenberg, 1993; Miles and Huberman, 1994). Within this interpretivist paradigm there are numerous methodologies for constructing knowledge (Goulding, 1999). One of these, and the one used in this research, is grounded theory (Creswell, 2007). Grounded theory is founded on the concept that theoretical prediction or preconceived theory should be avoided before data collection, allowing for the development of a theory that is grounded in data that has been systematically gathered and analyzed (Strauss and Corbin, 1997). It is considered a ‘general method of comparative analysis’, founded on the position that generating grounded theory is ‘a way of arriving at theory suited to its supposed uses’ (Glaser and Strauss, 1967). According to Suddaby (2006), it is considered an organic process of theory emergence based on how well data fit conceptual categories identified by the researcher and by how relevant the categories are to explaining the phenomena being observed. It is therefore well suited to exploratory research (Suddaby, 2006). Grounded theory was combined with a case study strategy to achieve the proposed objectives of this study within the time available (Yin, 2009). This is the preferred strategy when examining contemporary events where relevant behaviours cannot be manipulated (Gerring, 2007; Yin, 2009). Case study research is the ‘detailed examination of a single example of a class of

phenomena' (Abercrombie et al., 2000) that investigates a contemporary phenomenon in depth and within its context, particularly when boundaries between phenomena and context are not clearly evident (Yin, 2009). Although findings originating from case studies cannot be generalized to populations, by following a rigorous methodological framework that includes maintaining the 'chain of evidence' and protecting against validity problems, case study research can strongly contribute to knowledge about social interactions or related phenomena (Yin, 2009).

1.3.2.1. Data collection and analysis

Data were collected through semi-structured interviews with respondents from five distinct stakeholders groups: 1) communities; 2) government; 3) researchers; 4) industry; and 5) non-governmental organizations (NGOs). Interviews, as opposed to surveys, allowed greater flexibility, providing opportunities for the respondent to change the course of the conversation and bring up new issues that were not previously conceived by the researcher, thereby contributing to theory building. Data gathered through interviews often feature a richness and holism of information offering a strong potential for uncovering complexity; and it allows for the possibility of understanding underlying or non-obvious issues (Miles and Huberman, 1994). Considering the aims of this study were to understand how stakeholders perceived the impacts of the GFC within a broader context, qualitative interviews were appropriate.

All interviews were fully transcribed and translated (interviews were conducted in Portuguese). Using computer software designed for qualitative

analysis (MAXQDA), data analysis started with the coding of major categories, writing analytical notes on linkages amongst these categories and generating interpretations towards a theoretical framework. Coding is the process of breaking down the qualitative data which allows for the generation of new ideas and the finding of emerging themes, not often explicit, helping the theory building process (Richards, 2005). It involves the creation of categories, with specific themes and patterns emerging within and between categories. By following the constant comparative method (CCM) (Boeije, 2002; Glaser and Strauss, 1967) we looked for relationships in the data. Categories where then refined to reduce the bulk of codes and to delineate a structure that represented the theoretical framework for the studied phenomenon (Miles and Huberman, 1994).

Data collection and analysis occurred interchangeably, as data collection was determined by an ongoing interpretation of the data and emerging categories (Glaser and Strauss, 1967; Suddaby, 2006). This was an interpretive rather than deductive process, where interpretation of the data by the researcher is not viewed as contaminating the study (Suddaby, 2006).

Validity was considered throughout the research process. Findings were compared and contrasted to verify consistency with existing reports (e.g. statistical data, industry figures) and literature on similar issues (e.g. studies conducted on different crises and in different contexts). The reports were peer reviewed. Auditability and transparency of the complete analytical process was also used to increase external validity, as readers are able to track where findings are originating from, understand the context and decide in which circumstances they could be applicable (Thorne, 2000). A common concern

about case study research is that it provides little basis for generalization (Yin, 2009). The findings produced from case studies however, are for generalization to theoretical propositions rather than populations (Yin, 2009). Therefore, although the findings of this study are not be generalizable beyond the case studies, the results provide fruitful and constructive insights on the forest resource issues that may need to be considered by decision-makers during economic downturns and point to areas where future research is required.

Specific data collection strategies and analysis are further described in the following results chapters of the thesis. Figure 1.1 presents a summary of the research design and methodology.

1.4. Expectation for the following chapters

This Chapter has presented the general objectives of the thesis and the conceptual methodological framework that was followed. The following results chapters are presented as manuscripts and present more specific literature review, research objectives and methodologies.

Chapter 2 explores and contrasts the experiences and perspectives of knowledgeable stakeholders on how the GFC impacted sustainable forest management in the Brazilian Amazon, using the State of Pará as a case study.

Chapter 3 qualitatively analyzes the experiences and perceptions of diverse stakeholder groups to describe the challenges and opportunities that were associated with the GFC for Brazil's forest plantation sector.

Chapter 4 presents the overall conclusion of the thesis, including its contribution to knowledge and some directions for future research.

1.5. Figure

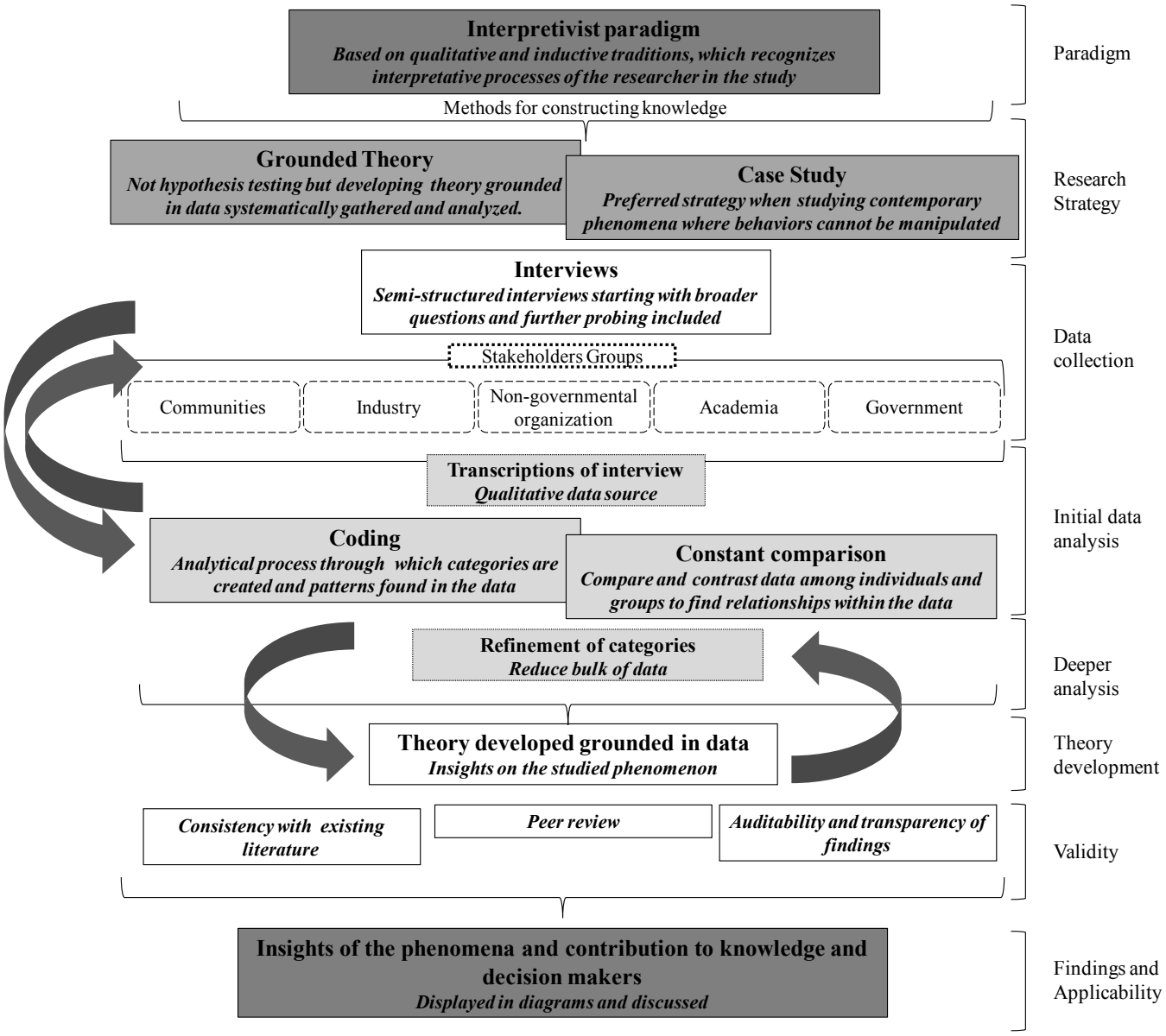

Figure 1.1: Conceptual methodological framework for the research

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PREFACE TO CHAPTER 2

Chapter 1 provided an overview of the context in which the GFC took place, some of the linkages between economic downturns and natural resources and the motivations for this thesis. It is also highlighted the differences between sustainable forest management in the Amazon Basin and the forest plantations sector in Brazil, which has led to the separation of this thesis into two manuscript-based results chapters. Chapter 2 presents stakeholder insights on the impacts of the GFC on SFM in the Amazon Basin, using the State of Pará as a case study.

CHAPTER 2. STAKEHOLDER PERSPECTIVES ON HOW THE 2007-08 GLOBAL FINANCIAL CRISIS IMPACTED SUSTAINABLE FOREST MANAGEMENT IN THE BRAZILIAN AMAZON: A CASE STUDY

2.1. Abstract

The 2007-08 Global Financial Crisis started in the U.S.A. and quickly spread to affect world economies. Several facets were perceived as drivers of the crisis, however, its dynamics and consequences for the environment remain largely unknown, particularly in Brazil. Combining grounded theory and case study methodologies, this research explores and contrasts the perspectives of knowledgeable stakeholders on how the GFC impacted sustainable forest management in the Brazilian Amazon, using the State of Pará as a case study. Our findings indicate that the GFC cannot be considered as a unique phenomenon impacting SFM and that it is intimately linked to other political, social and environmental events unfolding within Brazil and at the global level. Decreased deforestation was perceived to have occurred due to restrained production, increased risk aversion, increased public awareness and enhanced government efforts towards law enforcement. The forest-based exporting segment was seen to suffer the most severe impacts of the crisis. Environmentally friendly initiatives were perceived to offer forest product differentiation in the market; while investments in non-market-oriented initiatives were restrained. Our results suggest that in times of economic crisis, forest policy-makers need to focus on both formal and informal forest economies in order to promote sustainable forest management objectives.

Keywords: Global Environmental Crisis; Forest Certification; Tropical Forestry; Governance; Globalization.

2.2. Introduction

In 2007 and 2008, the world experienced a remarkable Global Financial Crisis (GFC) that started in the U.S.A. and quickly spread to affect the global economy (Foster and Magdoff, 2009). Several factors were perceived as drivers of this crisis (Goodhart, 2008), however its dynamic and long-term consequences, in particular its impact on natural resources, remain largely unknown. The GFC is known to have affected developing countries through a decrease in commodities demand, reduced exports and investments, and unstable economic scenarios (World Bank, 2009). Importantly, economic downturns and environmental degradation have been shown to be consequential (Ma et al., 2009; Nilsson, 2009; Sunderlin et al., 2001); therefore it can be assumed that the GFC had impacts on various initiatives to promote environmental protection and sustainable natural resource management in a range of contexts. It is from this starting point that our research sought to better understand and qualify the impacts of the GFC on sustainable forest management in the Brazilian Amazon. Further, as financial and economic crises are often occurring at different levels (Mishkin, 1996), and in roughly 10-year cycles (Nilsson, 2009), this paper seeks to provide key insights that will assist forest managers and policy-makers to better understand recent trends in sustainable forest management, and the future prospects for policy during financial crises.

2.2.1. The 2007/2008 Global Financial Crisis

Considering its multifaceted drivers (Goodhart, 2008; Reinhart and Rogoff, 2009), understanding the causes of the GFC is not simple. Although it

started in the United States in 2007, its dynamics and consequences were felt globally. The resulting global economic contraction affected both developed and developing countries (World Bank, 2008). By the end of 2008, global industrial production had been reduced by 20 percent and global GDP declined for the first time since World War II (World Bank, 2009). Developing economies experienced falling exports to developed nations, unemployment transfers (ILO, 2009), a reduction of capital flow, capital withdrawal and credit dry up, triggering a fall in production and investment in most sectors (Lin and Martin, 2010; World Bank, 2008). In addition, the potential introduction of trade barriers and economic nationalism were considered threats to globalization (Nilsson, 2009). Tighter credit availability compromised government expenditure while poverty was seen to increase in many regions due to the impacts on food and fuel prices (World Bank, 2008). Reduced economic growth led to increased unemployment in many sectors. According to the ILO (2009), in 2008, global unemployment increased by 14 million people. Job losses in formal, mostly export-oriented industries, likely resulted in an increase in the number of informal workers (ILO, 2009), potentially intensifying the social pressures on natural resources, particularly in developing countries.

2.2.2. Economic Downturns and Forest Resources

It is commonly assumed that economic downturns bring negative impacts to the environment (Elliott, 2011; Gross and Bragg, 2009), as environmental issues are often considered to be the least important priority of government and industry during crises. In the global forest sector, reports on

the impact of the economic crisis have found that the sector faced a decrease in demand and prices, a lack of profitability, and decreased investment (Nilsson, 2009; Presas, 2009). While insightful, these reports present global perspectives on the consequences of the GFC, shedding little light on the impacts at sub-national and regional levels. Studies conducted in Indonesia (Sunderlin, 1999; Sunderlin et al., 2001) have indicated that policies to improve tropical forest conservation and management are often based on the assumption of political and economic stability and that some of the most important changes in the conditions affecting tropical forests can occur when there are unpredictable political and economic conditions.

Economic downturns can have positive or negative implications for forest resources, depending on the broader context. A study on the impacts of the 1997 financial crisis on Indonesia's forests found a reduction in the pressure being placed on forest resources due to declines in demand and prices for timber, an associated slowdown in road construction, and a decline in government spending on directed settlement programs (Sunderlin, 1999). Conversely, pressure was found to increase due to the dismissal of forest workers, the bankruptcy of timber mills and increased workforce migration from urban to rural areas (Sunderlin, 1999).

The 1986 crisis in Cameroon demonstrated that macroeconomic stability played an important role in determining the way that population, agriculture and labour roles affected forest-clearing activities, resulting in increased pressure on forest resources (Sunderlin and Pokam, 2002). Elliot (2011) examined the impacts of both the 1997 Asian financial crisis and the 2007/08 GFC on environmental sustainability on East Asia and indicated that both

crises generated similar patterns of impacts: 1) weakened global demand and prices for commodities and therefore somewhat restrained environmental impacts; 2) vulnerability of government expenditures on environmental protection; 3) urban-rural migration; 4) vulnerability of rural population not only to the impacts of the economic crises but also to environmental degradation and in the availability and access to natural resources; and 5) increased discussion toward a 'green new deal' strategy. To date, reports examining the impacts of the 2007/08 GFC have primarily focused on Asia's and Africa's forest resources, forestry industries and trade (Chipeta and Heath, 2009; Ma et al., 2009; Tieguhong et al., 2009). For example, reports have suggested that exports from China, South Africa and Central Africa dropped as a result of the GFC and decreased purchasing power of the main importers of timber such as the USA and the European Union (Chipeta and Heath, 2009; Ma et al., 2009; Nilsson, 2009; Tieguhong et al., 2009). China's domestic demand for timber products was also found to have dropped, resulting in the shutdown of small- and medium-sized forest enterprises and increased unemployment and social instability in forest areas (Ma et al., 2009). In Central Africa, recent studies have found that in times of crisis, communities had a higher reliance on Non-Timber Forest Products (NTFP) for employment and income, thereby increasing the pressure on some species (Tieguhong et al., 2009). Another recent report on the impacts of the GFC on the North American forest sector (Taylor, 2009) focused on the collapse of the housing market as a major threat. Reports assessing the impacts of the GFC in Latin America have been limited to the effects on forest plantations, describing restrained exports and production associated with currency appreciation, and

declines in demand and prices (Faleiros, 2009; Tomaselli, 2009). However these reports have not addressed the potential impacts on tropical native forests in Latin America, particularly in the Brazilian Amazon. Furthermore, no previous study has examined the perspectives and experiences of the stakeholders involved in forest management in Brazil.

2.2.3. Sustainable Forest Management in the Amazon

Sustainable forest management (SFM) is a widely accepted concept that defines the aim of managing forests according to the principles of sustainable development (WCED, 1987). More specifically, SFM involves balancing the social, economic and environmental values associated with forest resources with some consideration of these values for future generations (Hickey, 2008). The Amazon Basin is a particularly important forest area for the provision of goods and services, including the regulation of climate and precipitation, biodiversity conservation, provision of timber and non-timber products, among others (Banerjee et al., 2009). It also accounts for 49% of the national territory of Brazil (SFB, 2010).

In Brazil, the term sustainable forest management is often used to describe Reduced Impact Logging (RIL), which refers to a set of management practices that offers a more sustainable solution to timber harvesting, while continuing to meet rising global demand for tropical timber (Ros-Tonen et al., 2008). However, SFM expands the scope of reduced impact timber production to include all the social, environmental and economic aspects associated with forest management, governance and the inclusion of stakeholders (Ros-Tonen et al., 2008).

Although Brazil's forests have historically been harvested using management techniques that neglect environmental and social forest values (Barreto et al., 1998; Holmes et al., 2000), several attempts to promote SFM have been initiated since the launching of the Forest Code in (1965). Initially focused on RIL, new standards and criteria have since been incorporated into the regulatory framework through amendments to the Code (Banerjee et al., 2009), encouragement to third-party forest certification (May, 2004) and engagement in SFM criteria and indicator processes such as the 'Tarapoto Process' (Carazo, 1997).

While some authors question the profitability of SFM, based on the fact that the products originating from sustainably managed areas need to compete in a market flooded by illegally produced forest products (Rice et al., 2001), others have stated that well managed forests can present much higher profitability when compared to conventional logging (Holmes et al., 2000). Nevertheless, SFM initiatives often require additional planning and initial investments compared to conventional logging practice. It is therefore likely that these initiatives would be affected in times of severe economic slowdown.

2.2.4. Objectives

The main objective of this study was to better understand the impacts of the GFC on SFM initiatives in the Brazilian Amazon from the experiences and perspectives of highly knowledgeable stakeholders. Considering the enormous extent and complexity of the Brazilian Amazon we selected the State of Pará as a case study. The following research question guided the study: *"How has the Global Financial Crisis impacted SFM in the Brazilian*

Amazon?" More specifically, the study aimed to: 1) Understand the perceptions of different forest stakeholder groups on the impacts of the GFC on SFM in the region; and 2) Assess the degree of similarity and difference between stakeholder perceptions on this issue.

2.3. Methodology

This research followed an interpretivist paradigm (Lowenberg, 1993; Travis, 1999). Within the interpretivist paradigm, we used grounded theory as our methodology for constructing knowledge (Goulding, 1999). Grounded theory allowed us to develop findings that are grounded in data that were systematically gathered and analyzed (Strauss and Corbin, 1997), based on themes that emerge from the data. We used a case study strategy in combination with grounded theory as this is the preferred strategy when examining contemporary events in an exploratory manner (Yin, 2009).

2.3.1. Case Study: The Brazilian Amazon in the State of Pará

Brazil is a major player on the global forest market, with approximately 61% of its territory covered by forests. These forests fulfill important social, economic and environmental functions through the provision of a wide variety of goods and services at local, national and global levels (SFB, 2010). Brazil has 509 million hectares of natural forests encompassing six different biomes: Amazon; Caatinga; Cerrado; Pantanal; Atlantic Forest; Pampas (SFB, 2010). Of these, the Amazon Basin is the largest (355 million hectares) and it is considered to have appropriate vegetation formations for SFM (Banerjee et al.,

2009). Furthermore, the Amazon accounts for 84% of the volume of timber harvested in Brazil (SFB, 2010).

Considering the extent, diversity and complexity of the Amazon Basin we selected the State of Pará as our case study. The State of Pará plays an important economic role in the Amazon region (Pereira et al., 2010). Responsible for half of the gross revenues originating from roundwood harvested annually in the Brazilian Amazon (US$ 1094.2 million in 2009), Pará also accounts for the largest GDP in the region (US$ 14.53 billion in 2007) (Pereira et al., 2010). Due to the past disregard for environmental aspects (Barreto et al., 1998; Holmes et al., 2000), approximately 20% of the territory of Pará has been deforested (Pereira et al., 2010). Although proportionally moderate when compared to the States of Maranhão, Rondônia and Mato Grosso (which have respectively lost 42%, 34%, 22% of their forests) (Pereira et al., 2010), due to the massive size of the State of Pará (1247.7 million km^2) this represents a significant loss of forest cover. Additionally several programs from NGOs [e.g. Imazon, World Wildlife Fund (WWF), Instituto Floresta Tropical (IFT), among others] and government have been implemented in recent years to control deforestation and promote SFM in Pará. These include, but are not limited to, projects aiming to: 1) establish and improve governance of conservation units (WWF and Pará government); 2) monitor areas under deforestation as well as identity critical municipalities with higher indexes of forest losses (Imazon); 3) build capacity and social capital for low impact forest management (IFT, SFB); and 4) strengthen enforcement operations in municipalities with high deforestation rates (State and Federal government – 'Arch of Fire').

2.3.2. Data Collection

Our exploratory research relied on non-probability sampling, often used in qualitative studies (Bernard, 2006; Honigmann, 1986; Mays and Pope, 1995). The stakeholder groups were identified based on the work of Wilson (2009), and the list of entities represented on the Committee for the Management of Public Forests created by the Brazilian Forest Service. Subsequently, our stakeholder groups included non-government organizations (NGOs), industry, government agencies, communities and researchers. In-depth semi-structured interviews were then conducted (in Portuguese) between June and August 2010 with stakeholders from each group (see Table 2.1). Respondents from each group were selected using purposive sampling - a non-probability sampling method by which the researcher finds the people who would be most appropriate to provide them with information relevant to the research topic (Honigmann, 1986). The criteria to select the respondents were based on: 1) the position occupied by the interviewee, aiming for those in leadership positions (e.g., senior managers, government and community leaders); 2) level of engagement in discussions surrounding the forest sector (e.g., they represented stakeholders in public discussions concerning forest management); and 3) availability and willingness to participate and contribute to the research. In this kind of sampling, opportune social contacts may be exploited for the special knowledge they possess (Glaser and Strauss, 1967; Honigmann, 1986). It is applied when the study aims to capture multiple dimensions of the social processes of the studied topic (Glaser and Strauss, 1967).

Our sample size (n=12) could be considered limited by natural science standards, which aim for generalization to populations. However, from a social science perspective, the sample size can be justified as follows: 1) qualitative sampling does not aim to identify a statistically representative set of respondents, considering the findings do not portray frequencies and statistical analysis (although simple counts may provide a useful summary of some aspects of the analysis) (Pope et al., 2000); 2) purposive sampling is based on the assumption that a common culture, challenge or experience is reflected in practically every individual, event or institution belonging to a common system (Honigmann, 1986); 3) sample sizes in qualitative research depend on the study design, the quality of the data (Starks and Trinidad, 2007) and when the theory reaches saturation (i.e., when additional respondents do not bring significant new information) (Suddaby, 2006).

The semi-structured interviews were anonymous and designed to allow analytical comparisons between groups.

2.3.3. Data Analysis

2.3.3.1. Constant Comparison

Data analysis was conducted using the constant comparative method (CCM), a technique for qualitative data analysis in grounded theory (Boeije, 2002; Strauss and Corbin, 1997). The strength of the CCM is that it allows researchers to inductively develop theory based on categorizing and connecting the categories (Boeije, 2002). Figure 2.1 shows our analytical process, named the "Ladder of Analytical Abstraction" (Miles and Huberman,

1994). This approach is based on a progression of emerging insights and ideas through data transformation. Once the interviews had been translated and transcribed, the computer software MAXQDA was used to manually analyze and organize the data. This involved coding the major categories raised in the text, writing analytical memos, searching for relationships between categories and interpreting these relationships with a view to building a theoretical framework. During this process we sought to identify the specific themes and patterns that emerged within the broader categories.

2.3.3.2. Similarity Index Analysis

In order to compare the different perceptions between stakeholder groups and understand the overall themes that emerged in terms of level of importance, we used the similarity index analysis approach described by Purnomo et al. (2005). Once the themes were consolidated, interview transcripts were revisited to assess how each theme was perceived by each respondent and each group. A table was then constructed, with a score of '1' assigned if the theme was considered relevant to the group or to have had an effect on the specific outcome (e.g. impacts on deforestation) and a score of '0' assigned if the stakeholder group neglected the theme or considered it not particularly relevant in terms of its contributions to the specific outcome. Table 2.2 provides an example of how this matrix would be formed. The first column in this table represents the themes that emerged thought the interviews perceived as affecting SFM. In this example, the stakeholder group A perceived themes 1, 2, 3, 6, 7 and 8 as relevant and neglected the others, while

group B perceived only themes 4, 6, 7, 8, 10 as relevant, and so forth.. This analysis resulted in a presence/absence matrix.

Once created, a 2 x 2 table was constructed to allow us to calculate the relationships between the perceptions of stakeholder groups based on the themes that emerged (see Table 2.3 for an example). This 2 x 2 table was built by counting the occurrences where a theme was considered important for both groups A and B (1, 1), not relevant to both groups (0, 0), or important to one group and not relevant to the other (1, 0) or (0, 1).

In order to measure the potential commonality between the perceptions of different stakeholder groups, a simple matching similarity coefficient was used. This is considered the most commonly used coefficient to cluster and compare binary data where values 1 and 0 are both considered informative (Purnomo et al., 2005). This coefficient is the ratio of the number of matches (co-importance or co-irrelevance) and non-matches using the following equation:

$$S = (a + d) \div (a + b + c + d) \quad (1)$$

Here, *S* is the similarity coefficient; *a* represents the case were both stakeholders consider the factor important (i.e., both have values of 1); *b* and *c* represent cases when one stakeholder considers the factor important and the other considers it irrelevant (i.e. one is zero and the other is one and vice-versa); *d* represents the case where both respondents perceive the factor as irrelevant (i.e. both have values of zero). The closer to 1 the index is, the closer the groups are in terms of their perceptions.

2.3.3.3. Assumptions and limitations

One of the main concerns when using grounded theory and case study research relates to the potential for bias. In order to reduce the potential bias in our analysis, we used MAXQDA for the text analysis (coding) which allowed meticulous and auditable identification of categories and themes, rather than basing findings only on interpretations of readings. The use of CCM is also highly regarded for increasing the internal and external validity of the findings (Boeije, 2002). Our findings have been articulated in a manner that the logical development process is accessible to readers, and we have established a direct connection between the data and the conclusions. To this end, we have included quotes where insightful and representative. According to Thorne (2000), this approach allows readers to evaluate the quality of the study, and decide in which cases the findings may be applicable. We also conducted a pre-test of our semi-structured interviews in May 2010 with two respondents to test the questions for ease of understanding and to avoid inadvertently leading the answers of participants. Finally, our emerging findings were compared with existing literature and statistics, where available, to increase reliability.

External validity is a common concern when conducting case study research as the findings are not generalizable to populations or universe, rather to theoretical propositions (Yin, 2009). Against this backdrop, this case study research does not aim to generalize to the whole Amazon forest; but rather to produce valuable and grounded insights for decision-makers and questions for researchers to consider how financial crises impact SFM.

2.4. Results

This section begins with a general description and explanation of the overall themes that emerged throughout the coding process and their linkages to four global international goals of SFM: 1) Impacts on the extent of forest resources; 2) Impacts on investment and trade (economic functions); 3) Impacts on the social functions of forest resources; and 4) Impacts on the institutional framework [see themes established by Food and Agricultural Organization (FAO, 2010)]. We then compare the perceptions of the different stakeholder groups on the SFM processes and outcomes driven by the GFC in Pará.

2.4.1. Descriptive exploratory analysis of themes

2.4.1.1. General context

(a) Crisis briefness: This theme represents the perception that the impacts of the GFC were intense and short in Brazil's forest sector. By way of context, Lula, Brazil's former President, used the following metaphor in 2008: "In the U.S. this crisis is happening like a Tsunami. In Brazil, it will be just a ripple". At the time, President Lula was heavily criticized for this statement, considered as neglecting the magnitude of the potential impacts of the GFC. However, two years after his statement, several of our participants reflected on this statement, even repeating some of his words:

> *"I know it is hard to admit - but maybe Lula's idea about the crisis as a ripple in Brazil, was not all that wrong…"* – NGO respondent

"Some countries were affected during the crisis for a period of time; this period was certainly a lot longer than what happened in Brazil. I think Brazil felt the shock and soon recovered" – Academic respondent

(b) Combined effects: Respondents argued that the GFC cannot be considered as a unique phenomenon impacting SFM and that it is intimately linked to other political, social and environmental events unfolding within Brazil and at the global level. These observations are summarized in Figure 2.2. One of the events identified was the broader Global Environmental Crisis (GEC) (Gross and Bragg, 2009) that started 20 to 30 years ago with the increasing public awareness and concerns towards the use of natural resources. This brought changes in strategies and planning on the part of industries, government and the civil society, which, according to respondents, affected SFM. While trying to distinguish the impacts of the GFC on the broader context, some of the respondents expressed concern:

"I think it is important to define which crisis we are talking about...if you look only through the economic point of view, I think the crisis is not complete…because this is a crisis that associated the economic aspects with environmental aspects…this is a fact. I am not sure if it is possible to take apart these two crises (...) The fact is that they happened at the same time…" – Industry respondent

"The impression I get is that it was not a unique crisis, it was a combination of crises (...). The financial crisis, aligned with the

environmental crisis and global warming (...) it started setting up a new paradigm of production; which is still consolidating, but that will certainly go towards a more sustainable production process..." – NGO respondent

2.4.1.2. Impacts on the extent of forest resources

Participants described a *decline in deforestation rates* in the Amazon over the last few years. Respondents considered the GFC, the GEC and government actions to be drivers of this decline (see Figure 2.3), further described below:

(a) Increased risk aversion: Respondents suggested that illegal activities were no longer paying off due to the increased risk of getting caught by government enforcement operations combined with the low market value of timber products and agricultural commodities during the GFC. The following quote illustrates this perception of risk aversion:

"Whoever is exploiting timber in the Amazon is spending US$ 200 dollars/m^3, and selling, in some cases, for US$ 400-450-500 dollars/m^3, taking the risk and getting caught it not worth it..." - NGO respondent

(b) Decline in commodity prices: Respondents indicated that the GFC caused an overall decline in demand for agricultural commodities, and consequently production. Commodities such as soybeans, meat and corn have often been pointed to as important drivers of deforestation in the Amazon. Restrained agriculture was perceived as potentially contributing to restrained

deforestation in the Amazon during the crisis. The following quote illustrates respondents' perceptions:

> *"The crisis had an effect on the reduction of the demand for agricultural commodities as well, and consequently a reduction of the deforestation pressure"* – Industry respondent

(c) Public awareness: This theme was perceived as one of the most important outcomes of the unfolding GEC. The engagement of civil society combined with media pressure, and information disclosure were perceived as contributing to environmentally friendly practices and restrained deforestation. The following quote captures this perspective:

> *"…it (deforestation) reduced. But I think that this decline has not much to do with the economic crisis (….) it was due to the strictness of the law and the participation of the society… Participation of the communities… Social organizations also have the right to pressure banks and companies… to talk about the issue (environment) (…) this helped a lot"* – Community respondent

(d) Reputational damage: This theme represents the concern on the part of organizations to portray an image of sustainable practices. Respondents noted that the aversion to having company names and brands associated with tropical deforestation has pushed companies and governments to create strategies to comply with social and environmental regulations, as shown in Figure 2.3. According to respondents, some of the measures to avoid reputational damage include: 1) the replacement of native tropical timber with alternative source of materials that can have proof of origin or be dissociated

with tropical deforestation (e.g. aluminum, timber from high-yield plantation, PVC, etc); 2) stricter financial institution requirements when it comes to environmental compliance and mitigation of risks; and 3) the establishment of international procurement policies by large importers of tropical timber (e.g. the American *Lacey Act* and the European *FLEGT*). The following quote illustrates respondents' insights on reputational risks:

> *"I think that the binomial education vs. embarrassment - led by the NGOs for years - it is now going towards corporations' leadership. And those that are incorporating sustainability issues into their corporate strategies and as attributes to their products. This is all related to reputational issues, image, consumer awareness…all that"* – Industry respondent

(e) Stronger enforcement system: Respondents viewed the government's improvement in technologies, human resource availability and the number of operations conducted to prevent illegal logging and forest cover losses as a major driver of the decline in deforestation. However, respondents also suggested that although government enforcement activities have improved, levels of illegal logging and deforestation were still high in the Amazon Basin:

> *"…monitoring and control mechanisms are clearly reinforced. I have no doubt about that whatsoever. One can't say that they were not. In this sense, the government did act. Is it perfect? Of course not... Is it at its maximum efficiency level? Of course not… Has it inhibited timber production? No. We have several problems....and it is not possible to change that from night to day. But there was*

definitely a change in the quality of the tools…. There were stronger surveillance operations in the field, etc…"- NGO respondent

2.4.1.3. Impacts on the economic functions of forest resources

Participants described changes in economic trade and investment rates in the Amazon. Once again, respondents considered the GFC, the GEC and government actions to be drivers of this decline (see Figure 2.4), further described below:

(a) Exports downturn: Forest products export was perceived as being significantly affected by the GFC and the segment where the impacts have lingered longer. The downturn in demand from European countries and the United States were identified as a strong driver of the reduced exports. Respondents noted that export-oriented companies restrained their production levels hoping for a change in the market. The quote below illustrates this point:

"By August 2008 this crisis had spread out to the rest of the world and we felt the crash in 2009, when exports dropped almost 50% as compared to 2008 (...) all countries presented some sort of reduction in imports of Amazon timber. (...) We had a significant decrease of timber exports to the US and European Union, which represent together 60% of the wood exported from our state" – Industry respondent

(b) Green initiatives as a market differential: Participants described market-oriented "green initiatives" (e.g. forest certification) as a tool to avoid

reputational risk and assure market differentiation in order to reach stricter and unstable markets. Firms selling these products did not face major constraints during the GFC, often guaranteed a premium price over non-certified products. The following quotes illustrate this finding:

> *"...with (forest) certification I have a premium price of almost 20%, and this allowed me to continue operating"* – Industry respondent

> "*...from the Lehman Brothers' bankruptcy until last week, chain of custody certificates increased about 40% a year (...) Companies were seeking some kind of differentiation in the market, that had become even more competitive"* – NGO respondent

(c) Non-market-driven initiatives restrained: This theme refers to the perceived reduction in investments and support towards non-market-driven initiatives, such as environmental education, philanthropic projects and endowments to non-profit organizations. Respondents described economic uncertainties leading companies and organizations to prioritize projects and strategies that could assure the survival of the business, reducing investments in initiatives considered not essential. Respondents also suggested that in some cases non-market-driven initiatives were not stopped, however they were not stimulated or increased due to limited investments and funding sources:

> *"When there is a crisis situation, the first thing a company does is to review its costs… And quit all activities that they might consider not essential for the business (...) In a period of uncertainties*

brought by a crisis like this, all these projects (socio-environmental projects) are affected." - Industry respondent

(d) Reducing Emissions from Deforestation and Forest Degradation (REDD) and Carbon mechanisms stimulated investments: In spite of the reduced investments due to the effects of the GFC, respondents claimed that SFM in the Amazon possibly benefited from the advent of initiatives such as REDD and carbon markets. As shown in Figure 2.4, environmental services mechanisms were described as defying the restrained investments conditions brought about by the GFC. The following quote illustrates the idea:

"*I think that environmental policies and programs had even a higher volume of investments (during the GFC), due to all the issues related to REDD and carbon…Environmentally speaking, today we have more money than ever before…"* – Government respondent

(e) Indirect effects from government actions to cope with the crisis: Respondents agreed that there was no direct government action towards the forest sector to help it cope with the GFC; however, government programs launched in 2009 to stimulate civil construction (e.g. through tax relief for construction materials and the launching of "My Home My Life", a government program that invested R$ 13 billion (US$ 7.2 billion) in housing from 2007 to 2010 [Ministério de Cidades - MCidades (2009)] and help industries, in particular to preserve jobs (Matias-Pereira, 2009), were perceived as stimulating the domestic economy. As a result, the forest sector benefited indirectly though enhanced domestic demand for timber and tax

relief over more industrialized products. The following quotes illustrate respondents' perceptions on the government's indirect actions:

> *"Now the civil construction sector is heated. It is growing exponentially…the pressure over wood will increase…Civil construction is a thermometer of timber demand…and now they are beating all the records…Reduced production from the crisis, is now climbing back up…"* – Government respondent

> *"Tax relief over industrialized products helped to maintain consumption of certain items….so I believe that the benefits that the forest sector felt was somehow a derivative effect of that…"* – Academic respondent

2.4.1.4. Impacts on the social functions of forest resources

Participants described a series of impacts on forest based communities, who although perceived as not being greatly impacted by the GFC, felt the effects of government actions and programs (see Figure 2.5), further described below:

(a) Communities at the Margin of the GFC: Most respondents indicated that forest-based communities were the group least affected by the GFC, due to their locally-oriented production and informal markets. In addition, 26% of the community-based forest management produced NTFP, perceived as not being affected by the economy slowdown. According to respondents, the communities employed by exporting companies may have felt the effects of the GFC, due to restrained production and workforce dismissal.

Unemployment was not perceived to be a significant outcome of the GFC, but rather an outcome of government enforcement actions:

> *"I don't see a direct relationship between the communities, or the areas that strongly relied on forest resources, as being affected by the crisis (…) even the industries…there was not a massive workforce dismissal*" – Academic respondent

> "*…there were no impacts of the crisis…The biggest impact came from the legal instruments to control wood exploitation…" –* Community respondent

(b) Unemployment – Respondents claimed that the government's restrictive measures to prevent illegal logging had raised unemployment in communities that relied on timber industry jobs. Information on the number of sawmills closed by government enforcement is lacking, however studies have shown that from 2004, when the enforcement policy was launched, to 2009 the number of timber processing companies in the Brazilian Amazon decreased by 29%, from 3132 to 2226 companies (Hummel et al., 2010). Respondents also argued that the closing down of sawmills was not combined with the provision of alternative sources of income for these communities. Increased crime rates in these regions, followed by social damages such as prostitution, alcoholism and robbery, were perceived as resulting from these job losses, as illustrated by the following quotes:

> *"The largest impact (on communities) was from the legal instruments to control illegal logging…"* – Community respondent

"If you look at the regions that were hit by the environmental police, the number of robberies and crime after sawmills were shut down skyrocket...." – Industry respondent

"...in a small town that has about four or five sawmills, the police comes and shut them down; that has a huge impact on labour force and on the local economy..." – Government respondent

2.4.1.5. Impacts on the institutional framework supporting SFM

Respondents felt that the GFC did not bring major changes to the institutional framework and policies supporting SFM in Brazil. However other factors were perceived as being important drivers affecting the development of SFM in Brazil, among which were: the belated launching of the Brazilian Forest Service; the approval of the Public Forest Concessions law in 2006; and the lack of institutional organization and decentralization of enforcement power (see Figure 2.6), further described below:

(a) Enforcement and monitoring not affected: Government enforcement actions to combat illegal logging were seen as not being affected by the GFC:

"*…For this "strong hand" (law enforcement) I believe that there wasn't any shortage of investments."* Industry respondent

(b) Approval of the public forest concessions law: This theme represents one of the most important policies to promote SFM in Brazil (Law 11.284, March 2nd, 2006). It aims to give private organizations the right to manage public forests and was perceived by respondents as the most appropriate alternative to encourage SFM in the Amazon. Avoiding risk taking and

concerned about the feasibility and reputational issues of this process, several companies hesitated to participate in the second bidding process of the national forest concessions, which coincided with the GFC. Some respondents also argued that the delayed public concessions process has been most likely driven by a lack of institutional and political regulation, rather than by the impacts of the GFC. The following quotes highlight both perceptions:

> *"We will only be able to compete with illegal timber production when we are able to implement the forest concessions on a large scale…"*- NGO respondent

> *"…I think that the biggest problem (for public concessions) is really related to institutional issues. The process is going in the right direction, but with the wrong speed. It is going a lot slower than expected (…) I think that this change in the institutional environment is normally pretty slow. We can't just blame it on the administrative efficiency. I believe that great part of the difficulties of implementing this process is related to the lack of understanding of the society that this is a solid way to go, and that can be positive for the country…"* – Industry respondent

(c) Belated launching of the Brazilian Forest Service: This theme relates to the relatively recent launching of the Brazilian Forest Service (SFB), in 2005. Respondents believed that its launching will help the institutional organization and creation of policies to promote SFM. However the SFB was seen to still face several challenges in regards to organization, limited resources and efficiency:

"I think there have never been enough people to conduct the process (forest concessions). SFB has only 200 people. The majority are consultants that are coming and going... The US Forest Service has about 25,000 people and more than 100 years. They have a much stronger organization. This is a progressive process. SFB was launched in 2005. Unfortunately it won't be able to get organized in 2 or 3 years..."– NGO respondent

(d) Lack of institutional organization: Most respondents suggested that a lack of institutional organization and decentralization of enforcement power were the major aspects preventing an efficient control of illegal logging and the encouragement of SFM in the Amazon. Some of the perceived challenges included: 1) deficiency in communication and engagement amongst federal and local agencies; 2) lack of high-end technology, equipment and trained professionals; 3) lack of capacity building for forest inspectors; 4) corruption; 5) excessive bureaucracy; and 6) lack of provision of capacity building and incentives to help loggers and producers to meet regulations aiming for more environmentally friendly practices. In addition, decentralization of enforcement responsibility was indicated as an institutional bottleneck compromising forest security. This refers to programs, projects and duties that used to be under Federal government jurisdiction and have been shifted to the State level. This transition was seen as abrupt, causing a collapse in the previously existing system and overwhelming States with duties that they were not prepared for. Interviewees expressed their perspectives about the current institutional framework:

"*…government agencies don't get along with each other*" – Government respondent

"…the sector is in a confusing institutional environment" – Industry respondent

"…corruption is embedded in the system…" – NGO respondent

"*…they need to have a standard (…) Each State has the freedom to create their own systems…"* – Academic respondent

2.4.1.6. Importance Analysis

Table 2.4 presents the results of the binary comparison of stakeholder perceptions with the consolidated list of themes influenced by the GFC, the GEC and government actions.

Seven themes were considered to be significantly impacting SFM goals across all the groups during the GFC. Of these, four were considered direct outcomes of the GFC (increased risk aversion; reduced exports; communities at the margin of the impacts; unaffected NTFP), one was driven by the ongoing GEC (aversion to reputation risk) and two were driven by government actions and programs (stronger government enforcement system; and lack of alternative provision of sources of income for loggers). Despite these commonalities, groups of respondents had diverging perceptions. Based on the simple matching similarity coefficient (Purnomo et al., 2005), Table 2.5 presents the similarity index of perceptions among groups based on the values in Table 2.6.

The highest similarity indexes were observed between government and academia respondents (0.880) and government and NGO respondents (0.808). Community and academia respondents presented the lowest similarity index (0.500), indicating the most diverging perspectives in terms of the factors affecting SFM in the Brazilian Amazon during the GFC. Similarity indexes among government and community respondents; and government and industry respondents had the same value (0.615).

2.5. Discussion

Our results suggest that the 2007-08 GFC presented both threats and opportunities for SFM in the State of Pará.

The maintenance of the extent of forest resources, a major goal of SFM, was not perceived to have been negatively impacted by the GFC. This finding is consistent with official data from the Program of Assessment of Deforestation in the Amazon (PRODES) which also showed a decreasing trend in deforestation rates between 2008 and 2009, from 12.9 to 7.4 thousand km^2/year [National Institute of Spacial Research (INPE), 2010]. Although this trend started in 2005, right after the federal government enforcement program was launched (Plan to Prevent and Control deforestation in the Legal Amazon-March, 2004), the rate of reduction in 2008-2009 was significantly more than previous years (INPE, 2010). This insight is not in line with the findings of other studies conducted under different crisis conditions which reported increased deforestation rates (Nilsson, 2009; Sunderlin et al., 2001; Sunderlin and Pokam, 2002). Our results suggest that in Pará, the clearing of forests decreased during the GFC as a result of a combination of factors including: 1)

increased risk aversion, in particular aversion to reputational damage driven by public awareness and facilitated disclosure; 2) impairment of agricultural production; 3) establishment of national and international procurement policies; and 4) the strengthening of the government enforcement system.

Recent studies confirm a downturn in the prices of agricultural commodities during the GFC (Dias, 2009; Matias-Pereira, 2009). Although some respondents argued that it might have contributed to restrain deforestation, this was not a completely agreed upon theme. Some respondents suggested that even though there was a decline in demand for some commodities, it was not significant enough to avoid deforestation.

Perhaps not surprisingly, our results suggest that the timber exporting segment was the most affected by the GFC in terms of market access and restrained production. This finding is consistent with existing studies that have indicated declines in the export of forest-products during economic slowdowns (Elliott, 2011; Sunderlin, 1999; Sunderlin and Pokam, 2002). Risk aversion during crisis is supported by a number of other studies which have shown that organizations and businesses avoid risk-taking in times of unstable economies and challenging markets (Freitas, 2009). In the forest sector, reputational risks have become very important due to increased public awareness about the use of natural resources (Baranzini et al., 2010) combined with the easy access to information (Meijer et al., 2009). This has driven new production paradigms based on environmentally and socially acceptable practices (Rondinelli and Berry, 2000; Sun, 2010). Our results indicated that the GFC encouraged these initiatives (e.g. forest certification) as producers sought market differentiation for their products.

According to our respondents, traditional forest-based communities in Pará were not affected by the GFC. This may be attributed to the fact that they do not belong to a formal economy and that their products are rarely export-oriented, mostly produced at small scales for local markets. According to the Brazilian Forest Service (2010) approximately 30% of the forest-based communities in the Brazilian Amazon rely on NTFP. Recent statistics show a decrease of 8.3% in non-timber forest production between 2003 and 2008 (IBGE, 2009), however this declining trend was not observed for the export-oriented production of Brazil-nut (*Bertholletia excelsa*), suggesting the GFC did not significantly impact NTFP. Sunderlin (2001) noted that during the 1997 economic crisis in Indonesia, there was a greater community reliance on NTFP; however we did not find this in our case study.

Each stakeholder group that participated in our study perceived the impacts of the GFC on SFM in different ways. Interestingly, NGO respondents and the representative of traditional communities that were interviewed in our case study did not present a high similarity index in their perceptions, despite NGO's often working to support communities or represent them against the government. Although this finding cannot be generalized beyond our study it warrants further investigation. Furthermore this insight is consistent with results reported by Purnomo et al. (2005), who found that local communities' perspectives in regards to SFM in Indonesia were not close to those of NGOs. In terms of SFM, communities often have a more local and concise perspective compared to NGOs which tend to have a broader view. This may explain the discrepancy in the themes considered important in our case study.

The highest similarity indexes were observed among government and academia (0.880) and government and NGO (0.808) respondents. This could be linked to the contributions that academia and NGOs make to forest policy-making processes in the Amazon. Communities and academia presented the most diverging perceptions in our study. This may point to the very different realities experienced by these two stakeholder groups. This may also suggest that recent calls to increase the level of engagement between science and society in policy making would be relevant to this case (Cortner, 2000).

2.5.1. Contribution to decision makers and future directions

Although not generalizable to the entire Amazon Basin, our study provides grounded insights on a wide range of forest policy and management issues that are useful for decision-makers and future research.

Participants in this study recognized the governments' efforts to enforce environmental regulations and control illegal logging as a strong contributor to restrained deforestation; however they also claimed that these programs neglected the social impacts associated with implementation. Therefore, in addition to enforcement, focused policies and program need to be established to provide capacity building and alternative sources of income for those that rely on illegal logging. This is consistent with the findings of Sabogal et al. (2006) which indicated that one of the bottlenecks in meeting SFM goals in the Amazon, in general, was the scarce capacity building available for loggers and company managers.

Our findings also suggest that third-party forest certification was not hindered by the GFC and was perceived as a tool to reach markets. However,

our case study was conducted in Pará, where large scale forest operations are common and this finding may not apply to small-scale operations. Therefore, there is a need for further research to understand the adoption of forest certification in more remote areas of the Amazon Basin, where small scale operations are the majority.

Traditional forest-based communities were perceived as not affected by the GFC in Pará, which leads us to infer that these communities live and work in more informal economies, often operating at the margin of formal legal frameworks and economies. Therefore, although it is noted that formal regulations are important for achieving improved forest resource management and market expansion, the efficacy of these regulations will depend on their interactions with, and recognition of, existing informal institutions (Pacheco et al., 2008). The insights that have emerged from this case study suggest that further research is needed to better understand the interactions between formal and informal forest economies in the context of SFM in the Amazon Basin.

2.6. Conclusion

This exploratory case study has revealed that the GFC caused a decline in exports of timber products, restraining production and leading to unemployment in some forest-dependent regions of Pará, located in the Amazon Basin. However, it also raised opportunities for improved production practices through a shift towards forest certification driven by a need for market differentiation and an increased aversion to the reputation risks associated with deforestation and illegal logging of tropical forests. Our results also suggest that in times of economic crisis, Brazil's forest policy-makers will

need to continue to focus on economic investments and incentives to support low impact forest production in the formal forest economy. They will also need to develop policies to build social capital in the informal forest-based economies that operate in the Amazon through capacity-building and education. Efforts to better understand the rule of informal institutions operating in the Amazon (e.g. traditional communities) are crucial to integrate them into policies intended to improve local people's livelihood and achieve the social goals of SFM.

2.7. Acknowledgements

This research was supported by the Neotropical Environmental Option (NEO) and McGill University. We would also like to acknowledge the anonymous participants for donating their time and expertise to this study.

2.8. Tables

Stakeholder Group	Organization role towards Forest Management in the Amazon	Respondent Position	Interview Date	Location
NGO	*NGO with projects in the Amazon Basin to promote sustainable use of resources, capacity-building, community engagement, reduction of carbon emissions and establishment of conservation units*	Program Coordination	June/2010	Brasília-DF
NGO	*NGO with projects in the Amazon Basin to monitor and control deforestation, provide evidence and influence policy making, promote sustainable development in the region, support and engage communities, mitigate climate change and deal with policies and regulations*	Forest Engineer and Researcher	July/2010	Belém-PA
NGO	*International NGO that disseminates eco-labels and forest certification as a tool to promote the sustainable use of forest resources. Aims to increase adoption in the Amazon Basin*	Board Member	August/2010	São Paulo- SP
Government	*Federal government agency which aims to promote the use of forests while maintaining conservation of valuable resources. Focus on increasing the benefits generated from forests, capacity building and public policies*	Director	July/2010	Brasília-DF
Government	*Federal government regulatory agency that aims to enforce environmental regulations, grant operational permits and environmental licensing*	Program Coordinator	July/2010	Brasília-DF
Industry	*Institution that represents forest companies and associations in Pará State with the main goal to promote the forest production sector in the region and represents its associations in the forest policy debate.*	Executive Secretary	July/2010	Belém-PA
Industry	*Association of timber-based industries that aims to discuss and release information regarding timber harvesting, national and international marketing of timber-based products, promotes low impact management and capacity-building in the sector. Represents mainly large-scale producers*	Director	July/2010	Belém-PA
Industry	*Association of people and small producers engaged in the timber production chain in the Amazon. Participates in policy debates as the representative of its associates*	Director	July/2010	Belém-PA
Community	*Non-profit organization that represents and advocates the social, economic, cultural and environmental rights of the traditional forest population in the Amazon Basin by participating in political debates, engaging communities and defending the rights of communities that rely on forest resources for their livelihoods*	Community leader and Association representative	July/2010	Belém-PA
Academia	*Researcher with extensive experience in SFM and reduced impact management, forest policy, forest certification, dynamics of tropical forests and forest ecology*	Researcher	June/2010	Piracicaba-SP
Academia	*Researcher with extensive experience in economics of forest resources and public policies towards SFM in the Amazon*	Researcher	June/2010	Piracicaba-SP
Academia	*Researcher with extensive experience in forest management, economics of forest resources and public policies for the Amazon*	Researcher	August/2010	Belém-PA

Table 2.1: Interviewed stakeholders

Emerged themes - Factors affecting SFM	Stakeholders				
	Group A	**Group B**	**Group C**	**Group D**	**Group E**
theme 1	1	0	0	1	0
theme 2	1	0	1	0	0
theme 3	1	0	1	0	0
theme 4	0	1	0	0	1
theme 5	0	0	0	1	1
theme 6	1	1	0	0	0
theme 7	1	1	1	0	0
theme 8	1	1	1	1	1
theme 9	0	0	1	0	0
theme 10	0	1	0	1	0

Table 2.2: Example of relative importance of themes according to stakeholder perceptions.

		Stakeholder Group B		
		1	0	Total
Stakeholder Group A	1	**3 (a)**	**3 (b)**	6
	0	**2 (c)**	**2 (d)**	4
	Total	5	5	**10**

Table 2.3: Example matrix showing the relative importance of emerged themes for stakeholder group A and group B based on Table 2.2.

Coded Categories		Emerged Themes	Stakeholders Perceptions				
			Communities	Industry	NGOs	Academia	Government
Reduction of deforestation Rates	Global Financial Crisis	*Increased risk aversion*	1	1	1	1	1
		Reduced prices of agricultural commodities and Impairment of agricultural production	1	0	1	1	1
		Reduced exports	1	1	1	1	1
	Global Environmental Crisis	*Public awareness*	1	1	1	0	1
		Media pressure	1	1	1	0	0
		Aversion to reputational risks	1	1	1	1	1
		Replacement for alternate materials	0	1	0	0	0
		Strictness on the part of financial institutions	1	1	1	0	0
		International procurement requirements	0	1	1	1	1
	Government Actions and Policies	*Strengthening of government enforcement system*	1	1	1	1	1
		National procurement policies	0	1	1	0	0
Impacts on trade and investments on the sector	Global Financial Crisis	*Downturn in exports*	1	1	1	1	1
		'Green' initiatives perceived as market differentiation tool	0	1	1	1	1
		Not market-driven socio-environmental initiatives restrained by the GFC	0	1	1	1	0
	Global Environmental Crisis	*Emergence of REDD and carbon mechanisms stimulated investments in SFM projects*	0	0	1	1	1
	Government Actions and Policies	*Government policies to cope with the CFC indirectly affected the forest sector (positively and negatively)*	0	1	1	1	1
		Decentralization of enforcement power	0	1	0	1	1

Table 2.4: Stakeholder perceptions regarding the emerged themes affecting SFM (0: irrelevant; 1: important)

Coded Categories		Emerged Themes	Stakeholders Perceptions				
			Communities	Industry	NGOs	Academia	Government
Impacts on forest-based communities	Global Financial Crisis	*Communities at the margin of the effects of the GFC*	1	1	1	1	1
		Unemployment on the regions where production was exports-oriented (restrained production)	1	1	0	0	0
		NTFP not affected	1	1	1	1	1
	Government Actions and Policies	*Unemployment (sawmills shut down)*	1	1	1	1	1
		Lack of alternative for the communities leading to increased crime rates	1	1	1	1	1
Institutional framework	Global Financial Crisis	*Enforcement and forest security not affected*	0	1	1	1	1
	Global Environmental Crisis	*Launching of the Public Concessions Policy*	0	0	1	1	1
	Government Actions and Policies	*Lack of institutional organization*	1	1	1	1	1
		Belatedly launched Brazil's Forest Service (incipient)	1	0	1	0	1
		Decentralization of enforcement power	0	1	0	1	1

Table 2.4: Continuation. Stakeholder perceptions regarding the emerged themes affecting SFM (0: irrelevant; 1: important))

	Industry	NGOs	Academia	Government
Communities	0.640	0.607	0.500	0.615
Industry		0.760	0.654	0.615
NGOs			0.741	0.808
Academia				0.880

Table 2.5: Similarity indexes among stakeholder groups

	Industry			NGOs			Academia			Government		
Communities		1	0		1	0		1	0		1	0	
	1	**14**	**2**	16	1	**15**	**2**	17	1	**11**	**5**	16	1	**13**	**3**	16
	0	**7**	**2**	9	0	**9**	**2**	11	0	**8**	**2**	10	0	**7**	**3**	10
		21	4	25		24	4	28		19	7	26		20	6	26
Industry						1	0			1	0			1	0	
					1	**19**	**3**	22	1	**16**	**6**	22	1	**16**	**6**	22
					0	**3**	**0**	3	0	**3**	**1**	4	0	**4**	**0**	4
						22	3	25		19	7	26		20	6	26
NGOs										1	0			1	0	
									1	**18**	**2**	20	1	**19**	**4**	23
									0	**5**	**2**	7	0	**1**	**2**	3
										23	4	27		20	6	26
Academia														1	0	
													1	**17**	**1**	18
													0	**2**	**5**	7
														19	6	25

Table 2.6: Similarity matrix among stakeholder groups

2.9. Figures

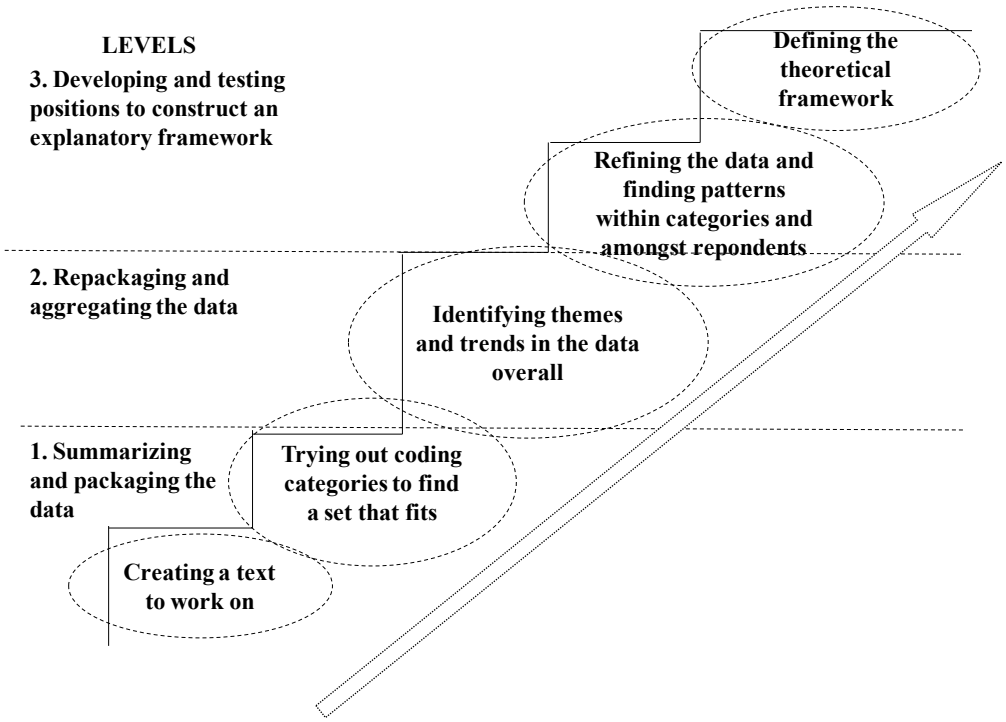

Figure 2.1: Analytical process for qualitative analysis

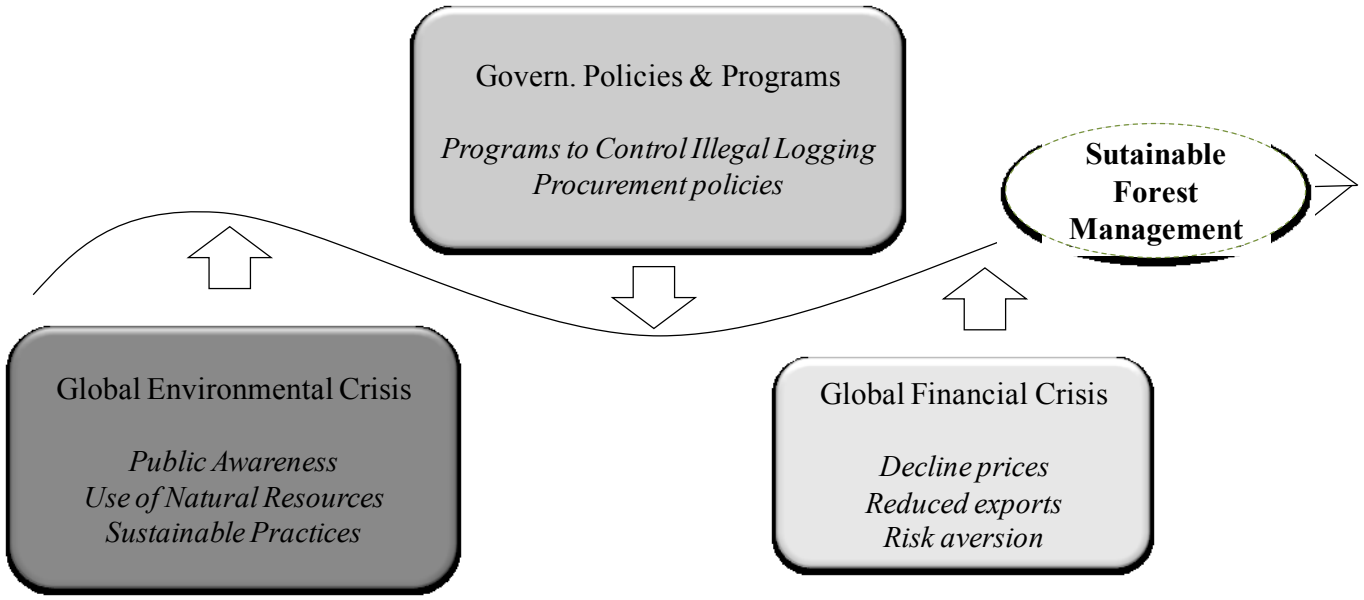

Figure 2.2: Global Financial Crisis and the broader context affecting Sustainable Forest Management in Brazil

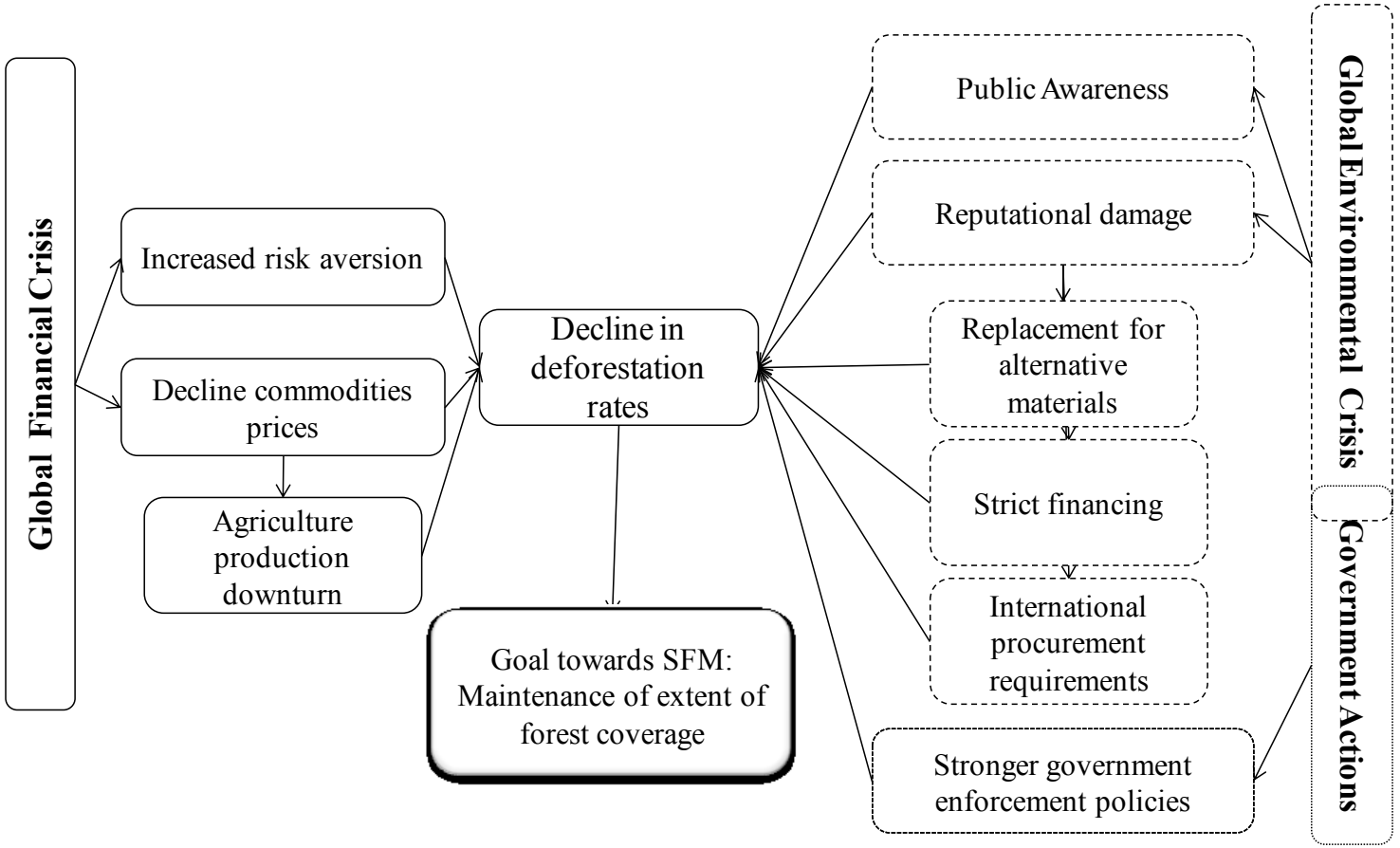

Figure 2.3: Factors affecting deforestation rates in Brazil and the relation to the international SFM goal: *"To maintain the extent of forest resources and environmental functions of forest resources"*.

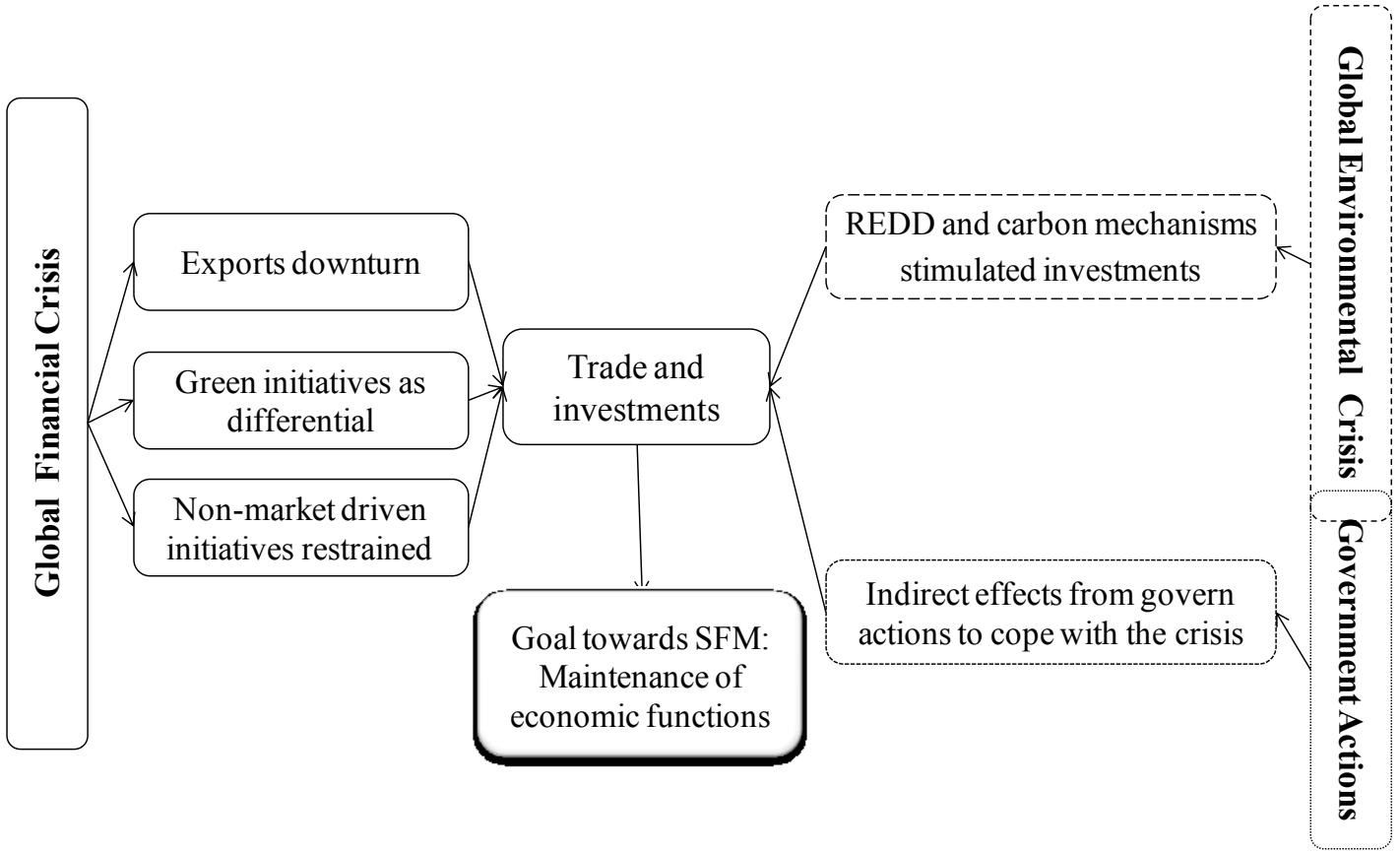

Figure 2.4: Factors affecting deforestation rates in Brazil and the relation to the international SFM goal: *"To maintain the extent of forest resources and environmental functions of forest resources"*.

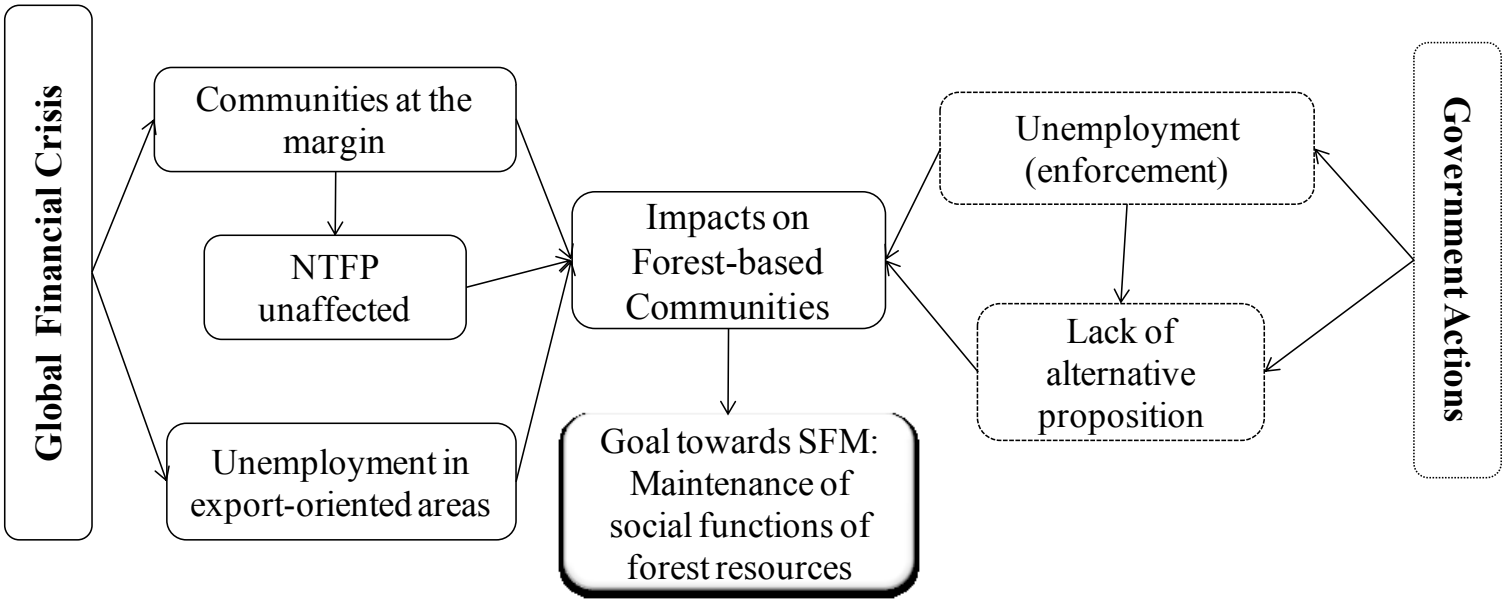

Figure 2.5: Factors affecting forest-based communities in Brazil and the relation to the international SFM goal: *"To maintain the social functions of forest resources"*).

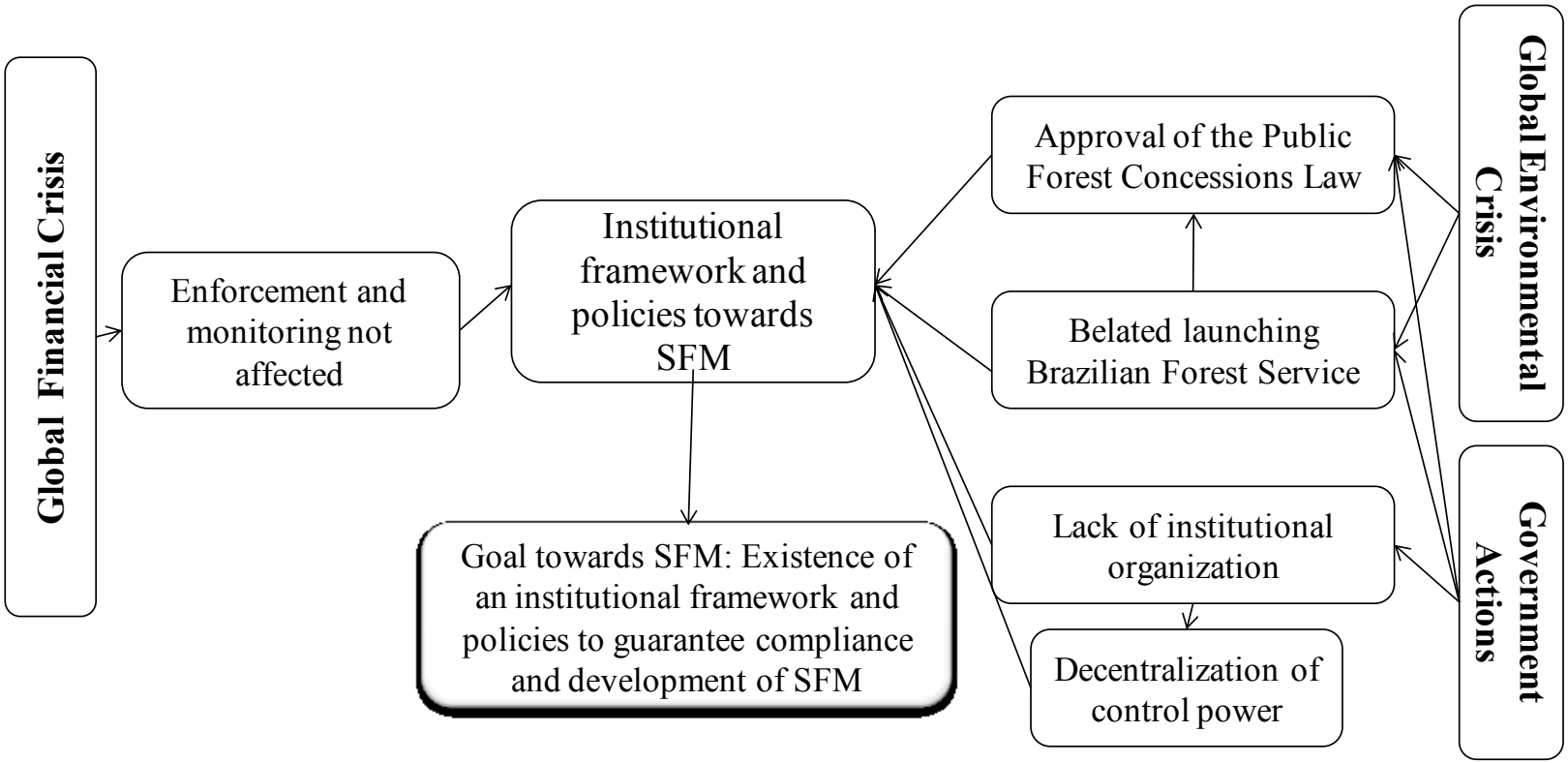

Figure 2.6: Institutional framework and policy factors affecting SFM in the Brazilian Amazon

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PREFACE TO CHAPTER 3

In order to understand the impacts of the Global Financial Crisis on SFM in Brazil, the effects on the forest plantation sector also need to be understood. Complementing the native forest case study presented in Chapter 2, Chapter 3 presents stakeholder insights on how the GFC impacted the forest plantation sector in Brazil with a view to identifying lessons for decision-makers.

CHAPTER 3. UNDERSTANDING THE IMPACTS OF THE 2007-08 GLOBAL FINANCIAL CRISIS ON BRAZIL'S FOREST PLANTATION SECTOR: A QUALITATIVE ASSESSMENT

Abstract

The world's forest plantation industries are known to have felt the impacts of the 2007-08 Global Financial Crisis (GFC), however relatively little is known about the nature of these impacts, particularly in the context of South America. Focusing on Brazil, this exploratory study sought to uncover lessons and insights that could assist industry managers and government policy-makers to better understand recent trends in the plantation sector, including future prospects for achieving policy objectives and overcoming the challenges associated with economic downturns. Using a combined grounded theory - case study approach, we qualitatively analyzed the experiences of key informants from diverse stakeholder groups to describe both the challenges and opportunities associated with the GFC. Negative impacts included: 1) decline in exports; 2) restrained production and establishment; 3) workforce dismissal; 4) a downturn in socio-environmental investments. However, the GFC also exposed some of the sector's competitive advantages which led to a rapid resumption in investment and an expansion in market share at the expense of competitors. The results offer insights and understandings that will be of value to decision-makers when assessing strategic options for policy intervention during future economic crises.

Keywords: Industry; Recession; Planted forests; Technology; Foment; Policy

3.1. Introduction

Forest plantations are essential for providing forest goods and services internationally (Carle and Holmgren, 2009). Planted forests are composed of trees established through planting or the deliberate seeding of either native or introduced species (FAO, 2006). Based on the results of the Global Planted Forests Thematic Study 2005 (FAO, 2006), it is estimated that around 76% of planted forests have production as their primary function, generally referred to as 'forest plantations'.

The forest sector plays an important role in Brazil's economy (SFB, 2010; Tonello et al., 2008). Approximately 516 million hectares of the country is covered by forests, representing 60.7% of its territory. This area includes natural forests (509.8 million hectares) and forest plantations (6.8 million hectares) (SFB, 2010). Despite the comparatively small area occupied by forest plantations, the gross value generated by this sector was estimated to be approximately US$ 300 billion dollars in 2009 (ABRAF, 2010). These plantation forests have single species, uniform planting densities, even ages, short rotation cycles, and are managed for commercial purposes.

In 2007-08 the world experienced the largest Global Financial Crisis (GFC) since the Great Depression (1929), resulting in the first contraction of the global economy since World War II (Boorman, 2009). The GFC was triggered by numerous factors (Goodhart, 2008) and likely resulted from a process that started 25 to 30 years ago, driven by the tremendous economic growth the world had experienced during that period (Reinhart and Rogoff, 2009). Increased credit availability (White, 2006), a deregulated financial

market (Roubini, 2009) and the American government's stimulus to enlarge mortgages, resulted in the burst of the subprime bubble (Gjerstad and Smith, 2009). This 'bubble burst' triggered other bubbles to burst, affecting the global financial system and weakening many developed and developing economies (Boorman, 2009; Roubini, 2009).

To date, reports examining the impacts of the 2007-08 GFC on the forestry sector have primarily focused on Asia's and Africa's industries (Chipeta and Heath, 2009; Ma et al., 2009; Tieguhong et al., 2009). For example, studies have suggested that, as a result of the GFC, exports in China, South Africa and Central Africa dropped and decreased the purchasing power of the main importers of timber such as the USA and the European Union (Chipeta and Heath, 2009; Ma et al., 2009; Nilsson, 2009; Tieguhong et al., 2009). China's domestic demand for timber products was also found to have being negatively affected, resulting in the shutdown of small- and medium-sized forest enterprises and increased unemployment and social instability in forest areas (Ma et al., 2009). Another recent report on the impacts of the GFC on North America's forest sector (Taylor, 2009) focused on the collapse of the housing market as a major threat. Reports assessing the impacts of the GFC in Latin America have, to date, been limited to industry figures, indicating restrained exports and production associated with currency appreciation, and declines in prices (ABRAF, 2010; Faleiros, 2009; Tomaselli, 2009). While informative, these reports do not provide deeper insights to the effects of the GFC on the plantation sector, including industry structuring, firm behaviours, market characteristics and the social, environmental and economic implications. Focusing on Brazil, this was the purpose of our study. More

specifically, we sought insights that will assist industry managers and government policy makers to better understand recent trends in the plantation sector, including future prospects for achieving policy objectives and overcoming the challenges associated with economic downturns.

3.1.1. Overview of forest plantations in Brazil

According to the Brazilian Forest Service (2010), forest plantations account for 1.3% of the total forest area in the country, with *Eucalyptus* and *Pinus* species representing 93% of this area. Plantation-grown trees are used for both industrial (i.e. sawn wood, panels and pulp) and energy purposes (i.e. charcoal and firewood) (Juvenal and Mattos, 2002). Building on its favourable edaphoclimatic (soil and climate) conditions for tree growing, Brazil has invested significantly in the development of technology for production, management and processing, allowing forest plantation yields to double or triple those of many competitor countries (ABRAF, 2010). The plantation sector is export-oriented, representing 3.6% of Brazil's total exports (US$ 5.6 billion dollars) in 2009 (ABRAF, 2010). In that same year, pulp and paper accounted for 59.2% and 30.1% respectively of the total exports of the sector, with U.S.A., Europe and Latin American countries the major importers (ABRAF, 2010).

The forest plantations sector generates approximately 1.7 million direct and indirect jobs (ABRAF, 2010) and subsidizes forest plantations for farmers, also called 'fomented plantations' (do Canto et al., 2009). According to do Canto et al. (2009) foment initiatives integrate communities, guarantee timber supply, stimulate regional markets, and provide farmers with access to

knowledge and technology, including high yield tree clones. In 2009, 500,000 hectares of forest plantations were under these foment contracts (ABRAF, 2010). Global Timber Investment Management Organizations (TIMOs) are also heavily involved in Brazil's forest plantations (ABRAF, 2010).

In 2009, more than 72% (4.9 million hectares) of the total area of forest plantations in Brazil were third-party certified, with 3.5 million hectares certified to Forest Stewardship Council (FSC) standards and 1.4 million hectares certified to Cerflor standards, the Brazilian system endorsed by the Program for the Endorsement of Forest Certification Schemes (PEFC) (SFB, 2010).

3.1.2. Motivations for the research and objectives

As with other parts of the economy, the forest plantation sector felt the impacts of the GFC (ABRAF, 2010; CIFlorestas, 2009). Reports on industry figures indicate impacts that include: 1) a decline in demand for wood products and scaling down of production; 2) reduced willingness to pay for environmental services; 3) a contraction of the formal economic sector opening opportunities for expansion of the informal sector, highly dependent of natural resources; and 5) unemployment of rural workers (ABRAF, 2010; CIFlorestas, 2009; FAO, 2009; Tomaselli, 2009). While informative, these studies shed little light on stakeholders' prospects: how they experienced the impacts of the phenomenon and the measures taken to overcome it. Our study aimed to contribute to a better understanding of the impacts of the GFC on the forest plantations industry in Brazil through the experiences of highly knowledgeable stakeholders. The following research question guided the

study: "*How has the Global Financial Crisis impacted the forest plantation sector in Brazil?*" More specifically, we aimed to: 1) Understand the perceptions of different forest plantation stakeholders on the impacts of the GFC; and 2) Understand the challenges and opportunities brought about by the GFC for the plantation sector.

3.2. Methodology

In order to achieve the proposed objectives, we applied a grounded theory approach (Goulding, 1999; Strauss and Corbin, 1997) to systematically gather, analyze and test our data in order to discover emergent themes and theories (Strauss and Corbin, 1997). We combined this grounded theory methodology with a case study strategy (Yin, 2009), which is the preferred approach when exploring contemporary events and when relevant behaviours cannot be manipulated (Gerring, 2007; Yin, 2009).

3.2.1. Data collection

Participants were selected for the interviews using a non-probability sampling method, known as 'purposive sampling', by which participants are selected based on their potential to contribute to the clarification of the topic being examined (Polkinghorne, 2005). It is applied when the research aims to capture multiple dimensions of the social processes being studied (Glaser and Strauss, 1967). Rather than aiming for statistical generalizations or representativeness, we aimed to reflect the diversity of insights within a given population which experienced the phenomena (Barbour, 2001). Nine key informants from five different forest plantation stakeholder groups were

subsequently interviewed between June and August 2010 (see Table 3.1). Our sample size (n=9) is appropriate considering that 1) qualitative sampling does not aim to identify a statistically representative set of respondents (Pope et al., 2000); and 2) theoretical sampling is a method based on the assumption that a common culture, challenge or experience is reflected in practically every individual, event or institution belonging to a common system (Honigmann, 1986).

Each interview was conducted in Portuguese and lasted approximately one and a half hours. We used a semi-structured interview format to ensure an appropriate degree of comparability between interviews while also allowing each respondent the opportunity to identify and discuss their own perspectives.

3.2.2. Data analysis

Data analysis was conducted following the Constant Comparative Method (CCM) (Boeije, 2002), which allows researchers to develop theory inductively, by categorizing and connecting insights, ideas and themes that emerge from the data. Further, constant comparisons between participants and groups of participants work to enhance the validity of the findings. Interview transcripts were coded using MAXQDA, an advanced computer software package designed for text analysis and qualitative research. This process involved defining categories and identifying specific themes and trends that emerged within these broader categories and searching for conceptual relationships within the data. Using the CCM, we were able to refine the data to reduce the bulk of codes and themes and to delineate a theoretical

framework that described the studied phenomenon (Miles and Huberman, 1994).

3.2.3. Assumptions and limitations

This study was based on the assumption that interviewing key informants from the various forest plantation stakeholder groups in Brazil could provide a richer, deeper and more integrated perspective on the impacts of the GFC on the plantation sector. To avoid findings based solely on interpretations of readings and improve the reliability of our emergent themes, we transcribed all interviews and conducted our data analysis and reduction process using MAXQDA to allow data transparency and auditability. To assure an appropriate level of understanding and interpretation of the interview questions by participants, and to avoid 'leading' questions, our questionnaire was pre-tested in May 2010 with two plantation industry stakeholders. Additionally, where possible, we compared and contrasted our emerging findings with industry figures and previous studies to enhance validity. Although case studies are not generalizable to populations, the insights are generalizable to theoretical propositions (Yin, 2009). Therefore, the aim of this research was to produce valuable insights on issues that may be important for plantation sector decision-makers or researchers to consider in future economic downturns. We recognize that the forest plantation sector cannot easily be considered as a whole, instead often divided into segments (i.e. pulp, panels, sawn wood, charcoal, firewood) (ABRAF, 2010; Juvenal and Mattos, 2002). However rather than aiming to reach specific industry segments, this study sought to reach an audience operating at the strategic level of

management, who would benefit from an improved understanding of the impacts on the forest plantation sector as a whole. Furthermore, reports that aim to provide information for decision-makers generally consider the forest plantations as a unique sector (Carle and Holmgren, 2009; FAO, 2006) rather than dividing it into industry segments.

3.3. Results

Overall, participants agreed that the GFC resulted in some challenges for the forest plantation sector; however, the impacts were not all negative, particularly when viewed over the longer term. As a result, we have divided the themes that emerged through the coding process into two categories: 1) Challenges experienced by Brazil's forest plantation sector during the GFC; and 2) Opportunities for Brazil's forest plantation sector during the GFC. In what follows, the expressions highlighted in *italics* represent the themes that emerged during the coding process.

3.3.1. Challenges associated with the Global Financial Crisis

Participants described the GFC as negatively affecting the forest plantation sector in a number of ways, particularly in the short term (see Figure 3.1 for the emergent theoretical framework, further described below). These effects were experienced from the second half of 2008. Recognizing that Brazil's forest plantation sector is strongly reliant on exports, all participants observed that the major impacts of the GFC resulted from *reduced international demand* for commodities, which included forest-based products, particularly pulp, pig iron and panels (i.e. MDF - medium density fiberboard-,

veneer, particle boards, plywood). A *decline in direct investments and limited credit* were also seen as considerably affecting firm's cash flow. According to participants, these two factors catalyzed the need for a *reduction in production costs*.

Participants identified that remarkable *losses* were also *faced by companies whose financial strategies involved speculating with risky derivative contracts*. These losses caused extraordinary *indebtness* to these firms, who consequently restrained investments in infrastructure and production and emphasized the urgent need to *reduce costs*.

Reduced international demand combined with *currency depreciation* was seen as triggering the *decline in exports* of plantations-based products. According to participants, the downturn in the international market for specific products was not compensated by the domestic market. *Domestic demand for pulp and panels*, particularly, was also restrained during the crisis period. Overly abundant supply and reduced demand caused an *enlargement in stocks* and a *decline in prices*.

Restraining production levels was indicated as the most common strategy established to overcome crisis difficulties. Participants argued that *planting and nursery production* were the most affected departments of the industry. In an attempt to reduce production costs, participants argued that companies' strategies shifted towards eucalyptus *coppicing* (coppicing method) rather than replanting, avoiding seedlings and labour expenses. This strategy was seen as resulting in social problems. Participants claimed that *contractors and third parties* who are often hired for the planting and

maintenance treatments were dismissed during the crisis period. Therefore, *workforce dismissal* was an outcome of the GFC in the sector.

Participants also suggested that in times of economic downturn, projects that were not considered essential were put on hold. Therefore, *socio-environmental and philanthropic projects were restrained* during the GFC (e.g. financial support for communitarian institutions, environmental education, endowments to NGOs and local organizations). Participants emphatically stated that the majority of these projects were not interrupted, avoiding conflicts with the surround communities and reputational risks. However, investments that were previously planned and new projects scheduled to be launched were seen as postponed and not executed.

An additional negative social impact of the GFC for the plantation sector related to the *partnerships between companies and 'fomented farmers'*. According to participants, due to enlarged stocks many companies decided to postpone some of these contracts. Although the existing agreements were not nullified, the harvesting, and therefore payment for the partners' timber, did not occur as scheduled in the contract. This strategy resulted in some financial distress for farmers who were expecting revenue at a certain time.

The urgent *need to reduce production costs* and *maintain cash flow*, aligned with *restrained investments and international credit* resulted in a reduction in the pace of implementation of new industry processing plants.

3.3.2. Opportunities associated with the Global Financial Crisis

Our results revealed that the GFC presented a number of advantages and opportunities for Brazil's forest plantation sector (see Figure 3.2 for the emergent theoretical framework, further described below).

A recurrently raised topic was the *high competitiveness of the forest plantations sector* in Brazil. Although not directly related to the GFC, participants argued that the efficiency and competitiveness of the sector allows for a shorter harvesting cycle, reducing the time of maturation of projects. This high degree of competitiveness was perceived to result from *high yields*, relatively *low production costs* and the *high quality of products.* Respondents claimed that these aspects resulted from a combination of factors: 1) appropriate *soil and climate conditions;* and 2) application of *advanced technology*, including genetic improvement and advanced production processes, which are often a result of *cooperation agreements among industries and universities* or research institutions.

The plantation sector was also seen as one of the few agro-industrial segments that *comply with national socio-environmental regulations*. Accordingly, they identified that the majority of the *forest plantations industry is certified* to internationally recognized forest management standards.

Participants also suggested that within the past decade, the sector has incorporated *stakeholders' engagement* as a strategic tool to assure socio-environmental compliance while mitigating reputational risks. They also indicated that the maintenance of a dialogue and involvement of stakeholders facilitated the understanding towards more sustainable production processes. Despite forest plantations not being formally recognized by the regulated

carbon market, our research participants also indicated that much discussion has been ongoing about forest plantations as providers of *environmental services* (ES).

Participants indicated that the plantation sector's competitive potential and its *global reach* guaranteed an *advantage when compared to producers from other producing countries*, particularly North America and Europe. According to participants, the *impairment of producing competitors* reassured *TIMOs interests in investing in Brazil's forest plantations*. Although they agreed that there had been a reduction in these investments during the down cycle of the GFC, they also witnessed their activities resume when it became clear that the Brazilian economy had not been strongly affected. Other factors seen as affecting TIMOs were the devaluation of the Brazilian currency (Real) compared to the US dollar, a decline in the demand for agricultural commodities during the crisis which resulted in shifts in investment from agriculture to forest plantations, viewed as a lower-risk activity, and Brazil's perceived *political and economic predictability* (i.e. democratic elections, regulated financial markets and well established legal systems).

Participants also argued that despite of the difficulties faced in the international market, domestic political and economic conditions favoured the forest plantation sector. National economic growth *increased population 'consumption power'.* In addition, the government launched mechanisms to mitigate the impacts of the GFC, such as reducing taxes on industrialized products, favouring domestic industries including the forest plantation sector. Programs to stimulate civil construction through tax relief on construction

materials and the launching of a housing program called 'My Home, My Life' were also seen as indirectly benefiting the sector.

The GFC was perceived as an encouragement for *internal and external rearrangements* of the sector : 1) *Internally through the incorporation of socio-environmental tools* and strategies such as forest certification in an attempt to achieve market differentiation and reach stricter markets in the case of companies that were not yet certified; and 2) *Externally through the merging and acquisition of large firms* in the industry, creating "mega"-organizations that increased the scale and enhance the international competitiveness of the sector.

3.4. Discussion

3.4.1. Reliability of findings

This section compares our findings with industry figures and other studies to enhance the reliability of our insights. Overall the interviewed stakeholders tended to agree upon the impacts of the GFC in the forest plantations sector, therefore, no distinctions are made amongst groups.

The financial uncertainties and economic downturn brought about by the 2007-08 GFC resulted in worldwide impacts. Our findings suggest that timber, as with other commodities (Lin and Martin, 2010; World Bank, 2009), faced a halt in production associated with the decline in international demand, resulting in a significant downturn in plantations-based exports from Brazil. This finding is supported by industry figures which indicate that in 2009, exports of forest plantation products decreased 18% in value from 2008 levels

(ABRAF, 2010). Our findings also suggest that demand for pulp and panels (plywood, veneer, particle boards) were not compensated by the domestic market. Conversely, reduced international demand for pig iron, an industry reliant on wood from plantations as an energy source, was seen as partly overshadowed by the increased demand in the domestic market. These findings are consistent with figures presented by ABRAF (2010) which indicated that the panels segment showed fragility during the GFC period, most intensely during the first semester of 2009, when exports reduced 30% and domestic sales decreased 20% as a consequence of the slowing demand for furniture. The same report also indicated that the abrupt decline in demand for pig iron, starting on the last trimester of 2008, caused a decrease of 51% in production. This resulted in a significant downturn in demand for export charcoal, which in 2009 reached levels 33% lower than the previous year. Specific data regarding the domestic market for charcoal from forest plantations is currently (2011) lacking, therefore the perception that national demand compensated international market losses cannot be validated by existing statistics.

The government's measures to cope with the GFC indirectly helped the forest plantation sector. These included tax relief for industrialized products and incentives for the civil construction sector to stimulate the economy and preserve jobs (Matias-Pereira, 2009). This may have been one driver stimulating the domestic demand for charcoal.

Restrained forest production (mostly planting and nursery activities) was identified as a strategy to reduce production costs and maintain cash flow. As a result, coppicing was preferred over replanting. However, the reduction in

costs associated with seedlings (nursery) and labour in the short term can have long term impacts through yield losses when compared to the genetically improved clones that are available. According to participants, the halt in forest production also had social impacts. These findings can be validated by official statistics which indicate a decrease of 11% in jobs generated by the forest plantation sector in 2009 (including direct employees and contractors) due to the decline in demand and firm revenues (ABRAF, 2010). Foment partnerships were another social dimension of the forest plantations sector perceived as affected by the GFC. ABRAF's figures (2010) support this finding, indicating a 58% reduction in new foment contracts signed in 2009, when compared to 2008.

Our results also suggested that although existing socio-environmental projects in the sector were not drastically interrupted, new projects and investments were not stimulated. This finding is consistent with forest plantation figures that showed, in 2009, socio-environmental investments were negatively affected by the GFC, when compared to the previous year, with: 1) a decrease of 6% in the value of investments in social programs and a reduction of 40% in the number of municipalities reached by plantation firms; 2) the total amount invested by forest plantation firms in environmental conservation programs decreased 5%; and 3) Capacity building programs for employees and surrounding communities received investments reduced 34% from the previous year (ABRAF, 2010).

Our findings indicate that impacts of the GFC on Brazil's forest plantation sector were not essentially negative and that the crisis emphasized the need to be highly competitive and led to some restructuring of the sector.

This finding is supported by a number of authors who argue that crises often 'catalyze and accelerate changes' and significant technological and structural improvements are demanded (Dias, 2009; Faleiros, 2009). Therefore, effects of economic downturns can be positive while stimulating the restructuring of industries and sectors towards more efficient and environmentally friendly practices. It results in the shut down and losses of market share of those industries/firms which are not able to cope with the new competitive standards.

The retrieval of external capital from the country and the consequent depreciation of the national currency (R$ Real) in relation to the American dollar (US$) had remarkable impacts on organizations that were investing in derivate contracts, losing billions of US$ during the GFC. For example, one of the largest pulp and paper producers in Brazil at the time (Aracruz Celulose) lost more than US$ 2 billion dollars in a year (2009) (FAO, 2011). Although this case was often mentioned by participants as a negative impact of the GFC on the forest plantation sector, they also claimed that these losses contributed to the sector's rearrangement, through the merging of companies. Merging and acquisition combined with the closing of old and inefficient mills are indicated as the two main routes to consolidation in the forest industry (FAO, 2011). These two factors were catalyzed by the GFC and enhanced the competitiveness of Brazil's forest plantation sector.

Although participants agreed that credit availability and investment in the sector were restrained during the down cycle of the GFC, they claimed that the sector's competitiveness and the country's perceived macroeconomic stability attracted investments soon after. This is consistent with studies that

have indicated that external capital is flowing into Brazil (Azevedo and Terra, 2009).

One of the emphasized opportunities associated with the GFC was the exponentially growing Chinese market. Despite the reduced demand from the United States and Europe, China's economy continued growing, albeit at a lower rate, during the GFC (Boorman, 2009) and soon dominated the market, becoming the major importer of Brazilian pulp, accounting for 60% of total export (ABRAF, 2010).

Compliance with socio-environmental standards, including through third party forest certification, was perceived by respondents as an advantage to the sector in attracting investors. Aligned with the increased demand from China, the demand for certified timber in the international market was identified by ABRAF (2010) as one of the factors that prevented Brazil's exports of forest plantations from dropping to even lower levels.

3.4.2. Considerations for policy-makers

Overall, our study indicates that the sector's efficiency, comparatively lower risks, the reassuring interests of TIMOs, the continuous growth of the Chinese market, and the domestic economic growth combined to support Brazil's plantation sector during the GFC period, despite the challenges created by declines in global demand. Nevertheless, policies to support forest management and the forestry sector in Brazil, particularly towards forest plantations, are incipient, hindering the development of this industry (Câmara Setorial de Silvicultura, 2009).

One of the factors that allowed the plantation sector in Brazil to reveal competitive advantages during the GFC was its use of advanced technology. This technology, resulting in higher yields and shorter maturation cycles, has been predominantly funded and generated by the industry and transmitted to small farmers though foment programs (Juvenal and Mattos, 2002). However, to maintain the development of new technologies, policies may be required to support research projects in partnership with public universities and research institutions in order to improve technology, and more efficient and environmentally friendly practices. Based on our results, government incentives for forest establishment (planting and nursery) in times of financial crisis could also help maintain production levels while avoiding workforce dismissal.

During the crisis, international credit availability was restrained and this affected the plantation sector which often relies on international funds for credit. Despite some of the existing credit programs (Câmara Setorial de Silvicultura, 2009), the sector may benefit from policies promoting local credit accessibility, including higher limits and lower interest rates, which could provide firms and farmers with a risk buffer to the international credit market. This issue was recently (2011) considered in the Federal Agricultural Plan 2011-12, resulting in an increase in credit limits and reduced loan interest rates from 6.57% to 5.5% per year, with a view to favour investors and producers of plantation forests (Ministério da Agricultura Pecuária e Abastecimento, 2011).

Our study suggests that foment initiatives were impacted by the GFC. Additional research on the characteristics of foment partnerships, particularly when financial capital is constrained, could further illuminate this finding.

Government support to stimulate activities that better integrate small-scale farmers into the forest plantation sector could help reduce the reliance of these farmers on private firms while assisting social integration and stimulating timber supply. In this regard, Diesel et al. (2006) argued that government support to foment programs can promote the goals of: 1) social policy seeking alternatives for development and to mitigate rural poverty; 2) economic policy by supporting a productive sector that has the potential to stimulate regional economies; and 3) environmental policy by, for example, promoting the use of previously degraded land and mitigating the pressure on native forests.

Finally, compliance with environmental regulations and third-party forest certification standards have been found to be important features of Brazil's plantation sector that assure export market access. Forest certification could, therefore, be further considered in government policies as a tool to assure international competitive advantages for the plantations sector while mitigating social and environmental impacts (May, 2002).

3.5. Conclusion

This exploratory study has revealed that the GFC brought both challenges and opportunities to the forest plantation sector. Our results suggest that in times of economic crisis, Brazil's forest policy-makers need to focus on specific economic investments and incentives to support the forest plantation sector, including support to: 1) the development and improvement of technology; 2) initiatives to integrate small farmers into the large scale industry; 3) improve credit availability and accessibility to the sector; and 4) encourage forest certification with a focus on exports. These measures could

help to maintain the competitive advantages associated with the forest plantation sector in Brazil and promote the expansion of its international market share. They could also assure the maintenance (or increase) production levels and contribute to the generation of jobs and the stimulation regional economies. While the negative effects of the 2007-08 GFC in Brazil have largely subsided, the results of this exploratory study offer insights and understandings that will be of value to decision-makers when assessing strategic options for policy intervention during future economic crises.

3.6. Tables

Stakeholder Group	Organization	Position	Interview Date	Interview Location
Industry	*Large pulp and paper corporation*	CEO	August 2010	São Paulo- SP
Industry Association	*Association of pulp and paper producers*	Technical Director	August 2010	São Paulo- SP
Industry Association	*Association of forest-based companies*	Executive Secretary	July 2010	Brasília- DF
Industry Association	*Association of forest-based companies*	Executive Director	July 2010	Piracicaba-SP
Academia	*Researcher with extensive experience in process optimization and management of forest plantations*	Researcher	July 2010	Piracicaba-SP
NGO	*Non-profit organization with projects aiming to promote the adoption of sustainable practices by the forest plantation sector*	Executive Secretary	July 2010	São Paulo- SP
NGO	*Non-profit organization that promotes forest certification as a tool for good management practices*	Board Member	June 2010	Brasília- DF
Government	*Federal government agency that aims to promote the forest production sector*	Director	June 2010	Brasília- DF
Government	*Federal government agency in charge of law enforcement and forestry operational regulations*	Director	June 2010	Brasília- DF

Table 3.1: Key informants interviewed from Brazil's forest plantation stakeholder groups

3.7. Figures

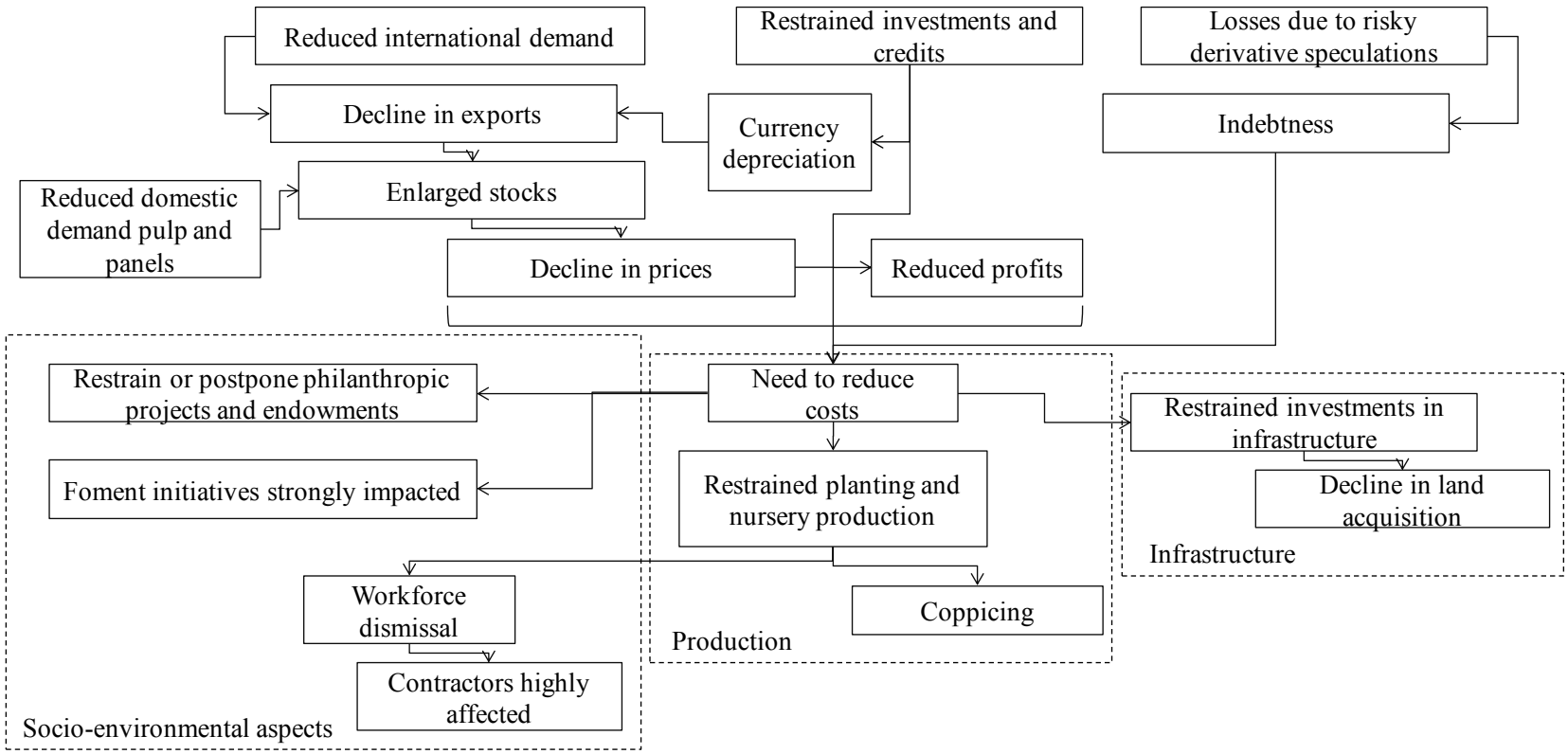

Figure 3.1: Challenges experienced by Brazil's forest plantation sector during the 2007-08 Global Financial Crisis.

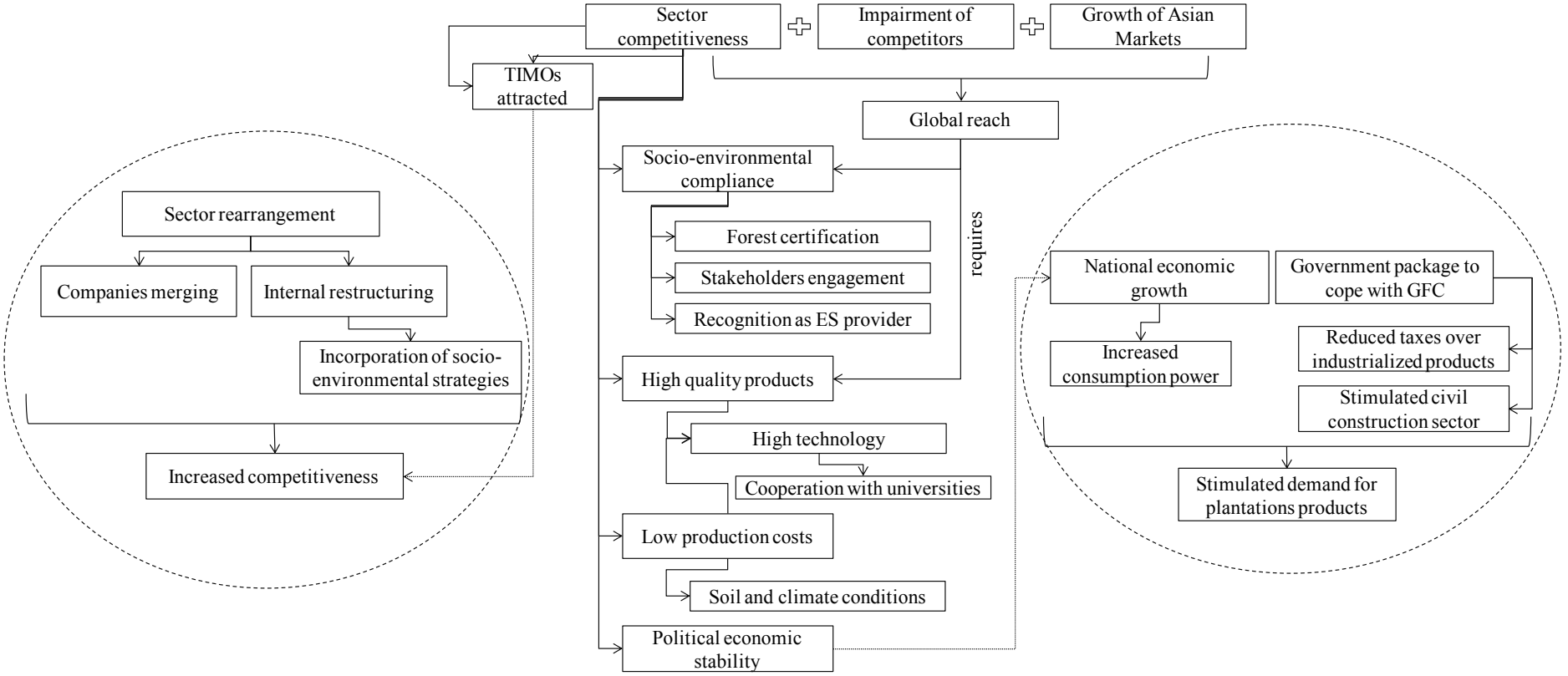

Figure 3.2: Opportunities for Brazil's forest plantation sector during the 2007-08 Global Financial Crisis

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CHAPTER 4. CONCLUSION AND FUTURE DIRECTIONS

This research has identified a range of challenges and opportunities for sustainable forest management (SFM) in Brazil resulting from the 2007-08 GFC. Rather than focusing on industry figures and statistical data, this thesis approached the phenomenon from a qualitative perspective, drawing on the perceptions and experiences of highly knowledgeable stakeholders. This approach was chosen because it allowed us to explore the meanings of social phenomena as experienced by individuals in their natural context (Bernard, 2006; Miles and Huberman, 1994). Further, understanding stakeholder perspectives is seen as key to addressing the complexity of environmental problems (Reed, 2008).

The results have revealed both negative and positive impacts associated with the GFC in both the Pará native forest case study (Amazon Basin) and the forest plantation sector in Brazil.

Some of the negative impacts experienced in the native forests of the State of Pará included restrained timber production and reduced timber exports, thereby affecting one of the main goals of SFM [see Theme 4 from the Food and Agriculture Organization SFM themes (FAO, 2010); and criteria 9, 11 and 12 from the 'Tarapoto Proposal' criteria and indicators for SFM (Carazo, 1997)]. However, our results also suggested that the effects of the GFC could not be understood separately from other relevant events and policies underway in Brazil. As a result, the GFC was seen as having combined with the broader ongoing global environmental crisis and government policies and programs to generate some positive impacts,

particularly reduced deforestation rates resulting from increased risk aversion, impairment of agricultural production and stronger enforcement policies. Furthermore, environmentally responsible production practices (e.g. forest certification) were encouraged as a strategy for market differentiation

Similarly, exports of forest plantation-based products were described as negatively affected by the GFC, causing restrained production and significant workforce dismissal, particularly over the short term. However, considering Brazil's forest plantation sector is much less complex that the native forestry sector, with greater technological inputs and lower risks, the GFC was found to have exposed some competitive advantages. Our results indicated that the plantation sector was able to expand its market share at the expense of competitor countries that were more strongly affected by the GFC. China also played a significant role in maintaining the demand for plantation-based products. The GFC also contributed to the merging of firms, resulting in "mega" plantation corporations, which was also considered a positive outcome by the key informants interviewed. As with our findings from the native forests in the Amazon Basin, forest certification and environmentally responsible market-driven strategies were identified as a tool to reach markets that were risk averse.

The insights generated through this research suggest that despite the magnitude and severity of the 2007-08 GFC, appropriate policies and programs in support of SFM initiatives in Brazil and to promote the forest plantation sector can facilitate the development of the local and national economy while fulfilling social and environmental goals. Such policies may include: 1) the development and improvement of harvesting and regeneration

technology for native and plantation forests; 2) initiatives to integrate small farmers into large-scale industries; 3) improving domestic credit availability and accessibility for forest management; 4) encouraging third-party forest certification; 5) creating mechanisms to favour the export of sustainably produced forest-based products; 6) investments in human capacity building (social capital); 7) appropriate enforcement strategies for regulations in both formal and informal economies; and 8) better considering the relationship between formal and informal forest economies in SFM policy.

4.1. Future Directions

This study aimed to provide a better understanding of the relationship between economic downturns and forest resources management in Brazil. As an exploratory study, and the first of its kind in South America, it was designed to both highlight areas in need of further research and to provide a more holistic and descriptive understanding for decision makers.

Our findings suggested that during the GFC, environmental programs that were not market driven (e.g. environmental education, philanthropic projects and endowments to non-profit environmental organizations) were restrained due to a reduction in investment and a prioritization of strategies that could assure the survival of the business. Despite the reduced support to environmental projects, participants agreed that the GFC contributed to restrain deforestation in Brazil. Conversely, studies conducted in other economic crises within diverse contexts, for example Africa and Asia, have suggested that economic downturns resulted in forest losses (Sunderlin et al., 2001; Sunderlin and Pokam, 2002). Threats resulting from restrained

investment in environmental programs, in addition to changes in forest cover and land use, during economically unstable periods are likely to affect other natural resources (positive or negatively). As a result, there is a need for further research to assess the impacts of economic crises on natural resources in Brazil (e.g. water and soil).

Our research was designed to provide insights for decision-makers operating at the macro level of policy and management, rather than focusing on the impacts within particular segments of the forest-based industry (e.g. pulp, paper, furniture, panels, charcoal, etc) or firms. Building on the results of this study by incorporating surveys and deeper emphasis on specific segments may help industry managers and government bureaucrats to better understand the impacts of financial and economic slowdowns on the forestry sector.

Policies aiming to improve forest management and conservation are 'often based on the assumption of political and economic stability' (Sunderlin, 1999). Nevertheless, crises are occurring in cycles (Nilsson, 2009) and the insights provided by this qualitative study represent only the 'tip of the iceberg' in terms of how economic slowdowns affect natural resource management. There is, therefore, a need for natural and social scientists to more fully integrate their knowledge to understand trends and impacts at different scales to improve the sophistication in our understanding of causal relationships and provide better evidence for policy. The more we understand about crises, and the more we recognize the dynamic and adaptive nature of socio-ecological systems in policy, the more we will be able to realize sustainable forest management goals.

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