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SUSTAINABILITY RESEARCH: A GROUNDED THEORY APPROACH IN THE FIELD OF CLIMATE CHANGE

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ABSTRACT: Climate change is a complex and uncertain global problem because it is driven by human behavior, with long-term climate-related risks for natural and human systems. Changes in human behavior, financing flow, policy instruments, and multilevel governance are needed for mitigating and managing major climate risks. Understanding the social dimensions of climate change is, quite literally, a hot topic to be studied. Most of the scientific literature in the field is focused on the 'hard science'. Different methods of theory building are used in applied social sciences. However, the use of the grounded theory approach in sustainability research, specially on 'soft science' in the field of climate change, is scarce. The intent of this paper is to discussion the use of the grounded theory method in an emergent research field that combines governance and climate change. The article presents substantive results of an emerging theoretical framework that explain the governance process of REDD+ in Brazil, an United Nations Framework Convention on Climate Change (UNFCCC) climate finance mechanism focused on mitigating forest-related emissions in developing countries. Instead of discussing best procedures and techniques to build grounded theory, which are largely accessed through several peer-reviewed publications, our focus is to provide a practical guide and discuss lessons learned from the field to integrate the 'REDD+ Governance Theoretical Framework'. Thus, scholars and graduate students are encourage to test and validate (or not) the emerging theoretical framework.

KEYWORDS: theory building; grounded theory; sustainable development research; soft science; REDD+; climate change.

RESUMO: A mudança climática é um problema global, complexo e incerto, pois é impulsionado pelo comportamento humano, e apresenta riscos no longo prazo para os sistemas naturais e humanos. Mudanças no comportamento humano, fluxo de financiamento, instrumentos de política, e governança multinível são necessários para mitigar e gerenciar os principais riscos climáticos. Entender as dimensões sociais da mudança climática é, literalmente, um tema quente a ser estudado. A maior parte da literatura científica nessa área é focada em 'hard science'. Diferentes métodos de construção de teoria são utilizados nas ciências sociais aplicadas. No entanto, o uso da abordagem da teoria fundamentada na pesquisa em sustentabilidade, especialmente 'soft science' na área de mudanças climáticas, é escasso. O objetivo desse artigo é discutir o uso do método teoria fundamentada em um campo de pesquisa emergente que combina governança e mudança climática. O artigo apresenta resultados substantivos de um quadro teórico emergente que explica o processo de governança de REDD+ no Brasil, um mecanismo de financiamento climático da Convenção-Quadro das Nações Unidas sobre Mudanças Climáticas (UNFCCC) focado na mitigação de emissões florestais em países em desenvolvimento. Ao invés de discutir sobre os melhores procedimentos e técnicas para construir uma teoria, que podem ser acessadas em várias publicações científicas, esse artigo apresenta um guia prático e discute as lições aprendidas para integrar o "Modelo Teórico de Governança em REDD+". Acadêmicos e pós-graduandos são encorajados a testar e validar (ou não) o modelo teórico emergente nesse estudo.

PALAVRAS-CHAVE: construção de teoria; teoria fundamentada; pesquisa em desenvolvimento sustentável; soft science; REDD+; mudança climática .

RESUMEN: El cambio climático es un problema global complejo e incierto porque es impulsado por el comportamiento humano, con riesgos a largo plazo relacionados con el clima para los sistemas naturales y humanos. Los cambios en el comportamiento humano, el flujo de financiamiento, los instrumentos de política y la gobernanza multinivel son necesarios para mitigar y gestionar los principales riesgos climáticos. Comprender las dimensiones sociales del cambio climático es, literalmente, un tema candente para estudiar. La mayor parte de la literatura científica en el campo se centra en la "hard science". En las ciencias sociales aplicadas se utilizan diferentes métodos de construcción de la teoría. Sin embargo, el uso del enfoque de la teoría fundamentada en la investigación del sustentabilidad, especialmente sobre la "soft science" en el campo del cambio climático, es escaso. El propósito de este documento es discutir el uso del método de la teoría fundamentada en un campo de investigación emergente que combina la gobernabilidad y el cambio climático. El artículo presenta resultados sustanciales de un marco teórico emergente que explica el proceso de gobernanza de REDD + en Brasil, un mecanismo de financiamiento climático de la Convención Marco de las Naciones Unidas sobre el Cambio Climático (CMNUCC) centrado en mitigar las emisiones relacionadas con los bosques en los países en desarrollo. En vez de discutir sobre los mejores procedimientos y técnicas para construir una teoría, que pueden ser accedidas en varias publicaciones revisadas por pares, este artículo presenta una guía práctica y discute las lecciones aprendidas para integrar el 'Modelo Teórico de Gobernanza en REDD+'. Académicos y post-graduandos son alentados a probar y validar (o no) el modelo teórico emergente en ese estudio.

PALABRAS-CLAVE: construcción de teoría; teoría fundamentada; investigación en desarrollo sostenible; soft science; REDD; cambio climático.

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1. INTRODUCTION

Climate change is an uncertain, global, and long-term problem (Wagner & Zeckhauser, 2012). It is a priority issue that effect human and natural systems, including air, biological diversity, freshwater, oceans and land. Those complex systems are interrelated and interact with interdependent human behaviors, making climate change a global driver of environmental, social, health and economic impact by putting the society at risk. Time is running out to prevent irreversible and dangerous climate change risks. Global emissions must be radically reduced in the next decades to keep the temperature well bellow 2°C above pre-industrial levels as established in the Paris Agreement under the UNFCCC (IPCCC, 2014; Masson-Delmotte et al., 2018; Prins & Rayner, 2007; UN Environmental Programme, 2019).

Mitigation and adaptation in climate change are complex and manage climate risks will be extremely expensive. Some researchers show that funds promised to least-developed countries under the Paris Agreement might not be enough to prevent the most dangerous climate risks (Kennel, Briggs, & Victor, 2016). Solutions in climate change rely on multilevel governance systems, institutional capacity, policy instruments, technology innovations, financing, and changes in human behavior. Those are some of the conditioning factors needed to enhance the feasibility of mitigation and adaptation solutions (Masson-Delmotte et al., 2018).

Anthropogenic CO_2 emissions have increased by about 90% since 1970. Emission from fossil fuel combustion and industrial processes have contributing about 78% to the total GHG emissions (IPCC, 2014). Deforestation is the second largest source of anthropogenic CO_2, accounting for 12% in total (Van der Werf et al., 2009). Although deforestation and forest degradation are considered major drivers of climate change (Lederer, 2012), activities to mitigate forest-related emissions are considered a cost effective way to curb emissions because large-scale programs can be implemented in the short term (Stern, 2007).

Brazil has proven its capacity to dramatically reduce the deforestation rate in the Amazon by 72% since 2004 (INPE, 2019, May 28) through a set of combined public policies, command and control activities, soy and beef moratoria, civil society interventions and projects, and initiatives supported by the Amazon Fund with international funds originated from REDD+ resources.

REDD+ stands for "reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries" (UNFCCC, 2014). It is an UNFCCC performance-based climate finance mechanism focused on mitigating forest-related emissions in which developing countries receive incentives to improve forest management by attributing an economic value to the additional carbon stored in trees or not emitted (Corbera & Schroeder, 2011).

The contribution of this paper in existing (however scarce) literature, is to discussion the use of grounded theory method in an emergent research field that combines governance and climate change. The article presents substantive results of an emerging theoretical framework that explain the governance process of REDD+ in Brazil. Instead of discussing best procedures and techniques to build grounded theory, which are largely accessed through several peer-reviewed publications, our focus is to provide a practical guide and discuss lessons learned from the field to integrate the 'REDD+ Governance Theoretical Framework'

We suggest that building a conceptual framework from empirical data, in which using the inductive grounded theory methodology rather than logical-deductive approaches, is an appropriate and effective method for studies where existing theories are incipient, and the phenomenon studied is highly complex due to its multidisciplinary and diversity of actors involved. The purpose of the empirical research (Pinsky, 2017) we use as an example was to understand how the governance system of REDD+ actually works in Brazil.

The paper is structured in five main sections. Following this introduction, we provide a conceptual discussion of grounded theory as a qualitative research method. Section three describes the methodological procedures and technics to build the theoretical framework. Section 4 presents the emerging 'REDD+ Governance Theoretical Framework'. Conclusions are presented in the final section.

2. THE LOGIC OF GROUNDED THEORY

Grounded theory was created by Glaser and Strauss (1967) as a theory building method to discover theory from data, systematically obtained and analyzed in social sciences. It does not use hypothesis nor research question in the beginning. Rather, grounded theory is a suitable method to explain a phenomenon that is not enough explained in existing theories (Hueser, 1999).

A major strategy in grounded theorizing is the general method of comparative analysis, just like are the experimental and statistical methods – all these methods use the logic of comparison. Evidence obtained through comparative analysis aim at accurate data, empirical generalizations, specifying a concept, verifying, and generating a theory (Glaser & Strauss, 1967). In grounded theory, there is no rigid approach to analysis. Rather, data analysis should be an interpretative, free-flowing, and dynamic process (Corbin & Strauss, 2015).

Glaser and Strauss' grounded theory method is based on two major technics: 'constant comparison', in which data gathering and analysis occur at the same time, and 'theoretical sampling', where decisions about which data should be collected next are guided by the emerging conceptual categories that will form the theory (Suddaby, 2006).

There are distinguished grounded theory methods and approaches in doing analysis (see Charmaz, 1983; Corbin and Strauss, 1990; Glaser, 1978; Glaser and Strauss, 1967; Hall and Callery, 2001). Rather than discussing the divergences between methods and approaches, we bring light to Charmaz's view of what is common among them: 1) concurrent data gathering and analysis; 2) developing of codes and categories from empirical data; 3) developing of theories to explain behaviors or processes; 4) writing memos during the coding process to support writing first concept papers, and 5) theoretical sampling (not representative sampling) to reach saturation in the categories (Charmaz, 1996).

An theoretical framework formed by a well-codified set of propositions is not the only form to present a theory. According to the Glaser and Strauss' approach, grounded theory can also be presented in a running theoretical discussion based on conceptual categories and their properties. The beauty of grounded theory methods rely on the fact that graduate students and experienced researchers alike can use its basic procedures and technics by taking a rigid approach to doing analysis (Charmaz, 1996; Corbin & Strauss, 2015), and to unpacking researchers' creativity and imagination with its inductive theory building approach (Pozzebon, Petrini, Mello, & Garreau, 2011).

Grounded theory methods provide a set of procedures for conducting rigorous qualitative research, which is a result of hard work and systematic approaches for structuring and organizing data-gathering and analysis. Though, their inductive nature assumes an open and flexible approach, resulting in empirical studies, whether data sources are case studies, participant observations, or secondary data (Charmaz, 1996). Additionally, grounded theory should be consistent with key assumptions about real-world problems based on how individuals interpret reality. The method is less appropriate when the intent is to built theory about an objective reality (Suddaby, 2006).

In the next section we describe the technics and procedures used throughout the research process, and discuss how we integrated the 'REDD+ Governance Theoretical Framework' from empirical data.

3. METHODS

The research process took about two years – from the design of the research project until its conclusion – and comprehended seven major phases: 1) Research design; 2) Data source and sampling; 3) Data collection; 4) Data analysis – research demonstration project; 5) Theoretical sampling; 6) Theoretical integration, and 7) Drawing and confirming conclusions. The procedures adopted in the research process are described with its respective outcomes, and some lessons learned.

3.1 RESEARCH DESIGN

The intent of the study was to understand the governance system of REDD+ in Brazil (Pinsky, 2017). At first, the method chosen for the study was the traditional case study (Yin, 2004) with multiple units of analysis, considering a cluster of experiments. As we start to collect data through in-depth interviews with few experts, we noted that preliminary results from ground data were too generic and participants could not explain the

phenomenon clearly. That was an indicator that the case study method and the research model with preconceived constructs were not a suitable approach for the phenomenon to be studied. We needed not only a suitable methodology that enable us to develop comprehensive explanations about an emerging research area, but procedures to analyze systematically the phenomenon and related behaviors from different angles.

Because of the preliminary results, and the lack of existing theories that would explain the phenomenon, the Glaser and Strauss (1967) grounded theory method was found suitable by taking a social constructionist approach to a contemporary real-world problem. Thus, Corbin and Strauss (2015) technics and procedures of doing analysis and working with data, which are centered on pragmatism as a philosophical worldview, were adopted in the research – based on the Strauss's method (1987).

As recommended by Corbin and Strauss (2015), a preliminary literature review was conducted in two fronts: governance in REDD+ and experimentalist governance. The literature on the governance system of REDD+ was found incipient, with some case studies in developing countries (see Fatorelli, Gebara, May, Zhang, and Gregorio, 2015; Korhonen-Kurki, 2017; Marcovitch and Pinsky, 2014), and few theoretical papers (see Corbera and Schroeder, 2011; Lederer, 2012). As the existing literature was insufficient, we search for other governance theories in the political science field – the experimentalist governance theory (see Sabel and Zeitlin, 2008).

These preliminary results from the field and the initial literature review supported the adjustments in the research problem, and refinement of the interview guide by reformulating some of the questions based on the elements of the experimentalist governance theory. The revised instrument was pilot-tested, and questions were adjusted after the beta test.

3.2 DATA SOURCE AND SAMPLING

A research protocol to select sampling was developed. The first list of participants was formed by policy makers and experts deeply involved in the policy making and implementation processes of REDD+ in Brazil. The snowball method (Biernacki & Waldorf, 1981) was used to determine further potential participants in the initial phase of data collection and analysis. Participants inclusion criteria was determined by their expertise, importance of the institution they represent, and high variation in data (different positions, perspectives, and interests). Semi-structured interviews were conducted in person or Skype.

Sampling was formed by 29 participants (one participant was interviewed twice in different times), including state actors (43%) from all the key federal Ministries involved with REDD+ (Environment, Foreign Relations, Agriculture and Finance) along with subnational governments (states of Acre and Mato Grosso), Brazilian Development Bank (BNDES), and the largest donor country (Norway). More than half the sample (57%) was formed by non-state actors, including international and national NGOs, community-based associations, and scholars.

Observation was another important source of data because it placed the researcher into the center of action to understand the phenomena. Through participatory and non-participatory observations was possible to identify similarities and differences, contradictions, and divergent positions within and between the two comparison groups (state and nonstate actors). Indeed, the combination of interview-observation-interview was important to validate the researcher's interpretations of the facts during the simultaneous data collection and analysis.

The observation technique was used to collect primary data in important events and technical meetings. Some of the important speeches during meetings and presentations were recorded and transcribed to facilitate analysis. Notes were taken during field observations, including UNFCCC meetings, technical forums, and working groups focused on REDD+.

3.3 DATA COLLECTION

We used multiple sources of data, including interviews, participant and non-participant observations, public speeches, documents, newspapers, and internet postings. Triangulation on data source seeks convergence and corroboration of empirical results, as well as a more trustworthy study (Greene, Caracelli, & Graham, 1989;

Johnson & Turner, 2003). Interviews and observations were the primary source of data. Primary data was collected and analyzed from September 2016 to January 2018.

In total, 30 interviews were conducted. Questions were revised and adjusted throughout data collection and analysis, as new information and concepts emerged from the data. Indeed, participants were invited to bring up any topic they though relevant, and the researcher could ask additional questions to further develop specific topics. This flexibility is needed for theory building (Corbin & Strauss, 2015). All of the interviews were recorded with the previous consent of the participants. Notes were taken during all interviews and used as evidence in the analysis. As per research protocol, confidentiality was assured with participants before the interview.

Previously collected empirical data was used as secondary data to reinforce and validate the findings, as recommended by Glaser and Strauss (1967). This secondary data refers to in-depth interviews conducted in 2013 with experts about the Amazon Fund governance (Marcovitch & Pinsky, 2014). Non-technical literature was reviewed to complement data gathering and analyses of interviews and observations, including, but not limited to reports, policy briefings, laws, decrees, minutes of meetings, newspaper and webpage articles. Indeed, social media postings from three highly influential experts were monitored on a daily basis.

3.4 DATA ANALYSIS – RESEARCH DEMONSTRATION PROJECT

Prior to describing the analytical tools and procedures adopted in this study, it is important to define some key terms to facilitate the understanding of the analysis process adopted in the study. Table 1 describes the operational definition of key terms related to the data analysis approach adopted in this study.

As required in grounded theory studies, data collection and analysis in this study occurred concomitantly through a general comparative method in which theoretical sampling guided the extent and depth of data collection (Corbin & Strauss, 2015; Glaser & Strauss, 1967).

Triangulation of data source was used, considering multiple viewpoints, perspectives, positions, and standpoints from qualitative data (Johnson, Onwuegbuzie, & Turner, 2007). Triangulation is the integration and comparison of the mixed methods approach, using data sources, technical analysis, and inferences in order to analyze the same phenomenon from a variety of perspectives in a new or deeper dimension to improve the validity of research findings (Jick, 1979; Mathison, 1988; Tashakkori & Teddlie, 2003).

Constant comparison was the technic used to analyze data, in which raw data (interview transcripts and field notes from observations) was broken into manageable pieces and compared for differences and similarities during the coding process. Primary data were constantly compared within and between the theoretical research groups – state and non state actors. Corbin and Strauss (2015) recommend the use of constant comparison to reduce data to concepts and differentiate one concept from another in terms of their properties and dimensions. Indeed, finding similarities and differences around concepts facilitated the integration of the theory.

Raw data was processed before starting the analysis (Miles, Huberman, & Saldaña, 2013). All audio recordings from the interviews and important speeches were literally transcribed into texts. The only exception was the interview conducted in group with the Amazon Fund team that could not be recorded due to the BNDES no recording policy. Instead, notes were taken during the interviews. Filed notes, interviews and speeches transcriptions were reviewed, and gaps in understanding were completed or revised.

Data was managed using Atlas.ti, a qualitative data analysis software program. The use of software to support the qualitative analysis improves the researcher's ability to be creative (Corbin & Strauss, 2015), and enables data encryption through coding rules and filters (Sampieri, Collado, & Lucio 2006). Processed transcripts and field notes files were uploaded into the Atlas.ti project, then classified and grouped according to document type. Interview and speech transcripts were separated according to the theoretical group they belonged to – state and nonstate actors. Secondary data was also grouped, including newspaper and webpage articles, and reports. These document groups were important for filtering purposes and to compare results from different groups.

Table 1: Operational Definition of Key Terms

TERM	DEFINITION
Coding	Attributing concepts to stand for meaning; codes are attributed to quotations
Quotation	Segments of data (interview or speech transcripts)
Concepts	Words used to stand for interpreted meaning
Open coding	Breaking data apart and delineating concepts to stand for interpreted meaning of raw data; concept identification and exploration
Axial coding	Categories are related to their subcategories, and the relationships tested against data; coding for concept development and elaboration
Categories	Higher-level concepts able to group a number of lower-level concepts, denoting the main themes of the research
Subcategory	Lower-level concepts that define and provide explanations of the categories; they provide the foundation of the theory. Once placed under a category, lower-level concepts become the properties and dimensions that specify and differentiate categories and variation within the categories
Properties	Characteristics or qualities of concepts that define, give specificity, and differentiate one concept from another
Dimensions	The range over which a property can vary; an important concept in grounded theory because it accounts for differences and brings density to the theory
Memos	Written records of analysis
Conceptual saturation	The process of acquiring sufficient data to fully develop each category or theme in terms of its properties and dimensions and to account for variation
Theoretical sampling	Data collection based on concepts that appear to be important to the evolving story line

Source: Adapted from Corbin and Strauss (2015, pp. 57, 106, 216, 239; Corbin and Strauss, 1990, p. 13).

The first cycle of analysis is open coding, which is a reflection on and interpretation of the meaning of the data, a method of discovery through data condensation (Corbin & Strauss, 1990, 2015). Initial data analysis started with the manual creation of quotations, which is a part of a document, like a sentence or paragraph that was important or interesting for the context of the study.

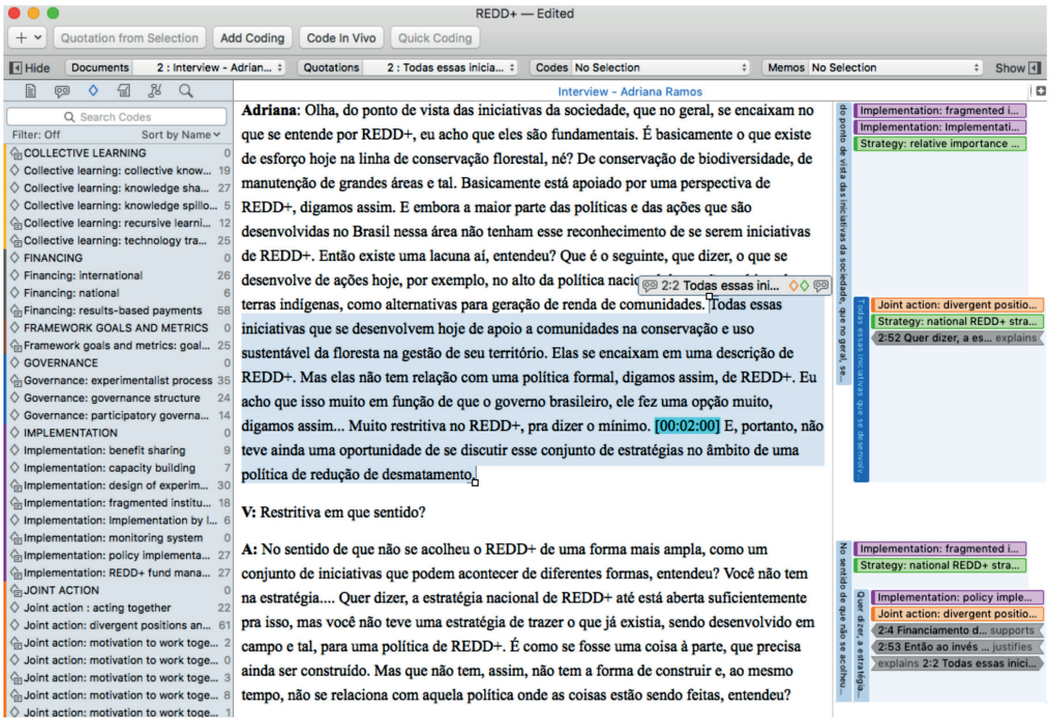
Open coding process, defined as "the interpretative process by which data is broken down analytically" (Corbin & Strauss, 1990, p. 12), was systematically conducted in each document. Codes were created concomitantly with the quotation process, and assigned to each quotation. Code is defined as a "label that assigns symbolic meanings to the descriptive or inferential information compiled during a study" (Miles et al., 2013, p. 71). Most of the quotations were given two or more different codes. This was done line-by-line coding of all transcripts throughout the analysis to extract meaning from the data. Empirical evidence was compared to find similarities and differences, and then coded with the conceptual labels.

A screenshot of Atlas.ti project is presented in Figure 1. The column on the left shows the partial list of codes. The text in the center is an interview transcript with quotations (such as the part of the text highlighted in light blue), and assigned codes on the left.

There are several coding approaches. For the purpose of this study two types of coding were used, including 'descriptive coding', in which labels were assigned to data to summarize in a word or a few words the meaning of the content, and 'in-vivo coding' in which the participant's own words were used to determine a code. The creation of codes was an inductive process as they emerged during data collection and analysis (Miles et al., 2013). Codes were not previously developed or proposed before the analysis of empirical data.

Although there are several versions of doing analysis in grounded theory, this study adopted

Figure 1: Demonstration of Quotations and Assigned Codes – Interview Transcript



Source: Atlas.ti project screenshot (2017, June 16).

the Corbin and Strauss approach that includes a set of techniques and procedures for theory building. Concepts are the basis of analysis, which are "names placed on data based on a researcher's interpretation of the meaning of data" (2015, p. 26).

Concepts were developed in terms of their properties and dimensions, and then integrated around a core category. They vary in levels of abstraction. Lower-level concepts derived from codes attributed to quotations (segments of data) from raw data during the open coding process. Higher-level concepts are called categories, which are more abstract and may group related lower-level concepts. While lower-level concepts provide the foundation of a theory, higher-level concepts are the structure of the theoretical framework (Corbin & Strauss, 2015).

The open coding process resulted in a set of 71 codes as listed in Table 2. This first cycle coding started on November 5, 2016, with the analysis of the first interviews. An inductive approach was used to create the codes based on grounded data. This first analysis was open and exploratory. Open coding was conducted line-by-line within interview and speech transcripts. Several new codes emerged from the analysis of the first transcripts.

Codes and concepts created at the beginning of the analysis are considered provisional as they were compared with further data, added, reused, discarded, or modified, depending on the interpretation of the new data (Corbin & Strauss, 2015).

In the case of this study, memos were written during the coding processes, including methodological notes (step-by-step of the data analysis process), a 'to do' list, questions and doubts to guide next data collection. Ideas and new interpretations that came up during data collection and analysis were written in analytical memos. Some of them resulted in the development of higher-level concepts (categories), and supported theory integration. Indeed, some quotes led to the search for secondary material to explain new elements that showed up during the interview. These additional materials were uploaded into the Atlas.ti project, coded, and linked to the respective quotation that required additional explanation.

Diagrams were hand drafted to facilitate think through the process focused on the development of the concepts and categories, including their properties, dimensions and types of relationships. Atlas.ti network assistant, Power Point, and Word were used to further development of diagrams as some of them became more dense and complex.

Table 2: Open Coding Process – First Cycle Coding

1	Additionality and innovation	37	Involvement - civil society
2	Advocacy	38	Involvement - private sector
3	Aid effectiveness	39	Jurisdictional REDD+
4	Amazon Fund	40	Knowledge sharing
5	Barriers	41	Knowledge transfer
6	Benefit sharing	42	Lack of transparency
7	Bottom-up approach	43	Mitigation potential
8	Broad network	44	Monitoring and assessment - civil society
9	Capacity building	45	Monitoring and assessment - donors
10	Cause and effect	46	Monitoring and assessment - linkage
11	Collective action	47	Monitoring and assessment - national level
12	Collective building of the REDD+ agenda	48	Monitoring and assessment - permanence
13	Collective learning	49	Motivation to work together - among donor counties
14	Country circumstances and capability		
15	Deforestation	50	Motivation to work together - among NGOs
16	Design of experiments	51	Motivation to work together - among recipients
17	Divergent positions and interests	52	Motivation to work together - donor and recipient
18	Diversity of actors	53	New proposals
19	Diversity of experiments	54	Nudging
20	Effective participation of different actors	55	One-size-fits-all
21	Exchange experience	56	Openness to discuss REDD+ strategy
22	Experimentalist process	57	Origin of the concept
23	Expertise	58	Outcomes
24	Financial mechanism	59	Participatory governance structure
25	Financing - international	60	Political Power Game
26	Financing- national	61	Political will
27	Forest governance	62	Private sector
28	Fragmented institutional environment	63	Problem
29	Framework goals and metrics - AF level	64	Readiness
30	Framework goals and metrics - international	65	Recursive learning process
31	Framework goals and metrics - national	66	Relative importance of REDD+
32	Fund management	67	Results-based finance
33	Governance - CONAREDD+	68	Safeguards and people's rights
34	Governance - ENREDD+	69	Shared responsibility
35	Implementation by lower levels	70	Stakeholder engagement
36	International cooperation	71	Top-down approach

Source: Extracted by the author from the Atlas.ti project (2017).

The first saturation point was reached when no new code was emerging from data in the analysis of six interviews and three speeches. From this point on, codes turned into concepts systematically elaborated through axial coding in which "categories are related to their subcategories, and the relationships tested against data" (Corbin & Strauss, 1990, p. 13). The axial

coding process took place in three steps. First, the resulting list of codes was extracted from Atlas.ti into an Excel file. Codes were sorted by their groundedness, which is the number of quotations linked to a code. The analysis on the frequency of codes showed the most cited ones.

Second, a process of merging and replacing codes was carried out. Codes with two or less linked quotations were individually revised according to their relevance. Some of them were eliminated due to the lack of groundedness and power of explanation. Others presented similar meanings with different names. Synonymous codes were merged into a target code. Similar codes were grouped into smaller units to generate concepts and categories by reducing the amount of data during analysis. Lower-level and higher-level concepts were constantly updated and revised throughout the study.

Various codes were eliminated during this process, including: Barriers; Broad network; Forest governance; Framework goals and metrics: AF level; Framework goals and metrics: international; Monitoring and assessment: civil society; Monitoring and assessment: donors; Monitoring and assessment: linkage; Monitoring and assessment: permanence; New proposals; Origin of the concept; Safeguards and people's rights. Linked quotations from these codes were analyzed individually: some were merged into a similar code, others were discarded.

This second cycle coding resulted in a condensed list of codes, as described in Table 3. Codes were reviewed, consolidated, or eliminated during the joint data gathering and analyzing processes.

The third phase of axial coding included the development of the research categories or constructs, based on the concepts that emerged from the data, by making use of code groups. Similar codes or concepts were grouped into a code family that was labeled with a conceptual name, the main theme.

In some cases the conceptual name was taken from an already-existing code such as collective learning'. In others, a new conceptual name was created, such as 'implementation'. These code groups became the main research categories created from the bottom-up (grounded data). Codes or concepts under a main category label became subcategories as they explain data variation to build their properties and dimensions.

After the refinement in the development of main categories and related subcategories, a procedure to recode the labels in the Atlas.ti project was made to reorder the sub-codes (sub-categories) under the main code (category) to facilitate further analysis using the software functionalities. Prefixes were added in the sub-code names to build a code hierarchy in the Atlas.ti project.

3.5 THEORETICAL SAMPLING

Theoretical sampling was a major technic used throughout data gathering and analysis. Data collection and analysis occurred concomitantly through a general comparative method in which theoretical sampling guided the extent and depth of data collection. This interactive cycle of data collection and analysis aims to generate concepts based on constant comparisons of different types and sources of data (high data variation).

From this point on, theoretical sampling guided the development of concepts and categories. Data collection was followed by analysis. Data analysis led to the development of concepts. Gaps in the explanations of the concepts guided additional data collection. This cycle only ended when the saturation point was reached with the main categories fully developed in terms of density and variation, and integrated into the theoretical framework.

Concepts and categories, including their properties and dimensions, were refined and integrated throughout the analysis, resulting in a set of seven categories, 28 subcategories, and 25 dimensions. The analysis in the Atlas.ti project comprehended 55 documents that resulted in 508 quotations, and 39 memos written.

3.6 THEORETICAL INTEGRATION

Theoretical integration is the final analysis in grounded theory, which consists of "linking categories around a central or core category to form a theory". A list of concepts and categories alone do not make a theory and must be linked and integrated into a theoretical framework with explanatory power around the core research category. The 'final theory' is constructed by the researcher

Table 3: Axial Coding Process – Second Cycle Coding

ORIGINAL CONCEPT	CHANGE	FINAL CONCEPT
Bottom-up approach	renamed to	Policy implementation
Governance - CONAREDD+	renamed to	Governance structure
Governance - ENREDD+	renamed to	National strategy
Monitoring and assessment: national level	renamed to	Monitoring system
Top-down approach	renamed to	Policy implementation
Additionally and innovation	merged into	Design of experiments
Aid effectiveness	merged into	Results-based finance
Amazon Fund	merged into	REDD+ fund management
Benefit sharing	merged into	Mechanism
Cause and effect	merged into	Design of experiments
Collective action	merged into	Acting together
Collective learning	merged into	Collective knowledge development
Country circumstances and capacity	merged into	National circumstances
Deforestation	merged into	National circumstances and deforestation
Diversity of experiment	merged into	Fragmented institutional environment
Exchange experience	merged into	Knowledge sharing
Expertise	merged into	Collective building of the REDD+ agenda
Financial mechanism	merged into	Results-based finance
International cooperation	merged into	Motivation to work together
Jurisdictional REDD+	merged into	Design of experiments
Knowledge transfer	merged into	Technology transfer
Lack of transparency	merged into	Political power game
Mitigation potential	merged into	Motivation to work together
Motivation to work together among donors	merged into	Motivation to work together
Motivation to work together among NGOs	merged into	Motivation to work together
Motivation to work together among recipients	merged into	Motivation to work together
Motivation to work together - donors and recipients	merged into	Motivation to work together
Nudging	merged into	Motivation to work together
Outcomes	merged into	International cooperation
Participation of different actors	merged into	Collective building of the REDD+ agenda
Political will	merged into	Openness to discuss REDD+
Private sector	merged into	Diversity of actors
Problem	merged into	Divergent positions and interests
Readiness	merged into	Capacity building
Shared responsibility	merged into	New proposals and benefit sharing

Source: Elaborated by the author (2017).

through the integration of categories that have emerged from empirical evidence.

The Corbin and Strauss (2015) paradigm model, an analytical tool to assist the organization of concepts, was used in this study to enrich analysis during the axial coding process, identification of relationships between categories, and theoretical integration. They point out that "the logic behind the paradigm is that analysts can use it to sort out and arrange concepts by asking questions and thinking in terms of possible linkages" (p. 157). The paradigm model includes three categories: conditions, actions-interactions, and consequences. Conditions are the perceived reason why, when and how something happens. Actions-interactions are the actual responses individuals or groups give to an event or problem based on actual

Table 4: Techniques Used to Aid Theoretical Integration

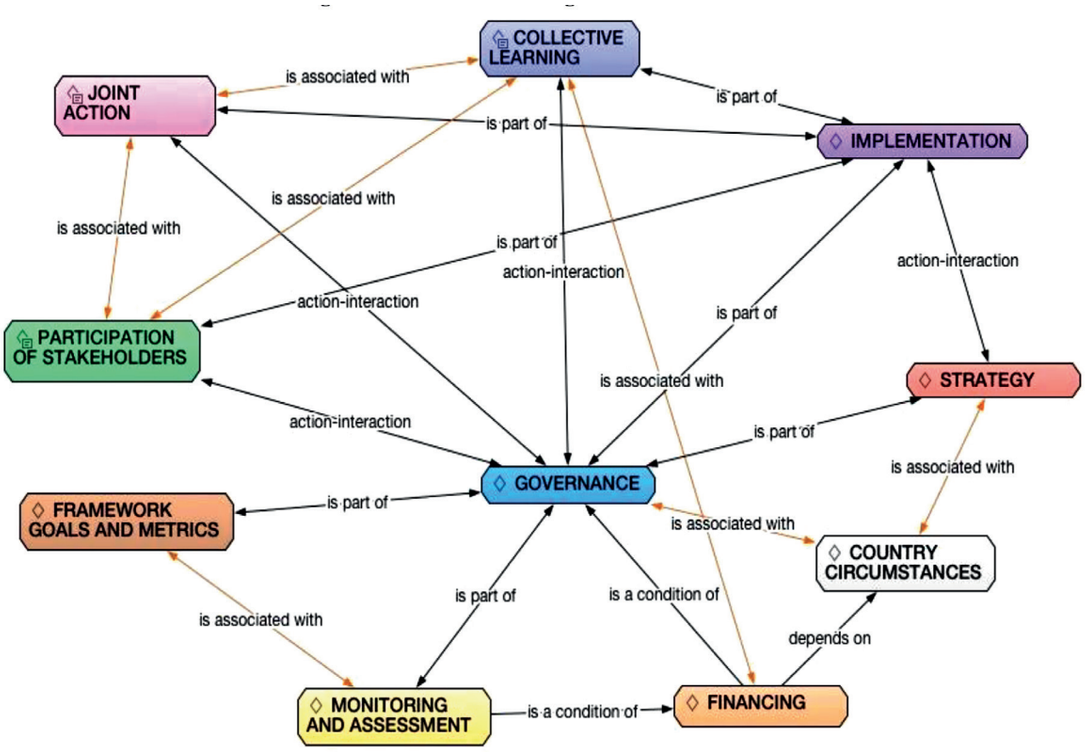
TECHNIQUE	ACTION
Descriptive memo	Descriptive summary memos were written about concepts that presented great explanatory power during data collection and analysis. The storytelling approach was used to write these memos.
Conceptual memo	Conceptual memos were written, such as summaries of research findings focused on the explanation of the relationship between concepts.
Integrative diagram	Integrative diagrams were made using the Atlas.ti network assistant and Power Point. It was an excellent tool for sorting out the relationships between categories. Several versions of diagrams were drafted concomitantly with writing the conceptual story.
Talking with professor	Several meetings with the PhD advisor were needed in this phase to integrate the theory. Successive revisions were essential to push the researcher to rearrange the categories, review the types of relationship that explained the action-interaction between categories, and refine the integration of the emerging theoretical framework.

Source: Elaborated by the author, based on techniques recommended by Corbin and Strauss (2015).

circumstances. Consequences are the expected or resulting outcomes of actions-interactions.

Research participants were asked to answer questions related to these three paradigm categories during the interviews. The paradigm classification was used to assist the theoretical integration of the core phenomenon and associated categories. Indeed, this tool was very useful to help the explanation of the resulting theory. Besides the paradigm tool, there are several analytical techniques

Figure 2: Theoretical Integration – First Draft



Source: Elaborated by the author using the Atlas.ti network assistant (2017, March 1).

to aid the integration of findings around the core category. This study combined the use of some other techniques proposed by Corbin and Strauss (2015) throughout the integration of the theory process, as summarized in Table 4.

Writing memos and making diagrams were key tools used during the analysis to facilitate the integration of concepts. Memos were very helpful to keep a record of partial analysis, thoughts, and questions throughout data collections and analysis. Nevertheless, the most powerful technique during theoretical integration was the use of integrative diagrams as they helped to organize or clarify think through the process about the logic of the relationships between categories and integrate the theory. While writing memos was simple and most of the time descriptive, making diagrams was complex and theoretical. Both techniques were helpful and very time consuming.

Figure 2 the first interactive diagrams used to integrate the categories, which is the preliminary diagram drafted in the initial phase of the theory integration process.

It is important to mention that using interactive diagrams to support the integration of the categories was very helpful. Making and revising diagrams forced the researcher to explain the different types of relationship among the categories. Indeed, the integration process showed the need to collect additional data to fill certain gaps in the explanation of the theory.

Describing the relationships that exist between categories is a critical step in research based on grounded theory methodology. As postulated by Sutton and Staw (1995), a list of constructs (known in this study as categories) is not a theory in itself. A theoretical argument of proposing frameworks explains the reasons why the phenomenon occurs. The web of relationships between categories that emerged from the data was analyzed in light of the paradigm model, considering conditions, actions-interactions, and consequences around the REDD+ governance, the core phenomenon of this study.

Theoretical integration occurred throughout the concurrent data collection and analysis processes. High variation in data considering different data collection techniques and participants with distinct perspectives and interests was critical to develop the theory. Some categories presented a higher level of saturation than others due to their groundedness and explanatory power. As recommended by Corbin and Strauss (2015), "poorly developed categories are saturated through further theoretical sampling" (p. 200). This is how the integration of the theory was conducted in a logical way, consistent with the data, resulting in a well-differentiated and connected set of categories that explain the phenomenon studied.

Governance emerged as the research core category. According to Corbin and Strauss, core category is "a concept that is sufficiently broad and abstract that summarizes in a few words the main ideas expressed in the study" (2015, p. 187). The following analysis explains the integration of the emerging theoretical framework through the relationships between categories, which are linked to the core category *Governance*.

Data analysis resulted in a conceptual framework formed by a core category, six major categories, and 28 subcategories, as listed in Table 5.

The integration of the seven major categories listed in the Table 5 was supported by the Atlas.ti network editor, resulting in the diagram presented in Figure 3. The diagram shows the set of categories discovered throughout data collection and analysis that explains the REDD+ Governance. In this phase, the relationships between the categories were identified to support the explanation of the theory. As can be seen in the diagram, REDD+ Governance is a complex process that involves seven categories (higher-level concepts that emerged from the data) that are related to each other in an interactive and non-linear process.

The core category Governance has direct and indirect relations with six other categories: Strategy, Financing, Participation of stakeholders, Joint action, Implementation, and Collective learning. The type of relation is represented by named links that connect source and target nodes between categories. Directed links start in a source node and end in a target node to which the arrows point. Nodes are used in networks to connect elements, and each category has a node. A source node represents the origin of the relation between two categories, the starting point of the arrow in a source category that points to a target category. Arrows represent the relations between categories by connecting source and target nodes.

Table 5: Research Categories and Related Subcategories

CATEGORIES	SUBCATEGORIES
1. Governance | Multi level institutions	1.1 Governance structure
	1.2 Participatory governance structure
	1.3 Experimentalist process
2. Strategy	2.1 Country circumstances
	2.2 Relative importance of REDD+
	2.3 One-size-does-not-fit-all approach
	2.4 National REDD+ Strategy
	2.5 Framework goals and metrics
3. Financing	3.1 Results-based payments
	3.2 International level
	3.3 National level
4. Participation of stakeholders	4.1 Diversity of actors
	4.2 Advocacy
	4.3 Collective building of the REDD+ agenda
	4.4 Openness to discuss the REDD+ strategy
5. Joint Action	5.1 Acting together
	5.2 Motivation to work together
	5.3 Divergent positions and interests
	5.4 Political power game
6. Implementation	6.1 Policy implementation
	6.2 Implementation by lower-levels
	6.3 Monitoring system
	6.4 Design of experiments
	6.5 Fund management
	6.6 Benefit sharing
	6.7 Capacity building
7. Collective learning	7.1 Collective knowledge development
	7.2 Recursive learning process

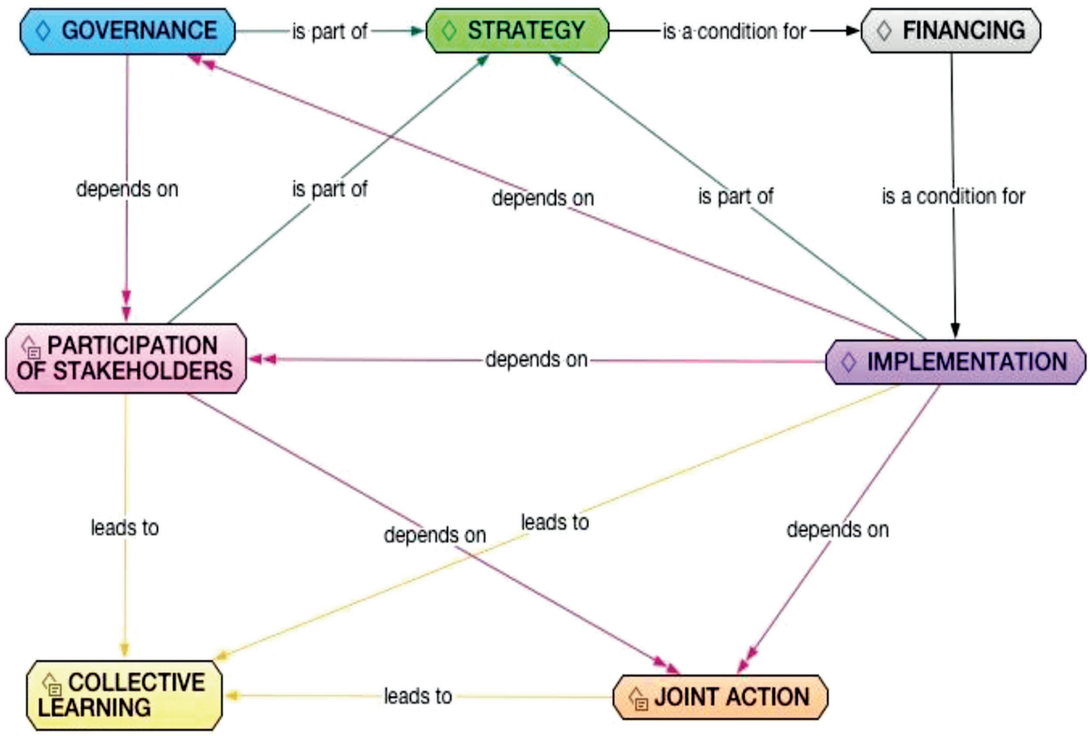
Source: Elaborated by the author (2017).

The relationships between categories, represented by arrows, were classified into four types: 'depends on', 'is a condition for', 'is part of', and 'leads to'. Understanding the relations between categories is critical to guide the development of a theory as the relationship links represent important aspects of the research problem. The types of relations used to link categories are important epistemological tools (Friese, 2013) and part of the methodology adopted in this study to integrate the theory and explain the phenomenon. Table 6 describes the types of relations between categories.

The arrows representing the relationships between categories were classified into two formal attributes, asymmetric and transitive, as presented in Table 7.

The use of these formal attributes was a method adopted by the researcher to facilitate the identification of possible relations between categories that were not evident in a specific phase of the categorical integration process. The use of the transitive

Figure 3: Integration of the Theory – Relationships Between Categories



Source: Elaborated by the author using the Atlas.ti network assistant (2017).

property supported the identification of links between categories that were connected through a dependency type of relationship ('depends on'), as a logical result of the relationships between three categories (AB, BC, CA).

The integration of the theory was based on thirteen direct relationships between the seven major categories. The types of relation between categories are further discussed in light of evidence from empirical data to sustain the explanation of the emerging theoretical framework. The occurrence of different types of relations between categories is summarized in Table 8.

The unit of analysis in grounded theory is the category (or construct) that emerges from the data. The resulting theoretical framework includes seven major units of analysis. Each category presented different types of relation and interaction with

Table 6: Types of Relation Between Categories

TYPE OF RELATION	DEFINITION
Depends on	A dependency relation means that the operationalization of a source category relies upon the existence of a target category. A category depends on another category through a transitive relation, as explained in Table XX. For example, the category *Governance* 'depends on' *Participation of stakeholders.*
Is a condition for	The source category is a condition for the target category in which the first gives the condition for the feasibility or operationalization of the second. A category is a condition for another category through an asymmetric relation, as explained in Table XX. For example, the category *Strategy* 'is a condition for' *Financing.*
Is part of	A source category is part of a target category when the first is a formal element of the second category. A category is part of another category through an asymmetric relation. For example, the category *Implementation* 'is part of' *Strategy.*
Leads to	In this type of relation, the source category may contribute within the development of the target category. A category leads to another category through an asymmetric relation. For example, the category *Joint* action 'leads to' *Collective learning.*

Source: Elaborated by the author (2017).

Table 7: Types of Formal Attributes Linking Categories

ATTRIBUTE	DEFINITION	TYPE OF ARROW
Asymmetric	Asymmetric relations were found whenever category A is related to category B but category B is not related to A. Types of asymmetric relations identified in the theoretical framework: 'is part of', is a condition for', and 'leads to'. For example, the category *Governance* (A) is part of *Strategy* (B).	An asymmetric relation is linked by an arrow pointing from the source category (A) to the target category (B). A → B
Transitive	Transitive relations were found whenever category A is related to category B and category B is related to category C; then category A is related to category C or vice-versa. Type of transitive relation identified in the theoretical framework: 'depends on'. For example, the category Implementation (A) depends on *Governance* (B); *Governance* (B) depends on *Participation of stakeholders* (C); *Implementation* (A) depends on *Participation of stakeholders* (C).	A transitive relation is linked by a double arrow pointing in the same direction from the source category (A) to the target category (B). A ⇉ B

Source: Elaborated by the author (2017).

other categories. Other papers discuss the results of this study (Pinsky, 2017; Pinsky, Krugliasnkas, & Victor, 2019).

3.7 DRAWING CONCLUSIONS

Certain analytical tools were used to generate meaning from data and confirm major findings. As per the basis of the grounded theory method, constant comparison and theoretical sampling were the major strategies used throughout the whole data gathering and analyzing process. Data collection and analysis occurred concomitantly. Comparisons were made within and between different groups. The development of concepts and categories guided data collection until conceptual saturation was perceived (Corbin & Strauss, 2015; Glaser & Strauss, 1967; Morse et al., 2002).

Sampling was considered appropriate as it involved a number of participants who have knowledge of the phenomenon studied and have been deeply involved in the REDD+ policy arena and implementation of important initiatives. Actually, all of the most important senior policy makers involved within REDD+ in Brazil were interviewed, as well some of the most important civil society representatives.

Table 8: Relationships Between Categories

#	SOURCE	RELATION	TARGET	FORMAL ATTRIBUTE
1	Financing	is a condition for	Implementation	asymmetric
2	Governance	depends on	Participation of stakeholders	transitive
3	Governance	is part of	Strategy	asymmetric
4	Implementation	depends on	Governance	transitive
5	Implementation	depends on	Joint action	transitive
6	Implementation	depends on	Participation of stakeholders	transitive
7	Implementation	leads to	Collective learning	asymmetric
8	Implementation	is part of	Strategy	asymmetric
9	Joint action	leads to	Collective learning	asymmetric
10	Participation of stakeholders	depends on	Joint action	transitive
11	Participation of stakeholders	leads to	Collective learning	asymmetric
12	Participation of stakeholders	is part of	Strategy	asymmetric
13	Strategy	is a condition for	Financing	asymmetric

Source: Elaborated by the author (2017).

Triangulation of data was used to enhance the analysis and confirm findings. The analysis and the resulting theory were reviewed several times to check gaps, internal consistency, and logic. During reviews, some subcategories were found to be poorly developed. In these cases, memos and quotations linked to the concepts were reviewed to fill up the gaps in terms of their properties and dimensions.

Although some categories were more developed than others in terms of their dimensions, the theoretical framework that emerged from data was built with considerable variation and by using a relevant sample. Theoretical saturation of the main categories was reached with sufficient variation to develop their properties. The emerging framework was compared to the experimentalist governance theory.

4. THE 'REDD+ GOVERNANCE THEORETICAL FRAMEWORK'

REDD+ is a large scale governance experiment in climate finance. Brazil is the largest recipient country and the Amazon Fund is the most important REDD+ experiment in the world. The purpose of the study was to understand the governance system of REDD+ in Brazil. Using grounded theory methodology, the 'REDD+ Governance Theoretical Framework', a substantive theory that explains the phenomenon as a continuous and non-linear experimental governance process, emerged from the data.

The emerging substantive theory, which is applied to the governance process of REDD+ in Brazil, was elaborated from concepts that emerged from the data based on the perception of research participants and observations. Thirty in-depth interviews were conducted with important state and nonstate actors, knowledgeable people deeply involved in the REDD+ policy arena with different interests, views, and professional backgrounds. The transcripts of the interviews, participatory and non-participatory observations, and field notes were used as primary data. Transcripts were coded with the support of Atlas.ti (qualitative data analysis software). The paradigm model, in which data collection and analysis were conducted through the lens of conditions, human actions-interactions, and consequences in order to explain the phenomenon, was applied throughout the study.

The extensive qualitative analysis resulted in concepts that were consolidated into seven high-level categories and 28 related subcategories. The theoretical framework was drafted from grounded data collected and systematically analyzed using constant comparison and theoretical sampling technics. The main categories are well differentiated, sufficiently developed in terms of their properties and dimensions, presenting consistency and groundedness. The theoretical framework was integrated in a logical and consistent manner through the explanation of the relationships between categories, based on the perception of policy makers and civil society participants, with rigorous data collection and analysis technics.

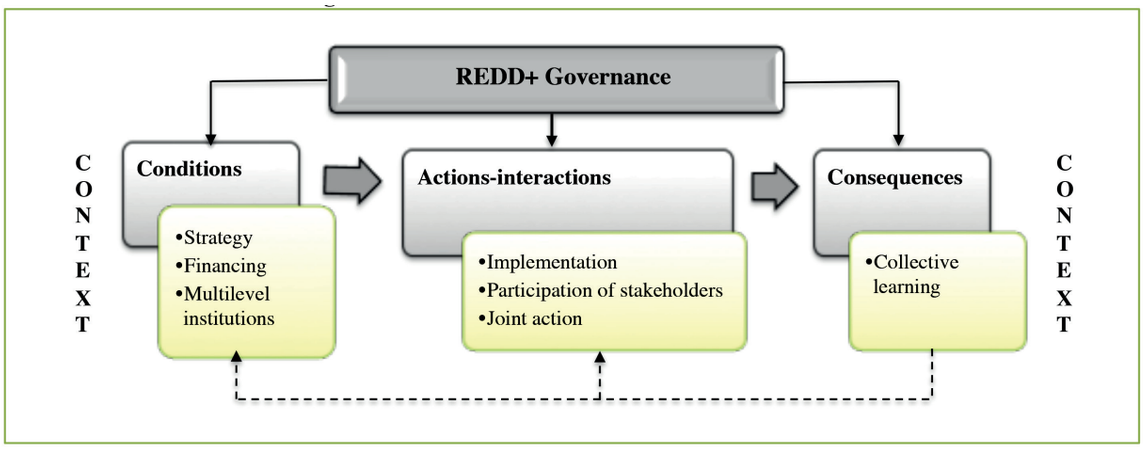
The narrative of the theory explains the REDD+ governance process, in the move from description to explanation, formed by seven major categories: Governance, Strategy, Financing, Implementation, Participation of stakeholders, Joint action, and Collective learning (see Figure 4).

The context of the phenomenon, which is related to country circumstances, influences the dynamics of the governance process. REDD+ governance is an ongoing managerial process that includes a web of conditions and consequences that result from actions-interaction between actors and groups at different levels.

Strategy, *Financing* and *Multilevel institutions* are the conditions to implement REDD+. Recipient countries are required to establish a REDD+ strategy or action plan as one of the UNFCCC's requirements for a developing country to be eligible to access results-based payments under the regime. The availability of financial resources, in addition to the business as usual national budget, is also a condition for a developing country to implement REDD+ activities. The process requires actions-interactions between actors and groups during policy making and *Implementation* processes through the *Participation of stakeholders* and *Joint actions*. *Collective learning* is the outcome or expected result from these actions-interactions, which is a consequence of the *Governance* process. Indeed, *Collective learning* is supposed to be the output in the feedback system.

In this conclusion an important research finding related to the *Collective learning* category should be discussed as it is a central element in the theoretical framework. This study suggests that *Collective learning* is related to the effectiveness of the *Governance* process in REDD+. *Collective*

Figure 4: REDD+ Governance Theoretical Framework



Source: Elaborated by the author (2017).

learning was integrated into the theoretical framework as a passive category because it did not initiate any type of relationship with other related categories. However, the *Implementation*, *Joint action*, and *Participation of stakeholders* categories lead to *Collective learning* through a direct relationship, which suggests that *Collective learning* is a result or a consequence of actions-interactions between actors and groups in REDD+.

The theory suggests that *Collective learning* should be an outcome of the *Governance* process, in which the collective knowledge developed from the lessons learned during implementation could feed a recursive learning system aiming at improving the policy making and implementation processes through a learning-by-doing approach. Indeed, *Collective learning* can create opportunities to improve the policy cycle. However, research findings indicate that the lack of institutional arrangements to stimulate *Collective learning* and incorporate lessons learned from ground experience into the process has been a constraint on improving the REDD+ *Governance* in Brazil. This major finding was discussed in light of the experimentalist governance theory from the political science field in previous works.

5. FINAL REMARKS

The intent of this paper was to discuss the use of the grounded theory method in a emergent research field that combines governance and climate change. To do that, substantive results of an exemplar theoretical framework that explain the governance process of REDD+ in Brazil, an UNFCCC climate finance mechanism focused on mitigating forest-related emissions in developing countries, was presented. Instead of discuss best procedures and techniques to build grounded theory, which are largely accessed through several peer-reviewed publications, this paper focused on providing a practical guide and discuss lessons learned from the field to integrate the 'REDD+ Governance Theoretical Framework'.

For some scholars, theory building is classified into three different levels: substantive, middle range, and formal. A substantive theory, which is the case presented in this paper, emerges from research in a specific situation and does not aim to explain other phenomenon for which there are no data. A middle-range theory is developed when a study uses a broader concept, originally developed in another study, to be applied in a different situation to increase the abstraction of a core category. Formal theory derives from middle-range theory by adding more concepts with an even higher level of abstraction and can be generalized by explaining different situations with broader applicability (Glaser & Strauss, 1967; Corbin & Strauss, 2015; Goulding, 2002).

The theory that emerged in this study is substantive and applied to the REDD+ governance process in Brazil. However, we argue that the proposed theoretical framework could be tested in any REDD+ recipient countries, and results could validate (or not) the applicability of the emerging theory to other cases. In that sense, evidences could guide the implementation of national strategies and governance systems in REDD+ in other developing countries. Indeed, the proposed theoretical framework suggests important practical applications for teaching, policy, and practice as the theory emerged from grounded data to explain a real-world problem.

This theory adds to the limited body of literature in the field by extending the knowledge on REDD+ and climate finance. The theoretical framework stimulates discussion and creates opportunities for further research on different topics and policy domains for theoretical advances.

5.1 PRACTICAL IMPLICATIONS

The study identified constraints, challenges, and opportunities for REDD+ in Brazil. Practitioners can benefit from the theory as it explains a real-world problem from the perspective of policy makers at the national and subnational levels and civil society representatives deeply involved in the REDD+ policy arena. Indeed, anyone interested in the forest and climate policy can benefit from having different viewpoints and perspectives on the REDD+ governance process in Brazil.

Performance-based approach in climate finance is an innovation as REDD+ is considered an experimental breakthrough mechanism in international cooperation on climate change. Brazil is the first developing country in the world to be eligible to access results-based payments in REDD+ under the UNFCCC regime by complying with all major requirements. This study can stimulate the international debate based on the principles of good governance in official development assistance (ODA), especially related to aid effectiveness in developing countries. ODA is the traditional modality for North-South cooperation in which donor countries usually participate in the development of the initiative and have some control over implementation.

Indeed, lessons learned from the governance process to implement the innovative results-based payments approach are important for the long-term discussion facilitated by the World Bank on good governance, in which donors want to improve the effectiveness of aid in developing countries in different policy domains, including, but not limited to, the environment, education, and public health. The REDD+ Theoretical Framework can be tested and applied in an interdisciplinary way. This study can also be helpful for policy makers that are working on the operationalization of the Green Climate Fund (GCF), the main UNFCCC financial mechanism to support mitigation and adaptation initiatives in developing countries. As the GCF aims to fund scalable and transformational programs, this study provides an opportunity for experts and policy makers to learn about the challenges and constraints faced by a developing country to implement a performance-based mechanism focused on mitigation results.

5.2 ACADEMIC IMPLICATIONS AND FURTHER RESEARCH

Grounded theory is a method frequently used in the research fields of Sociology, Psychology and Nursing. Although the theory was created by Glaser and Strauss in 1967, its use in qualitative research is still incipient in applied social sciences. In some cases, researchers do not use the method comprehensively, employing only certain elements and technics to support data analysis because the method is complex, time-consuming, and centered on the researcher. Indeed, the lack of consensus among grounded theorists on conceptual differences and analysis technics, without a greater concern for the actual application of the method, has not helped to include grounded theory in the universe of practical application (Ikeda & Bianchi, 2009).

Grounded theory method has seldom been used in the field of climate change. This study can be used to teach qualitative analysis and grounded theory methodology as a case of practical application in social sciences. Indeed, the theory can be applied in an interdisciplinary way to teach about different substantive areas such as management, sustainability, climate governance, environmental management, government relations, international relations, global policies, among others.

It is important to mention that the substantive theory developed in this study is at an initial phase, results are exploratory, and therefore further studies are needed to strengthen and refine the 'REDD+ Governance Theoretical Framework'. This study came up with new concepts and ideas to explain the emerging REDD+ governance process and not just provide empirical data to test an existing theory. Although this theory is substantive and applied only to REDD+ governance in Brazil, the theoretical framework may be applied and tested in other similar cases, including developing countries that are implementing REDD+ activities, or in any other case related to the implementation of performance-based mechanisms in climate finance. Additionally, the theory may be tested in other areas of ODA such as health and human rights, in which the performance-based

approach has been used within international cooperation agreements.

Similarities and differences found in these tests will enhance the development of the theory to another level of abstraction. Qualitative studies can improve and refine the development of the categories in terms of their properties and dimensions. In this case, the use of grounded theory methodology would be recommended to reinforce the consistency of the refinement of the theory. Quantitative studies can use the theoretical framework to guide research design, validate or test the variables (categories, subcategories categories and their dimensions), as well as criticize or corroborate research findings. Additionally, parts of the theory could be tested instead of applying the complete conceptual framework to enhance the theory in other illustrative cases. While this study was framed in governance and climate finance, it would be interesting to test and expand the resulting theoretical framework to other policy domains.

Indeed, collecting additional data from different actors aiming at more varied type of data is recommended to validate the theory as this study considered only two comparison groups, policy makers and civil society representatives, due to limitation of time and resources. Further studies should include other comparison groups such as indigenous peoples, traditional communities, small landholders, the private sector, and donors.

Based on the lack of theories focusing on REDD+ and performance-based mechanisms, the need for additional research is important to further discussions on the operationalization of the GCF in light of the commitments assumed by developed countries in the Paris Agreement to assure an annual financial flow of USD 100 billion (starting in 2020) for mitigation and adaptation initiatives in developing countries.

Empirical evidence indicates some of the REDD+ experiments or initiatives that are based on the experimentalist approach at different levels. Although this study did not intend to investigate the implementation of REDD+ in programs or projects, understanding how these experiments were designed and implemented by different actors is important in order to understand the emergence of the experimentalist process. Some other suggestions for future studies in REDD+ are listed below:

- analyze the effectiveness of the mix of top-down and bottom-up strategies used in REDD+;
- investigate why actors with divergent positions and interests decide to work together in REDD+;
- understand whether consensus is the most appropriate approach in rule making and deliberations, considering the involvement of several actors with different ideologies and views in REDD+;
- investigate how and to what extent the Brazilian national government is incorporating lessons learned from lower-level entities when the national strategy becomes fully operational;
- analyze the REDD+ spillover effect in different sectors in Brazil and other developing countries.

5.3 Research limits

Grounded theory is not perfect but is a proven qualitative research method that has been used for over 40 years around the world. As it requires sensitivity, creativity and hard work to conduct a research project, grounded theory challenges researchers to be bold; however, the method is complex and time-consuming. Decisions made by researchers, especially during data collection and analysis, are not free from bias and prior assumptions – as in any other qualitative study. Values, perspectives, professional background, and previous knowledge on the literature related to the research topic are among the factors that may influence the research and which cannot be completely eliminated (Corbin & Strauss, 2015).

Certain limits are assumed in this study due to limitation of time and resources. The first research limit is related to the saturation of the categories. Some concepts that became categories and subcategories presented more groundedness, density and variation than others in terms of their properties and dimensions. Limitation of time prevented extending data collection and analysis, as required in theoretical sampling, until categories reach saturation. In fact, limitation of time was decisive in order to stop data gathering.

Another research limit is related to variation in data. Despite the diversity of participants and the criteria used to select sampling, only two comparison groups were considered. A deep analysis was conducted within and between these two theoretical groups. However, the inclusion of other groups of stakeholders with multiples perspectives would have enriched the analysis by increasing variation and groundedness.

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