

Elements Of Public Action And Governance In Capture, Stocking And Carbon Transportation Activities

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ABSTRACT: *The present article intends to analyze and discuss the governance of the Carbon Capture and Storage (CCS) technique within the Brazilian bureaucracy. The role of the Brazilian State in Public Action and Governance is also discussed, as well as the publication of Law 12,187, of December 29, 2009, which establishes the National Policy on Climate Change (MMA, 2018). In order to understand the articulation of social, political and legal rules and procedures related to the CCS activities in Brazil, it is necessary to detect overlaps, gaps and develop advances with a view to implementing a normative framework in addition to knowing, giving visibility and analyzing the actors involved in the different instances related to them and discussing their legitimacy. The present article serves as a literature that deals theoretically with the production of the cognitive of frameworks that give meaning to the actions in CCS as a mitigating element of climatic changes, aiming to describe its structures of action, rules, routines, procedures and the mobilization of social actors involved and their dynamic exchange.*

KEY WORDS: *CO2 capture and storage, Public Action and Environment: Mitigation of Climate Change.*

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I. INTRODUCTION

In the 1990s, the implementation of the United Nations Framework Convention on Climate Change (1992), the creation of the Kyoto Protocol (1997) and the Paris Agreement (2015) provided a new perspective for the future of international climate policy, with the purpose of reducing CO₂ emissions, reversing the accumulation of CO₂ in the atmosphere over the centuries, mainly by the use of fossil fuels.

According to Macedo (2017, p. 33), the issue of global climate change has become a problem of global collective action since the 1990s, in view of the human capacity to influence in the climate system, because of its scale and its scope. According to the author, since then, relationship between science and politics has become increasingly complex and explicit this scope.

The Intergovernmental Panel on Climate Change (IPCC) established in 1988 by the World Meteorological Organization (WMO), issued a report in 2015 outlining risk aspects of climate change and the urgent need to ensure that the global average temperature for the 21st century does not exceed 2°C, remaining within a "carbon budget" estimated at 200GtCO₂e (IPCC, 2015; Macedo, 2017).

Brazil ratified in 2016, through the National Congress, a basic document to define the strategy for implementing the country's commitments from 2020, according to the NDC (Nationally Determined Contribution) (Macedo, 2017; MMA, 2018). Other forms of climate change mitigation to be implemented by the country, which expects to reduce greenhouse gas emissions by 37% below 2005 levels by 2025 with a subsequent indicative contribution of reducing greenhouse gas emissions in 43% below 2005 levels by 2030. To this end, the country committed itself to increasing the share of sustainable bioenergy in its energy matrix to approximately 18% by 2030, restoring and reforesting 12 million hectares of forests, as well as achieving an estimated 45% share of renewable energy in the composition of the energy matrix in 2030 (MMA, 2018a). According to the IEA (2016), currently, energy generation is one of the main carbon emitting sources in Brazil, accounting for 43.6% of the CO₂ emitted by stationary sources, which shows the intensification of new approaches, discussions, technological development and incentives for CO₂ capture and storage.

Carbon Capture and Storage (CCS) has gained prominence for the permanent storage capacity of high volumes of CO₂, in appropriate geological formations (Almeida et al., 2017, p.2) as one of the main alternatives for reducing CO₂ emissions. The authors point out that the technique consists of injecting compressed CO₂ (in the supercritical state) into rocks, such as sandstones, willows, dolomites, basalts or charcoal. In order to become CO₂ reservoirs, in addition to maintaining adequate porosity and permeability, these rocks must present a satisfactory seal and a stable geological environment in order to avoid compromising the integrity of the storage site (Almeida et al., 2017, p. 2.).

For the authors, in the Brazilian scenario, CCS technology may represent a strategic alternative for CO₂ reduction, especially for the energy sector, and, nevertheless, observe that knowledge about this

technology is still little consolidated between the country, as well as the respective regulation of this activity (Almeida et al., 2017, p.2).

Thus, while the role of the Brazilian State in Public Action, with emphasis on the publication of Law 12,187, of December 29, 2009, which establishes the National Policy on Climate Change - PNMC (MMA, 2018), this article intends to analyze and discuss the governance of the Carbon Capture and Storage technique within the Brazilian bureaucratic apparatus.

II. PUBLIC ACTION AND ENVIRONMENTAL GOVERNANCE: THE CCS ISSUE

Public Action has as a starting point what Lascoumes and Le Galès (2012) consider, government actions, alone or in conjunction with private actors who try to respond to situations perceived as "problem", translating into collective action that contributes to the creation of social and political management of society in the regulation of tensions, but also the integration of groups and resolution of conflicts.

In an empirical study, Musarra (2016) obtained results that supported by the revelation of Lascoumes (2012) on environmental issues, that they escape the traditional administrative territorial divisions and that the relationship between the social actors and between the actors and the resources emerge challenges that require answers capable of articulating different interests and perspectives on territories / natural resources subject to political, technical and economic interventions, in permanent construction based on local actions.

The concept of "environmentalization", based on José Sérgio Leite Lopes (2016), integrates the internalization of the different faces of public issues about the environment, noted from the transformations in the form and language of social conflicts in their partial institutionalization, implying changes in the state and in the behavior of people. Following the perspective of Lopes (2016), Pierre Teisserenc (2010), refers to the two processes (territorialization and environmentalization) as often imbricated by influences that impose limitations such as the need for certain territories to benefit from specific resources through the operationalization of a project of territory attentive to the demands of the sustainable development, to interventions of the State.

Emphasizing the use of Sociology of Public Action (Patrick Le Galès and Pierre Lascoumes) and the Sociology of Public Action and Environment (Pierre Lascoumes) approach, more specifically for the understanding of Carbon and Capture Storage activities as components that seek to respond to the demands of the "environmentalization", in view of its potential effect of mitigating climate change and acidification of the oceans. The relevance of the research lies in the importance given globally to the effects of the emission of anthropogenic CO₂ in the environment.

The understanding of environmental degradation as a social process led Mauro Leonel (1998) to assert that ecological facts would be inseparable from social facts, and would ultimately be sociological facts. The author states that there is no natural force imposed on a human group outside the framework of economic, political and symbolic systems, and since it is proper for the social sciences to understand and explain the processes that generate particular configurations in a particular social space, with the relationship between different uses of natural resources, including the uses that cause disruptions among man, societies and their nature (LEONEL, 1998).

For Cajka (2001) man is not only a member of an ecosystem, but a special member that has conditions to guide the capacity of the ecosystem, becoming a social being that constantly acts and transforms nature.

According to Lascoumes (2012), in the second half of the nineteenth century, at least in the European context, public intervention domains proliferated and the type of actors mobilized diversified, and, since 1970, the field of environmental protection provided a ground of change of the role of the State and its modes of action, often having decisions in contexts of uncertainty. Thus, environmental themes, as well as social protection issues, have led to questioning the political choices made since the 1950s. As a result, forms of environmental regulation have multiplied, with law being a preferred tool, increasingly complemented by fiscal instruments, economic and participatory. The means used to frame and mobilize civil society (companies, NGOs and increasingly citizens) have increased and, given this complexity, it is often difficult to grasp the coherence of public action tools (Lascoumes, 2012).

According to Lascoumes (2012), public action can be analyzed from five interconnected variables: I) actors, who are individual or collective beings, endowed with interests and resources, who have some autonomy to develop strategies and have the capacity to do choices that are more or less guided by their material and / or symbolic interests; II) representations, which are the cognitive and normative frameworks that give meaning to actions, but also reflect condition, describe the issues and connect them with values and symbols; III) institutions, which are structures of action, that is, norms, rules, routines, procedures; IV) processes, which are the combination of the first three variables, the mobilization of agents and their dynamic exchange, and that change over time; and V) results, which would be the effects on the organizations and the behaviors (exits), or the impact on the problem that one would like to deal with.

It is in this context that governance arises while the exercise of government power activity, within its legitimate actions and the implementation of its public agendas, according to Gonçalves (2007, p.14):

"governance is not isolated action of society seeking greater spaces of participation and influence. On the contrary, the concept comprises the joint action of the State and society in the search for solutions and results for common problems. But it is undeniable that the emergence of non-state actors is central to the development of the idea and practice of governance. "

Still, Gonçalves (2007: 14): "For Law, governance has to do with the growing presence of these actors in the political and social scene. It is about establishing rules and norms for their participation, although not with strict institutional formalization. It is a matter of recognizing, in the field of international law, the growing presence of these actors in the discussion and formulation of treaties, conventions and resolutions, as well as in their effective implementation. "

Clear is the urgency of Brazil to see the context that aims at understanding strategies to mitigate climate change, its uses and impacts on society and the environment, which are fundamental elements for the achievement of environmental justice, a great propeller of international debates. Thus, from the variables actors, representations, institutions, processes and results, the following item proposes to describe how the same is posed in relation to the CCS activities.

III. BRAZILIAN LAW AND GOVERNANCE FOR CCS

It is important to highlight the formal management of the resources involved in the CCS activities, the limitations placed on the implementation of the public action and the participation of individual or collective non-formal actors in the processes, results will be primordial aspects of the observations, as well as the comparison of the Public Action and Governance focused on CCS in countries where its implementation is more advanced.

The starting point will be the Sociology of Public Action, which aims to understand the articulation of social and political norms, conflicts and political activities, issues of legitimacy of actors (mainly state, government and government officials to play a significant role) takes into account the actors and institutions, norms and procedures that govern all these interactions, as well as collective performances (Lascoumes, 2012).

In this sense, Marcelo Sampaio Carneiro (2012) approaches "governance" as a form of polycentric coordination, associating, in variable geometry, actors from the State, private initiative and civil society. Supported by Le Galès (1998), Sampaio (2012) points out in governance the attempt to construct government policies in a context in which the State no longer holds the primacy of public action, or even (points out the author based on Borraz, 2004) that in a context in which the State no longer has the capacity and resources needed to operationalize its actions vertically. For Sampaio (2012), an efficient form of governance in the case of the exploitation of natural resources would be able to face the challenges posed by environmental problems.

In the case of governance, we can often perceive discrepancies between recommendations and policy decisions, such discrepancies are explained by the importance of lobbying by various interest groups and political and economic commitments of government action (Lascoumes, 2012).

The present research aims to avoid the profile of environmental regimes of Brazil pointed out by José Eli da Veiga (2014), which is that they continue to overlap and growing difficulties of understanding about the ways that could give some efficiency to the big conventions accentuated situations of impasse. Around the world, however, there are cases studies that have demonstrated that populations can organize and monitor resource use by their members, allocate user rights among members, and adjust aggregate utilization levels to maintain sustainable resource use (Feeny et al. al, 2001).

CO₂ capture consists of the separation of CO₂ from other gaseous effluents, compression for volume reduction and fluid accommodation. The capture takes place at specific points of generation and emission, such as thermoelectric plants or cement manufacturing industries, and different methods can be applied, with emphasis on absorption, adsorption, membrane separation and cryogenic separation (IEA, 2009).

For transportation, CO₂ is compressed through pipelines, by ship or by truck, from the production unit to the storage location (International Energy Agency - IEA, 2009).

CO₂ storage can occur through different technologies, and can be grouped into two categories: biological fixation (biotic sequestration) and geological storage (abiotic sequestration) (International Energy Agency -IEA, 2009).

From the normative point of view, it should be noted that Brazilian Law 9,478/97 itself has the objective of protecting the environment and promoting energy conservation; as well as proposes that measures be taken to mitigate emissions of greenhouse gases and pollutants in the energy and transport sectors.

Law 9478/97 and its articles present the scope of the topic in Brazil still to be discussed and examined, demonstrating that since its inception the National Energy Policy has been connected to strategic topics such as CO₂ Capture and Storage. Also worthy of note is the edition of Law 12,187, of December 29, 2009, which establishes the National Policy on Climate Change - PNMC (MMA, 2018).

It is important to understand the relevance of Law 12,187 in the historical context of the government of former President Luís Inácio Lula da Silva, when Brazil undertakes commitments under the United Nations

Framework Convention on Climate Change, the Kyoto Protocol and of the other documents on climate change that the country will become a signatory.

Thus, in art. 5: “the promotion and development of scientific and technological research, and the diffusion of technologies, processes and practices aimed at: a) mitigating climate change through reduction of anthropogenic emissions by sources and strengthening of anthropogenic removals by sinks of greenhouse gases.”

The National Policy on Climate Change (PNMC) is governed by the Interministerial Committee on Climate Change (CIM), which guides and elaborates the implementation, monitoring and evaluation of the National Plan on Climate Change, established by Presidential Decree 6,263 / 2007 (MMA, 2018b). The Decree also established, within the framework of the CIM, the Executive Group (GEx), with the purpose of elaborating, implementing, monitoring and evaluating the National Plan on Climate Change. (MMA, 2018b).

The National Policy on Climate Change establishes in its art. 7th the institutional instruments listed below:

- Interministerial Committee on Climate Change;
- Interministerial Commission on Global Climate Change;
- Brazilian Forum on Climate Change;
- Brazilian Research Network on Global Climate Change-Climate Network;
- Commission for the Coordination of Meteorological, Climatology and Hydrology Activities (MMA, 2018b).

It is observed from the examination of these standards and considering the current commitments assumed by the country in the context of the 2016 and 2017 (MMA, 2018b) Conferences of Parties that the maintenance and growth of fossil fuel consumption becomes viable through the adoption of mitigation measures, such as CCS technology. Therefore, it is recommended that the spheres of government that are competent to specifically regulate CCS activities in Brazil should act.

IV. THE REGULATION OF CO₂ CAPTURE AND STORAGE IN BRAZIL

Based on existing regulations in other countries and analyzing national legislation on institutional and socio environmental aspects, the implementation and environmental licensing of CO₂ storage in salt caves should be based on a consistent structure to enable CCS activities in Brazil. In addition, it is necessary to develop legal scenarios to ensure the safe and effective implementation of CCS, considering the role of relevant regulatory authorities, the main environmental licensing requirements, definition of CO₂ ownership and the allocation of long-term liabilities (Costa et al., 2018a).

There are global / regional environmental treaties that may have implications for offshore geological storage of CO₂, especially agreements on climate change and the marine environment, which are particularly important in cases where the project involves international waters. Among the main international treaties are the London Protocol (1996), the Convention for the Protection of the Marine Environment - OSPAR (1974), the United Nations Convention on the Law of the Sea - UNCLOS (1982) and the United Nations Framework Convention on Climate Change (UNFCCC) (1992).

As legal experience in some countries, Australia was quick to recognize and promote the potential benefits of CCS, including the design and promulgation of national and Commonwealth legal and regulatory models (Havercroft and Macrory, 2014). In 2009, the European Union (EU) established a directive on the geological storage of CO₂ (EU Directive 2009/29 / EC), further establishing a series of regulations / directives associated with climate change, for example, Directive 2003/87 on the establishment of a scheme for greenhouse gas emission allowance trading (GHG) in the Community.

UK has set the long-term offshore CO₂ storage requirements in the Energy Act (2008) adopted in 2010 by Parliament, while Norway attaches great importance to carbon capture and storage (CCS), ratified, in 2015, an amendment relating to the export of CO₂.

In the United States, the US Environmental Protection Agency (EPA) has established federal requirements for operators geologically storing / sequestering CO₂, creating, for the new category of CO₂ injection in geological formations, a legal and regulatory framework for permits, characterization of the site, financial responsibility etc. It should be noted that, in the American context, the Safe Drinking Water Act (SDWA) states that the operator of the CO₂ storage facility (CCS) must prove that it does not pose any risk to drinking water, in addition to various regulatory requirements.

In Canada, jurisdiction is shared responsibility, while ownership and regulation of natural resources are the responsibility of the provincials. The province of Alberta has been particularly active in recent years, implementing several legislation and recently (2013) completing the review / review of the regulatory framework for existing regulations (Havercroft and Macrory, 2014).

In Brazil, Romeiro-Conturbia (2014) pointed out that it is necessary to build rules on CCS activities, as well as define the competencies of the respective governmental authorities, in order to develop a legal and institutional apparatus on how this technology and liabilities should be treated.

In fact, in the case of Brazilian legislation, there is no specific regulation for CCS (onshore / offshore) activities, and there is no institutional attribution of government agencies, despite the need, mainly, for the exploration and production of the Pre-Salt. On the other hand, with regard to environmental impact, it is important to consider the various normative instructions of IBAMA, as well as the different climate change regulations established by several state laws (Bahia, Espírito Santo, São Paulo, Rio de Janeiro) (Romeiro-Conturbia, 2014).

In this context, Romeiro-Conturbia (2014) proposes the installation of a "CCS National Regulatory Committee" to be constituted by representatives of different regulatory agencies with the objective of creating a national legal and regulatory framework of CCS. See Figure 1, in which Romeiro-Conturbia (2014) describes the Committee formed by the Brazilian agencies. For Capture: National Agency of Petroleum, Natural Gas and Biofuels (ANP) and National Agency of Electric Energy (ANEEL). For Transport of CCS, ANP, National Agency of Terrestrial Transport (ANTT) and National Agency of Water Transportation (ANTAQ) would be competent. For Storage, besides the ANP, the National Mining Agency (ANM) and the National Water Agency (ANA).

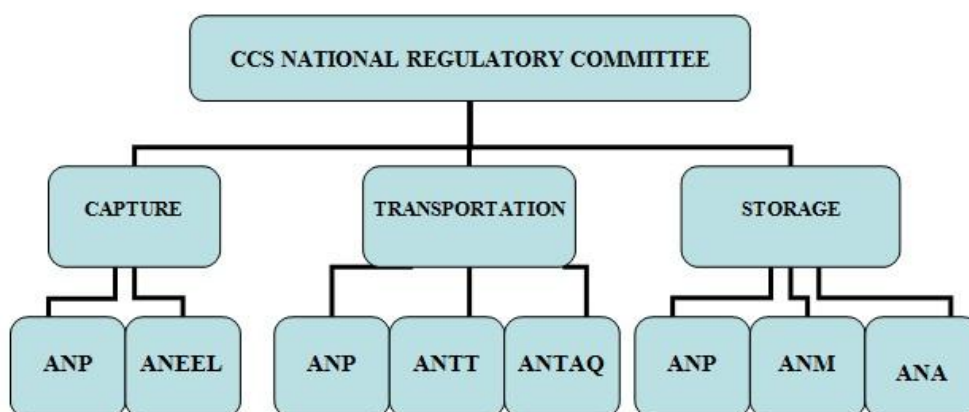


Figure 1 Proposed National Regulatory Committee CCS (Romeiro-Conturbia, 2014)

Considering the ownership of CO₂, the Federal Constitution establishes that the ownership of mineral resources located in the Brazilian subsoil as being of the Union (Article 20. IX and Par. I). Brazilian Civil Code (Federal Law 10,406 of 2002) states that "The surface right does not authorize work underground, unless it is inherent to the purpose of the concession" (Brazil, 2002).

On the other hand, long-term liability is defined in a single paragraph of art. 927 of the Brazilian Civil Code (2002), which establishes both the theory of strict liability, which, in case of any aspect of damage, the author is responsible for recovery, regardless of causality (Romeiro-Conturbia, 2014) (Almeida et al., 2017) (Rodrigues, 2002). Table 1 indicates the experience of some countries.

Table 01 - Regulation of CCS and long-term responsibility in several countries

Country	CCS legal and regulatory framework	Adoption	Minimum period for transfer of long-term liability
Australia	Offshore Petroleum and GHG Storage Act	2006	At least 15 years after the issue of the site closing certificate.
United Kingdom	Energy Act 2008 and EU CCS Directive	2008	No shorter than 20 years
European Union	EU CCS Directive	2009	No shorter than 20 years
Norway	EU CCS Directive	2009	No shorter than 20 years
Canada, Alberta	CCS Statutes Amendments Act	2010	No shorter than 10 years
United States	EPA UIC Class VI Regulation	2010	50 years following the cessation of injection
United Nations*	CDM Modalities and Procedures for CCS	2011	No shorter than 20 years or after ending the issuance of CERs

Source: (Romeiro-Conturbia, 2014)

In Brazil, the main environmental policies defined in the National Environmental Policy Law (Federal Law 6.938 of 1981) and the various resolutions of the National Environment Council (CONAMA), for example Resolution 01 of 1986, which calls for an evaluation and an environmental impact report prior to the granting of environmental licensing by the environmental regulatory agency or Resolution 420 of 2009, which defines terms, establishes rules and tools for the management of contaminated areas. In this case, the precautionary principle established in the Federal Constitution (1988) should be prioritized where the possibilities of reuse take into account the potential public health risks of local communities, as well as the depreciation of properties (Costa et al., 2018a; 2018b).

Although generic, the IBAMA Normative Instruction 12/2010 can be considered an important landmark for the institutionalization of CCS activities in Brazil, since its article 2 determines that the Licensing Board of IBAMA assess, in the process of licensing activities capable of emitting gases of greenhouse gases, the measures proposed by the entrepreneur with the objective of mitigating these environmental impacts, in compliance with the commitments assumed by Brazil in the United Nations Framework Convention on Climate Change. This means that the assessment of mitigation measures constitutes merit in activities licensing processes. To that end, Article 3 of the Normative Instruction establishes that the Term of Reference prepared by IBAMA must guide Environmental Impact Studies for the licensing of projects capable of emitting greenhouse gases and contemplating measures to mitigate or compensate for such impacts (Costa et al., 2018b).

V. GOVERNANCE PROPOSAL FOR CCS ACTIVITIES IN BRAZIL AND FINAL CONSIDERATIONS

The study of Brazilian laws and the steps that precede and succeed them become a topic for discussion and diagnosis on the use of fossil fuels in Brazil, their economic and environmental impacts when applied, energy transitions and positive results, and / or CCS negative.

As discussed in the previous item, the regulatory agenda for CCS activities in Brazil is comprehensive, for which purpose, Romeiro-Conturbia (2014) proposes the installation of a "CCS National Regulatory Committee" to be constituted by representatives of different regulatory agencies. However, we disagree with this proposal given the institutional complexity that results in the high cost of coordination and the risk of loss of efficiency of public policies aimed at CCS activities. In addition, it is believed that the formats of Council or Committee do not collaborate for the effectiveness of the construction of the appropriate normative apparatus.

Adopting the vision of the National Policy on Climate Change, it was pointed out that it would be more appropriate to adopt a bureaucratic structure of the Board of Directors with the Ministry of Mines and Energy, with a decision and regulation function, with the Ministry of the Environment acting as advisory. In the latter, the participation of civil society would be encouraged in order to build legitimacy in the process of promoting CCS activities.

For the realization of the activities, concession and authorization models, as well as similar to the management of residues of the productive chains could be proposed by the MME, as well as the creation of insurance for the purpose of circumventing the long term responsibility.

From this perspective, we provide inputs and data for future research related to the subject, together with the understanding of how facts related to economics, environmental quality and policy interfere directly in the applicability of CO₂ capture and storage through the study of the Norms.

As a consequence, it is noted that much of the initiatives and development reflects the attitudes of the past, which we need to carefully analyze so that new paths can be traced with safety and visibility of an energy dependent world, as mentioned here. Therefore, it is urgent to implement measures to make feasible the regulation of CCS activities in Brazil.

The research aimed to contribute as literature to enable full conditions of empirical observation of changes in local social practices arising from the influence of social actors responsible for carrying out CCS activities, their policies and legal duties. It also makes it possible to understand overlaps, limits and contributions derived from both social actors' practices and management and / or governance tools.

It is envisaged that future research will include the articulation of social, political and legal norms and procedures related to CCS activities in Brazil, taking into account the following topics:

- 1) Absence of specific legal and regulatory framework for CCS activities in Brazil:

According to the International Energy Agency (IEA, 2016) legal and regulatory frameworks are key to ensuring that geological storage of CO₂ is safe and effective and that the storage sites and risks that accompany it are properly managed. Therefore, it is necessary firstly to study International Agreements related to CCS activities to subsume the Brazilian normative apparatus and to verify the state of the art of CCS activities in the world, starting with the following documents and institutions:

- London Convention (1972)
- Convention for the protection of the marine environment - OSPAR (1974)
- United Nations Convention on the Law of the Sea – UNCLOS (1982)
- The Basel Convention (1989)
- Convention on Environmental Impact Assessment – ESPOO (1991)
- United Nations Framework Convention on Climate Change (1992)
- London Protocol (1996)
- Carbon Capture and Storage Statutes Amendment Act 2010 (Canada)
- Act: European Community (2011) (European Union)
- Act: Offshore Petroleum and Greenhouse Gas Storage Act / Federal Executive Council, 2012 (Australia)
- Act: US Environmental Protection Agency (2010) (United States)
- Ministry of Environmental Protection (MEP) Japan
- UK Department of Energy and Climate Change (2010) United Kingdom

2) Access to the key interlocutors of the formal management context:

A specific CCS regulatory framework in Brazil is likely to include a number of existing regulations that will require joint coordination between the various ministries and stakeholders (Almeida et al, 2017).

3) The identification of individual and collective actors who are interested in CCS activities:

It is necessary to identify possible actors interested in carrying out, monitoring, approving - among other actions - CCS activities in Brazil, so that it is possible to describe their participation mode, spaces and opportunities for manifestation and action.

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