

# Compensatory measures in technological disasters: a neglected link?

## Medidas compensatórias nos desastres tecnológicos: um elo negligenciado?

Monika Dowbor<sup>1</sup>  
mdowbor@gmail.com

Roberta Carnelos Resende<sup>2</sup>  
roberta.carnelos@ufba.br

Aloisio Ruscheinsky<sup>3</sup>  
aloisioruscheinsky@gmail.com

### Abstract

The objective of this research is to analyze how the medium-term effects of disasters in Brazil are mitigated. To this end, an analysis of the legislation and the Terms of Adjustment of Conduct was used, the instrument through which disaster-causing companies and the Brazilian State adapt conducts, in four specific cases (Chevron, Iberpar, Samarco and Hydro Alumnorte). We detected the predominance of the generalist and vague definition of both compensatory measures and the instruments and strategies for their implementation, but with some learning over time. The exclusion of the participation of the affected communities as a recurring aspect in the original agreements and the absence of specialized sectors of the State both in the control and in the implementation of the actions draws attention.

**Keywords:** technological disasters; compensatory measures; legislation; Conduct Adjustment Agreement.

### Resumo

O objetivo desta pesquisa é analisar como são mitigados os efeitos de médio prazo decorridos de desastres no Brasil. Para tanto, recorreu-se à análise da legislação e dos Termos de Ajuste de Conduta, instrumento por meio dos quais as empresas causadoras de desastres e o Estado brasileiro adequam condutas, em quatro casos específicos (Chevron, Iberpar, Samarco e Hydro Alumnorte). Detectamos o predomínio da definição generalista e vaga tanto das medidas compensatórias quanto dos instrumentos e estratégias de sua implementação, mas com certa aprendizagem ao longo do tempo. Chama atenção a exclusão da participação das comunidades atingidas como aspecto recorrente nos acordos originais e a ausência dos setores especializados do Estado tanto no controle como na implementação das ações.

**Palavras-chave:** desastres tecnológicos; medidas compensatórias; legislação; Termos de Ajuste de Conduta.

1 Universidade Federal de Pelotas (UFPEL).

2 Universidade Federal da Bahia (UFBA).

3 Universidade Estadual do Rio Grande do Sul (UERGS).

## Introduction

The study conducted focuses on the occurrence of technological disasters, which can be understood as calamitous events resulting from the use of scientific knowledge, such as events arising from the improper exploitation of natural resources. The subject gains scientific and social relevance that raises questions concerning the risk creation of and conflict management for both the recomposition of the environmental scenario and impact mitigation on the daily lives of citizens. How are the effects of disasters in Brazil mitigated, especially those of medium-term - period of invisibility in the public agenda and in the media, which follows the crisis event that generated significant publicity and quick, urgent responses? How does Brazilian legislation address these consequences? What are the forms and management models created to deal with the impacts of these catastrophic events? The purpose of this article is to contribute to answer these questions, through the analysis of legislation and four cases that occurred in the country in the last twenty years and the content, the scope and management models related to the measures that compensate for these effects in technological disasters. Empirically, this information is available in the Conduct Adjustment Agreement (TACs) - which have become a common instrument that establishes the rules of the game as well as the responsibilities and their supervision.

The TAC was signed in each of four emblematic cases analyzed here: the rupture of the Iberpar tailings reservoir in 2003, the oil spill at sea by Chevron in 2013, the dam failure in the case of Samarco in 2015, and the leakage of tailings by Hydro Alumnorte in

2018. The selection of cases was made based on them being the main technological disasters that occurred in Brazil between 2000 and 2018, both in terms of the volume of leaks and the extent of damage, and which were caused by large companies.

The TACs are instruments that mediate relations between the companies responsible for the disasters and the Brazilian State, which, on behalf of the population and the affected environment, negotiates the terms of damage repair and future prevention. It is important to emphasize that this extrajudicial instrument is preceded in Brazil in the case of damage to the environment by the Public Civil Action normally issued by the Public Ministry, which is responsible for defending collective rights. (MEDEIROS; ALBUQUERQUE, 2012). In the longer timeframe, management will be routinized and will lose the reputational spotlight of the media as well as get off the agendas of politicians. The letter contract (TAC) and the agreements made through it will be the only legal thing to remain for those citizens and communities directly involved. Therefore, the content and design of the measures to be adopted over time is relevant, as well as the degree of involvement of the populations affected and sanctions imposed for breaching the agreements.

TACs agreements can be compared to public policy action insofar as they interfere to solve the problem that has been elevated to the category of public problem, a necessary condition for the transformation of social issues into public policies. The State, through its agencies and TACs, establishes the lines of action that may concern people's health, their working conditions and income, the recovery of the environment, among others. This is

a set of problems with which the Brazilian State is used to working. It has done so very frequently since 1988, activating participatory institutions through which the population and its representatives are called upon to influence the formulation and implementation of public policies. It is this knowledge and forms of action that can or could be engaged in the formulation of TACs. This is the normative load translated into a working hypothesis that we approach here the conflict resolution instruments. In summary, this research is carried out through the prism of the content of compensatory measures, the implementing agents, the involvement of the affected communities and the fines. These points denote, respectively, what is understood as compensatory measures, what is the involvement of the State, civil society and the market, how the participation of the population is understood, and what are mechanisms of control and sanction.

The empirical analysis is preceded by a literature review on different approaches to compensatory policies which we reviewed for the definition of measures that interfere in the mitigation of medium-term effects – here defined by invisibility in the public and media agenda and that affect people and the environment over the years. This review allowed us to group the proposed typologies and use the term “broad compensatory measure” to refer to any and all measures, economically measurable or not, which intends to eliminate or minimize the consequences of the damage caused by the disaster, whether in the social, economic, cultural and/or environmental dimension.

The first analysis through the prism of compensatory measures was based on the legislation corresponding to the theme, including that of TACs. The examination of

recent legislation on natural and anthropogenic disasters in Brazil allows us to observe that prevention and emergency are at the heart of determinations. Compensatory actions, the focus of this study, do not receive specific treatment in this set of laws. The legislation that deals with the use of TACs is, in turn, generic and does not design guidelines to frame the compensatory measures (VIEGAS; PINTO; GARZON, 2014). With this, a legal void is created, which must be filled in some way in the signing of the Agreement by the actors involved, namely, the public agencies and those responsible for the disasters. As the legislation omits compensatory measures, there is room for the state agencies and their bureaucracies discretion in the signing of TACs.

Next, we proceed to the analysis of the Conduct Adjustments Agreements of the four cases. Among the main results is the finding about the low specificity of compensatory measures. When viewed from a comparative perspective, it is clear that in the most recent disasters, they start to occupy more space in relation to preventive and emergency ones, and they become more detailed. This may indicate advances in the learning of State institutions. Management models invariably rely on civil society organizations as providers and have little accountability. Of the absences in the adopted models, the most glaring were the populations affected, and the little use of state capacities.

## **Technological disasters and compensatory measures**

We have organized this section into three moments: first, we will present what technological disasters are and how they

can be thought of based on their medium-term impacts; next, we will present different theoretical approaches to measures taken after disasters, and more specifically to compensatory measures<sup>4</sup>; and, finally, we summarize how Brazilian legislation deals with the consequences of disasters.

## Technological disasters and their medium-term effects

Technological disasters such as those resulting from a dam rupture or oil spill generate tragic and harmful immediate impacts whose self-revealing images occupy the media, social networks and government agendas for a while. Short, most of the time, as they lose visibility while the mud is still drying or settling and the oil still stains the ocean waters. In the interim between the disaster and its immediate and visible impacts, public actors come into action, civil society and the main affected identified as such. As a whole, we value the resolution of immediate demands, the creation of agreements related to the resolution of future problems and the prevention of new disasters. In this favorable scenario, arrangements are made to carry out measures and, which most often happens, in Brazil, through Conduct Adjustment Agreements (VIEGAS; PINTO; GARZON, 2014). These arrangements agree on the terms that will govern the resolution of damage caused by the disaster to the environment as well as to the populations that inhabit the affected area for a longer time. We call this time medium-term, a colloquial term, to which we attribute the idea of political invisibility that differs from the short-term in which the disaster is

presented to decision-makers as a crisis event (KINGDON, 1996), generating great publicity and urgent and quick responses. Measures to be taken in the medium term will have to consider the interdependence of environmental, social, economic and institutional factors as the consequences of the disaster reinforce previous inequalities and vulnerabilities (INGRAM et al., 2006). These aspects will be analyzed as the content of the compensatory measures of the TACs.

Phenomena are seen as amplified insofar as they are not limited to time and space: a) increasing the scale of production at industrial plants also multiplies the scale of risks and disasters (FREITAS; PORTO; MACHADO, 2000); b) the direct and collateral implications, such as health, psychology and long-term social relationships, are also amplified; c) environmental impacts are consistent with the rupture of social relationships, equally attesting to the high cost of environmental devastation; d) loss of trust in security and prevention institutions; e) vulnerable sociotechnical systems interact with a population made vulnerable, once they are deprived of resources to face the events.

According to Haddow, Bullock and Coppola (2011) disasters sound like an inevitable product of development with technological innovation and demand to minimize production costs. Technological risks, therefore, insofar as they arise from the application of technology in human activities, can be seen as caused by the Anthropocene, with effects on the most varied systems. In other terms, the disasters can occur through failure to apply an existing technology and are expanding

<sup>4</sup> In Samarco's TAC it is clearly characterized and delimited: "Remedial programs" comprise measures and actions that aim to mitigate, remedy or recompose the socio-environmental and socio-economic impacts resulting from the event; "compensatory programs" comprise measures and actions that aim to compensate for non-mitigable or non-repairable impacts arising from the event, through the improvement of the socio-environmental and socio-economic conditions of the impacted areas, whose repair is not possible or viable, under the terms of the programs.

as reliance on technologies increases. One of the contributions of the social sciences is that planning, preparation, and compensation actions in practice continue to fail because they take a top-down approach (DRABEK, 2007). Or, in the present case, they frustrate expectations fueled by the institutional agreement since they are rooted in assumptions that reflect the myth of progress and not the results of diagnoses resulting from scientific research. The disaster management area, in turn, works with institutional instruments where TAC planning can be considered an unfinished product, even with structuring programs.

Most social scientists see compensation management as "(...) the process by which uncertainties that exist in potentially dangerous situations can be minimized and public safety maximized. The aim is to limit the social and political costs of disasters by implementing a series of strategies and tactics that reflect the full disaster lifecycle, i.e. preparedness, response, recovery and mitigation" (DRABEK 2007, p. 63).

Despite the differences, the reference to disaster is a fundamental strategic issue both in investigations and in the management of compensations that can include socio-technical innovations. From the perspective of economic agents in view of the scope of disasters, the discussion of the levels of attribution of responsibility involving the corporate strategies and organizational formats of the groups is decisive. In the cases examined, the more diffuse the consequences, the lower the possibilities of proving accountability. Disclaimer strategies are recurrent procedures (MANSUR et al, 2016), among these is the frequent contestation

of sanctions applied by public bodies. Even when the amounts are paid, fines are not effective in radically abolishing the deleterious consequences for the environment and citizens.

## **Compensatory policies and their different approaches**

How do different theoretical approaches that work with types of post-disaster measures conceptualize effects that spread over time?

We find in disaster law<sup>5</sup> a first analytical framework to accommodate the effects of disasters in time and the ways to deal with them. The disaster law cycle proposed is a set of strategies that include mitigation, emergency responses, compensation and reconstruction (MEYER, 2019; FARBER, 2012). For the authors, mitigation refers to the phase before the disaster in which efforts to reduce the potential impacts of the disaster are formulated. Next to the disaster itself, the emergency response is the most dramatic in the cycle, and here the legislation clearly points out the competences and responsibilities of public entities such as Civil Defense, Firefighters, declaration of a state of calamity and emergency with the release of extra resources. Compensation measures in the face of victims' losses and, therefore, of their respective rights as citizens, as shown by Farber (2012), they are built as the center of the considerations of law in the face of disaster. The legal system provides a set of public and private practices, all marked by serious limitations in their use and application, among which are private insurance and litigation against responsible third parties. Adversities

5 Due to our object of analysis, the Conduct Adjustment Agreements (TACs), we opted for the legal approach, although there were other ways to base the discussion, such as the Sociology of Disasters. The international literature on the sociology of disasters has been dedicated to understanding this phenomenon from several perspectives, among them the use of certain concepts and visions of the phenomenon and its analytical consequences (QUARANTELLI, 1998; LINDELL, PRATER, PERRY, 2007). In Brazil, part of this research agenda focuses on prevention and its respective legal and institutional instruments, as well as mitigation strategies, such as the collections organized by Valencio (2010; 2013). The collections stand out for prioritizing this dimension as the responsibility of the national State, and for criticizing the recurrent uses of the term natural disasters.

also occur because of the difficulties of compensation on the part of the State when suing corporations for their negligence, for example. Compensation in the view of this approach has the monetary character. The reconstruction phase, in turn, refers either to the well-being destroyed by the disaster or the restoration of the ecosystem, such as flora and fauna, whether with significant volumes of financial resources, or time to carry out. This last phase concerns the set of actions that restore part of the context prior to the disaster, either from the socioeconomic point of view or from the environmental point of view.

The debate around human rights, our second source for reflection on the effects of disasters, brings as central the idea of the effectiveness of justice contained in the duty to repair. According to Van Boven (2010), in a report to the United Nations (UN) Commission on Human Rights, reparation results from justice solutions that are capable of eliminating or minimizing the consequences of the loss, and also to avoid the occurrence of new violations, either through prevention or deterrence. Reparation, the most comprehensive category of this debate, must be proportionate to the seriousness of the violations and the damage suffered, and can occur in some formats, among which: restitution, compensation, rehabilitation, and satisfaction measures and non-repetition guarantees. Restitution aims to restore the situation that existed before the violation of human rights or humanitarian consequences, and requires, for example, restore family life, work, property and the city. This is the first measure to be applied, since, in principle, refunds must have the effect of ending the illicit act and

re-establishing the existing situation prior to the damage. However, restitution shall only be applicable provided that it is not materially impossible or disproportionately burdensome in relation to the benefits of applying other restorative measures.

Compensation, in turn, will be agreed in relation to damage resulting from the violation of human rights or humanitarian law, and that is economically assessable. Here it is understood as damage: a) physical or mental harm, including pain, suffering and emotional distress; b) missed opportunities, including those related to education; c) property damage and loss of income, including loss of earnings; d) damage to reputation or dignity; e) expenses incurred to obtain legal or specialist assistance. Rehabilitation includes medical and psychological care, as well as the provision of legal and social services. Finally, satisfaction and non-repetition guarantees include, for example, fact-checking and wide public disclosure of the truth of what happened, and official declaration or court decision that restores the dignity, reputation and rights of the victim and people who have ties to it (VAN BOVEN, 2010).

Contemporary Environmental Law, in turn, takes ecological disasters<sup>6</sup>, of natural or technological origin as one of its themes, both in terms of its aggravation in the face of climate change due to the intensification of risks arising from technological development, as well as the environmental vulnerability generated by inequalities. The effects of disasters can affect individuals differently because of this vulnerability, because, as the environmental justice movement points out, environmental risks are not equitably distributed. Exposure to the risks and effects of ecological disasters can

<sup>6</sup> According to Lienhard (1995, p. 91), it is an event that goes from the passage of an incident, natural or technological, to an accident of collective dimensions.

be understood as a violation of human rights, and human rights protection systems can play an important role in protecting these rights of vulnerable individuals. In this sphere, it is worth highlighting the role of the European Court of Human Rights, which has an innovative and consolidated jurisprudence in environmental matters, recognizing the violation of the right to life motivated by natural disasters or caused by dangerous human activities (CAVEDON; VIEIRA, 2011).

The environmental damage, argue the exponents of this slant, depreciates the existing natural resources and entails patrimonial and extrapatrimonial responsibility, and, in case of occurrence, the causer must repair it. In this case, the first option will be the reconstitution, recomposition and reintegration of the damaged environmental assets, and not the compensation to the victim. Thus, the priority of the repair system is natural restoration, that is, the search for a return to the status quo ante of the environment. Such restoration can be in the form of in natura recovery (or ecological restoration), preferential option, or ecological compensation. The first constitutes the ideal and complete form of repair, and seeks to recover the functional capacity of the degraded environment. The second form is used when in natura recovery is impossible (irreversible damage) or disproportionate (inequity between cost and benefit), and aims to restore the integrity and functionality of the environment, through the recovery of an area different from that degraded. If it is not possible to use either of the two previous forms, the reimbursement

must be made via pecuniary compensation (economic compensation), which is, therefore, the last hypothesis to repair the environmental damage. (CARDIN; BARBOSA, 2008).

Aleixo and Bastos (2018), in discussing about the contributions of Human Rights and Environmental Law, specifically analyze the Samarco disaster pointing to the importance of pursuing the ideal of integral reparation, that is, one that aims to adequately repair the damage related to social, economic, cultural and environmental rights caused by the catastrophe. Referring to Advisory Opinion 23/2017 of the Inter-American Court of Human Rights, the authors state that in repairable events, measures are insufficient when environmental issues are ignored, since "social, economic and cultural rights include that to a healthy environment (...). Thus, the protection of the environment and the realization of other human rights have an undeniable relationship". (idem, p.164). In the sphere of inseparability between the protection of human rights and the environment, the agreement signed in the case of the Samarco disaster, by instituting programs within rigid axes of action, the socio-economic and socio-environmental, removes the intrinsic connection between these dimensions, suggesting that it is possible to repair people without recovering the environment.

In summary, although the three approaches understand<sup>7</sup> the compensation phase in a similar way, that is, the monetary compensation, the emphasis attributed and the moment of prioritization of this step are different, depending on the central object of

7 Another source for thinking about medium-term measures is found in international instruments that serve as benchmarks for assessment and guides for post-disaster and disaster situations. We will not use them here as they do not constitute theoretical approaches in themselves, but it is worth highlighting here their elements that refer to medium-term measures. One of them is the 2015 Post-Disaster Needs Assessment (PDNA) tool developed by the United Nations Development Group (UNDG), the World Bank (WB) and the European Union (EU) that can be used by governments to assess damages, losses and post-disaster recovery needs. This document works with the notion of a consolidated recovery framework. Another is the Sendai Framework for Disaster Risk Reduction 2015-2030, adopted at the Third United Nations World Conference in Sendai, Japan, in 2015. Especially in this, the need for actions in the sense of what we call actions here is recognized. compensatory: In its priority 4, the document refers to preparing for disasters in order to obtain an effective response and "build back better" in recovery, rehabilitation and reconstruction.

the approach. For example, while in disaster law, pecuniary compensation seems to be the preferred option, in environmental law it is the last alternative to be used. Some studies, such as Aleixo and Bastos (2018), have sought to intensify the dialogue between environmental law and human rights, bringing a broader understanding of compensation.

In this study, we start from a broad concept of compensatory policy, which aims to compensate those affected in its integral sense, that is, in the relationship between individual, society and the environment. When we talk about compensatory policy, we refer to any and all measures, economically measurable or not, that aim to eliminate or minimize the consequences of the damage caused by the disaster, whether in the social, economic dimension, cultural and/or environmental. In order not to confront concepts established in the legal literature, or in other areas of knowledge such as public policies, we name this type of "wide compensatory measure".

### **How does Brazilian legislation address the effects of disasters and mitigation measures?**

In summary, the legal arrangement of disasters in the country is composed of the set of laws, decrees and ordinances that provide for the competences of federated entities and of the various bodies related to Civil Defense and Protection, in addition to specific regulations, which vary depending on the type of disaster or the branch of activity of the enterprise involved. Regarding the more general ordering, the highlights are the Federal

Decree 7.257/2010 and the Laws 12.340/2010 and 12.608/2012. With regard specifically to dams, which applies to the type of Rio Doce Disaster, for example, the foundation is found in the Law 12.334/2010.

Decree 7.257/2010 defines that the Federal Executive Branch will support, in a complementary way, the States, the Federal District and Municipalities in an emergency situation or state of public calamity, caused by disasters. The Law 12.340/2010 addresses the transfer of resources from the Union to agencies and entities of other federal level for the execution of prevention actions in areas at risk of disasters and response and recovery in areas affected by disasters. The Law also deals with the National Fund for Public Disasters, Protection and Civil Defense (FUNCAP<sup>8</sup>). The Law 12.608/2012 institutes the National Civil Defense and Protection Policy (PNPDEC), covering prevention, mitigation, preparedness, response and recovery actions aimed at civil defense and protection, and provides for the National Civil Defense and Protection System (SINPDEC), which aims to contribute to the process of planning, articulation, coordination and execution of programs, projects and actions of civil defense and protection. In the present law, there are no definitions of what each of these actions would be specifically, but only, within the scope of the guidelines, that they would be addressed in a systemic way.

Our question about mitigating measures was also applied to the legislation that underlies the Conduct Adjustment Terms, which are instruments frequently used to deal with environmental conflicts, also called "extrajudicial route". They were introduced into

<sup>8</sup> The background was established by Decree-Law 950 of October 13, 1969.



Brazilian legislation from 1990<sup>9</sup>, providing public bodies, such as IBAMA, PROCON, and Public Ministry, that is, those who deal directly with the reality of society's rights, the possibility of resolving conflicts through extrajudicial means. Viegas, Pinto and Garzon (2014) emphasize the diversity of understandings about its use due to the fact that all the normativity concerning this agreement is reduced to a few and generic lines formulated by the legislator.

More specifically, environmental crimes and conflicts began to be resolved through the Conduct Adjustment Agreement (TAC), through the Provisional Measure N° 2.163-41, of August 23, 2001<sup>10</sup>. A consultation of the legislation reveals that the law only refers to the possibility of its use, without regulating how it should be done. It is in environmental legislation that we find a more developed institutional framework, forcing the parties to include the following items, outlined very succinctly<sup>11</sup>: 1) the name, qualification and address of the committed parties and their respective legal representatives; 2) the term of the commitment; 3) the detailed description of its object, the value of the planned investment and the physical schedule of execution and implementation of the works and services required, with quarterly goals to be achieved; 4) the fines that can be applied to the individual or legal entity committed; and 5) the competent forum to settle disputes.

The MP 2.163-41 provides that it is incumbent upon Organs environmental bodies of the National Environment System (SISNAMA) - constituted by the bodies and

entities of the Union, the States, the Federal District, of the Municipalities and by the foundations instituted by the Public Power,<sup>12</sup> - concluding TACs with natural and legal persons. It does not mention the Public Prosecutor's Office or those affected as integral parts of the celebration process. Nor it mentions the federative composition of bodies such as affected states and municipalities along with their state capacities in terms of public policy management. Analyzed from the point of view of socio-state relations, the elaboration of the TAC excludes civil society actors as well as public power agencies possibly affected by the greater demand due to environmental damages such as, for example, secretariats of social policies.

The TAC, according to the Federal Public Ministry (MPF), is an instrument that "has the purpose of preventing the continuation of the situation of illegality, repairing the damage to collective right and avoiding legal action"<sup>13</sup>. Some jurists praise this mechanism, as it would avoid "extremely costly, exhausting and time-consuming processes for both parties" (FONTES, 2018). However, "repairing the collective damage" hides a process that may eventually include, depending on the case, complex and medium and long-term actions that, in normal contexts, would be in charge of the Executive Branch. Thus, we have an instrument that for its elaboration: 1) does not include the participation of those affected, nor does it foresee the inclusion of sub-federative instances of the State; 2) places mandatory items without taking into account

9 The Law 7.347/85, which regulates the public civil action of liability for damages caused to the environment, among others, in its paragraph 6th, menciona que os órgãos públicos legitimados poderão tomar dos interessados compromisso de ajustamento de sua conduta às exigências legais, through commissions, which will have the effectiveness of an extrajudicial executive title (Included by Law n° 8.078, de 11.9.1990).

10 Added an article to Law 9.605, of February 12, 1998. Before, two other legislations had foreseen its use: the Statute of the Child and Adolescent (1990) e o Código de Consumidor. According to Mazzilli (2006) the conclusion of the TAC as an extrajudicial agreement to resolve conflicts was the creation of the MP itself in the 1980s. This proposition is configured as another indicator of institutional activism of the MP portrayed and criticized by Arantes (2019).

11 Available at: [http://www.planalto.gov.br/ccivil\\_03/MPV/2163-41.htm](http://www.planalto.gov.br/ccivil_03/MPV/2163-41.htm)

12 Available at: [http://www.planalto.gov.br/ccivil\\_03/decreto/antigos/d99274.htm](http://www.planalto.gov.br/ccivil_03/decreto/antigos/d99274.htm)

13 Available at: <http://www.mpf.mp.br/sp/atuacao/ajustamento-de-conduta>

social control; 3) leaves room for the discretion of the actors responsible for its celebration.

It is defined what can be done and who should do it, but not how to do it, which results in the space for the discretion of action of the body proposing the TAC with regard to the choice of a range of rights and ways to satisfy them. This lack of specification already detected by the national literature finds its equivalent in the evaluation of the voluntary approaches that constitute extrajudicial agreements found in the international literature as a way of resolving environmental conflicts (OCED, 2003, p. 4). Among the three types of these agreements, the "negotiated" is the closest to the TAC insofar as it presupposes a commitment elaborated on the basis of negotiation between an industry and the public power. They are often used at the local level (Japan) and in the case of the European Community the most frequent is the national type. The OCED report (2003) points out the fragility of the data insofar as research on voluntary approaches is still very rare, but indicates, from the evaluation of its performance, the following aspects as critical for a good design of the agreement: transparent, clear, quantitative and partial objectives to be able to assess implementation difficulties, credible regulatory threats, a credible control and monitoring system, third-party participation to increase incentives and legitimacy, and sanctions for non-compliance, among others (OCED, 2003, p. 92).

This short review of the legal frameworks shows that the main instrument of conflict mediation is in fact the TAC, and that national legislation on disasters has little or nothing in this regard. Next, we will analyze the TACs signed in the event of technological disasters, seeking to understand how these instruments

treat the "broad compensatory measures", focusing on the following points: the presence or absence of compensatory measures, what are these measures, who formulates them, if deadlines are established for their execution, if fines are foreseen for non-compliance, who is designated to implement them, and who monitors them. In summary, the analysis of the TACs will be done through the prism of the contents, the implementing agents, the involvement of the affected communities and the fines.

### **Analysis of TACs in four technology disasters**

The data for this analysis, the Conduct Adjustment Agreements (TACs), were collected from the IBAMA (Brazilian Institute of Environment and Renewable Natural Resources) and the Federal Court of Accounts (TCU) websites. Subsequently, a content analysis of these documents was carried out. According to Bardin (1977, p.42), content analysis can be understood as a set of techniques for analyzing communications that aims to obtain, through systematic and objective procedures for describing the content of messages, indicators that allow the inference of knowledge regarding the conditions of production/reproduction of these messages.

According to Bardin (1997), the starting point of the analysis is organization and systematization; thus, content analysis should be divided into three stages: pre-analysis (organization of the material); analysis of the material (coding and categorization of data); and treatment of results, inference, and interpretation (development of data that synthesizes and highlights the information

provided for analysis). Regarding the specific categorization of data, it is worth noting that these were conceived to answer the inquiries of this study, and therefore, they are categories created by the authors for specific purposes but that, to some extent, interact with the dynamics of public policy cycles.

We now turn to the approach of the four cases that we call technological disasters (Iberpar, Chevron, Samarco and Hydro Alunorte), and, more specifically, the identification of the "broad compensatory measures" contained in the TACs. As seen, Brazilian legislation is quite general in the treatment of environmental disasters, therefore, it is expected to find in these agreements clearer outlines regarding the mitigation of these disasters.

### **The rupture of the tailings reservoir of the company Iberpar (Cataguases/MG-2003)**

The disaster refers to the rupture of an industrial tailings reservoir on March 29, 2003, in the city of Cataguases, Minas Gerais, which released 1.2 billion liters of waste into the Pomba and Paraíba do Sul rivers. The TAC was signed on May 9, 2003, between Iberpar empreendimentos and Participações LTDA (parent company of Florestal Cataguazes Ltda and Indústria Cataguazes de Papel), Federal Public Ministry (MPF), and State Public Ministry-MG (MP-MG), with the intervention of the State Environmental Foundation (FEAM). The agreement refers to emergency and preventive measures, especially to avoid the occurrence of new claims arising from the existing environmental liabilities at Fazenda Bom Destino, in the rural area of the Municipality of Cataguases in the following

terms: i) the hiring of a specialized company for the elaboration of the executive project of the emergency measures that guarantee the stability of the existing dams in the place (within 10 calendar days) and ii) the deactivation of the dams, with the removal and proper disposal of all industrial waste (within a maximum period of 02 years). The only "broad compensatory measure" contained in the TAC refers to the monitoring of the water quality of Ribeirão do Cágado, Rio Pomba and Paraíba do Sul. The Public Ministry and FEAM were responsible for monitoring compliance with the first two measures, under penalty of a daily fine of BRL 7,000.00, and the Minas Gerais Institute for Water Management (IGAM) and the National Water Agency (ANA), the water quality monitoring. In order to ensure compliance with the established obligations, Iberpar offers a security deposit of BRL 10,000,000.00, within 5 working days, via bank guarantee or security deposit.

This TAC has four amendments signed over four years, which stand out for renegotiating some issues, especially those related to the inclusion of new parts (companies, foundations, and educational institutions) for the preparation and/or execution of projects, and on the detailing of the measures to be adopted. Only in the third amendment, three years after the disaster, was there any mention of compensatory measures, and in this one, unlike the other documents, the execution of the measures was the responsibility of a civil society organization.

The first amendment, dated 12/05/2003, with the intervention of FEAM and IBAMA, and signed by MPF, MP-MG, IBERPAR, GEST-Engenharia e Consultoria Ltda, CMEC – Consórcio Mineiro de Engenheiros Consultores

Ltda, R&D Engenharia de Juiz de Fora Ltda, and AMBIENTAL Environment Research and Projects (company specialized in the area of waste collection), aims to renegotiate and establish measures related to the "repair", denomination used in the agreement itself, of damages caused to properties and rural producers who carry out activities in affected areas. However, no "broad compensatory measures" were identified in this term. The second amendment, dated 05/17/2004, is the same as the first amendment, only with a change in the date.

The third additive, of 05/10/2006, it has as parts the company Iberpar, the MPF, the MP-MG, and the Mokiti Okada Foundation – FMO<sup>14</sup>, and as stakeholders IBAMA, FEAM and Instituto Estadual de Florestas-MG. It refers to the implementation of measures for the deactivation of dams, which characterizes a preventive measure. The document differs from the previous ones in two aspects: first, because there is the presence of a civil society organization (FMO) for the execution of the measures, and second because it specifies what we call "broad compensatory measures" to be carried out by the company: i) present the final disposal project of lye (chlorine)-topographic survey, physical-chemical characterization of soils and groundwater, mapping of spring and water table areas, pilot fertigation project, and evaluation of the possibility of intercropping eucalyptus plantations with other crops; ii) execute the fertigation plan according to the results of the pilot test. The Mokiti Okada Foundation would be responsible for providing continuity to the services contracted for the execution of projects related to Iberpar's obligations, under the terms of the

respective contracts, and respond to requests for information from stakeholders and the Public Prosecutor's Office. The latter, together with IBAMA, FEAM and Instituto Estadual de Florestas-MG, will monitor compliance with the established measures.

Finally, the fourth amendment, dated 07/14/2007, signed by the MPF, MP-MG, Iberpar and Universidade Federal de Viçosa (UFV), having the IBAMA, the FEAM and the Instituto Estadual de Florestas-MG as stakeholders, also refers to the implementation of measures for the deactivation of dams. It would be up to Iberpar: i) to execute the fertigation project along the lines of the project presented by UFV; ii) present to the MPF and to the intervening parties, at the end of the emptying of the reservoirs, the plan for deactivating the dams and recovery or future use of the areas.

In summary, the TAC and its amendments signed over four years present, at first, clarity, definition of terms and amounts of fines, regarding the measures to be carried out, but little specific, that is, in general these are broad and not detailed. In a second moment, the definition of deadlines becomes less judicious (few measures have this information), and the specification of sanctions, on the other hand, are more detailed with regard to compensatory measures, especially the third amendment. Regarding the latter, it is also worth mentioning that the compensatory measures are in charge of a former civil society organization, the Mokiti Okada Foundation. In this sense, the execution of the implementation of broad compensatory policies is delegated to a third party, not directly linked to the State or the infringing company. There is no room for the participation

14 This foundation was established on January 19, 1971 as a non-profit, private legal entity with a view to achieving moral, cultural, educational, assistance and environmental objectives in accordance with the Philosophy of Mokiti Okada. É uma entidade da sociedade civil, sendo reconhecida e certificada como uma entidade de utilidade pública nos âmbitos municipal, estadual e federal com atuação em todo o território nacional através de programas, projetos e atividades. Para mais detalhes, ver <https://www.fmo.org.br/>

of affected communities at any time. This solution differs from the solution found in the case of the Mariana disaster where, as we will see later, a foundation linked to the companies responsible for the crime was created.

### **The Oil spill disaster caused by Chevron Company (Rio de Janeiro - 2013)**

The TAC signed on September 13, 2013, between the company Chevron, the Federal Public Ministry, IBAMA and the National Petroleum Agency-ANP refers to the oil spill that occurred in 2011, in the Campos Basin, 120 kilometers off the coast of the State of Rio and about 1,200 meters deep, caused by the company's drilling activities. Approximately 3700 barrels of oil were thrown into the sea. The term recognizes that the company collected the fines imposed by the National Petroleum Agency and IBAMA in the joint amount of BRL 68,467,010.00, and in this commitment, the company undertakes to provide "as socio-environmental compensation" the amount of BRL 95,160,000.00.

Chevron's TAC refers to obligations of a "preventive", "precautionary" and "compensatory" nature. The first part deals with "measures for the prevention and precaution of environmental incidents and for the improvement of the response system to such incidents" that, compared to the compensatory ones, present very detailed and concrete technical specifications. So, for example, in preventive the TAC<sup>15</sup> indicates Chevron's obligation to install an integrated offshore oil detection and monitoring system that "shall operate continuously 24 hours a day, regardless

of visibility conditions, and rely on automatic leak detection by radar and infrared sensor, stabilized in relation to the vessel's movement, with the ability to estimate the thickness and volume of oil". Or even when indicating the installation by Chevron Brazil, the TAC foresees: "the integrated meteo-oceanographic data acquisition system, containing at least: (i) weather station with sensors for wind, temperature, atmospheric pressure and relative humidity, as well as (ii) oceanographic sensors with gauges of salinity, intensity profile and direction of marine currents, at a minimum on surface, wave and sea surface elevation data".

In the section dedicated to its "compensatory measures", the TAC is generalist in terms of content and does not indicate compensatory measures in the terms used in this article. The maximum specification is formulated as follows: "Compensatory measures will have as main objectives, among others, (i) the conservation of biodiversity along the coast, (ii) sustainable use of fisheries resources, strengthening artisanal fisheries and (iii) environmental education". As for the elaboration of projects to translate these objectives into practice, the MP delegates this function, in the first place and in the first 60 days, to IBAMA and ANP. Based on the proposition of these two public bodies, the company has six months to present the projects that include the compensatory measures, with a physical-financial schedule for their execution. The MP will continue to mediate the relationship insofar as it is the one who will take a position on the projects presented after having heard the ANP and IBAMA. IBAMA, ANP and MPF become supervisors of the execution of projects, which will be considered

<sup>15</sup> Available at <http://docplayer.com.br/8839395-Ministerio-publico-federal-procuradoria-da-republica-no-estado-do-rio-de-janeiro-200-oficio-meio-ambiente-e-patrimonio-cultural.html>

as carried out when the compensatory measures are concluded.

TAC does not create any special body to control and monitor projects; it does not summon any representative of civil society or those affected for any activity, nor does it mention any public body or sector related to the object of measures such as fishing and education. By the TAC, Chevron declares that it has, under the penalties of the Law, full technical capacity to comply with the agreement, a fine of one million reais per day is foreseen in case of non-delivery of the forecast, and the publication of reports on the internet with a minimum frequency of six months.

### **Samarco's dam failure disaster (Minas Gerais and Espírito Santo - 2015)**

The rupture of a Samarco mining dam occurred in Mariana/MG on November 5, 2015, and TAC<sup>16</sup> was signed on March 2, 2016, between the Union, IBAMA, Instituto Chico Mendes de Conservação da Biodiversidade-ICMBio, ANA, Departamento Nacional de Produção Mineral-DNPM, Fundação Nacional do Índio-FUNAI, State of Minas Gerais, Instituto Estadual de Florestas-IEF, IGAM, FEAM, State of Espírito Santo State Institute of Environment and Water Resources-IEMA, Institute of Agricultural and Forestry Defense of Espírito Santo-IDAF, State Water Resources Agency-AGERH (all committed, also responsible for monitoring the actions of the agreement), Samarco Mineração S.A, Vale S.A and BHP Billiton Brasil LTDA. This set of agents highlights the presence of a force field, whose multiple interpretations of the Rio Doce disaster belong to different rationalities,

which is why it is assumed that in addition to the apparent consensus made possible by the agreement, tensions and disputes still echo as permanent struggles over the measures.

The TAC provided for the creation of a Foundation (created on August 2, 2016 and named Fundação Renova) under private law, with autonomy in relation to companies, whose objective is to manage and execute all the measures provided for in the socio-economic and socio-environmental programs. In addition to the Foundation, it also foresees the institution, by the Government, of an Interfederative Committee, as an external and independent instance of the Foundation, for permanent dialogue with the Foundation, and to define priorities in the implementation and execution of projects, following up, monitoring and inspecting the results. In summary, the Renova Foundation has a complex governance model, composed of a Board of Trustees, an Executive Board, an Advisory Board (with provisions for the establishment of channels for civil society participation) and a Fiscal Council.

The purpose of the agreement is to forecast programs to be elaborated, developed and implemented by the foundation, with the objective of recovering the environment and socioeconomic conditions of the coverage area impacted by the event, in addition to the adoption of mitigation measures, compensation and indemnification, necessary and provided for in the programs. According to the TAC, compensatory programs comprise measures and actions that aim to compensate for non-mitigable or non-repairable impacts arising from the event, through the improvement of the socio-environmental and socio-economic

<sup>16</sup> Available at <http://www.fundacaorenova.org/wp-content/uploads/2016/07/ttac-final-assinado-para-encaminhamento-e-uso-geral.pdf>, with reformulation at <http://www.mpf.mp.br/grandes-casos/caso-samarco/documentos/tac-governanca>

conditions of the impacted areas, whose repair is not possible or feasible under the terms of the programs (Lavalle and Carlos, 2022).

The thematic axes, socio-economic programs and socio-environmental in which they configure compensatory measures. They are numbered in the long list, albeit with little specification: They would be designed, developed and executed or supervised by the Foundation: There are: 1) Social Organization: program for surveying and registering those affected; compensation and indemnification program for those affected; program to protect and restore the quality of life of indigenous peoples; program to protect and restore the quality of life of other traditional peoples and communities; social protection program; communication, participation, dialogue and social control program, and animal assistance program; 2) Infrastructure: program of reconstruction, recovery and relocation of Bento Rodrigues, Paracatu de Baixo and Gesteira; recovery program for the UHE Risoleta Neves Reservoir; and recovery program for the other impacted Communities and Infrastructures between Fundão and Candonga, including Barra Longa; 3) Education, Culture and Leisure: Program for the Recovery of Schools and Reintegration of the School Community; Program for the Preservation of Historical, Cultural and Artistic Memory; and Program to support tourism, culture, sport and leisure; 4) Health: Support Program for Physical and Mental Health of the Impacted Population; 5) Innovation: Research Support Program for the Development and Use of Socioeconomic Technologies Applied to the Remediation of Impacts; 6) Economy: Program

for the Resumption of Aquaculture and Fisheries Activities; Program for Resumption of Agricultural Activities; Program for the Recovery and Diversification of the Regional Economy with an Incentive to Industry; Micro and Small Business Recovery Program in the Commerce, Services and Productive Sector; Program to Stimulate Local Hiring; Emergency Financial Aid Program for those affected; and Reimbursement Program for extraordinary public expenditures by the parties involved; 7) Action Plan Management: Socio-economic program management program; 8) Tailings Management and Water Quality Recovery: Tailings management program resulting from the Fundão dam failure, considering in situ conformation and stabilization, excavation, dredging, transport, treatment and disposal; Program to implement tailings containment systems and in situ treatment of impacted rivers; 9) Forest Restoration and Water Production: Environmental area recovery program <sup>17</sup> in the municipalities of Mariana, Barra Longa, Rio Doce and Santa Cruz do Escalvado, including bioremediation; Permanent Preservation Areas Recovery Program (ARP) and recharge areas of the Rio Doce Basin control of erosive processes; Spring Recovery Program; 10) Biodiversity Conservation: Program for the conservation of aquatic biodiversity, including freshwater, coastal and estuarine zone and impacted marine area; Program to strengthen the screening and reintroduction of wild fauna structures; Terrestrial fauna and flora conservation program; 11) Water Safety and Water Quality: Program for the collection and treatment of sewage and disposal of solid waste; and Program to improve water supply

17 São as áreas abrangidas pela deposição de rejeitos nas calhas e margens dos rios Gualaxo do Norte, Carmo e Doce, considerando os respectivos trechos de seus formadores e tributários, bem como as regiões estuárias, costeiras e marinhas na porção impactada pelo evento.

systems; 12) Education, Communication and Information: Environmental education and preparedness program for environmental emergencies; Information program for the population in the environmental area 1; and National and International Communication Program; 13) Environmental Preservation and Security: Environmental risk management program in environmental area 1 of the Rio Doce Basin; and Research and monitoring program for the Rio Doce Basin, impacted estuarine, coastal and marine areas; 14) Sustainable Land Use and Management: Conservation Units Consolidation Program; and Program to encourage the implementation of the Rural Environmental Registry-CAR and the Environmental Regularization Programs-PRAs in the environmental area 1 of the Rio Doce Basin; 15) Action Plan Management: Management program for the environmental recovery plan for the Rio Doce basin, estuarine, coastal and marine areas.

Evaluation and monitoring are part of planning, under the auspices of attesting to some effectiveness and repercussion of political governance actions in different areas to which mitigating measures address. For this, the institutional arrangement provides for the regular publication of monthly reports by the Renova Foundation, attesting to the relevance of the processes of systematization of information related to the practices of alleviating the devastation caused by the disaster. The participation of those affected was not foreseen. Regarding the information contained in the reports, one can point to the embarrassment insofar as the monitoring perspective is linked to what the mining companies wish to communicate with the aim of legitimizing. The consolidation of periodic

reports is probably a *sui generis* case regarding the institutional arrangement engendered in the post-disaster, aiming to account for the complexity and scope of the phenomenon.

The absence of effective channels for participation of those affected and the poor results of the implementation of Renova programs (Dowbor et al., 2022) resulted, under the leadership of the MPF and within the Public Civil Action, in the establishment of three new legal frameworks. The Preliminary Adjustment Term (TAP) of January 2017 introduced the hiring of independent specialist entities to diagnose and monitor Renova's performance with the aim of assisting the MPF. Soon after, the Public Ministry itself promoted 27 meetings with those affected, which highlighted the fragile position of local communities with regard to the processes of monitoring and negotiating the terms of the TAC. This diagnosis resulted in the signing of the Addendum to the TAP, in November 2017, in which it was decided to hire technical consultancies for those affected, with the aim of strengthening their ability to interpret the complexity of the data and the technicality of the agreements and standards. (Lara, 2022)

Finally, on June 25, 2018, the new TAC was signed, called the Governance TAC, which specifically created new formats for the effective and constant participation of affected communities, in all stages and phases of the agreement, both in the planning and effective execution and monitoring. 39 Local Commissions and 6 Regional Chambers were created made up of those affected, in addition to the Observers' Forum. All would be under the supervision of the MP and Public Defender's Office and some would be financed by the companies responsible for the disaster (Lara, 2022). The designs for participation



changed, even though the milestones still had certain biases that harmed the architecture of effective participation (LOSEKANN, 2018; SILVA, CAYRES, SOUZA, 2019 )

### **Tailings leakage disaster caused by Hydro Alunorte (Pará - 2018)**

The main occurrences of this disaster took place between the 16th and 25th of February 2018, and consisted of leaks of mining tailings from the Norwegian company Hydro Alunorte in Barcarena, Pará. The action had its origins in the denunciation of leaks of bauxite tailings, in aluminum production, in the air and in rivers, with contamination rates above what is permitted by law. Similar facts to the disaster in the region have been recognized since 2001 by risk management actions by mining companies. Therefore, the territory suffers from vulnerabilities due to the actions of mining companies whose management, despite Contingency Plans and legislation, implies an explicit admission of recurring damages. It is worth mentioning that there is an extractive system in the region that integrates several companies, with non-equivalent attributions.

The TAC was signed on September 5, 2018, between MPF, Public Ministry of the State of Pará (MPPA), State of Pará, Secretary of State for Environment and Sustainability (SEMAS), Alunorte Alumina from Northern Brazil S/A and Norsk Hydro Asa. Its objective is to implement emergency measures, based on the principles of precaution and prevention, aiming at the evaluation and indication of measures to mitigate the impacts and supposed risks created by the industrial activity of the company in Barcarena, in view of the investigation of the facts that occurred.

In terms of compensatory measures, we have found: a) soil and water quality assessment; b) epidemiological, clinical and laboratory evaluation of potentially affected communities; c) detailed environmental investigation in the Murucupi river basin, indicating solutions and technical measures to be adopted; d) survey and limnological and ichthyofauna Monitoring Plan for the Murucupi River and the Água Verde, Pramajozinho and Tauá streams, indicating solutions and technical measures to be adopted; e) present studies of the sediments of the Murucupi River and the Água Verde, Pramajozinho and Tauá streams, indicating solutions and technical measures to be adopted; f) payment of compensation in the amount equivalent to 70% of the minimum wage (i.e., BRL 670.00), per family unit that demonstrably resided in the referred area; g) to make, in favor of the impacted families, the payment of a monthly minimum wage, per family unit, for a period of 12 months, h) invest up to BRL 5 million in the implementation of alternative drinking water treatment and distribution systems, including residential connections, with groundwater capture and water treatment plants within 180 days and monthly quality assessment, as well as the quality of the water for the fishing activity; i) implementation of a public system for assessing surface and groundwater in the basins of the Pará, Murucupi and São Francisco rivers, which will be donated to a competent public entity for operation and maintenance, j) implementation of a public bathing assessment system for the beaches of Caripi, Vila de Itupanema, Vila do Conde, Vila de Beja, Ilha Trambioca and Ilha do Capim, which will be donated to a competent public entity for operation and maintenance; k) implementation of a public air quality assessment system,

considering particulate matter and the emission of toxic gases, in the areas surrounding the Alunorte industrial plant, which will be donated to a competent public entity for operation and maintenance; l) installation of telemetric buoy systems to assess water quality on the beaches of Itupanema, Conde, Beja, Caripi, Ilha Trambioca and Ilha do Capim, to be donated to a competent public entity for operation and maintenance; m) elaboration of a research program, with institutions, organisms, universities, in line with the Innovation Policy and within 3 years to present a product developed from the use of bauxite waste, replacing the current final destination of bauxite waste. In this list, we observe a greater specification of measures similar to the Samarco disaster.

The agreement does not envisage the creation of a specific institution to implement the compensatory measures, which will be the responsibility of Alunorte itself, with the assistance of companies to be hired for specific tasks. A Committee to follow up on the TAC was set up, consisting of the signatories to the agreement and entities from civil society to be defined by the parties. The State of Pará, MPF, MPPA and SEAM are responsible for monitoring and inspecting the agreement. The company is responsible for hiring and paying for an independent audit, based on a public selection and upon approval by the Commitments, and Alunorte must provide all the data, information and accesses for the registration of families, within 120 days.

On October 11, 2018, the first amendment to the TAC was signed between MPF, MPPA, State of Pará, SEMAS, Alunorte Alumina do Norte do Brasil S/A and Norsk Hydro Brasil LTDA. Basically, it involves adjustments to the wording of the previous document, some definitions of terms, and the inclusion of a clause that emphasizes

that any communities and neighborhoods covered by the area identified in the annex to the text, could present themselves to the MPF and MPPA to request their inclusion in relation to the indemnity amounts established by the TAC. Finally, on March 25, 2019, the second amendment was signed by the same parties involved in the previous document, which focuses on the establishment of deadlines for some previously established measures, as well as the extension of some deadlines.

### **Summarizing the four cases**

Analyzed from the perspective of broad compensatory measures that would treat this kind of effects, TACs show little specification in their content, forms of decision and implementation of these measures (Table 1). At the same time, in a comparative perspective between the four TACs signed over 15 years, attention is drawn to a growing expansion and characterization of terms relating to these measures. They start to occupy more space in relation to preventive and emergency ones, they become more detailed, including specifying monetary values as in the case of Hydro Alunorte or defining programs by sector and area as in the case of Samarco.

As for the management model, three of four cases rely on a very loose model with little accountability. Decisions on action plans are sent exclusively to the signatories of the TACs, including the MP and the bodies of the National Environment System (SISNAMA), through poorly detailed processes. The implementation of the measures is invariably the responsibility of the consultancies that carry out the environmental technical studies and various diagnoses and of civil society organizations

whose choice is not justified and their actions are not subject to control processes, except by the offending company itself. Organizational innovation occurs in the case of the Samarco disaster where a foundation is created especially to implement compensatory measures. However, the Renova Foundation reports to the companies responsible for the crime, which restricts its ability to act and intervene (LAVALLE; CARLOS, 2022) their results are below expectations (DOWBOR et al., 2022).

Two absences are evident at the TACs: that of civil society and affected communities and

state entities beyond those of the environment area. Its inclusion in the designs of management models is not observed, with the exception of the Samarco disaster, which means the exclusion of these voices from the decision making process. Thus, these agreements that will last give up both the state and societal capacities. Despite a long tradition of Participatory Institutions in the country and the accumulation of studies on them, TACs do not consistently incorporate these institutional innovations into decision-making processes regarding programs and strategic actions in their territories.

Table 1 - Comparison table of disasters

Company responsible for the Disaster	Iberpar	Chevron	Samarco	Hydro Alunorte
Analyzed instruments	CAA (29/05/2003) Aditivo 1 (05/12/2003) Aditivo 2 (17/05/2004) Aditivo 3 (05/10/2006) Aditivo 4 (14/07/2007)	CAA (13/09/2013)	CAA (02/03/2016) CAA-Governance (25/06/2018)	CAA (05/09/2018) Additive I (11/10/2018) Additive II (25/03/2019)
Is there a specification of compensatory measures?	Yes	No, just generic mention	Yes	Yes
Who carries out the compensatory measures?	Iberpar and Fundação Mokiti Okada (civil society organization)	Chevron, IBAMA and ANP	Fundação Renova	Alunorte and Norsk Hydro
Are there deadlines for implementing the measures?	Yes, most of the time	No	Yes	Yes
Are the amounts of fines specified in the event of non-compliance?	Yes, most of the time	No	Yes	Yes
Who supervises the measures?	MPF, IBAMA, FEAM and Instituto Estadual de Florestas-MG	MPF, IBAMA and ANP	União, IBAMA, Instituto Chico Mendes de Conservação da Biodiversidade, ANA, DNPM, FUNAI, State of Minas Gerais, IEF, IGAM, FEAM, State of Espírito Santo, IEMA, IDAF, AGERH	MPF, MPPA, State of Pará, SEMAS
Are there any plans for the participation of the affected communities?	No	No	Yes (in the second CAA)	Yes Partial

Source: Authors' own elaboration (CAAs).

Finally, the table below (Table 2) presents a synthesis of the compensatory measures described in the TACs of the four cases analyzed here. It is observed that few measures were directed towards the affected communities. The Samarco case is once again emblematic, as it adds, in addition to issues related to

compensation and reimbursements, aspects such as the recovery of the quality of life of those affected and support for mental health. This suggests that, in some way, the involvement of civil society and the affected individuals in the drafting of these documents was important for the incorporation of their demands.

Table 2- The compensatory measures

Iberpar	Chevron	Samarco	Hydro Alunorte
- water quality monitoring;	- conservation of coastal biodiversity;	- compensation and indemnification program for those affected;	- epidemiological, clinical and laboratory evaluation of affected communities;
- presentation of final lye disposal project, by fertigation;	- sustainable use of fisheries resources, strengthening artisanal fishing;	- protection and restoration of the quality of life of indigenous peoples and traditional communities;	- payment of a monthly minimum wage to each impacted family unit, for 12 months;
- execution of the fertigation plan.	- environmental education.	- Recovery of Schools and Reintegration of the School Community;	- implementation of a public system for assessing surface and groundwater, in the basins of the Pará, Murucupi and São Francisco rivers, which will be donated to a public entity for operation and maintenance.
		- support to the Physical and Mental Health of the Impacted Population;	
		- improvement of water supply systems.	

Source: Authors' own elaboration (CAAs).

## Final considerations

The production of metals via mining, essential for innovation and the maintenance of consumption levels, in addition to products destined for export, also produces an economy of destruction of nature. This last dimension is also present in oil exploration and pulp production. In this sense, it is up to the social scientist to deal with disasters in the context of the challenges delegated by the emergence of the risk society. There are social and environmental dimensions in the production of disasters, in the face of which the institutional agreements generated are intended to act to reverse the aggravating factors to the vulnerability of the affected

population and the environment in the short, medium and long term.

The legal instruments analyzed here, the TACs, establish the rules that will govern the actions of the actors involved in the disasters, especially in the medium term, when disasters become invisible in the public and media agenda. In general, the TACs are not clear in terms of specifying the compensatory measures to be adopted. However, over the years, considering that specimens of these instruments from 2003 to 2019 were analyzed, it was observed that compensatory measures gained more prominence compared to preventive and emergency measures, becoming more detailed. Although the study on the implementation process of these measures

would be necessary to verify if this degree of specification generates positive effects, it is possible to say that compensation gains more space in the agreements, pointing to advances in the learning of the State institutions involved in terms of understanding the impacts of disasters in the medium and long term. Future studies may provide evidence on the effects of specifying compensatory measures in the implementation process.

The implementation of these measures was entrusted to the civil organizations, except in the case of Samarco, with the creation of the Renova Foundation. Regarding the participation of civil society and communities affected by the disaster in the specification of projects, decision-making, and implementation, the Samarco case is also an exception, as the most common was the absence of these actors in this process.

Finally, it is worth noting that the agreements ratified between state agencies and companies, to compensate for the socio-environmental impacts of the respective disasters, indicate that the State chooses not to assume for itself, even if through payment by the violators, the mitigation of medium-term effects as a public policy. This is a path that is recurrently discarded by TACs signatories, although possible. In the case of Samarco, in the governance arrangement under the leadership of the Interfederative Committee and its Technical Chamber of Health, Technical Notes were issued in 2018 – 3 years after the dam collapse – which ordered the Foundation implementing programs to establish a subprogram to support and strengthen the Unified Health System (SUS) and that the affected municipalities and their health secretariats should prepare Health Action Plans to be supported and strengthened by

the Foundation. Here, the logic of diagnoses and management of compensatory measures is inverted. The public power enters with its capacities to mitigate the medium-term effects, paid for by the violator, basing its action on the hearings of the population (MACHADO; DOWBOR; AMARAL, 2020).

The next step in the study is to determine the degree of compliance that the agreements impose on the signatories. That is, seeking to answer the question whether the wording of the terms as identified in this analysis makes the cost of punishment for not complying with the TACs in terms of broad compensatory measures not less than the cost of carrying them out. Well, in this case, as mentioned by Brinks, Levitsky and Murillo (2019), it would be a weak institution, that is, one that, despite its ambitious statutory objectives, lacks measures to enforce them. In other words, it is about verifying if the TACs are instituted for the Brazilian or for the English to see.

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