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# **The aftermath of the Fundão dam disaster in Barra Longa, Brazil – Compensation and participation from an environmental justice perspective**

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International Environmental Studies



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**Declaration**

I, Vilde S. Haugsnes, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature.....

Date: December 17, 2018

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## **Abstract**

This paper has as its main objective to look at how the compensation and participatory strategies used by Samarco and the Renova foundation has created conflicts among actors in the local community. By using a conceptual framework based political ecology, with the main focus on social and environmental justice, as well as different perspective on power, the paper will show how there has been an unfair distribution of benefits in comparison to damaged suffered by the Fundão dam disaster. The paper will further show how the lack of recognition is an important factor creating distributional injustice.

Simultaneously with the process organized by the Renova foundation the social movement (MAB) has created an alternative process focused on local participation in the construction of the recovery program. The group created surrounding MAB works for environmental justice through a broader recognition off all those influenced by the dam rupture, a just compensation and real participation in the recovery work.

## **List of acronyms:**

AEDAS: Associação Estadual de Defesa Ambiental e Social/ State Association of Environmental and Social Defense

BG: Base group

CIF: Comitê Interfederativo/ Inter-federative committee

ES: Espírito Santos

FAEMA: Fundação Estadual do Meio Ambiente/ State Foundation for the Environment (MG)

IBAMA: Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis/ Brazilian Institute of the Environment and Renewable Natural Resources

IBGE: Instituto Brasileiro de geografia e estatística /The Brazilian institute of statistics and geography (ES)

IEMA: O Instituto Estadual de Meio Ambiente e Recursos Hídricos/ The State Institute of Environment and Water Resources

MAB: Movimento dos Atingidos por Barragem/ The movement for those affected by dams

MG: Minas Gerais

MP: Ministério Público/ the Public Prosecutors Office

MPF: Ministério Público Federal/ The Federal Public prosecutors Office

PE: Political Ecology

TAC: Termo de Ajustamento de Conduto/

TTAC: Termo de Transação e de Ajustamento de Conduta/

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# 1. Introduction

## 1.1. The dam bursts

On the afternoon of November 5th, 2015, the Fundão dam in the state of Minas Gerais (MG), in southeast of Brazil collapsed. The dam situated along the Doce River held back iron ore tailing of surrounding mines. The rupture, which occurred only one hour after a first leakage had been notified by the operating company Samarco, it released a wave of toxic mud that, on its 668-kilometer-long way to the Atlantic Ocean, buried various human settlements and killed 19 people. Its journey took 17 days (Fonseca do Carmo et.al, 2017). As a direct consequence of the released mud large amounts of fish and vegetation died and people lost their home and livelihood. There is still no consensus between the Civil defense, Samarco and the local governments about how many people have been affected by the disaster. According to IBGE the Brazilian institute of statistics and geography 1,29 million people live in the affected counties (Pereira Leão da Motta et.al, 2017). The future socio-environmental damages of the mud are still hard to measure, especially considering the high content of heavy metal and other substances (Fonseca do Carmo et.al, 2017). The Fundão dam was owned and drifted by Samarco Mineração SA, a joint venue between the Brazilian company Vale SA and the Australian company BHP Billiton, as a part of the Germano complex. The joint venture as seen today was started in 2000 (Pereira Leão da Motta et.al, 2017). The dam was built in 2008 and had an expected lifespan of 25 years (Fonesco do Carmo et.all, 2017).

The Fundão dam disaster is not an isolated incident, through the history of the Brazil. The state of Minas Gerais has experienced dam- and mining disasters since the beginning of its mining adventure in the 1800s. In recent years the country has experienced a range of dam disaster related to the mining sector, most of them in Minas Gerais (de Castro Lacaz et.al, 2017). In 1986 in Itabino (MG) a dam belonging to the Itaminas group ruptured. In 2001 a dam owned the Rio verde company ruptured and left São Sebastião das Águas Claras (MG) suffering, still today the community feel the environmental consequences caused by the rupture (Augusto, 2015). In 2003 followed another accident this time with a dam owned by a paper company. In 2004 large national manifestations occurred as a response to the continued dangers with the mining sector, as a result a plan for prevention, preparation and quick solution in environmental emergencies with dangerous chemical products was created. The plan had no practical consequences, and little has been known about it (de Castro Lacaz, de Sousa Porto & Magalhães Pinheiro, 2017.) In 2007 and 2008 Minas Gerais suffers another two disasters, first a dam rupture in the in Mirai affecting the Pomba River and the year after in Congonhas. In 2014 a dam ruptured in Itabinas and killed five people. The Fundão dam disaster is the last in the long line and is considered the

biggest environmental disaster in Brazil so far, and one of the world's biggest of its kind (de Castro Lacaz et.al, 2017)

The reason behind the Fundão dam disaster is contested. The companies (Samarco, Vale and BHP Billiton) and the Renova foundation, created to recover the damages, argue strongly that the disaster was an accident and refuse to take any blame for the failure (Philips, 2018 & Paes, 2018). The companies argue they are doing everything in their power to compensate all those who suffer consequences of the disaster. On the other hand, social movements, the federal prosecutor's office and different research sees the disaster as a crime committed by the companies (MAB 2018; MPF,2016; Poemas, 2015). The technical report made by an independent group hired by Samarco, clearly indicates that the rupture occurred due to multiple failures both in the construction and storage of the tailing. The report argues that Samarco had knowledge of these issues, the construction defect goes all the way back till 2009. A mixture of different types of tailings led to liquefaction of the structure and created an increased pressure and weakening of the dam structure. A small seismic shock that occurred 90 min before the rupture weaken the structure further, leaving it at a precarious state of stability, which eventually led to the rupture (Morgenstern, Vick, Viotti, Watts, 2016; Fonesco do Carmo et.all, 2017). The research group PoEMAS (2015) argue that technological advances in mining and increased mining prices around the time lead to additional tailing and hence contributed to the failure of the Fundão dam. The research group calls it a technological disaster. Documents that have occurred after the rupture proves that all the three companies involved knew about the precarious state and risks concerning the dam and as noted by the Federal Public Prosecutors office (MPF) (2016), they chose economic gains instead of improved safety of the dam.

The Fundão dam case is not the only case of corporate crime occurring with the purpose of maximizing profits. Amita Etzioni and Derek Mitchell (2007) describe how large corporations around the world commit crimes using corporate infrastructure or assets to increase profits that will benefit the stakeholders. According to Kramer (1984 and Cullen, Cavender, Maakestad and Benson, 2006) employees and local communities are regular victims of corporate crimes by damages done to the environments of which they live in. The lack in maintenance as well as implementation of health and safety regulation is another way for corporations to reduce cost. Every year different forms of corporate "accidents" are creating damages to people and the environment (Kramer 1984; Yokoyama, 2007). Since 1996, Samarco have been charged with 19 environmental violation from both federal and state environmental organs, IBAMA, FEAM (MG) and IEMA (ES) (PoEMAS, 2015). Showing how the company lacks interest in complying

with environmental legislation. In relation to the Fundão dam disaster this is shown in the lack of warning system and trained personnel to help the communities in case of emergency. Even though, this is a demand by Brazilian legislation in The National policy of dam safety (Lei.12.334, 2010).

Samarco, Vale and BHP Billiton are facing a range of legal charges, from homicide to environmental damages. The charges for homicides are directed to the companies, but also to individuals with key position within the company, the federal prosecutor's office (MPF) has run the case against them and together with the federal police found documents that prove the knowledge about the structural issue of the dam (MPF, 2016). Both the environmental organs of the states of Minas Gerais (MG) and Espirito Santos (ES) has created cases against the companies, as well as the Chico Mendes institute for Conservation and Biodiversity. None of which are as big as the fine put forward by the IBAMA, The Brazilian Institute for Environment and Natural Resources (IBAMA, 2017). As state by IBAMA (2017) Samarco has already used all the available appeals stated in the legislation. In addition to the charges and fines against the company, they settled a Framework agreement, called the Transaction and Conduct Adjustment Term (TTAC ) It was signed by Samarco, Vale and BHP Billiton together with the federal government, the state governments of Minas Gerais (MG) and Espirito Santos (ES) and other institutions such as IBAMA, the Chico Mendes institute, Funai, the national Water Agency, on March 2nd, 2016, The purpose of the TTAC was creating guidelines on how to organize the recovery work after the impacts of the mud. TTAC legally created the Renova foundation as the entity to execute the defined recovery programs with a strong focus on citizen participation in both the development and execution of the programs (TTAC, 2016).

On June 30<sup>th</sup>, 2016 the Superior Court of Justice announce the suspension of the TTAC agreement, the application to suspend the ratification was sent from Federal public defender's office and the Public prosecutor's office (MP) of Minas Gerais, with the support from the movement for dam affected people (MAB). The MPs attorneys argued that the agreement was not valid as its elaboration lacked participation from the affected people, stressing that the agreement could not guarantee complete reconstruction and sufficient information on the establishment of the compensation payments (STF 2016; MPF, 2016). Regarding the suspension of the TTAC, Samarco (2018a) state that "*Even with the suspension of the TTAC ratification on June 30th by the Superior Court of Justice, the obligations contained in the document continue to be fully complied with.*" Clearly, stating that the work will continue as planned.

The recovery work after the disaster has been a slow process. Both Samarco and Renova present citizen participation as very important in the compensation and reconstruction process, however in practice the lack of participation is a returning issue. As a response to lack of participation the movement for those affected by dams (MAB) together with the affected people and AEDAS (a technical advisory group) started an alternative process for the implementation of the recovery work, based on broad participation. The creation of the alternative process increased the ownership of the process for those who participate, but on the other side, created a division between those apt for a collective process versus those who prefer to resolve their issues individually. The research objective of this paper is to understand how *mechanisms of participation* and *compensation* in the recovery process in Barra Longa and Gesteira have *triggered* conflicts by using a political ecology and environmental justice perspective.

To reach the objective I will answer the following questions

**Research questions:**

1. Who is recognized as being affected and who claims to be affected but is not recognized?
2. What compensation schemes have been implemented? Who has received what?
3. Who is representing who?
4. How does participation look like in theory and in practice?
5. What are the narratives used by Renova and Samarco vs MAB and the commission?

The first question investigates who are affected by the dam rupture and to what extent these people are recognized by Renova. It further looks at the importance of recognition in relation to distributional justice. Question two discusses the different types of compensation schemes implemented and how these are distributed amongst the population of Barra Longa and Gesteira focusing on environmental justice including recognition and distributional justice. The third and fourth questions focusing on understanding issues concerning participation and procedural justice. It involves the different actors and their roles in relation to the affected people. It further goes on to looking at participation as presented and executed by Samarco/Renova and the opposing project presented by the social movement (MAB) together with the Commission of affected people and AEDAS. The last question concerns the strategies and narratives used by Samarco and MAB who the leading political actors in this case are. Finally, there will be a discussion concerning who the above issues have led to local conflicts.

## 1.2. Area of study



Figure 1: Placement of Barra Longa in Minas Gerais (left corner Minas Gerais in Brazil).

For my research I choose to concentrate on the recovery work done in the town of Barra Longa and the village of Gesteira. Both locations within the administration of Barra Longa municipality. A small municipality in the south east of Minas Gerais with a population of approximately 5900 people (IBGE, 2018). In a Brazilian context the town of Barra Longa (Barra Longa, from now on refer to the town, unless otherwise mentioned) has a long history of

about 300 years of existence, the town was created based on mining in the Carmo and Gulaxo do Norte River, which were known for being abundant in gold. On the night of November 6<sup>th</sup>, 2015, the life changed drastically, and people had to learn how to live as affected people, both rural and urban areas got affected by the mud. Barra Longa was severely damaged the central square was completely flooded in mud and the primary school destroyed. 36 stores and a couple of restaurants were damaged by the mud, together with 112 houses and 188 gardens (Samarco, 2016a). The mud destroyed everything it passed by, including multiple bridges connecting the two sides of the Gulaxo do Norte river, creating restriction in important access point for the local communities. Barra Longa was covered in mud for about four months until the removal work was completed (Samarco, 2016a). A lot of complaint of the recovery work for being slow and lacking citizen participation led to the creation of the commission of affected people, who together with MAB and more recently AEDAS, are creating an alternative and more participatory options for the recovery work.

In the rural area large amount of agricultural land, roads and farming equipment got destroyed. The Village of Old Gesteira, a small rural community on the border of the Gualaxo do Norte river, got completely devastated by the mud, destroying nine houses, a church, a local shop, a school, a football field, and a range of productive gardens and a community hall. Not to mention the community life that was a very important part of this community that has existed for more

than 300 years with strong agricultural traditions. The commission of affected people has also been very important in the resettlement process of Gesteira.

The affected people are a diverse group from different social classes and background. The town center of Barra Longa is dominated by the more well off and predominantly white people, while the further away from the city center the population is becoming majority “negro” as used in Brazil by the population with African descendants. The communities most affected by the disasters are all majority Negro. The city of Barra Longa has a 60,3% negros, while Gesteira as many as 70,4% (IBGE 2018 & PoEMAS, 2015).

### 1.3. Structure of the thesis

The structure of this thesis is as follows, in *chapter 2* the conceptual framework that will be the bases for the analysis will be presented. First an introduction to social and environmental justice, following some considerations on participation and finally a section on Political ecology and power. *Chapter 3* present and explains the research method with sampling approach, the different types of data gathering methods, ethical considerations and trustworthiness of the study. In the end it considers the analysis of the data. From there on the main part will be divided in three. *Chapter 4* concerns compensation and recognition, first looking at how the definition of who are affected by the disaster in comparison to who are recognized as affected by Renova. It will further look at the compensation schemes introduced by Renova and the importance of recognition for distributional justice. Next it will consider how the distribution of benefits have strengthens already existing inequalities in Barra Longa. *Chapter 5* looks at which actors represent who and how participation is presented in theory versus practice. Further a criticism of Renova participation mechanisms will be discussed before looking at the alternative model created by the commission of affected people together with MAB and AEDAS. Chapter 6 gives an insight into the strategy used by the two sides (Samarco and MAB) and the different narratives used to explain the disaster. The narratives create the foundation for the conflicts seen in the communities and will together with the consideration from the previous chapters create the basis to explain how and why participation and compensation mechanisms have amplified conflicts among actors in Barra Longa and Gesteira. Last there will be a conclusion.

## 2. Conceptual framework

### 2.1. Environmental and social justice

The unequal distribution of impacts among social groups but also the contestations over forms of participation and compensation within the recovery process downstream of the dam, make this case a case of environmental justice. Social and Environmental Justice is divided in three central forms of justice *recognition, distribution* and *participation*. By using these three concepts the paper will discuss the potential injustice in a society when recognition, distribution and participation is not acknowledged and used in a proper manner. This can lead to an unequal distribution of environmental benefits and damages, strengthening already existing inequalities in society and increase the level of local conflicts.

The environmental justice concept originated from the 1960s and 1970s with the debates surrounding the unequal distribution of access to resources and exposure to environmental pollutions by the poor black communities in the USA (Bullard and Wright, 1990).

Environmental justice or injustice is understood in the form of equity or unfair distribution of environmental problems and benefit where poor families or communities, often black or racial minorities lives closer to environmental hazards (Robbins,2012; Schlosberg,1990, 2013).

Environmental justice can both be considered a form of social movement, as well as a form of analysis (Robbins, 2012).

The concept of justice was first discussed during the 2<sup>nd</sup> world war, with “relative deprivation” as the focus, arguing that deprivation was seen in relation to others (Crosby, 1976, Martins 1981; 1986). Later, equity became a large part of the study of justice (Tylor, 1994). John Rawls (1971) a classic thinker within liberal justice theory, tried to solve the issue of distributive justice, by the reconciliation of liberty and equality. He argued that any social or economic difference in society could only be accepted if the greatest benefit was given to the poorest members of society, however all member of society must have some equal basic rights. He based this argument on the thought experiment stating that if everyone lived behind a “veil of ignorance” and did not know their social status, everyone would vote for equal political rights and distribution of goods, even for the least fortunate in our society (Rawls, 1971).

Many have argued that the idea of distributive justice as the only bases for justice is limited (Young, 1990; Fraser, 1998 & Scholberg, 2004). Scholberg (2004) is critical to the liberal justice theories and their lack of willingness to include recognition as a central issue of justice, he argues:



*“Justice in theory may happen in isolation, neutrality or behind a veil of ignorance, but that is simply not the case in practice. If the interest is about attaining justice, rather than attaining a sound theory of justice, recognition is central to the question and resolution- and is not simply to be assumed” (2004:520)*

According to Iris Young (1990) the idea of redistribution is very central in the unequal distribution of benefits and risks, however, argues that other reasons for inequality exists. She sees unjust distribution as based on the lack of recognition of the differences between groups in society. By shifting the focus of justice towards the understanding of domination and oppression, it will open for other issues like decision making, culture and division of labor. Fraser (1998) divide the understanding of social justice in two types, first the claims for redistribution, focusing on an unfair distribution of goods and resources. Second, recognition claims where the goal is to acknowledge and recognize the diversity within cultures, and no longer assimilate to the dominant cultural norms of the majority. Fraser (1998) argues how there exists a disassociation between the two types of justice, but firmly states that both recognition and distribution is needed for justice.

Fraser (1998) uses gender as an example to show how injustice is two sided, arguing that gender suffers distributional injustice for example in the division of labor, between productive and paid work and reproductive unpaid work, where women in most cases has the largest responsibility. The other form is based on recognition and how there exists a status difference between the genders. Traits often associated with qualities known as masculine are prioritized. For Young (1990) to undermine the oppression that exist in society social justice needs explicitly attend to the difference. In other words, the lack of recognition is the foundation of distributional injustice. To understand the distributive injustice in society, we need to understand the social differences that affect privileges and oppression in society (Young, 1990).

Fraser (1998) introduces what she calls “participatory parity” including both recognition and distribution in a “bivalent” conception of justice. Participatory parity refers to the equal possibility of participation and interact in social arrangements in society. For participatory parity Fraser argues there must be two prerequisites (1) Material distribution must be as such to ensure independence and voice in the participation. (2) All participants must have equal respect and possibility to create social esteem without being restricted by the institutionalized cultural patterns of interpretation and evaluation.

Participation is also central in the discussion of procedural justice where the idea of *fairness* in process is central. E. Allan Lind and Tom R. Tyler (1988) argue that if the process is fair the outcome should be fair, independent of the outcome. However, participation of those involved is important to create a fairness process both for resolving disputes as well as in allocation of resources. Thibaut and Walker (1975) added to the idea of a fair process, the importance of people perception of how decisions are made relating the evaluation of procedural justice with process control and decision control. Process control being related to the evidence presented and decision control to the participants influence on the final decision. Tom R. Tyler (1994; Lind and Tyler, 1988) sees motivation for procedural justice as two sided, first the Resource based model, as used by Thibaut and Walker (1975), with a focus on maximizing gains from social interactions and the relational model, arguing that people are precondition to participate in social groups and the reward and self-realization this participation gives is fundamental. Tyler (1994) agrees with Thibaut and Walker about the importance of process control, however not that it is connected to resources, but that it is relationally motivated.

Both Fraser (1998) and Young (1990) argue that the lack of recognition and respect decreases the person's activity and participation in the local community and the political institutions. In this sense the political process is the key to increase justice by creating social recognition and social distribution of goods. "*Democratic and participatory decision-making procedures are then both an element of, and a condition for, social justice*" (Young 1990: 23) According to Schlosberg (2004: 519) Fraser and Young simultaneously manages to challenge "institutional exclusion, a social culture of misrecognition and current distributional patterns"

Schlosberg (2004) argues that recognition and political participation is essential in environmental justice from a social movement's perspective. That the demands from the social and justice movements contains some fundamental pillars two of which are the demand for recognition of the experiences and the diversity in affected communities, and Participation in environmental policy making and the political processes that affects them. Justice movements have a much broader perspective on justice than only distribution, especially in practice, both for individuals and communities, many of which have experienced misrecognition (Schlosberg, 2004). For movements the creation of participatory spaces and institutions for decision making is fundamental. Social movements demand institutionalized space for public participation with the recognition of local knowledge and inclusion of the diversity that exist in the community. A space at the negotiation tables and the right to speak are common demands. According to

Schlosberg (2004) these demands comes from the results of being misrecognized. Communities are demanding voice and real participation to challenge the cultural degradation, political oppression and the lack of political access which creates political, cultural and structural obstacles (Schlosberg, 2004).

## 2.2. Participation

Participation has become a buzzword within development work, Andrea Cornwell (2008: 269) argues it can mean “almost anything that involves people”. Sarah C. White (1996:6) states that: “Participation must be seen as political”, and when discussing it, underlying issues like, who are involved, how are they involved and on who’s terms are decision made, must be considered. White (1996) notes that dominant power patterns can change through participation, however, can also strengthen and reproduce exiting structures if not done properly. For a better understanding in the variation within participation typologies are useful. Arnstein (1969) created a ladder of participation with focus on who receives the projects/ programs, and the degree of participation the participants experience. Participation for Arnstein (1969) is the possibility of the “have-not citizens”, those currently excluded from the economic and political processes, to increase the redistribution of power and create future possibilities of inclusion. Participation with real power to influence is essentially different from participation without this power, as stated by Arnstein (1969:216) “*Participation without redistribution of power is an empty and frustrating process for the powerless.*”.

Arnstein’s ladder (see appendix: 2) is divided in three levels and eight rungs of participation, first what he refers to as non-participation, including participatory strategies contain elements of manipulation or therapy. “Therapy” might include extended activities for those involved, but without any chance of influencing the outcome. The next level is degrees of tokenism including informing, consultation and placation, all symbolic efforts of participation. At the stage of Placation some elected citizens might get a spot on the board or committee responsible for making decisions, although still with limited power as the citizen members continues as the minorities. The last level is degree of citizen power being partnership, delegated power and citizen control, in the two latter, the citizens has most of the decision-making seats and the leadership of the project (Arnstein, 1969).

Some limitations with the typology, includes that the degree and different types of participation varies a lot more than the eight-rungs represented in this typology. Some characteristics might represent different rungs depending on the execution, a citizen representative in an advisory

organ is one example where the levels of participation depend on the degree of influence and decision the representative gets. Another issue is that neither the powerholders nor the citizens are one homogeneous group. Lastly Arnstein (1969) underlines that the typology is lacking an important analysis within participation, namely the powerholders use of racism, paternalism and their resistant to redistribution of power (Arnstein, 1969).

### 2.3. Political Ecology and Power

Power and power relations are central to the discussion on participation and justice. Hence my study also relates to the conceptualization of power within Political Ecology (PE). PE is an approach that always relates environmental issues and changes to political, economic and social factors. The difference between apolitical ecology and political ecology is that PE studies environmental issues in their political and socio-economic context (Robbins, 2012). According to Robbins (2012), PE tends to find contradictions in the work or outcomes of different processes. Creating winners and losers in conflicts concerning the environment and access to environmental resources and how social as well as environmental outcomes are produced by the differentiation of power. Mitchell Dean (2012) in the signature of power show how power is everywhere, power exists in all social relations and relations between people, governments and companies.

Vatn (2015) has divided power into six concrete categories, (1) *Brute force*. (2) *Rights* both gives strength to the holder, but also limits others in relation to the rights holder. (3) *Knowledge* creates the capacity to act upon a specific topic, decide what are the main issues, how they should be interpreted and acted upon. Ignorance's is a way to disempower and implies that a person cannot act upon a certain issue (4) *Capacity to produce* is important to improve independence through the accumulation of economic power. (5) *Capacity to organize* by joining forces through organizing, strengthens the individual's capacities to become a member of a collective. However, the chance of disempowerment increases if the cost of interaction is too high. (6) *Capacity to motivate* or morally convince someone, is effective as a means to lead action.

Svartstad et.al (2018) argues the importance of using a broad perspective when theorizing power. They present three overlapping and crucial understanding of power. First, *the actor-oriented power perspective*, the actor is seen as the one who exercises power. This does not implicate that only one actor can have power, but multiple. Meaning power can be exercised without getting the planned result. Both Max Weber and Robert Dahl define power within the lines of the actor centered perspective. Where one actor has the ability to make the other actor do something they would not have done otherwise (Weber 1978 & Dahls 1957,)

Steven Lukes have extended this understanding of power to become three dimensional. the first dimensions based on Weber (1978) and Dahl (1957) (Lukes, 2005). Lukes's second dimension includes what is referred to as non-decision making, the ability of one person to hide issues from the decision-making process, first introduced by Bachrach and Baratz (1963). For PE the actor-oriented perspective gives an important contribution to the discussion of power. Hence, in PE ecology there are two main forms of actors who exercise power. Those who damages the environment, often being companies, governmental agencies or non-governmental organizations (NGO), and on the other side those who resist and oppose them, often being local communities, peasants or indigenous people (Svartstad et.al, 2018).

The second power perspective introduced by Svartstad et.al (2018) is the neo-marxist perspective. PE is very much inspired by the Marxism and its form of understanding the roles of the class in the capitalist system. Marxism argues that even though actors are free, society is built on determined social structures that precondition social class and through history the social structures reproduces (Svartstad et.al, 2018). The neo-marxist perspective can be characteristics by power as influenced by "the rule of the game". Showing how the currents institutions, believes and value systems gives preferences to specific individuals or group of people, who's interested are promoted and protected by the systems status quo. Gaventa (1980) in his studies on latent conflicts gives and interesting insights on how oppression and discrimination can continue over time without resistance and revolt. He argues that the power contained by the social elites is used to form the will of the suppressed by preventing them to participating in decision making and accepting that this is the way it should be. Only when the non-elites' revolt can one discuss the change in power-relation

The post structuralist perspective, the third perspective on power commonly used in PE, is deeply inspired by Michel Foucault. One example is discursive power, discourses being the way we understand certain things in society. Discourse power on the other hand is when companies, NGOs or government agencies produces and uses discourses consciously to influence people's opinions in a hidden way so that people themselves adapt and redistribute these discourses (Svartstad et.al 2018).

### **3. Methodology**

#### 3.1. Research methods

This study will be based on a qualitative method due to the nature of its research questions. The form of the research process is very much dependent on the chosen methodology, it affects the sampling approach, the data gathering method and how the data material is analyzed, and this will be discussed in the following steps.

##### 3.1.1. Sampling

The purpose of sampling is to find suitable subjects that potentially can represent the population of the study (Berg & Lund, 2004) Depending on the information needed in a research project, a sampling approach is chosen. For quantitative studies probability sampling is most commonly used. Giving each subject in the population equal chance of being selected. In qualitative studies the use of non-probability sampling is the most common (Berg & Lune, 2004). In probability sampling the researcher get a broader influence on the subjects chosen, making it easier to pick central or relevant people who to the case. Throughout the study the sampling approach might change depending on its usefulness to find suitable candidates (Bryman, 2016) Case studies can be based on single or multiple cases, they can be holistic or embedded. A holistic case study focuses on one unit of analysis, while embedded case studies have one case with multiple sub cases (Yin, 2013)

A case study is useful in understanding a particular case and to identify its complexities and create suggestion for further research. Barra Longa, Minas Gerais is the case for this study and the period will be post-rupture of the Fundão dam on November 5th, 2015. This research started as a holistic single case study, selected using purposive sampling within the larger area of the affected Rio Doce Basin. Barra Longa was chosen as the only unit of analysis, however as the research went on it became clear that Gesteira, would be a useful complementary unit of analysis. Barra Longa was the chosen unity of analysis for different reasons, first because it is a smaller city and less well known than Mariana, hence less research has been done about Barra Longa. Secondly, Barra Longa was the only city hit by the mud where people lived very close to the mud for many months, affecting their everyday life. This also made it much easier to find those affected, as they continued living in the city, and not like in Mariana where people from Bento Rodrigue was now spread all over the city, and therefore more challenging to find. The last reason is MABs strong presence in Barra Longa, in comparison to other affected areas

From the first days I spent in Barra Longa, Gesteira was always talked about as the most affected place, for some time I continued my research only in Barra Longa, until one day Renova was having a meeting with the affected people in Gesteira. It was my first chance to see the interaction between Renova and the affected people. So, I went, and I continued to go to meetings there, seeing how the participatory process had gotten much further in Gesteira, they had even managed some good results. I decided therefor to include it in my research. As Gesteira has the same technical advisory group and the same representative from MAB as in Barra Longa it makes a good complementary study.

### 3.2. Data gathering method

The first week of field work was spent in Mariana, getting in touch with relevant people and gathering information about the processes going on in the region. I had already contacted MAB both in Mariana and in Barra Longa, but they kept silent. During a carnival parade I met an older lady who recommended me to go to Barra Longa, she even gave me a contact person. I contacted the person who unfortunately was not in Barra Longa, but who gave me the contact information of her sister and brother. Her brother who by chance is responsible for the coordination of the local government in Barra Longa. He received me when I arrived and gave me a tour of the city showing me the affected areas. He left me at his sister's house, who invited me for coffee and the next day for breakfast and then she offered me to stay in her house for the time I was in Barra Longa. She was one of these ladies where a lot of people gather in front of her house to talk. This helped me to create my first independent contacts. A few days after my arrival I contacted AEDAS and asked them for help to get in touch with the affected people of the different regions in the city, as well as people from the commission.

One of my main goals was finding people with different opinions in relation to the work done by Renova, AEDAS and MAB. I balanced between the people who I got in touch with through AEDAS and those I found on my own, using the network around the house I lived in. Another effort was to diversify the subjects between women and men, as well as different ages and regions in the city. I put a lot of effort into trying to find people that was satisfied with Renovas work as many of those I met were not. I noticed a pattern in the people who were indicated as satisfied with the recovery work, most of them owned local business. For the data collection semi-structured interview is the main information source, observations, informal conversation, media and document analysis will be other sources.

### 3.2.1. Participant observations

I spent three different periods in Barra Longa from the middle of February to the end of April 2018. First, two shorter periods where I got to know the area, meet people and try to understand how different people viewed the disaster and the recovery work that followed. I got to know quite a few people, everybody was very open and curious about what I was doing there. They invited me to their homes and showed me the areas that had been impacted by the mud. I participated in their daily routines, saw how they lived and how the disaster had affected most of them in some ways. I participate in base group meetings in different areas of Barra Longa. Observing how AEDAS interacted with the affected people listening to what they had experienced and learned more about the alternative process to recovery that AEDAS was doing with the affected people. I also created contacts with some of the members of the commission.

During my third stay in Barra Longa lasted for a whole month. I continued talking to people and taking part in everyday life. During this period, I participated in the total of six meetings and one assembly about health. One meeting with all the coordinators of the base groups in the municipality of Barra Longa. Another one with the base group in the exhibition park. Four of the meeting were in Gesteira, three of them negotiations with Renova. The negotiations created a very interesting aspect, the possibility of seeing the interaction between Renova, AEDAS, the public prosecutor's office and the affected people. Seeing how Renova threatened the affected people and the way they talked and presented their arguments. Outside of the meeting I spent only one day in Gesteira, however the community of old Gesteira got washed away with the mud, so many of the affected people lived other places. I visited and interviewed families from Gesteira living both in Barra Longa and in Mariana. I spent two days in Mariana with the families from Gesteira. They took me to see the Fundão dam.

Both in base group meetings and when I met people in the community, I always presented myself and told them about my research. I normally took some notes during the meetings, but I wrote most of the reflections after the meeting not to disturb the natural flow of the meetings. For the bigger assembly and the negotiation meetings with Renova, I did not present myself to the whole meeting, but at this point most of the people already knew who I was. The bigger meetings normally had breaks which gave a good opportunity to talk to people and discuss what they felt about the meetings and the topics discussed.



### 3.2.2. Interviews

A semi-structured interview model was used. According to Bryman (2016) a semi-structured interview, is something in between a structured interview and unstructured interview. A semi-structured interview gives the researcher opener frames and the possibility of not strictly following the sequence of the interview guide. It gives possibility for asking follow-up questions and ask for elaboration where necessary. It also gives the informant a greater possibility of contributing to the research with their own understanding. Questions in semi-structured interviews are often more general and open ended.

There are several ways of keeping interview data, with different benefits and issues. The most obvious form is note taking. The issue here is that it might be difficult to write down everything the informant says. It also takes the attention away from the informant, something that might discourage the informant to continue talking. Recording interviews is useful as the information is kept. It gives the researcher the chance to pay more attention to the informant, however some informant might feel more discomfort with a recorder. Another issue with a voice recorder is the possibility of technical issues, by only trusting the voice recorder if something goes wrong all the information gets lost. The question of disturbances while recording might also make the transcription afterwards harder, and information might be lost. The transcription is very time consuming, but necessary when the interview is recorded, to be able to analyze the data. For this research a voice recorder was used in all accept two interviews, as well as note taking. Notes more to highlight idea or important point mentioned during the conversation.

I started interviewing during my second stay in Barra Longa. Most of the interviews were done in the homes of the informants, creating a safe environment for them to talk in, it also made it easier for people to explain which part of their houses and gardens had been affected. Many showed pictures from the disaster and the mess that followed during the recovery work. The interviews with people from the commercial sector were done at their workplace. All the interviews were conducted in Portuguese, without an interpreter.

### 3.3. Ethical Considerations

Ethical considerations revolve around the issues of protecting the informants, as well as doing an honest and true research. Free and informed consent, confidentiality and privacy are important aspect to protect the informants, and most important of all to do no harm (Bryman, 2016).

Throughout this study before all the interviews I have made sure that the informants know what the research is about and what my role as a researcher is. Further the informants have been

informed about their rights to privacy and the possibility of withdrawal from the research at any time. Before using the voice recorder all the informants were asked if they felt comfortable about it, and informed that the recordings would be deleted after the completion of the study. All the names cited in this research are proxy names used to protect the identity of those involved. All the audio recordings will be deleted after the end of this study.

Written informed consent was not used during this study after thorough consideration. It felt like a written consent would give more negative connotations, as many people in the local community were very skeptical in regard to signing documents as they relate this to the company and many have had bad experiences after signing documents. There is also the question of people being illiterate and therefore will feel more uncomfortable if they must sign something they cannot read.

During research it is important to avoid biases, the researcher must be open to results different from those that are expected (Bryman, 2016). To avoid biases, it is important for the researcher to be as neutral as possible. Complete neutrality is impossible, but awareness of the possibility is crucial. By gathering information from different sources and using an interview guide helps to reduce the bias. I believe I have managed to keep my neutrality during this study, however as from a political ecology perspective I have within me a support towards those who fight for their rights against big companies. Despite this I have been open and listen to different sources. I have put in an effort in finding informants who are both positive and negative towards Renovas work, as well as the work of MAB. I incorporate different perspective for a more balanced understanding.

### 3.4. Trustworthiness

Bryman (2016) presents four criteria of trustworthiness, credibility, transferability, dependability and confirmability. For this study the most relevant of these are the credibility and confirmability. Credibility is very similar to validity more commonly used in quantitative studies. This relate to how credible the results of the research are. To test credibility one can, send information back to the informants to read through after finishing or as Bryman notes, use triangulation. Triangulation is the use of different sources, research strategies and methods. In this study triangulation was used both concerning the variation of sources and methods. For the sources both primary and secondary sources where used. Documents and texts from different researchers, social movements, the government and the companies. This helps to confirm the information and therefor increase trustworthiness. Different research method as interview,

observation and text analysis were used. During the study to create confidence in the information, multiple people were asked similar questions to get a broader understanding of the situation. Always remembering that the story people tell have been filtered through their eyes and opinions and might not always combine with the reality of other. Asking people from different background and with different opinion helps to get a broader understanding of the reality, as well as understanding the different perspectives.

Confirmability on the other hand is more related to the researcher's objectivity and ability not to be affected by personal opinions when studying the data materials (Bryman, 2016). This is related to biases as mentioned in the previous section. Neutrality as a researcher is very important, although almost impossible to manage completely. Therefore it is very important to be aware of biases and personal opinions that might affect the study. From the beginning of this study I have been very aware of my personal biases and done my best to be objective and neutral both when gathering and analyzing the data material. Picking informants with different opinions and not just those with similar opinions as myself. I arrived in Barra Longa expecting the recovery work to be almost done, which I soon realize was not the case. From there on I quickly noted a strong division between the population those on Renovas side and those on MAB/AEDAS side. My natural inclination would be to support the AEDAS side, I therefore during my study put an extra effort into talking to people from both "sides", but also those who did not feel they belonged to either. Always remembering that the case does not have two side, but a range of different individuals and opinions, which might lean towards one side or the other.

### 3.5. Data Analysis

There are two main ways of doing content analysis, a deductive or inductive strategy. Deductive strategy is mainly used in quantitative studies where the purpose is to create generalizable results from existing theories, using a linear process (Berge & Lune, 2004). Inductive strategy on the other hand is used to create new theories and concepts, through a constant back and forth between the steps in the research depending on the new information the researcher gets (Berge & Lune, 2004). For this study an inductive approach is used. After transcribing all the interviews, field- and observation notes, and relevant documents, a content analysis was used. The content analysis is useful when looking at different elements of participation and compensation and to discuss it in the light of the conceptual framework. For the analysis of the company strategies, different documents produced on the companies and movement's webpages was used, together with the interviews.

#### **4. Compensation and Recognition**

*The car picked us up at 18:00 at the newly renovated Manoel Lino Mol Square in Barra Longa, we were going to a negotiation meeting in Gesteira, concerning the approval of the names for the resettlement. As we were arriving the excitement in the car increase, there was a lot of expectation towards this negotiation meeting, would Renova accept all the 37 families suggested in the community's proposal for Resettlement. As we arrived the football court was transformed with a big screen, cameras, a lot of chairs and a table with food in the back. Both the mayor and city councilor were present and no less than 26 representatives from Renova, 3 firefighters, people from different universities, MAB, AEDAS and about 50 people from the community. The representatives from MAB and AEDAS was removing chairs, I looked at them, they told me Renova used the extensive number of chairs as a strategy to make it look like there are less people, to divide the community. The most surprising still was the two police cars present in the community with less than a 100 people, nobody had never seen that before. The representative from the public prosecutor's office opened the meet, stating clearly that they had not asked for the police cars, leaving no doubt that it was the work of Renova. (from a negotiation meeting in Gesteira 9/4/18)*

This meeting in Gesteira accurately shows Renovas willingness to put pressure on the participatory process created by the affected people, here showing a clear example of actor-oriented use of power where the company tries to intimidate the affected people, first by bringing an a very large group of people, only 3 of which spoke during the meeting. The two police cars present in a region which regularly only have one police car. Creating a lot of skepticism and anger amongst the affected people, they felt threatened. The one thing the affected people had asked for, was for Renova to bring representative who could answer their questions and confirm if all the families would be accepted for the resettlement, something they did not manage, even though all the information was received a month before. Renovas representative tried to finish of the meeting before a decision was taken concerning when the answer would come. The affected people together with the MP put pressure on Renova and said they would have the answer the next day, Renova tried to make different excuses, in the end it was decided to come back in 48 hours for answers.

The experiences from the meeting underline a range of different issues occurring in Barra Longa and Gesteira, firstly the disagreement between Renova and the affected people concerning who are acknowledge as affected, and after being acknowledge what are the criteria's for receiving

benefit. Secondly Samarco/Renova since the rupture of the dam has arranged 100s of meeting, but they can rarely give clear answers to the questions asked by the community, creating more anger and frustration amongst the people. The last issue is the use of hidden treats and the fear by the affected people that they will not receive anything if they do not accept Renovas offers.

#### 4.1 Actors and affected people

##### *Renova*

The creation of a Foundation to elaborate and execute the measures was defined in the TTAC, Samarco continued with the responsibility for the recovery work until the creation of the Renova Foundation in June 2016 (TTAC, 2016: 14). Renova is a private, non-profit organization, with the sole purpose of repairing the damages caused by the rupture of the Fundão dam. According to Samarco, Renova is an autonomous and independent entity; however, Renovas board of governors is made up of 7 people, 2 from each of the maintaining companies (Samarco, Vale and BHP Billiton) and one member chosen by the inter-federative committee (CIF). (Samarco 2018a & Renova, 2016a) Renovas statute mainly describes their governing structure, as well the task of implementing the agreements in the TTAC. Renova is constituted by four organs the Board of governors, the Executive leadership team, the fiscal committee and the Advisory committee. CIF is an external entity which comments on Renovas projects, plans and programs. They can suggest solutions for areas impacted by the rupture of the dam. More about Renovas work will be discussed below.

##### *The movement of those affected by dams (MAB)*

MAB is an autonomous, popular and political resistance movement that operates on local and national level. For 27 years MAB have support people affected by the construction, operation or destruction of dams and an unpopular energy policy. MAB clearly works within the frames of an environmental justice movement, for the development of a sustainable policy for access and use of water and energy. A model that put sustainability of environment, community and culture at the center. Incorporating a participatory mechanism for society to discuss, build and influence projects that affects them. The goal is sovereignty over territories, the natural goods and the public patrimony for the people (MAB, 2017). MAB fights for policy changes on the national level, to create laws that protect the rights of the people affected by dams, as well as their right to be heard in plans for developing new dam projects, independently if they are poor, women, black, indigenous, youths or LGBT those historically most oppressed within the society (MAB, 2017).

MAB organizes in communities or neighborhood base groups (BG), where all affected families within a certain area belongs to the same BG. Coordination groups on local, state and national level coordinates the organizations work. In most cases MAB arrives in areas where there are plans of constructing or during construction of dams, or in rare case when the disaster has already occurred as for the Fundão dam rupture (MAB, 2017). MAB normally arrives with one or only a few more experiences “militants” as called in Portuguese, meaning activists that work fulltime for the organization. They start by organizing the affected people into BGs, with the purpose of helping them construct their own autonomous, political project. (informal communication 003).

Already the first week after the disaster a representative from MAB arrived in Barra Longa. From there on they organized an assembly first for people to talk about their experiences and from there on start organizing the people. Tomas from MAB explains the situation as very difficult and confusing; people who had never heard of a social movement became a part of it overnight. Soon it was decided to create a commission of affected people who would represent the situation. The commission organized meetings with the population to discuss important topics. As they met a lot of resistance from Samarco and later Renova, they decided to fight for a technical advisory group that could help them in negotiation with Renova. After months of struggles they won and the technical assistance group AEDAS (State Association of Environmental and Social Defense) arrived in August 2017. The commission is the one responsible for AEDAS. AEDAS works together with the affected people to create an inclusive process, to discuss, suggest and evaluate the current situation and the challenges in the community.

### *The affected people*

Recognition is a central component in justice and especially within social and environmental justice. There is an ongoing disagreement about the term used for those suffering consequences by the disaster. TTAC uses the term “impactado” or impacted, while MAB uses the term “atingido” or affected. According to Mariana Corrêa dos Santos (2015), MAB has spent decades creating their collective identity as “affected by dams”, an identity that includes people from different social categories as fishermen, peasants, indigenes, and other who historically have suffered the effects of dams. This insistence on the term is important for the identity that joins together affected people around the country creating a collective force that increases the capacity to organize.

As mentioned by Vatn (2015) both the capacity to organize and motivate are forms of power, both very important for a social movement to create a collective force in the struggle against the company. Svartstad et.al (2018) argues that within actor-oriented perspective on power in PE those who damage nature which in this case is the companies, with Renova as their new face, and those who resist them MAB together with the local community and AEDAS are the two central actors struggling for power. The commission together with MAB and AEDAS has created an agenda of claims where they state: *“We, residence of the Barra Longa municipality claims the right to be recognized as affected people. The companies/ Renova, on the other hand deny this right and consider as “impacted” those who suffered any damage to their property”* (emphasis added). Asking the companies to respect their wish for being recognized as affected, not impacted.

During the interview with Renova the question about criteria used to define the affected people were asked, the response was *“the president of Renova said one day about the discussion of affected or impacted people the following: We treat them like people, they are all people. The judge also said this, even asked us not to talk about it”* Not answering the question but underlining how this debate is a conflicting between the affected people and the company. Using the argument that the president of Renova and the judge had said that this should not be talked about, using the words of prominent people. Considering the importance of the word “affected” as discussed above this answer clearly tries to undermine the discussion. The option of Renova changing their definition is not even considered. In other word the terminology used might create a difference in who will be considered for compensation.

As seen above the discussion of who are affected have created a lot of disagreement and contradictions, amongst the different actors. Scholberg (2004), Young (1990) and Fraser (1998) discuss who the lack of recognition in many cases might lead to the lack of distribution, as is true for this case. A lot of people must fight for their rights to be acknowledged as affected by the disaster, making the parameter for defining who are affected, a powerful tool to influence people’s life. TTAC defines two groups of impacted people, [directly] impacted a list of ten criteria’s (see appendix 3) and indirectly impacted those who do not fit into the listed criteria’s, but who:

*“suffer limitation on the exercise of their fundamental rights as a result of economic or environmental consequences, direct or indirect, present or future, of the EVENT\*. They will be covered with respect to access of information and participation in community*

*discussions, as well as having access to the public instruments resulting from the PROGRAMS” (TTAC: 8)*

\*The “Event” referring to the rupture of the Fundão dam.

Showing how the division of the term indicates a difference in compensation, as indirectly impacted your right for compensation are limited to be benefitted from “having access to the public instruments resulting from the PROGRAMS” (TTAC, 2016:8), meaning you will not have any more rights than everybody else in the area. The view of who are affected is a clear contradiction with Renova responsibility for repairing all the damages caused by the dam (Samarco, 2018b). MAB and the affected people fight for everyone’s right to be recognized as affected (from her on “affected” will be used for all those influenced by the mud). The commission created in their agenda a list of 26 conditions in which they consider people as affected (see appendix 4). The criteria’s presented is much more explicit and inclusive for a broad range of cases. The TTAC criteria’s “c” and “d” concerns losses of things or property, while “e” to “h” concerns economic losses based on work or productive areas or areas for fishery. Criteria “I” concerns health both mental and physical, while “j” refers to distribution or interference in community life of different forms of traditional community, not concerning Barra Longa, while there is an ongoing discussion whether Gesteira can be included, however it will not be discussed in this paper. As seen a majority of the criteria from the TTAC concerns loss of thing or income, which of course is very important, however not sufficient when a lot of people who feel affected are not recognized. The list created by the affected people shows the importance of collective participation in elaboration the criteria of who are affected.

Renova consider all those in direct contact with the mud as affected, however not necessarily recognized for all they have lost. People with informal work, like sugarcane cutters, seasonal works, salesmen etc. complains they are not being recognized by the companies. In Brazil a large portion of the female population have informal work as their main source of income (ONU, 2017). Two women from Gesteira mentioned how they had not been recognized by Renova for losing their jobs, as they had informal job, one as a hairdresser and the other as a cleaner. The loss of informal jobs is clearly stated multiple places in the document made by the commission, contrary to the TTAC where all losses must be proven:

*“Proven loss by the owner of movable or immovable property or loss of ownership of immovable property;... proven loss of areas for fishing activities and extractive*



*resources, rendering ineffective the extractive or productive activity; ... proven losses to the local productive activities, with unfeasibility of ... economic activities;” (TTAC 8)*

The question of proof can be very difficult especially for those who have lost their house, but also those with informal work or seasonal work. Proof given by neighbors or other in the community is not accepted by Renova. Fraser (1998) argues how institutionalized ideas about the “value” of certain issues, in this case work, favors trait associated with masculinity, in the case the loss of income created through formal and productive work like fishing is acknowledged and mentioned in the agreement, while cleaning and baking more feminine traits are not mentioned creating an injustice towards the woman that more commonly has informal works often combined with reproductive duties.

Health is another issue mentioned by many as a big concern and many struggles to be recognized as affected., even though it is mentioned in TTAC. The issue of health lack specification according to the Tina from the commission and more independent research on the topic is needed (informal communication 5). People feel Renova has done far too little in this concern, mentioning increased problems with breathing and rashes caused by the dust from the mud, some mentioned increased expenditures due to these issues. A recent study has also shown increased levels of heavy metal amongst some of the citizens of Barra Longa (Vormittag, Oliveira & Gleriano, 2018). The area hardest hit both concerning health, but also in relation to a struggle for recognition was the 8 families of African American descend who lived by the Exhibition Park (see city map in appendix 5) in Barra Long. The mud did not reach their houses on the day of the disaster; it stopped about 15 meters away. However, a few days later the trucks with mud started to arrive, duping the mud from other areas of the city to the exhibition park. Tomas explains how existing social divisions are enforced by the actions of Samarco;

*“the problem is that they reproduce even at the local level this logic of social division between rich and poor...so the mud was taken from the city center of Barra Longa to the exhibition park without consulting nobody, and with the authorization and responsibility of the Mayor’s office.... And for 18 months these families stayed in silence, inclusively the company did a work amongst them, so they did not want to talk to us, from the movement” (Informal communication 003)*

The transferring of the mud from a rich to a poor area clearly indicates the priority of some people over others. If it had been a white middle class the neighborhood, the mud would never have been place there. Showing a classical example of a neo-marxist perspective on the use of power, where the social conditions of poor people, living in simple houses are being exposed to

the environmental and health issue the mud brings, noise, and insecurity are other factors. The families did not have a say in the decided to bring the mud, it was taken above their heads. The company together with the local government approved the moving of the mud as an “emergency action” as mentioned by both the representatives from Renova, (Mateus and Marco) and Carlos from the mayor’s cabinet. Showing similarities with Lukes (2005) second dimension of power, where decision is taking without being discussed, as in this case “as an emergency action”. None of those living by the park received any information about the mud being placed there. Secondly it is a case of environmental justice and environmental racism inside the environmental disaster that is already being analyzed. The mud was taken from the city center, where in the case of Barra Longa mostly white people with a stronger purchasing power lives and taken to the exhibition park where poor negro families lived, an area not “naturally” covered by the mud.

Tomas explains that after 18 months doctor Evangelina, who studied health risk in the area, came and told him about the health situation of those living in and around the park. This case was kept “hidden” for 18 months, oppressing and making the people suffer the consequences without the local government or Samarco/Renova taking any action towards them. showing how as argued by Gaventa (1980) oppression can continue without resistance. Only after MAB and the commission started working with the community, things changed. They called a meeting with the company, who first said that nothing could be done. The commission then started talking to the people who lived by the park, giving them arguments and later involving the MPF. The first issue was to get these people recognized as affected, as argued by Young (1990) oppression is a common factor for distributional injustice. Four meetings were hold, the company continued to argue that nothing could be done, but after the fourth meeting that lasted until 02.00 in the morning the people living by the park had won their right to be recognized as affected.

Others who struggle to become recognized are households along the roads in Barra Longa whose houses have started to crack due to the heavy trucks and machinery used by Renova. Many complaints have led Renova to include cracked houses to the recovery programs. Renova has sent out technical research groups to investigate the complaints. AEDAS sent out a similar group to make their own reports. The reports from the two groups have shown different results for some of the same houses. Tomas mentioned an important issue concerning these technical reports: *“this technical debate is complicated, because it creates an illusion that there exists a neutral axis that is deciding the things, that doesn’t exist here, this is class struggle”* (Informal communication 003).

Three houses with reported cracks were visited, the houses had all in common that they were less than 1 meter from the road and their gardens on the other side had all been hit by the mud. All three received negative reports from Renova, arguing that there were other causes to the cracks. Renova came to handover Carla's report while I was visiting her. The guy from Renova was unsure whether to enter the house while I was there, and he offered to back later. Carla insisted he come in. From the beginning it was clear on his face that he was not carrying good news. The Renova report stated that her house was poorly constructed, and the ground was not equipped for construction. The report argued that due to the poor structure and shifting landmass the house had cracked. But as she argued herself:

*“In the same road, one house next to the other [have cracked], it doesn't exist bad ground... there was done a study and it [the area] is suited for construction. It was the engineer who constructed... Renova is claiming that my house was badly constructed and that the land is not good. Why did the house then last for 30 years without a crack?  
(Informal communication 20)*

When Renova uses the arguments of a house being badly constructed they automatically weaken the position of those with less economic power, as they do not have the resources to buy the best materials and the best work force to construct their houses, creating a differentiation in the treatment of people based on their social standing, as seen from a neo-marxist power perspective, discursive power is also used by Renova using a technical argument to convince people they are wrong, that other factors have led to the cracks.

AEDAS had also made a report on Carla's house, stating it had cracked due to the increased traffic. This shows clearly how these technical explanations not necessarily create a neutral view as presented by Renova. Seeing clearly what Karen Herbert (2016:116) refers to as “technoscientific dispute” between experts of different opinions. All technical answers can be explained by different factors, as seen in this case. Though, it is very peculiar how so many people, on the same road with the same issue, and only some of the issue being blamed on to the newly arrived changes, which is the increased work in the area.

For the resettlement in Gesteira the issue of recognition was present just as much as in Barra Longa, particularly concerning who would be a part of the resettlement. In the first resettlement project presented by Renova, they had included 9 families who lost their homes and another 11

who lost their plots. In the second plan for resettlement created by the affected people with AEDAS the number increased to 37 families with the right to resettlement based on Brazilian and international law as well as historic experiences. All presented by AEDAS on a public negotiation in Gesteira on April 9<sup>th</sup>, 2018. Showing the power of rights and knowledge as argued by Vatn (2015) in the struggles for justice. After the presentation Renova had to increase the number of families included in the resettlement, a change that would not have occurred, without the legal expertise of AEDAS. Young (1990) argues that unjust distribution is based on the lack of recognition of the differences between groups in society. This can be seen in the case of Gesteira, where a much broader specter of people had a right to resettlement than those first recognized by Renova. Included in the new resettlement those who had relation to the land either as paid worker or as workers for subsistence, children above 18 years old, with a relation to the land, and those living in areas of risk, and would lose community bonds by the moving of the community.

From a PE perspective there is a clear contradiction in the different views on how are affected. Why are some being recognized while other are not, when suffering similar situations. This can be explained from a neo-marxist power perspective, where the already existing class divisions are shown through an unequal treatment of different people, often negligent towards the black and the poor. From an environmental justice perspective, it shows clearly the unfair distribution of environmental damages, especially in the case of the exhibition park versus city center, but also in regard to who has to struggle the most to be recognized. Showing clearly the power of those who define the criteria for who are affected and by that means, decides who have the right to compensation and reconstruction.

#### 4.2. Compensation schemes

Compensation and reconstruction are very much related to distributional justice, as seen above in recognition is very closely linked to who will participate in compensation programs put forward by the TTAC. According to the Brazilian civil code, law n<sup>o</sup> 10.406/2002 article 927 states that “those who, by an unlawful act, causes damages to others, are obligate to repair those. Further down in article 944 it follows “The indemnity is measured by the extension of the damage” (Lei 10.406, 2002). These are the legal regulations used by AEDAS when considering who have a legal right to compensation after the disaster. The TTAC states that the companies have a legitimate interest and voluntarily have taken the responsibility to “*recover, mitigate, restitute, repair, including indemnification, and in cases where there is no possible repair, compensate the*

*impacts on the socioenvironmental and socioeconomic levels, resulting from the EVENT”*  
(TTAC, 2016: 7)

Renovas work is based on 42 programs divided in 3 thematic axes: People and community, Land and water, Reconstruction and Infrastructure, all based on the TTAC agreement. The purpose of Renova is to lead the recovery work with a high focus on popular participation (Renova 2018a). In this section the focus will be on the lack of criteria's, and how it creates an unequal distribution of benefit. The cases explained below will have a focus on reconstruction and emergency aid card, some issues concerning indemnity will also be discussed.

As mentioned above the TTAC agreement got suspended a short time after its signing, however, none of the companies involved accepted the suspension, arguing that the need for recuperation still existed. The government did not make any attempt to changed it but started new negotiation towards a final agreement. Even with the agreement officially canceled the companies continues their recovery work based on the TTAC agreement (STF 2016; MPF, 2016; Samarco 2018a). This shows the power contained by the companies when they can stand up to the government without any consequences. The company uses a form of discursive power by arguing that the work must be done anyway. In other words, the recovery worked is based on a suspended agreement, due to lack of participation in its construction. As seen above regarding recognition this has serious indications for who will be included in the programs. Distributional justice is in many ways what compensation is about, the just and equal distribution according to what was lost in the disaster. As will be seen in this case, there exist an unequal distribution of goods and benefits from the recovery programs. Carlos from the mayor's office had a very representative statement for Barra Long, he said:

*“If you look at the city, it is beautiful from the outside; from the outside Barra Longa is much more beautiful than it was. Barra Longa is wearing make-up. Because when you arrive here the town is beautiful, but when you arrive here and deepen, get to know the people who live here, you will see that there still exists many things that needs resolving, there are still many problems.”* (Informal communication, 004)

Three other people mentioned similar analogies about Renovas work in the town. All the programs created by Renova seems very nice on paper and from the meetings people gets the impression that things will move forward, the representative of the companies promising that

everything will be solved. Every time you talk to a person working for Renova they are all very patient and polite, however when you ask questions, they never have a clear answer.

One of the most pressing issues concerning compensation is the lack of clear criteria's, transparency and information concerning how the compensation and reconstruction work will be done. Not even the area directly hit by the mud, with clear geographically placement, the treatment is coherent. According to people living in these areas many feel differently threatened from their neighbors in relation to the emergency card and the recovery work being done. The issue of unclear criteria's is something mentioned by all of the people spoken to, Maria lived closed to the road 1. de janeiro, her garden was flooded by the mud, but her bigger concern was the cracks in her house. Due to the disaster she also lost her job in Mariana. She is very frustrated with Renova:

*“I am in the middle of two houses which were affected like me and they have both been called for negotiation, and my house which beyond being affected in the garden like their houses, the structure is all cracked. I don't understand what is happening.” (informal communication 4)*

This uncertainty was shared by many both concerning who received what and under which conditions. Morro Vermelho considered the poorest neighborhood in Barra Longa directly hit by the mud. Two of the people interviewed were from this area Emily and Adrian. Emily is a pensioned negro woman, who worked as house maiden and Adrian worked in one of the local stores. Both had their houses reconstructed, however not with a lot of satisfaction. Faults and mistakes in the work and poor quality of the material used was some of their issues. Emily even experienced to come back to a rebuilt house structurally different from the one she had. Emily explained with a sad voice trying to be satisfied, *“The house is good, it is good, it is a new house, but now I expect them to come here and finish the thing that is possible to do... The engineer was going to finish it, she wrote down everything that the company had to do and put it as priority, now we just have to wait”* (Informal communication 3). She further explains that not only was her house, but a shack in the garden and the garage was still missing. The shack she did not believe she would get as she had no proofs of its existence. During the recovery work she also lost a big piece of land, as the division wall was set much closer to the house than before. Adrian complained of different problems after the house was finished, especially the plumbing and the quality of the pain, that was already loosen from the wall. Adrian explained how the company had used much better materials to cover the walls in the city center.

Renova created a damage matrix as a tool to value the different losses created by the dam rupture, however, very criticized by many for putting prices on the low side of the scale, as well as not considering the real and long-term loss of fruits and vegetables. Both Tina and Lisa mentioned the unfair prices suggested by the matrix. The damage matrix was at least an attempt to create criteria's, but not with great success. The lack of criteria continues to create unequal distribution amongst the citizens. Carlos mentions the lack of criteria's and further adds how they perceive that some people have been attended before others.

*“What we perceive is that there have not been very clear criteria's from Samrcos foundation. There have not been specific criteria, “lets send out these criteria and lets follow these lines”. Yes, some people have been attended to first and others have not been attended and continues not being attended until today.” (Informal communication 004)*

Silvia had a home business, she had let Samarco lend her property to get access to the other properties to remove the mud. She said:

*“They entered here and did all the work. They told me they would do all the best for me, they did not do anything that was not already here. Better for me would be if they could have closed up the 7 meters [of wall] that I did not have, it was a fence. They used my area without paying anything. I thought therefor that they could at least give those 7 meters of wall to close of my property”*

Lisa as well mentions dissatisfaction with the treatment from the company, she underlines that some people have received more benefits than other:

*They [the company] said that everything is going to be compensated, that nobody would be impaired, that we were going to receive better than what we had before. You know for example everything that they could do they would do in the best way, and there exist some people like that, satisfied you know. I don't know if it is by ignorance or what, but some people call it “Santa lama (Saint mud)” because they didn't have what they are achieving today. I personally feel very dissatisfied” (Informal communication 9)*

Both quotes show how Renova promises, “all the best” and this is mentioned by most. Showing how Renova uses a clear discourse strategy, by keeping people's expectations up, some still

believed they would receive what was promised, but other like Lisa and Silvia, was starting to lose faith. During the study, all except one person felt some or a lot of dissatisfaction with Renovas work. One group of affected people expressed a much higher degree of satisfaction, the local business owners in the city center.

This difference might be explained by different factors firstly as a formal business the ability to prove what has been lost is often much easier, as documentation exists to a larger degree. Secondly Renova and the TTAC states clearly in their documents a high priority of those who have lost income and mentions specifically local businesses. The TTAC states: “*The Foundation shall establish and implement a specific program for the recovery of micro and small businesses in the trade, services and productive sector ... directly impacted by the EVENT,*”. However, it does not explain why, Silvia and other business owner not in the city center would not receive the same treatment. Another potential explanation is that the company has done a mistake given these people benefits, yet others have suggested that these are people with a greater influence in Barra Longa and make up good alliances for Renova (Informal communication, 5; 11; 003). As noted by Gaventa (1980) social elites can have the potential to influence the population by restricting participation in decision making.

John who owns a construction shop together with his wife noted improvements in the reconstruction in comparison to how it was before, stating that:

*“To be honest they did improvements, it became better than how it was. It was not everything that we wanted, but they improved the lights, the floor and there was a fence between us and the neighbors, they made it a brick wall, so that part was made better than what we had.”* (Informal communication 12)

Where John has received a new wall between him and the neighbor together with other improvements, Silvia on the other hand did not receive anything neither the rent for the space used by the company or the 7 meters of wall she had asked for.

The businesses owners from the city center talked to in this study (John and April) have kept open the whole time, even though parts of their properties were damaged. Both receives the emergency aid card, even after reconstruction or recovering of the areas damaged. John mentioned that he does not know for how long they will continue to receive the card, but when asked about their revenue he said: “.. yes, it even improved, because the city did not have that



*much construction work before, as it has today...The [construction] companies buy, Samarco bought and the companies that are here today buys, so the income really improved, compared to what it was.”* April and her husband own a bakery in the city center, it was not directly affected, but they had lost access to their house, but were still receiving the emergency aid card. Even though Renova buys food for their negotiation meetings at the bakery, making an increased revenue. According to TTAC the emergency aid card should go to:

*“Impacted people with their income compromised due to proven interruption of their economic or productive activity should receive the emergency aid card until the economic or productive activity is retaken. The financial dependency of this activity must be proven, the payment should continue until the economic activity is reestablished”*  
(TTAC 2016: 66).

From this description, the emergency aid card is for those with a compromised income, something that is not the case for the examples above. For three years Renova have paid business owner with the emergency aid card, as well as increased sales due to the construction and meeting activities that occur in the town. Showing a clear contradiction regarding what is stated in TTAC and the reality concerning the emergency aid card, creating distributional injustice, where those already well of in society receives benefits while other with a lower social class do not receive. Renova has made these people into clear winners on a local scale, by reproducing already existing social pattern and strengthening the inequality in the town by the use of their redistributive work. Showing a clear contradiction to Rawls difference principle where he argues that social or economic difference in society can only be accepted if the greatest benefit is given to the poorest members of society.

Another issue concerning the emergency aid card is those people who feel it is unfair that people who according to them, are not “properly” affected receives the card. This feeling is mostly seen amongst some of those who were directly hit by the mud and feels more affected than others. Adrian said, when asked if he participated in the meetings that, no: *“because many people who were not even affected participate”* he further underlines that *“People on the hillside that was not even affected, has received economic compensation, while a lot of people that got directly affected by the mud has not received, not even been invited to discuss the question concerning indemnity”* (Informal communication 1). Those who live on the hills might have received the card as a compensation of loss of work or by a mistake made by Samarco. As discussed above many of those living on the hill are affected in the broader sense of the term as used by AEDAS.

During the conversation with Johannes he mentioned multiple times the issue of people receiving more than they had the right to. He said: *“They [the company] did a big mistake when they gave the emergency aid card. He further asked: “How can people who were not affected in the city received the same as me and I had a firm and everything?”* (Informal communication 11).

During the interview with Mateus and Marco from Renova they acknowledge there had been a mistake regarding the handout of the emergency aid card and argued:

*“The card was distributed as an emergency action, and there are a lot of people who have them, who were not supposed to have one. Now we are in a phase of correcting this. We had a registry to prove income, the card was a response for that, it was an emergency action to guarantee support for that immediate loss of income...so now it is done a different analysis, if they have returned to the original condition [they will no longer receive the card].”* (Informal communication 001)

The conflict created concerning the emergency aid card is well known and as mentioned by Renovas representatives, they knew about it, but have done nothing for three years to solve the issue. Hence, some people who were not supposed to receive the emergency aid card have received it for three years, while others who lost income either through informal work or from loss of productive garden have not received it. For those with informal work the ability to prove losses is much harder, however in many cases those are the ones most dependent on it. Self-sustainable producers might not gain any proven financial profits, but the financial deficits of not having the production might have a great influence on the economic situation. This is specially seen in the rural areas like, Gesteira where a lot of people lost their productive garden. Ben mentioned how the issue concerning the emergency aid card had created problems in Gesteira as well, so much that it took away all the attention from the issue of resettlement:

*“I participated in all the meeting in Gesteira, the first meetings did not have any results, non. People did not have any idea of what to say, and the company used this weakness of the people, to stall [the process]. For example, everybody knew that Samarco had to give the emergency card, but nobody knew they had the right to resettlement. So, in the first meeting people were turning crazy wanting the emergency aid”* (Informal communication 04)

Only one case was talked about in Gesteira where somebody had received an emergency aid card for a garden, none of the other. The Resettlement process in Gesteira is a central part of the socioeconomic reparations mentioned in Renovas recovery programs. TTAC mentions the option of urban/ rural settlement or what they refer to as self-resettlement. According to TTAC a resettlement is when they deliver the land, house and infrastructure conjoint. In Old Gesteira the whole community got destructed, houses, lots and common areas. The people who lost their home got spread around, some in Gesteira, others in Barra Longa or in Mariana. On June 25<sup>th</sup>, 2016 the population voted for an area to build new Gesteira, they had two options, Macacos a land area of 7 hectares won with 95% of the votes. Renova started having meetings to discussion the expectation of the 9 families considered by Renova for new houses, and other meeting for the community (Samarco 2016b). The people of Gesteira waited and went to meetings without receiving answers. Samarco together with Renova did not manage to make an agreement with the landowners, so the land was never bought. In August 2017, AEDAS came and restarted the processor. This time together with the whole community, starting off by explaining the existing criteria for resettlement both related to who had the right, as explained above, and what are the basic parameters for a resettlement based on earlier experience from Brazil and the world. The new process will be further explained in the next section.

In this section it is seen how the lack of criteria's and the unequal distribution of benefits specially concerning the emergency aid card has created inequalities and reinforced already existing social differences. Taking the attention away from other issue. Even with Renovas knowledge of the issue, they do not seem very willing to resolve the it. Renova has anyway created not only an unjust distribution of benefits, going against the difference principle by Rawls, but also conflict within the community.

## 5. Participation in the Recovery Process

Participation or lack of participation is central to the problems seen in Barra Longa and Gesteira concerning the recovery work. Both Renova and TTAC have a strong focus on participation in their discourse, but reality has showed disappointing results. From an environmental justice perspective, participation is one of the fundamental pillars that can be central in increasing a fair result and redistribution of power. To achieve procedural justice as argued by Lind and Tyler (1988) a fair process, should create a fair result. That is also the hope of the affected people as they participate in an alternative and more participatory process, in their struggle for recognition and compensation. For Fraser (1998) the two forms of justice discussed above concerning recognition and distribution are fundamental to reach participatory parity or equal participation, giving equal chance for all in society to raise their voices and participate on equal ground. Tylor (1994) argues that the process can in some cases be more important than the outcome itself. To understand the processes going on, it is important to understand question surrounding representation.

### 5.1. Who represents who

All the actors involved in the disaster recovery would claim representing the affected people: Samarco, Renova, The Public Ministry, the Municipal Government, MAB, AEDAS and the commission. However, if asking the affected people, the answers would differ. It is important to remember that the affected people are not a homogenous group, more to the contrary. The affected people of Barra Longa are a complex group from all different social classes and life situations. They do not all feel represented by the same. Firstly, there is a division between those people who feel they can solve their own cases independently and those who apt for more collective solution. As mentioned by Viviana from AEDAS

*“There is one part of the population, one part of the affected people mainly in the city center which have a difficulty in understanding the need for a collective organization. They have a more individualistic view, a view that they themselves can solve their own problems. That it is not necessary to form a collective, so there has been a lower participation from this group” (Informal communication 002)*

The group Viviana mentions is divided in two, the first part is the business owners from the city center, who generally have received a good compensation or feel they have a connection to Renova, so their cases will be solved. From a neo-marxist perspective of power this can be seen in how the programs presented by Renova, are more facilitated to benefit this group of people.

Only from following the program set up by Renova these people received their rightful benefits. The other part of this group are very dissatisfied with Renovas work, they do not feel represented by Renova at all, they feel tricked and lied to, but have chosen an independent way of solving their issues by hiring private lawyers. Adrian is one of these, he mentioned one of his experiences with the companies:

*“In the beginning many people from Samarco came to buy (at the store where he worked), there was one woman she was particularly interested in talking to me, she asked a lot of questions and sort of push the answers from my mouth. Then on the first hearing with Renova, I saw her there, she was their lawyer. She never returned to buy more after that. Luckily I had not said too much”* (Informal communication 1)

From this moment already creating a distrust in Renova. Johannes has also hired a private lawyer, he explains how the whole process and the struggle with the company have been extremely tiring and both his wife and son got sick after the mud came. All the “*untruths*”, he repeats many time “*What really made me exhausted were all the untruths*” (Informal communication 11).

Some people with property damages and many of those who are struggling to be recognized participate in the collective struggle for compensation. The largest base groups are those a little bit outside of the center and in the rural areas (see appendix 6 for map of Barra Long with base groups). Many of the participants in the collective process mentioned the importance of MABs arrival. Emily from Morro Vermelho, mentioned that:

*“One person that helped us a lot was Tomas, it was Tomas who helped us. Without Tomas we would not have managed anything. He is from MAB, this movement who help us a lot. Because everything that had to be said, he said, he was not afraid of confronting those people. He helped us a lot.”* (Informal communication 3)

Tomas was mentioned by many as an important figure in the struggle against Samarco and Renova, He contributed to the creation of the commission of the affected people. The commission has a very important function in the empowerment of the affected people. Tomas explains the principles of the commission:

*“First this small group represents nobody, representation doesn’t exist. The group gather the information that is among the people, the demands, see possibilities and divide the*

*tasks...the objective [of the group] is to mobilize the rest, the whole city, there is no representative logic like in Mariana, that was a decision taken at the assembly, without election.*” Expressed in a firm voice (Informal communication 003).

He further explains how the commission represents the case and not the people. People must represent themselves, the representatives in the commission are not elected but have to show disposition to participate and be recognized by the community as having collective interests, and not only individual interests. The purpose of the group is to organize the affected peoples struggle against the companies, by organizing meetings, discussions and negotiation (Informal communication 003). Tomas further argues that: *“It is a great challenge to make people the subject of their own process, for real, and not individual subjects, but representing others, like a collective subject. This is a big challenge, but it is fundamental”* (Informal communication 003). This can very much relate to Scholbergs (2004) arguments about social movements and how they do not only demand fair distribution, but also a space in the political decisions making arena and a space by the negotiation table. This is very important for MAB that the people can have access to real participation, where they can take decisions.

Gesteira is a more homogeneous area, where everyone participates in the collective group, with few exceptions. From a meeting in Gesteira, a woman, who waited 43 days after the rupture, before she got a rented house, said as follows: *“We have on our side MAB, the advisory team and the Public prosecutor’s office”*, (Meeting 3/4/18). The MP is by many seen as a partner, but in some occasion the MP, has been criticized by the affected people for not being though enough in the negotiations with Renova (Meeting 3/4/18).

Even though Renova speak highly of participation every improvement in the level of participation is the result of pressure from the affected people with the help from the social movements and the public prosecutor’s office, sometime Renova even goes against collective decisions. The right to get a technical advisory group was won through a hard struggle by the affected people, only after both the affected people of Mariana and Barra Longa had already won for their groups, it became a right for all (MPF, 2017). Another time Renova went against a collective decision in Gesteira where the affected people had decided to apt for a collective process for indemnity and compensation, representative from the Renova still approach people and tried to create individual deals (meeting in Gesteira, 9/4/18). Showing how Renova does not respect the affected people wish, when it goes against her idea, which is based on secrecy and individual negotiation. Lisa mentioned concerning the private negotiation:

*“They call us individually, asks for a lot of secrecy, ask us to sign a confidentiality agreement because they do not want us to know what the others receive to avoid more embarrassment for them, because if not, we will come there [to their office] to fight, saying that Fulando [another person] got this much and I only this, why? For Samarco which today is the Renova foundation there are no criteria” (Informal communication 9)*

The company is how many people refer to Renova and Samarco, it can be one of them or both, as for most people they are the same. Adrian mentioned that: *“I believe Samarco put Renova in charge to slowdown the process, every time we want something, or complains they always has to ask Samarco”* (Informal communication 1). Tina as well, when she was asked about differences after Renova took over the responsible she answered:

*“more stalling, a lot more stalling, after it was given this new, softer name, after the media accepted better Renova, it is a nice name, well chosen. Samarco is a dark, extremely destructive name, this image of destruction and death was already created... so to be true for the first couple of meetings with Renova nothing was decided. Every time we presented something they said, “we cannot decide anything” then we asked, but are you not here because you are representing the company? “but I do not have that power”, never anybody had the power to decide”* (informal communication 5)

As well as consider Renova and Samarco the same, few people feel represented by them. Samarco and Renova in different setting seem to present and support each other. Even though Renova is supposed to be an independent organization, it behaves more like Samarco's extended arm, still with limited power to take decisions without asking higher up in the system. A speech given to the people by Roberto Waack, CEO of Renova shows a clear support to Samarco's work:

*“I would like to thank and acknowledge the work accomplished by Samarco so far and say that the company has shown great commitment – human and financial – to carry out the emergency actions, the reparation and reconstruction of the areas impacted by the collapse of the Fundão dam.”* (Renova, 2016b)

Consider the companies as most interested in reducing cost as the objective of the companies within the capitalist system (Cullen, Cavender, Maakestad and Benson, 2006). The TTAC state the importance of re-opening Samarco's business as one of their consideration for the agreement:

“CONSIDERING the importance of resuming SAMARCO operations”, (TTAC:6). Therefore, do enough work so that Samarco can re-open their work in the region and continue their production as before. The public prosecutors and the public defense both on federal and state level (MG and ES) and the ministry of Labor sent recommendations to Samarco, Vale and BHP Billiton asking the companies to respect the human rights of the affected people (MPT, 2018). Showing how that has not been respected properly at least until this point.

The two government organs most involved is the local government and the state’s public prosecutor’s office. The MP is the organ giving legal advice to the affected people, they are also making sure that Renova is following the laws and can suggest changes or take them to court if necessary, however in this case the MP mainly operate as an advisory organ helping by putting pressure on Renova. In March 2018 the MP of MG, ES and the federal public prosecutor’s office and the public defense together with the ministry of labor sent a letter of recommendations to Renova, containing a stern critic about among other the lack of real participation in Renovas program. The MP is also seen by a lot of affected people as mentioned above as a good support in the struggle. The local government on the other hand has met critics from the affected people.

Carlos mentioned that the local government’s responsibility is to make sure that Samarco recover what have been damaged, so their job is to follow up Renova and the technical groups. *“Our role is demand, accompany and make sure that the affected people get attended as quickly as possible. That they receive what are their rights, that is the role of the public authority”* He further argues that *“the public authority we are always...on the side of the affected people”* (informal communication 004) Making it clear that the local government is responsible for demanding progress in Renovas work and making sure the affected people get what are their right. It is interesting here to see the difference in the way disasters are treated, taking the Teton dam disaster from 1976, a very similar situation with the Fundão dam, but only a few days after the disaster the US government had taken full responsibility for the recovery work (Ford, 1976 & Law 94-400). In the case of the Fundão dam, the government has not taken any responsibility towards the public, except as the responsibility to pressure the companies to do their job. The government in that sense is following their legal obligation, but not necessarily doing what is best for the affected people.

The local governments work was framed as weak in relation to Renova by some, others suggested that the government are earning good money on Renovas presence in the city and that they to some extent is passing on some of their responsibility for the people to Renova. Johannes



expressed his misbelief towards the local government saying that: *“In reality the local government did well in this situation, because Samarco, according to them invest 500 or 600 thousand in the local government every month”* (Informal communication 11). He further argues that as the company must pay taxes to the city making it very beneficial to the city with all this recovery work. Other feels the government is not doing enough in demanding the right of the affected people Maria underlined: *“If the government is not going to fight for us, the company will not do everything they are supposed to do, they will not. She [the company] is putting a make-up on Barra Longa”* (informal communication 4). Tina goes as far as claiming that Renova in some sense is taking over some of the local government’s responsibility:

*“Renova is approaching the public authority and with this, it is in practice turning into the public authority in Barra Longa. Because it is her [Renova] who is fixing the roads, she who is fixing the doctors, but she does not help the affected people, for real she is facilitating the life for those who controls the city, and not those who live here.”*

(Informal communication 5)

Viviana explains the relationship between AEDAS and the local government. And mentions some of the same issue as Tina expressed. First, she mentions that there are areas where AEDAS would like to better collaboration with the local government, specially within health as they see this as a public responsibility. She argues that many affected people have come to her complaining about the treatment from the local government, she further says:

*“We have tried since the beginning to start a partnership, but it has been difficult, because the Renova foundation has a big influence on the local government, so it makes it harder to approach. The affected people report that they have difficulties for example with health. So, the local government passes the duty to attend to Renova. When a person needs a doctor, a test or medication they pass the orientation, talk to the Renova foundation”* (Informal communication 002)

Renovas representatives mentioned similar concerns:

*“The mayor is an educated man, he threats us very well, but we have these point where we disagree, which are many thing... we arrive at a moment when Renova has to hand over things officially, a public space, a road that has already been recovered, the*

*responsibility of one institution is hand over to the local government.*” (Informal communication 001)

They further continue to explain how different problems exist in the municipality that has nothing to do with the rupture of the dam, and how Renova cannot embrace the whole community. In other word say that the local government must take more responsibility and cannot continue to send all the responsibility to Renova.

The affected people that participate in the collective process feel much represented by MAB, AEDAS and most of them by the public ministry. Those affected that do not participate in this process mainly represent themselves or are represented by lawyers. As mentioned in the previous section, these often feel that MAB and AEDAS are including too many people into the recovery process. The public authority clearly sees their task as representing the affected people and demand answers from Renova, however as seen above the affected people feel like the local government need to take a firmer stand, and many expressed that the local authorities is giving to much responsibility to Renova concerning issues that is the responsibility of the local government. Renova to some extent confirms this by the way they talk about the local authorities, arguing that they are not taking responsibility enough of the basic duties which are their responsibilities. Renova on their side are very closely connected to Samarco even though, they are supposed to do the recovery work, a lot of the work must be confirmed by those higher up in the system, this will also be seen in the next section concerning, Renovas difficulty in giving direct answers in meetings.

## 5.2. Participation in theory and practice

Participation is fundamental for the citizens to feel a part of the work going on in their local communities. If participation is fair it is an important element of procedural justice but can also influence the distributive justice. For the population participating in the work driven by MAB and the commission, the issues of process and decision control are fundamental. Participation is acknowledged as having a great potential in the distribution of power within a population if used in the correct way (White, 1996). By joining forces in a collective the people can better influence the company and be a part of their own process. On the other White (1996) notes that participation can as well strengthen and reproduce exiting structures if the participants is not given real power to influence decision something that is seen in the case of Renova. Participation with real power to influence is essentially different from participation without this power,

creating frustration and anger amongst its participants, something that is commonly seen in this case.

TTAC presents a strong focus on local participation both in the recovery work, within the programs, projects and in their actions (TTAC, 2016). TTAC states that the elaboration and the execution of the programs should consider the principles of engagement and transparency in the discussion about actions in the local communities and give preference to the use of local labor. It furthers underlining the importance of actual and effective participation, with a real possibility of influencing all the occurring stages of the agreement (TTAC, 2016). Renova on their webpage uses the slogan “together” to promote most aspects of their work. From Renovas site “who are we” they explaining their work as follows:

*“We believe that no challenge can be overcome without adding one single word: together. Dialogue unites us and makes collective construction of the future possible. When getting together, each party becomes stronger. Our role, somehow, is this: to promote coming together and creating connections. Of past, present and future. Of people, initiatives and institutions. Of competencies, willingness and visions. All converging into the same place, which moves us and gives us meaning. From these meetings, certainly, solutions that, nobody would imagine possible will rise.” (Renova, 2018)*

In a private e-mail exchange with Renova, they mentioned their participatory strategy as:

*“..guided by listening, dialog and social participation. The action of the engagement group looks for durable solution that attends to the interests of the impacted population. The debate about the social and environmental practices is taken by collective decisions”*. Not giving a very clear description of how or with what purpose the different strategies are used. They also mentioned meeting divided by sectors as central in their work, very different to the alternative process that apt for collective assemblies. Collective assembly is a way of transparency to make sure everybody gets equal treatment. Even though Renova and the TTAC constantly mention participation, the degree of real participation is still low. According Arnstein (1969) if the participant does not have any real influence on the decision making, or possibility to participate in decision making organs, the degree of participation is still only within what he refers to as a degree of tokenism, still a long way up to real participation. Amongst other the Public Ministry has criticized Renova for the lack of participation (MPF,2018a and MPF, 2018b).

Until recently, there was only one organ, “The advisory committee” with participation of the affected people within the Renova structure, the organ can give advice and opinions but have no decisive power. It contains of 17 members, five of which are from the affected areas, three from Minas Gerais and two from Espirito Santos, (Renova 2016a). The affected people in the committee are elected by CIF (Renova, 2016a; 2017). On June 25th, 2018, Renova and the companies together with the governments and public ministries of MG and ES as well as the federal government signed the new TAC governance, the conduct adjustment term changing the governance structure of Renova. An agreement aiming at increasing participation within Renovas structure, with local boards and more participation of affected people. The number of participants will still not be enough to make decision and the board of governance continues without participation from the affected people (TAC, 2018). The repair programs would continue the same as those stated in TTAC.

This shows a clear contradiction in the work of companies, the local prosecutors’ offices and Renova when arguing they are reaching for real participation; however, the creation of TAC occurred exactly like TTAC, with no participation from the affected people. MAB right after the signing sent out a Public Note emphasizing this and underlining that: *“Participation is a right for the affected people, that is not guaranteed [in TAC] and pretending it is, violates their rights even more; and It is only possible to discuss participation of the affected people in the repairs starting from the vision of the affected”* (MAB, 2018). With the TAC agreement participation in formal organs would increase, but the possibility of real decisions making is still limited. Looking at Arnsteins ladder of citizens’ participation if the suggestions made by TAC get realized, the level of participation would raise potentially to Placation, the highest rung of tokenism. As noted by Arnstein (1969) in the cases where the participation has reached “partnership” it has always been as a result of citizens fighting and never as a result of somebody giving over power. On the question about Renovas ideal role Tomas replied: to fulfil the decisions made in collective by the affected people. He further argues that

*“Renova say that it functions like that. She [Renova] says that the affected people participate in the decision making, which is not true. Because the objective of the company, of Renova overall is to reduce her costs, so she will make a political decision on how she politically can control the situation, while reducing costs.”*

Renovas representatives when asked about participation confirmed that they have struggled with reaching the goals of including the communities: *“We need everybody. Participation have to be*

*constructive, the question of wanting to rebuild is missing, so Renova will do the repairs...Renova comes in and tries to bring the citizen to construct together and many times do not manage” (Informal communication 001).*

Looking at the responses from the affected people in relation to participation, many are dissatisfied and argue the form of participation is limited to meetings, either collective or private. Many of the affected people complained about inefficiency and lack of answers in the meetings. The quantity of meetings was another issue. People participated, but there was no progress from one meeting to the other. In Barra Longa, Samarco and later Renova had meetings every week. When asked what the company said during the meeting everybody had the same story *“They were going to resolve everything in the best manner, they were going making better than we had it and nobody would leave with a prejudice” (informal communication 11)* Silvia had a similar saying: *“In the beginning they said they were going to do the things, that they were going to do the best for me, that was the talk we had” (informal communication 8).* Johannes further talked about the community meetings like this:

*“In the meetings you arrived with the population...you thought finally all my problems will be solved, but these meeting were only protocol that the firm had to fulfil... they organized meetings once a week, and they gave a false hope that thing would be solved and asked for 15 days to solve the issue... Then 15 days passed, and they simply said, unfortunately it was a negative, the fault was not ours. And like that it continued 15 and 15 days and now 2 years has passed” (Informal communication 11)*

This description of the meeting reminds most of what Arnstein refers to as therapy dressed up as participation, the population is engaged in a lot of meeting, but it seems the purpose is more to show that something is done than actual participation. Tina explains some of the experiences in a meeting with Samarco where they realize the importance of standing together for their rights:

*“[in the beginning] it was Samarco, we arrived there, and there was an actress who did not let us speak. They [the representatives from the company] stayed on one side of the grid and us on the other, and then we started to reflect, who are the affected, who have the right to speak here. So, we started to insist, we started to question: [ we said] hey there, no more let’s do this and that in your garden... it will be this much for a coconut palm, and that much for a lettuce, that many centavos (pennies) for this thing and that many for that. Wait a bit the products are ours, is it you that will give it a price? Do we put a price on your minerals?” (Informal communication 5)*

Showing here how the company arrives to meeting with an already outlined program. Tina is here talking about the damaged matrix mentioned above. Another recovery program where the affected people was not included in the process of developing criteria. The same goes for the emergency aid card, the criteria for who are affected and the recovery needs as stated in the TTAC agreement. As argued by Tylor (1994) to reach procedural justice, the affected people need to be included in the process, here also including the creation of criteria. Information is another central issue for real participation as state by Arnstein (1969)

According to Carlos good and clear another thing lacking from Renova:

*“...sometimes the information arrives incomplete, not complete for us to understand everything that is being done.”* (Informal communication: 004)

The lack of information was very clear amongst the affected people, many was unsure what their rights where or how they would receive information. Some thought that everyone would receive the same as shown in the damage matrix, while other through it depended on the value of what was lost. People who had received some money was often unsure of why they had received money, was it due to the damages to the house or the loss of the job.

Gesteira is another area where the lack of proper information is seen. TTAC (2016:48) mentions the following action should be developed for a resettlement *“(a) Together with the community define an area for resettlement. (b) Buy the chosen areas together with the community and (c) elaborate and approve the project by the new community”*. What is written in TTAC seems far from reality. Vivian from AEDAS explains that Renova arrived with a proposal for Resettlement in November 2017, she furthers explain that: *“The affected people said that they did not want this proposal, as they felt it did not represent them”* (Informal communication 002). Liz from Gesteira said about Renovas project: *“The structure was to bring the project ready and show it to us, then they explained it.”* Ben who lived in Gesteira mentioned that the people rejected Renovas project as the land was very small without a water source and space for agriculture. Tomas explained Samarcos attempt as follows:

*“Without any type of prior preparation, without discussing any criteria's, without prerequisites of anybody, without a minimum information about the rights already won, a resettlement is already a given, it is the zero mark of the discussion. ...and with all this they came with very confusing suggestions, the people choose two land areas, the company did a whole lot of studies and presented them in a blue book which not even our*

*technicians managed to read, imagine the affected people that was there. So they choose an area of land, but they didn't have any information”* (personal communication 003)

These statements indicate a range of issues concerning real participation. Remembering Thibaut and Walker (1975) description of process control, this is a clear example where that is lacking. There was not enough information about rights and conditions for the affected people to taken informed decision. The project arrived ready and presented with an atmosphere of consultation, where the company already put the option on the table and the community had to choose, not giving the people any real decision-making control (Arnstein, 1969). The use of very technical and difficult language can also be seen as a form of discursive power, not in the way of forming decision, but using a language that is not understandable, and as argued by Frida *“We just agreed to everything they said, because we were desperate to have a house and they always disrespected the our rights”* (Informal communication 05)

Tomas further explains how this whole situation created confusion among the affected people. He underlines how the company inclusively worked to demobilize the affected people and tried to transfer their indemnity in money, using the project of self-settlement. Ben explains how the company *“planted tiredness in the people for them to become discouraged and they [the company] managed. The people stopped going to meeting, still arranged them, but a lot of people did not go. After the technical assistance group arrived everything changed. It became easier to demand action from Renova and everything became more structured”* (Informal communication 04). This is a form of manipulation by the affected people, the extensive use of meeting without results trying to demobilize them, to choose a solution that is easier and most likely cheaper for the company.

Another serious concern mentioned by two of those interviewed was that they felt threatened by Renova. Lisa argued that she had not gone to meetings with AEDAS as she felt her chances to be helped by Renova would be smaller. She said: *“I have not participated in any meetings with the technical assistance group, because they make threats, the people from Renova, saying either you stick with Renova and negotiate, or you stick with the technical assistance group”* (Informal communication 9). This putting a restraint on people's liberty to participate in the alternative process.

Parallel to Renovas work, the commission of affected people together with MAB and AEDAS has created their own participatory structure. As seen above many of the same issue are returning

in all steps of the reconstruction and compensation process, the lack of real participation. The alternative process gives the affected people the possibility to make criteria's and taking decisions concerning their own reconstruction and compensation process. First new criteria for who were affected, and which form of reconstruction and compensation the community need was created. Then they created guidelines for how the meetings with Samarco/Renova should be and from there lists of all those, eligible for receiving the emergency aid card where made, based on the criteria of impact on income, independently if the work was formal or informal. New guidelines for reconstruction as well and resettlement were also created together with the community.

Many of the programs created by Renova were distant from reality. Tina explains how the commission was created, as a response to all the meeting without results, she argued: *"We went there, we discussed, and everybody had problems, but we could not find a common point to continue. So, it became very clear that it was necessary for us to have an organization to be able to claim things correctly."* (Informal communication: 5). She further explains how they from there on formed the commission and created "the agenda of the affected people" prioritizing issues that they would discuss with the company. Tina said

*"from there on the commission was functioning, very confusing and with a lot of difficulties, but in certain way the group was growing in strength. After this it became clear that we were not moving forwards because our meetings with the company, were very tiring and not enough with that we left with a sensation of incompetence...then we remembered, Mariana had already won a technical advisory, so we started to dream of a technical advisory group...So we started our big struggle to get this technical advisory group and then for real we managed, even with the company putting out many obstacles"* (Informal communication 5)

From August 2017 AEDAS started to work in Barra Longa. They are hired by the commission and do not have any direct contact with the companies. AEDAS gives technical assistance to the affected, help them better understand their rights, possibilities and options. They participate in the Base Group (BG) meeting from the different neighborhoods, where they present information and work on suggestion for how to improve the recovery process. Each BG has two coordinators one female and one male, which meets the other coordinators of the other BGs to decide the agenda. The model is very similar to what Arnstein (1969) refers to as the citizen control, where the citizens are making their own programs and agendas, unfortunately as mentioned above the



ultimate decision-making power is still in the hands of Renova. Ideally the criteria's and decision made by the affected people, to get a proper participatory process should be adopted by the company as stated above by Tomas. Popular pressure is the strategy used by the commission to make the company accept their suggestions; the public ministry is also supporting them.

One of the most important changes concerning the participatory process was the decision made by the Commission to no longer meet with Samarco ou Renova on their own. Tina explains *"The commission surge.... and from there on we started to organize the meetings. We have arrived to a point where we do not accept to meet with Samarco with less than at least 4-5 people...but normally we meet with Samarco together with the people"* As argued by Scholber (2004) many of the demands that comes from the justice movement are due to experiences of being misrepresented or misrecognized, this is also the experience here. Tina explains how the meeting with Samarco used to be: *"Samarco only listen to us when the Public Ministry was present. When she [samarco] marked a meeting and it was just us, she killed us with anger; we went home with lost faith"* (informal communication 5).

The commission together with MAB was also very central in organizing and helping the people in the exhibition park to become recognized, the effect of coming together as a community very clear. Olga one of the older ladies who lived by the park explained:

*"In the beginning when the mud came, November 5<sup>th</sup>, it took only a few days before they put it there. They did not ask anything... they treated us very bad.... They did not say anything to us. Afterwards they realized they had done wrongly, it was MAB who helped us. They gave us the strength, because for them [the company] we would have stayed there, thrown in the middle of the rubbish. They did not treat us like human, but like something had thrown in the rubbish. After we started the meetings, they even had to gives us indemnity."* (Informal communication 18)

About the indemnity Olga explains that the company had called her to negotiate:

*"They called me, but it was in the beginning I did not accept it because they had not done anything with my house yet and because they will have to call all the neighbors, all the eight, because it was only me, so I did not accept, I found it to be very early. So until today I am just waiting and the next time they will have to call all the eight families to meet for everyone to talk about their parts, then we will accept the offer"* (Informal communication 18).

Olga here states she refused the indemnity offered to her. From a procedural justice perspective this shows a clear relations motivation in her action. Even though she expects to get indemnity on a later occasion, she argues that for her it is important that all the families impacted will receive indemnity. Obviously opting for a collective option, give all a better chance for a good and fair result. Miriam a grandmother of two who also lived by the park underlines the importance of the help they received:

*“We cannot complain, we have arranged everything like I told you, for September. We thank MAB and the advisory team and the Public Ministry that helped us resolve it. Renova did not want to resolve it, Renova wanted to stall us, in all possible manners. We united, because we did not manage alone. So, it was that they wonderful helped us.”*

Gesteira is another area that has seen great improvements in their process for resettlement with the help of MAB and AEDAS. As seen above the first process of resettlement organized by Renova lack participation and engagement from the community, but as mentioned by Ben when AEDAS arrived things started to change. Vivian explains how they first started: *“We discussed with them what is a resettlement, which standards and parameters are used in Brazil as well as on international level. A lot of the parameters connected to the human rights and how we guarantee the right to adequate housing... they pointed out what was important for Gesteira”* (Informal communication 002). Vivian further explains how they from there on made some general parameters and together with the community investigated who had the right to resettlement. In this process the number of families with right to restatement increased from the 20 families suggested by Renova to 37 families. Vivian underlines how they in the beginning felt resistance from the company, she said: *“There was multiple meetings with the Renova foundation for them to understand how it had been 20 families and now it was 37. Their suggestion was 7 hectares and the affected people’s suggestion was 39, for these 37 families. So, there was a lot of resistance, but the affected people won.”* Both the amount of area and families has been confirmed by Renova. All those interviewed from Gesteira agreed that this was a process they felt part of. Frida explains about AEDAS work how *“They looked for the information, to see how things really were, I am very satisfied, they came and talked to us about other resettlements that exists, so, when we went to debate, we already had clarifications about the topic”* (Informal communication 05). Ana mentioned that, *“It is only after AEDAS arrived that we are noticing progress, things are happening, it is very tiring, but we know it will be worth it in the end”* (Informal communication 02).

While talking to Renovas representatives they mentioned Gesteira as the best example of participation in their programs, saying that *“The resettlement program is the program with the most efficient participation. They decide together, it is the program I see as a model today”* (Informal communication 001). Showing a clear contradiction both concerning Renovas resistance in the process and the affected peoples view of Renova as a setback to their progress. Someone they had to fight to get their resettlement project recognize, however some argued that their relationship to Renova has improved now that some of the basic parameters as number of families and area for the resettlement is defined. Tomas laugh when he heard Renova had taken credit for the second process, he said:

*“In reality, what happened was a defeat and they [Renova] will absolve this process as theirs. They will do what they do. They will put it on their site: “the people chose a participative process”. They will not say that they fought against the people until the end, and that they got defeated. So, it will be our task to tell the society that it wasn't like that. It is for the affected people as well to see that it wasn't like that, for them to see themselves as subjects, it was a conquest”* (Informal communication 003)

This statement once more, underlines what Arnstein (1969) has said about partnership, it only happens due to resistance and struggle from the people. Hence this process cannot be defined as partnership it is more a negotiation, where the people with the help of MAB and AEDAS has created more knowledge and courage to fight for their rights. They have taken control of the process, but still need to convince Renova who has control of the decision. In other words, the level of participation has increased and so has the procedural justice, but without the power to decide. Tomas emphasizes how the struggle in Gesteira has shown that: *“a small group of people can pressure a big company”* (Informa communication 003)

## **6. Competing Narratives and Local Conflicts**

### 6.1. Competing narratives

In PE the studying of narrative and discourses is commonly used. Narratives reflect on how a story is presented or told. A difference between political and apolitical ecology is the difference in how problems are viewed. In apolitical ecology changes are blamed on causes within a proximity, while in political ecology the broader system is considered (Robbins, 2015). This can be seen in the different way Samarco and MAB are presenting the explanation of why the dam burst. When analyzing a narrative, it is important to considered what is the concrete content and what is the latent content. For whom and in what historical context is the narrative created. This

section is looking at the different strategies used by the companies and by MAB/ the Commission, and how certain narratives differentiate between the two groups. The documents used for the analysis are some documents from Renova and Samarco's web page, as well as the interview with the representatives from Renova. For the other side documents from MAB's website, as well as the interview from MAB and the commission. The last part of this section will look at how these narratives together with the other issue discussed above, have increased tension and conflict in Barra Longa and Gesteira.

There is a clear difference in the strategies of the companies and MAB. They are by their nature opposites. As mentioned by Tomas:

*"We are talking about class struggle and it is very important to say that. The environmental crime by Samarco that killed 19 people and provoked an abortion, the whole situation in the [river Doce] basin is a result of the capitalistic development model. This is not an isolated case, even considering the crime. An environmental crime happened, people died, but it is not isolated. Firstly, the ruptures in this region are not isolated, since 2008 there has been 7 dam ruptures.... Secondly all of this is a result of a particular political project and type of development model. There is one side who exploits the natural goods, a small group of national and international companies who exploits the natural goods and the workers. On the other side is the exploited population. This is what we are talking about, the affected people, who are a part of the working class who live, specifically who lives with the impact of the crime, therefore we need to see the affected people as a part of the working class..... not isolated from the general process in the society and the contradictions in capitalism (Personal communication 003: Tomas)*

MAB explains the disaster from a political perspective, arguing that what is going on is class struggle, based on structural differences and benefits given to the company, who were exploring natural resources, which should have belonged to the people. MAB sees the disaster as a crime, based on direct result of the company's over exploitation and lack of care regarding safety. This is not uncommon as explained by Cullen, Cavender, Maakestad and Benson, (2006), in their book on corporate crime under attack. MAB also underline how this disaster did not happen in a vacuum, but as a part of a bigger situation. Indicating a structural power relation, as shown in the neo-Marxist perspective on power. In all their discourses MAB uses the terminology "crime" about disaster, "criminals" when talking about the companies and "victims" when talking about

the affected people. Taking their public note, mentioned above, as an examples, it states about the disaster: “*The biggest socio-environmental **crime** in our history...*” and “*The **criminals** should stay away from their **victims**””, further stating that: “*The complete recovery will only be been done when the **victims** are being recognized as protagonist in the recovery work...*” (MAB: 2018)*

Emily Chamlee-Wright and Virgil Henry Storr (2011) writes about experience from the Katarina Hurricane in the USA, not a disaster blamed on a company, but as well a disaster with a large destruction. Chamlee and Storr (2011) explain how social capital can be helpful in facilitating collective action and argues that collective narratives are an important form of social capital. By creating a positive and productive narrative, it can increase the working spirit in the community to get thing done. On the other hand, they argue that by having a collective narrative that demotivate reconstruction, and only demands the community to wait for outside help can have a negative effect. This idea of collective narratives is obvious in the case of MAB, they use a strong discursive strategy as seen above. The companies are the criminals, Renova represents the criminals and the affected people are the victims of the crime. Not powerless victims, but autonomous people that stand up and fight for their rights, empowering the affected people to organize themselves and become political subjects. Both in a sense of the resource-based model of justice, that the collective struggle can create better deal for the individual, but also from a relational models perspective, that through the group they feel empowered, and the chance of a fair and equal process for all is stronger. Tomas emphasizes the importance of autonomy and the need of creating autonomous space for the affected people to share and created their own information. He states that:

*“... we [the collective] obligate the company to come to this collective space... this space, who coordinate, who says what is going to happened in the meeting is the affected, not the company. She [the company] listens and respond, this have nothing to do with the disrespect of the employees, we never permitted any physical violence nor verbal against the employees, this have never occurred. however, we never open the hand for the affected to have the right to lead the meeting. It seems a simple thing, but this is the expression of autonomy, decide the time of the meeting, where the meeting will be, which conditions, which agenda, this is to exercise autonomy.”*

This is MABs main objective for the people to have control of the process. As mentioned by Thibaut and Walker (1975) the control of the process and control of the discussion are important element for procedural justice, for MAB popular control of these two areas is very important. Tomas further elaborates on their strategy to influence the process:

*“We do as follow, here is our proposal, we want it to be done in this way after broad participation by the affected people in meetings... Then we tell the people, we have to mobilize to pressure, this means for example that the commission does not sit down with the company alone... whichever topic being discussed, we call the people [to participate]. Then the people sit down with the company, the people feel like they are subjects when they participate, and not when they are represented. This is the logic of common politics right, a logic of representation”*

Underlining the importance of the affected people being subjects of their own struggle and not as powerless victims. Another strategy important strategy was the creation of the Commission of affected people, those who participate feel they were the ones who created the commission, not MAB, they feel ownership something that is fundamental for its work to function. The use of a commission also facilitates participation by a broader sector of community, as some has a negative view on the social movements in Brazil after many years of negative campaigns by the media (Da Silva & Rothman, 2011). It is easier to join the commission of affected people than being a part of MAB however most of the strategies and narratives used by the commission and AEDAS come from MAB. MAB is the stronger political actor of the three, with a clear strategy and a broader view on the situation than the other two.

Samarco on the other side, as stated in TTAC, recognizes their responsibility for the recovery work, but prefer not to blame anyone for the disaster: *“...recognizing that the adoption of emergency measures is essential but does not imply any assumption of responsibility for the accident, whose causes remain uncertain and subject of independent investigations”* (TTAC: 3). Clearly stating that Samarco, Vale and BHP does not take any responsibility for *“the event”* as TTAC consequently refers to the dam rupture. On Samarcos webpage and in their booklet *“One year after the Fundão dam failure”* (Samarco, 2016a) they refer to the rupture as *“a failure”*. Creating an idea that it was the dam itself that failed and not the company that owns it. It continues on their webpage under the heading *“Understand the collapse”* (Samarco, 2018c) refers to the *“abrupt rupture of the tailing containment structure”*, instead of actually explaining way the dam collapse, they explain how they stayed *“within the limits allowed and licensed by*

*the competent environmental agency*”. They continue explaining qualities of the dam and how they, as well as the society really wanted to understand “*what led to an unprecedented dam failure like this*” and continues “. *In particular since according to the last audit carried out in July 2015, in order to comply with the federal legislation 12,334/ 2010 decree 416/2012 of DNPM and state legislation DN 87/2005 COPAM, the Fundão dam was stable*”. (Samarco, 2018c) Showing clearly that Samarco does not admit any blame in the failure or accident as they also refer to.

Further it is explained how Samarco a company to independently investigate the rupture, but without mentioning results by more than the following comment: “*geotechnical experts have identified that a combination of several factors led to disruption*” (Samarco, 2018c). A link to the report was added, however when clicking on the link a log-in was needed to access the report. Samarco was a company well-liked and respected in the regions, it was known as a company with a good working environment, very contrary to Vale. From a strategic point Samarco continues to hold on to the discourse that it was a failure. Samarco in many of their documents they present themselves as the good guys, who are doing everything in their power to repair the damages: “*With the **support** of BHP and Vale, Samarco has mobilized, since the rupture of the Fundão dam, to **assist** affected communities, to **reinstall** the homeless population, to support the search for missing persons and to provide clarification to the authorities*” Showing an eagerness to support and assist in the recovery work, as they are the one coming to help the population and not to clean up their own mess. Zhou et al (2016) has argued that Samarco puts themselves as “*victims of the circumstances*” and are helping the community as stated above. Another difference with Mab is how they talk about the mud residues, as non-toxic, even though reports from among the UN working group on the issue of human rights and transnational corporations and other business enterprises in December 2015 (2016) states that the residues were toxic containing heavy metals, this give implication for which health responsibility the company will take towards the population, as mentioned above, many complains in a lack of attention concerning the health issue.

The Renova foundation was another of Smarcos strategies, in the beginning they took the responsibility of the “emergency actions” as they call them. However, as the critics arrive, for not doing a good enough work, not protecting the affected people and a negative review from the UN, together with university and the media. The creation of the Renova foundation, took realized some of the pressure away from the company, as mentioned by some of the affected people above. However, all the three companies continue within Renovas governing structures.

During the interview with Renovas representatives they portray the dam rupture as an accident, explaining that of course nobody would have done this on purpose. Renovas representative argued that people threat the case differently when a company is to blame instead of a government or in the case of natural disasters he argues:

*“In the case of a company you turn it into a showcase to catch.... Many people critic and call it a crime. You can call it what you want. I think nobody would let a dam rupture because they wanted it to, just to do bad to other people...It was an accident”,* he said with commitment (private communication 001).

Showing a clear support toward Samarcos explanation of the disaster from the Renova representative. still with multiple criminal charges against the companies, and profs of them knowing about the risk.

All considered it is still important to remember that both Samarco and MAB have a broader perspective than the dam rupture. Samarco as sated in TTAC wants to re-open their production in the areas as soon as possible. MAB on the other hand will always fight against these big companies which for them represent the capitalist system, making them unwilling to create compromises with Samarco and the Renova foundation. Something that in some cases can be beneficial to the individually affected person. Depending on the motivational perspective, from a resource-based perspective a personal agreement with the company might lead to a quicker solution of the problem, however from a relational perspective, the collective struggle has a much stronger appeal. The same goes from a participatory and procedural justice perspective.

## 6.2. Local conflicts

Through this paper a range of contradictions are seen. The use of different forms of power and an unequal distribution of benefits based on already existing social structures. There is a clear distinction between the powerful companies that have damaged the nature and the environment and the affected people who have resisted. As seen the company still has the last word in decision, but much have happened due to the popular resistance regarding the participatory processes. Unfortunately, not without conflict. There are two types of conflict, one that goes between the companies, represented by Renova and the affected people supported by MAB and AEDAS, and another for of conflicts that goes amongst the population. The first type of conflict exists on different levels, first their view of the disaster, secondly concerning recognition of



those affected, and compensation where the TTACs criteria has led to distributional injustice. Last concerning the participation, and to what degree there exists procedural justice in the model used by Renova. The conflicts among the population exist mostly in the two latter levels.

The conflict that goes between the companies and the commission of affected people with MAB and AEDAS starts of from the narratives used to explain the disaster. While the company uses an apolitical explanation of what happened, MAB on the other hand has a much broader political understanding of the disaster. The company clearly state that they do not acknowledge blame in the disaster, they state it was a failure and an accident. Samarco saw it as an “unprecedented dam failure” (Samarco 2018b) something unthinkable and outside of their control. Renova which supposedly is an independent entity sees the disaster as accident and argues that nobody would have let a dam rupture happen knowingly. Both here and in other settings, like the speech given by The CEO of Renova, Renova show a clear support towards Samarco. MAB on the other hand uses a Marxist narrative to explain why the rupture is a crime. Explaining it not a singles case, but one in a chain of dam ruptures. Tomas argues that this continues due to the capitalist model of development putting profit in front of safety, in other words in front of human life and the environment (Informal communication 003). The crime happened as a consequence of the company not following the correct safety standards for years, and even though they knew about the possibility of the rupture they did nothing to prevent it.

Regarding the power relations both Samarco and Renova are using different forms of pressuring both the government and the affected people. The way Renova together with the other companies just ignored the government’s suspension of their agreement and continued the work, shows which influence and power Samarco have in regard to the government. Both Samarco and Renova as explained above, has used their powers in different forms to pressure the affected people. As mentioned before the companies arrive to meetings with suggestion already made, using a form of discursive power to convince the affected people, also playing on their lack of knowledge about legal terms and rights, as well as the use of a complex and often technical language. MAB and the commission on the other side through a strong discourse, strengthen and built up the affected people’s self-esteem to stand up against the company. Using collective meetings or direct actions to pressure the company.

In regard to defining who are affected, Samarco together with the others who signed the TTAC agreement has taken a very influential decision without letting the affected people participate, creating influential implications and injustice for many. A seen above many women are

particularly affected due to the underlining of what Fraser (1998) refers to a masculine trait in Renovas list of criteria for who are affected. Creating an imbalance in what Fraser (1998) refers to as the participatory parity, making it harder for women to reach the premises for a fair and equal participation. The area of recognition is a fundamental part of the conflict, because without recognition people does not receive compensation, however there is a different perspective amongst some people who deserves compensation. The whole community does not agree with the list made by the commission, some especially of those directly hit by the mud feel that others are asking for too much. Regarding Gesteira after Renova accepted the increased amount of families, other who did not participate in a collective process in Barra Longa complained that some of those recognized did not deserve to be part of the settlement, as they had not lost their house. So, both Renovas limited criteria's for recognizing people with the more extended list from the commission is splitting the community, especially in Barra Longa.

In an extension to that comes the lacking criteria for the emergency aid cards, creating three different conflicts among the population. All related to distribution injustice. First the issue of the emergency aid card Renova and others believe has been given to people that are not affected. Mostly mentioning those who lives by the hill, this was one of the most commonly mentioned issues when talking to people in Barra Longa. The other issue concerns the unequal treatments of neighbors and other in similar situations, where one person has received the card, while the other has not. There are speculations amongst people whether this has happened due to an unconscious mistake by Samarco/ Renova while handing out the cards, or intentionally to create conflict and remove attentions from other issues, as suggested by amongst other people in Gesteira. The third issue here, is the business owners in the city center, although their property being hit, they continued open, with an increasing income, and still receives the emergency aid card, the same goes for some of the issues seen in the rebuilding of houses. Strengthening already existing social structures in the community, by benefitting those already well of. As noted above, Renova already knows about these issues and the conflict it creates among the population and has left it like this for three years, showing a lack in interest from the companies' side to resolve the issue.

Another contradiction in the recovery work done by Renova based on TTAC is the strong focus on participation in all their governing documents, however not managing in practice to create real participation, creating procedural injustice for the communities. Firstly, due to the creation of TTAC with no participation from the affected people, later TAC is developed supposedly to increase participation, but still none of the affected people was invited to participate in its development. Looking at Arnsteins (1969) ladder of participation, Renovas work can never reach

real participation, as all the programs, the criteria for who are affected, the damage matrix and the condition for the emergency aid cards are all created without participation of the affected people. As white (1996) argues participation must be seen as political, and from this perspective Samarco and Renova is not willing to let people be a part of the real decision making, neither giving control over process or decision. A difference in how participation is presented by the two sides is how Renova use the wording do it “together” which seems to be them coming with suggestions and the population comments on that. For MAB on the other hand participation is about the people doing leading the process and the company accepting, which of course gives different implications for a participatory process.

The alternative process has as a main objective the distribution of power from the companies to the affected people concerning processes and decision that concerns them. By redoing all the processes done by the companies without participation, the commission together with MAB and AEDAS started a process to make the affected people into political subject with autonomy both in their struggle, but also in decision making. This is a clear example of what Scholberg (2004) acknowledges as fundamental pillars for the social and justice movements, first the recognition of the diversity amongst the affected people, by creating new criteria. Secondly, the demand for taking part in the policy process and the development of the recovery programs. Tylor (1994) refers to the relational model within procedural justice, something that can be seen in the alternative process. Most people enter the struggle motivated by distribution, but as they get a higher self-esteem, the struggle for rights becomes as important as the redistributive perspective. This can also be seen in the participation by people that are not affected themselves but see the importance in the collective struggle for rights. Another example are those people from Barra Longa who also participate in the struggle in Gesteira, even though it is a different process. The same goes for the process in the Exhibition park, where a lot of people arrived to support the families living there.

Another returning issue is the use of technical terms and technical solutions, trying to create what Tomas referred to as a neutral axis, this is another factor that has led to a lot of disagreements. Firstly, the difficulty a lot of people have in understanding the technical term, especially those with a lower education, creating more obstacles for them. Secondly, the issue of the reports concerning the cracks in the house, where report from the different sides show different result. Underlining the importance of the affected people to have their own technical assistance group both to understand the technical terms but do their own technical work. From an environmental justice and environmental racism perspective the work of MAB and AEDAS is

crucial to create a better balance in the right of those poorest in society. The case of the exhibition park is maybe the most influential one, where nothing was done until the social movement and the commission started to work in the area. Gesteira is another example who has extended their rights due to the resistance against the companies, showing how the collective struggle creates power. This is a clear example of an actor-based power relation, where the movements stand against the pressure from those originally more powerful, using the power of knowledge, right and collective action to create real resistance. The victories in both these areas is also an inspiration for the people in Barra Longa, but also other communities along the Doce rivers who struggles for their rights.

## **7. Conclusion**

This is a broad study looking into the compensation and participatory mechanisms used in Barra Longa and Gesteira and how these issues have created conflicts among the actors involved. This chapter will sum up the finding. First there has been a range of contradictions in the work done by Samarco and the Renova foundation. Concerning recognition of the affected people, compensations with regards to who receives what and especially participation concerning differences in what is presented versus the reality experienced by the affected people. All these contradictions have led to conflicts between actors and between the affected people themselves.

From an environmental justice perspective this paper has shown how Samarco and Renova has strengthen already existing social inequalities through their work. First concerning the lack of recognition by many affected people, due to the limited definition used by the company. Making informal work, health issues and poor housing conditions factors for not being properly recognized for actual losses. The lack of recognition has led to distributional injustice, through exclusion from Renovas compensation schemes. Another issue concerning compensation is the lack of clear and coherent criteria in the distribution of the recovery measures, this is especially seen in the distribution of the emergency aid cards, which have created a range of different issues, without Renova trying to resolve any of those.

The above issues are all symptoms of the lack of participation in the development of the programs and the criteria stated in the TTAC. Renova has a strong focus on participation in their ruling documents and on their webpage but looking at the work done, they are still a far away from what Arnstein refers to as real participation. As a response to this the commission of affected people, MAB and AEDAS has created an alternative process based on participation by the affected people, creating their own criteria's and demands for the recovery. This alternative process has positive effects on procedural justice specially concerning the control of process, however Renova still sits with the ultimate decision control.

The creation of this alternative process has increased participation by the less powerful people in society and their participation in meetings and community life. This might be a response of being recognized by MAB and AEDAS and given a chance for real participation. Not all see the alternative process as positive, some argue that people that are not affected participate in this process, however, this comes back to the disagreement about criteria concerning who are recognized as affected.

### 7.1. Limitations of the study and suggestions for further research

Many questions and issues concerning the recovery work has been left out of this study due to the limited scope of a master's thesis. The contribution given by this thesis has shown that there exists both distributional and procedural injustices in the recovery work in the municipality of Barra Longa, where the company strengthens already existing social difference. This study is limited as it is only based on a qualitative study, by adding quantitative aspects, a broader understanding of the extent of inequalities could be studied.

The research has been conducted on an ongoing process, making it more complicated to get final results as change processes are not concluded and might change. Making it difficult to get a complete reflection of the processes. For further research it would be interesting to study the real impacts of the alternative process on a more final state of the recovery work both, concerning who received compensation, what happened to the people who lived by the exhibition park and how was the resettlement of Gesteira is constructed.

Another limitation to this study is the lack of "formal" justice and a broader aspect of the legal procedures going on, both the governmental organs against the company, but also affected peoples struggle for justice through the legal system, something that could be considered for further research.

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## 9. Appendices

Appendix 1:

**Interviews** (The names are not the real names, but those used in the paper)

Number	Name	Date	Place	Comments
01	Liz	22/4	Gesteira	Woman, works, lives now in Mariana, negro, participate in collective process
02	Ana	22/4	Gesteira	Woman, informal work, lives now in Mariana, negro, participate in collective process
04	Ben	22/4	Gesteira	Young man, lives in Mariana, unmarried, negro, part of collective process
05	Frida	19/4	Gesteira	Woman, lives in Barra Longa, informal work, Collective process
1	Adrian	13&14/3	Barra Longa	Man, married, Lives in Morro Vermelho, Negro, Collective process
3	Emily	14/3	Barra Longa	Woman, married, part of collective process, lives Morro Vermelho, Black
4	Maria	16/3	Barra Longa	Woman, married, white, Lives in 1. de Janeiro
5	Tina	15/3	Barra Longa	Commission of affected people, married, white, teacher, lives in R. Matias Barbosa
8	Silvia	11/4	Barra Longa	Woman, white, Own business, lives in R. Matias Barbosa
9	Lisa	12/4	Barra Longa	Women, white, married, pensioned, Main square
11	Johannes	16/4	Barra Longa	Man, married, negro, own business, lived 1. de Janeiro
12	John	16/4	Barra Longa	Man, married, construction store, city center
17	April	25/4	Barra Longa	Women, married, white, bakery, city center
18	Olga	25/4	Barra Longa	Women, negro, pensioned, lived by the exhibition Park, Collective process
19	Miriam	25/4	Barra Longa	Women, negro, informal work, lived by the exhibition Park. Collective process
20	Carla	25/4	Barra Longa	Renova visited during talk, Women, negro, widow. 1. de Janeiro, collective process
001	Mateus and Marcos	24/4	Barra Longa	Renova
002	Viviana	14/2 & 18/4	Barra Longa	AEDAS

003	Tomas	26/4	Barra Longa	MAB
004	Carlos	26/4	Barra Longa	Mayor's office

## Appendix 2

### List of meeting

Date	Place	What	Who
14.03	1. de Janeiro	- Assembly - health - damage matrix	Base group + AEDAS
15.03	Monsenhor horta	- Assembly - health - damage matrix	Base group+ AEDAS
03.04	Gesteira (church)	How the next negotiation would be and the role of MP	Base group, AEDAS, MAB, MP
04.04	Exhibition Park	- Assembly - health - damage matrix	Base group+ AEDAS
09.04	Gesteira (sport arena)	negotiation	Affected people, politicians, MP, Renova
11.04	Gesteira (sport arena)	negotiation	Affected people, politicians, MP, Renova
16.04	Barra Longa- city center	Assembly about health	MP/ prefeitura/ MAB/ scientists
20.04	Gesteira (church)	To decide which families will enter into the resettlement	Affected people, Renova, AEDAS
25.04	Barra Longa	Next step in the work with damage matrix, difference between how Renova works and how AEDAS work/ think.	Coordinators of the Base groups + AEDAS

Appendix 3:  
**Arnstein 's (1969) ladder of participation:**

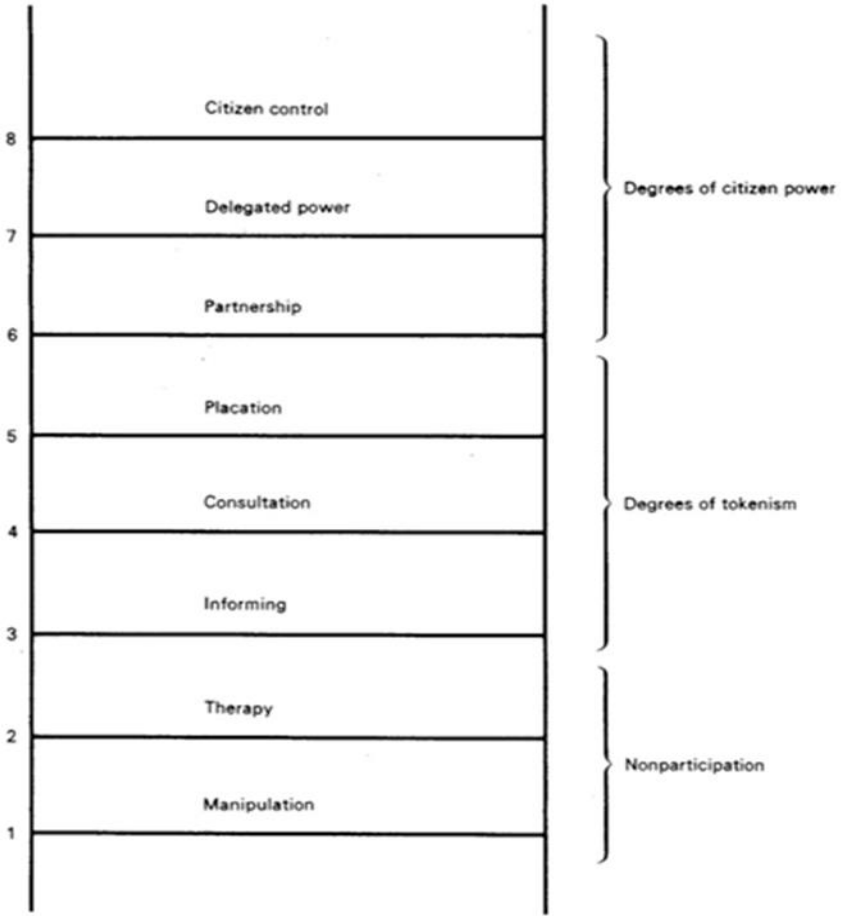


Figure 1 Eight rungs on a ladder of citizen participation

## Appendix 4

### **Impacted people according to TTAC**

- a) loss of spouse, companion, relatives until the second degree, by death or by disappearance;
- b) loss, by death or disappearance, of family members with kinship or persons with whom they cohabited and / or maintained a relationship of economic dependence;
- c) proven loss by the owner of movable or immovable property or loss of ownership of immovable property;
- d) loss of productive capacity or viability of use of immovable good or property or parts of it;
- e) proven loss of areas for fishing activities and extractive resources, rendering ineffective the extractive or productive activity;
- f) loss of income sources, work or self-subsistence on which they are economically dependent, as a result of the link with affected areas;
- g) proven losses to the local productive activities, with unfeasibility of establishment or economic activities;
- h) unfeasibility of access or management activity of natural and fishery resources, including the lands of public domain and collective use, affecting income, livelihoods and the way of life;
- i) damage to physical or mental health; and
- (j) destruction or interference in community life or conditions of reproduction of socio-cultural processes and cosmological features of riverine, estuarine, traditional and indigenous peoples.

(TTAC: 8)

## Appendix 5

### **Affected people according to the commission**

#### Loss of family members and material goods:

- Affected people who live in mourning for the loss of their relatives, friends and neighbors as a result of the rupture of the dam.
- Affected people who were forced to leave their homes, being completely or partially destroyed.
- Affected people who lost and / or had their material assets deteriorated: car, motorcycle, house, furniture, agricultural machinery and tools, plants, photographs, objects of sentimental value, personal objects, handicrafts, among others.
- Affected people that have lost or suffered changes in agricultural and animal production spaces, or even in backyards and pasture areas, transforming them into areas unproductive or unfit for food production.

#### Loss of income:

- Affected people who lost and continue to lose with the drop in sales of local commerce, whether formal or informal and live with the risk of not recovering..
- Affected people that, at the time of the Dam rupture, were formal or informal rural workers, tenants, sharecroppers, day laborers, partners or squatters, who had their income source compromised or paralyzed.
- Affected people who were autonomous workers and lost their jobs after the dam broke: masons, maids, vendors, garimpeiros, taxi drivers, yard workers, manicures, artisans, embroiders, fishermen, sugarcane cutters, among others.

#### Loss of access:

- Those who live or lived on the route of the mud and got their working conditions, their way of life, social, family and community relations changed.
- Affected people who lost their non-material patrimony such as: spaces and collective relations, religious festivals, meeting of the rivers, football championships, cavalcades, etc.
- Affected people who have lost access to leisure, culture, sport, religious and community spaces.
- Affected people who have lost access to the river, leisure space and artisanal and productive fishing activities

- Affected people who have lost access to the roads and have been obstructed in the right to come and go, being without water, food, access to basic health services, schools and workplaces, loss of communication with family members and the community

#### Health:

- Affected people who do not have information about the quality of water for human and animal consumption and for agriculture.
- Affected people who lost their right to healthy food, with food sovereignty and security, in the backyards that were destroyed by the mud, where they cultivated various fruits, vegetables, legumes and tubers, medicinal and aromatic plants.
- Affected people who suffer from health problems related to the rupture of the dam and the arrival of the mining waste, including those that no longer reside in the municipality: respiratory problems, allergies, dengue fever, yellow fever, trauma, insomnia, stress, depression, among others.
- The affected children who are in the formation phase and experience the consequences of the crime.
- Affected people who suffer from the possibility of the rupture of the Germano and Santarém dams, the dikes built below the Fundão dam and the lack of accurate information and credibility on the part of the company.

#### Other economic consequences:

- Affected people that had their land and real estate devalued.
- Affected people that are not contracted by the companies that operate in the municipality after the dam rupture.

#### General life changes:

- Affected people who suffer from the authoritarianism of the mining companies, as well as from the Renova Foundation, which prevent them from deciding on their own future.
- Affected people that were unable to continue their projects and ways of life.
- Affected people whose lives were put at risk by the rupture of the dam.

#### As a result of the company's work:



- Affected people who suffered and still suffers disruption of their way of life from increased circulation of machinery, trucks, workers, noise pollution, bad smell, and constant harassment of corporate employees.
- Affected people that had housing conditions violated: cracked houses, improperly reformed homes, reforms disrespecting the original format and houses with shaken structures as a consequence of the intense traffic of vehicles, machinery and the movement of the soil with the arrival and removal of the tailings.
- Affected people who had to reform their homes again with their own recourse after the reform done by the company.
- Affected people that live with the tailings after the rupture, through the transport and deposit in the Exhibition Park, for the paving or deposit on the roads, in the contamination of air, water, soil, plants, animals, food, among others.

Appendix 6:

**Map of Barra Longa:**







**Norges miljø- og biovitenskapelige universitet**  
Noregs miljø- og biovitenskapelige universitet  
Norwegian University of Life Sciences

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NO-1432 Ås  
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