



PoEMAS

Versos

Textos para Discussão

PoEMAS

Environmental disasters and mine tailings dams: Lessons not learned from the Doce River basin tragedy in Brazil

Bruno Milanez

Luiz Jardim de Moraes Wanderley

Tatiana Ribeiro de Souza

2017

v. 1

n. S1

Versos

Textos para Discussão PoEMAS

Equipe

Bruno Milanez (Universidade Federal de Juiz de Fora)

Luiz Jardim de Moraes Wanderley (Universidade do Estado do Rio de Janeiro)

Maíra Sertã Mansur (Universidade Federal do Rio de Janeiro)

Raquel Giffoni Pinto (Instituto Federal de Educação, Ciência e Tecnologia do Rio de Janeiro)

Ricardo Junior de Assis Fernandes Gonçalves (Universidade Estadual de Goiás)

Rodrigo Salles Pereira dos Santos (Universidade Federal do Rio de Janeiro)

Tádzio Peters Coelho (Universidade do Estado do Rio de Janeiro)

Como citar:

Milanez, B., Wanderley, L. J; Souza, T. R. (2017) Environmental disasters and mine tailings dams: Lessons not learned from the Doce River basin tragedy in Brazil. *Versos - Textos para Discussão PoEMAS*, 1(S1), p. 1-6.

ISSN: 2526-9658

Versos

Versos se propõe a trazer textos analíticos que debatam, a partir da perspectiva das ciências humanas, diferentes aspectos do setor extrativo mineral. Esta iniciativa busca estimular a discussão crítica sobre o papel deste setor no desenvolvimento local, regional e nacional no contexto brasileiro.

PoEMAS

O grupo de pesquisa e extensão Política, Economia, Mineração, Ambiente e Sociedade (PoEMAS) é um grupo multidisciplinar e interinstitucional formado por acadêmicos que se propõem a refletir sobre as múltiplas interfaces entre o setor extrativo mineral e a sociedade.

Maiores informações:
<http://www.ufjf.br/poemas/>
<https://www.facebook.com/grupoPoEMAS/>

Environmental disasters and mine tailings dams: Lessons not learned from the Doce River basin tragedy in Brazil ¹

Bruno Milanez²

Luiz Jardim de Moraes Wanderley³

Tatiana Ribeiro de Souza⁴

Abstract

Mineral extraction creates negative impacts on the environment and the surrounding human population. One of these impacts is the generation of tailings. The tailings dam solution has not prevented the continuation of environmental destruction because of the failures of these systems. Despite the risks, there has been little rigor in the environmental licensing process for tailings dams. Outstanding issues include underestimating areas of impact, disregarding potential damages to local communities, and insufficient assessments of technological alternatives. In a way, the lax attitude of the State can be attributed to a long-term promiscuous relationship between governments and mining corporations. This is very directly related to the influence peddling made possible by corporate donations to electoral campaigns. As long as public authorities are conniving with such processes the population living in mining areas will be at imminent risk.

Keywords

Mining, tailings dam, disaster, Rio Doce

¹ This text was originally published in Portuguese by *Le Monde Diplomatique Brasil*, March, 2017.

² Industrial Engineer and PhD in Environmental Policy (Lincoln University). Lecturer at the Department of Industrial and Mechanical Engineering and at the graduate Programme in Geography at the Federal University of Juiz de Fora. Coordinator of the Research Group Politics, Economy, Mining, Environment and Society (PoEMAS). E-mail: bruno.milanez@ufjf.edu.br.

³ Bachelor and Ph.D. in Geography (Federal University of Rio de Janeiro). Lecturer at the Department of Geography at the State University of Rio de Janeiro. Member of Research Group Politics, Economy, Mining, Environment and Society (PoEMAS). E-mail: lulawanderley@gmail.com

⁴ Lawyer and PhD in Law (Pontifical Catholic University of Minas Gerais). Lecturer at the School of Law and at the Graduate Programme of Law at the Federal University of Ouro Preto. Coordinator of the Group of Socio Environmental Studies and Research (GEPSA). Email: tati.rib@hotmail.com.

It is widely known that mineral extraction creates negative impacts on the environment and the surrounding human population. One of these impacts, the generation of tailings, has come under intense scrutiny in Brazil after the tragedy caused by the collapse of the Fundão tailings dam, in Mariana in the mineral-rich state of Minas Gerais. Despite the growing debate, big mining corporations persist in using tailings dams for storage of mining waste.

The generation of tailings is inherent to mining. Iron reserves in Brazil have an average ore concentration of 51%; in aluminium reserves, this concentration drops to 44%; and in gold, it is less than 1%. The waste material with no market value for the mining companies must be stored somewhere. There are various social and environmental effects of the tailings storage, resulting in the contamination of bodies of water and, in the event of a dam collapse, the destruction of river basins and human casualties.

One of the most infamous environmental disasters occurred in the Ok Tedi River valley in Papua New Guinea. In the 1980s, BHP (later BHP Billiton) began to discharge mining waste directly into the river system, after a landslide during the construction of its dam. The incident gained notoriety when local communities sued the company in Australia, since their local government was unwilling to take measures against BHP. After a lengthy lawsuit, the mining corporation and the communities signed an agreement and the company transferred its shares in the Ok Tedi mine to a development trust in Singapore. This reduced the risk of claims regarding any future impacts (Kirsch, 2014).

In Brazil, a similar situation occurred in Pará state, also in the 1980s. Mineração Rio do Norte (MRN) – a corporation formed at the time by Vale, Companhia Brasileira de Alumínio, and seven other foreign mining companies – discharged tailings from bauxite processing into Batata Lake, a tributary of the Trombetas River, for nearly a decade. In 1989, MRN was forced to launch a clean-up operation. After more than 20 years, the mining company has still not succeeded in full recovery of the lake's ecological system.

As legislation about environmental protection has been evolving in recent years, so have methods for handling and disposing of tailings. The use of tailings dams has become more widespread. The “dam solution”, however, has not prevented the continuation of environmental destruction caused by the tailings, mainly because of the failures of these systems. From 1990 to 2016, 105 tailings dam incidents were registered. But such incidents were not equally distributed around the globe; 64% of the failures and all deaths resulting from these events occurred in peripheral countries (Chambers & Bowker, 2016).

Within Brazil, the risk of such disasters is also unevenly distributed. Eighty percent of the existing dams in Minas Gerais State are in areas inhabited by predominantly non-white populations; meaning the disproportionate distribution of risk may be based on the race variable (Green & Acserald, 2016). For example, in the two districts of Mariana most affected by the collapse of the Fundão dam, 84% of the population of Bento Rodrigues and 80% of the population of Paracatu de Baixo declared themselves as either brown or black in the last census (IBGE, 2015).

Although the occurrence of tailings dam incidents has declined significantly, those that do occur have become more violent and have affected more extensive areas. This is due mainly to the increased scale of mining operations, which necessitates construction of even larger dams and, consequently, dams with greater destructive potential.

Mining companies can choose their mineral processing and waste management methods along with whether or not to use tailings dams. In Brazil, wet processing, in which separation occurs by density difference, is the main technology used for ferrous minerals. This process consumes a large amount of water and generates waste in the form of slurry, thus requiring the construction of dams.

There are other available technologies, however, such as thickening and dewatering, which remove excess water from the process and allow the tailings to be discharged in paste or in a dry state. In the event of failure, waste stored in these forms has a significantly lower socio-environmental impact. With iron ore, there is the option of dry processing, which does not consume water and does not generate slurry. According to Vale S.A., this technology "is comparatively simple and does not require significant adaptations in the processing plants" (Góes, 2016). Nevertheless, new projects are being approved without incorporating better waste disposal options.

Daniel Franks, a Chief Advisor of United Nations Development Project (UNDP), compares dry tailings storage to use of double-hulled oil tankers. Both are available and feasible technologies that reduce risks and lessen severity of impacts. However, while oil companies accepted incorporation of double-hulled tankers after the Exxon Valdez oil spill in Alaska in 1989, mining companies are still reluctant to adopt dry tailings storage. When it comes to mining, Franks argues that the cost savings from reducing tailings volumes, recycling wastewater, and lowering environmental monitoring costs often make this technology economically viable. He challenges the argument of higher operational costs (Franks, 2016).

In Brazil, there has been a significant increase in the frequency and severity of dam failures. From 2001 to 2015, there were seven serious tailings dam incidents just in the state of Minas Gerais. The most significant was the collapse of the Fundão dam at the Samarco mine, a joint venture BHP Billiton and Vale S.A., in Mariana.

Despite the risks, there has been little rigor in the environmental licensing process for tailings dams. Outstanding issues include underestimating areas of impact, disregarding potential damages to local communities, and insufficient assessments of technological alternatives. These issues were identified both in the licensing process for the Fundão dam (Brandt Meio Ambiente Ltda., 2005) and in the Environmental Impact Assessment (EIA) presented for the licensing of Vale's dam Maravilhas III; formerly the Congonhas dam (Lume Estratégia Ambiental, 2010). and Samarco's Alegria Sul⁵ tailings disposal unit (Arcadis, 2016).

⁵ Alegria Sul is a mineral extraction pit in the process of exhaustion. The disposal in exhausted pits tends to be safer than the conventional dams. However, to increase Alegria Sul's capacity, a dike will be built using a similar process to a tailings dam.

The area of influence of Fundão was arbitrarily limited to the municipalities of Ouro Preto and Mariana, without considering the possibility that a tailings spill could reach the Doce River. A similar error was made in the EIA of Maravilhas III; it restricted the area of influence to the municipalities of Itabirito and Nova Lima, and ignored that, in the event of a spill, the tailings would reach the river basin. In the case of Alegria Sul, the environmental impact study underestimates the environmental damages Samarco has already caused and limits the area of influence to the municipalities of Mariana, Ouro Preto, Santa Bárbara and Catas Altas. Through these omissions, the company avoids any debate about resumption of its activities, and attempts to deny the risk for affected communities all along the Doce River.

Critical issues also arise concerning the location of the dams. In the case of Fundão, among the three sites listed in the EIA, the one chosen was the only one that could cause the collapse of a chain of dams (Germano and Santarém) and the one nearest to Bento Rodrigues. The same disregard occurred in the EIA of Maravilhas III. Vale S.A. plans to build it upstream from Maravilhas II (also owned by Vale S.A.) and the Codornas dam (owned by AngloGold Ashanti). A failure at the Maravilhas III dam could cause the collapse of the dams downstream, with tailing reaching residential areas in less than 30 minutes. As for Alegria Sul, if the levee fails, the tailings could reach Santa Rita Durão, an urban area with a population of nearly 1,500 inhabitants. These choices by the mining corporations increase the potential for destruction and endanger local communities.

According to the environmental legislation in Brazil, the EIAs must present alternatives and justify its choice of the technology adopted. This criterion has often been disregarded in assessments of mine tailings disposal. In the case of Fundão, the evaluation of alternative technologies looked only at dam construction methods and the building material to be used. The EIA of Maravilhas III considered dewatering technologies, but these were discarded because they might cause “inconveniences,” such as truck traffic and bulk material handling. The EIA of Alegria Sul only discussed the construction method for the spillway, and did not include tailings disposal alternatives. There was no mention of dry processing techniques, even though Vale S.A. planned to adopt this technology in its processing plant in Mariana.

Such inadequacies are, to some degree, responsible for the magnitude of the disaster in the Doce River basin. Although the licensing processes of Maravilhas III and Alegria Sul took place after the tragedy at Mariana, the problems identified in the investigations of Mariana have not been taken up by public authorities. The dam of Maravilhas III received its Preliminary License in June 2016. As for Alegria Sul, the first public hearings took place in Ouro Preto on December 14th, and in Mariana on December 15th, 2016. In the case of Mariana, the hearing was scheduled for a Thursday. This is the day when people who lost their homes and property in Bento Rodrigues and Paracatu de Baixo meet regularly with the Renova Foundation⁶ to discuss resettlement plans. The coincidence of dates and lack of

⁶ The Renova Foundation was created by Samarco, Vale e BHP Billiton to be responsible for compensating the damage caused by the failure of the Fundão Dam. It would be in charge of the

information about the hearing considerably reduced the participation of those directly affected by the Mariana disaster.

In a way, the lax attitude of the State can be attributed to a long-term promiscuous relationship between governments and mining corporations. This is very directly related to the influence peddling made possible by corporate donations to electoral campaigns. These donations were widespread until the campaign finance law was amended in 2015, making such practices illegal⁷. Rather than seeking power by occupying positions in the government, the mining companies contributed to the campaigns of candidates from different parties so as to ensure their influence no matter the outcome of the election. For example, in the 2014 campaign, Vale S.A. affiliated companies donated R\$ 79.3 million to financial committees, directories and candidates. The largest sums of money were given to the three parties that either had candidates in the second round of the presidential elections or had been elected in the states of Minas Gerais and Espírito Santo. The PMDB received R\$ 23.0 million for vice presidential candidate Michel Temer and the elected governor of Espírito Santo, Paulo Hartung. The PT received R\$ 19.3 million for the elected presidential candidate Dilma Rousseff and the governor of Minas Gerais, Fernando Pimentel. The PSDB received R\$ 9.5 million for the senators Aécio Neves and Aloysio Nunes, running respectively for president and vice president (Coelho, Milanez & Pinto, 2016). Such practices were carried out at all levels of the federation and in both executive and legislative spheres, turning government agents into defenders of private business interests while compromising government action in the public interest for the defence of society.

With the political scenario carefully controlled by corporations, EIAs commissioned by big mining companies continue to operate on the assumption that tailings dams are the “only solution”. They do so even though studies point to the recurrent tailings dam failures, even though companies have knowledge of alternative technologies for the prevention or treatment of tailings, and even with data indicating the escalating damages generated by tailings dam failures. As long as public authorities are conniving with such processes, however, the population living in mining areas will be at imminent risk of new tragedies such as the one that destroyed the Doce River basin in 2015.

References

Arcadis. (2016). *Estudo de Impacto Ambiental. Sistema de disposição de rejeito - Alegria Sul*.

Brandt Meio Ambiente Ltda. (2005). *Estudo de Impacto Ambiental. Barragem de Rejeito do Fundão*.

programmes defined in the Agreement signed by the companies, federal government and state governments of Minas Gerais and Espírito Santo. The ratification of this agreement was voided by the courts in August 2016, for not taking into consideration the rights of affected communities.

⁷ In Brazil, there is a mixed system for political campaign funding. Political parties receive resources from both the state (from a public fund) and private donors. Until the electoral reform, in 2015, donations could be made by individuals and legal persons, and could be directed to individual candidates or parties.

Chambers, D. M., & Bowker, L. N. (2016). *Tailings dam failures 1915 - 2016*. Center for Science in Public Participation; Bowker Associates.

Coelho, T. P.; Milanez, B.; Pinto, R. G. (2016) *A empresa, o Estado e as comunidades*. In. M. Zonta, M; C. Trocate, (Ed.) *Antes fosse mais leve a carga: reflexões sobre o desastre da Samarco/Vale/ BHP Billiton*. Marabá: Editorial Iguana.

Franks, D. (2016). Anticipating and managing environmental issues. In *Natural Resources for Sustainable Development*.

Góes, F. (2016, 04/Aug/2016). “Vale muda processo operacional em minas.” *Valor*

Green, M. & Acserald, H. (2016) *Personal communication*.

IBGE. (2015). *Censo Demográfico 2010*. Rio de Janeiro: IBGE. Instituto Brasileiro de Geografia e Estatística.

Kirsch, S. (2014). *Mining capitalism: the relationship between corporations and their critics*. Oakland, California: University of California Press..

Lume Estratégia Ambiental. (2010). *Estudo de Impacto Ambiental Barragem de Congonhas*.