Perspectives in Ecology and Conservation 15 (2017) 206–208

ABECO
ASSOCIAÇÃO BRASILEIRA DE CIÊNCIA ECOLÓGICA E CONSERVAÇÃO

Perspectives in ecology and conservation

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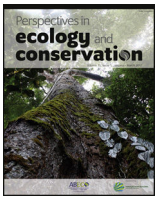

Policy Forums

Biodiversity monitoring in the environmental impact assessment of mining projects: a (persistent) waste of time and money?

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ARTICLE INFO

Article history:
Received 2 December 2016
Accepted 6 June 2017
Available online 27 June 2017

Keywords:
Biodiversity
Monitoring
Environmental impact assessment
Mining
Brazil

ABSTRACT

Environmental impact assessments, not only in Brazil, but also globally, have long had their effectiveness questioned. Among the most frequently debated problems are: low quality of the impact assessment statements, weak public participation, project delays, increased costs for proponents, amongst others. The ineffectiveness of the environmental impact assessment system is corroborated by recent scholarly articles that argue that poor follow-up is one of the key elements behind the worst environmental disaster in Brazil, the Fundão Dam failure. The quality of monitoring programs has long been criticized in Brazil for being partially implemented and for failing to clearly translate into better environmental decision-making. This paper discusses the state of environmental impact assessment related to biodiversity monitoring programs in Brazil's mining regions, highlighting the political interference around this practice. Biodiversity monitoring programs should set a collection protocol, using a robust sampling design, with sufficient survey effort, spatial replication, methodological consistency and time to detect eventual ecological alterations. Without scientific rigor, collected data may have no value for decision-making, representing a complete waste of time and money.

Introduction

November 5th 2016 marked the first anniversary of the collapse of the Fundão Tailings Dam, which was located in the iron ore mining site of Samarco, in Mariana, Minas Gerais, Brazil. While mining disasters have long been making the headlines in Brazil, the Samarco dam failure is being portrayed as the country's worst environmental disaster. The numbers are staggering. The wave of iron ore slurry that went down the Doce River basin, starting off in the afternoon of November 5th 2015, killed 19 people, spread over 1775 hectares, including 835 hectares of environmentally protected areas and 236 hectares of Atlantic Rainforest and reached the Doce River mouth 16 days later, affecting numerous marine habitats (IBAMA, 2015, 2016; Miranda and Marques, 2016; SEDRU, 2016; SOS Mata Atlântica and INPE, 2016). Not surprisingly, Herton Escobar called this phenomenon a "mud tsunami" in his Science article (Escobar, 2015). An entire village (Bento Rodrigues) was destroyed and dozens of communities downstream were severely affected (SEDRU, 2016). According to a panel of geotechnical engineers, this massive failure was a result "of a chain of events and conditions" (Morgenstern et al., 2016, p. ii), several of which related to the mismanagement of the Fundão Dam, which was monitored under the conditions of an environmental impact assessment (EIA) system.

One could argue that the dam's geotechnical flaws would not have occurred if the EIA had worked in the first place. EIA is a "systematic process that examines the environmental consequences of development actions in advance" (Glasson et al., 2005, p. 3). This process occurs prior to construction and during the installation and operation of development projects. EIA is one of Brazil's key mandatory environmental policy tools. If it had been properly implemented in the Samarco mining site, the likely risks of a dam failure would have been properly identified, managed, and prevented. Nonetheless, the investigations that followed the tragedy are showing that, after Samarco conducted EIAs and was granted environmental licenses for the mining site, both the company and

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http://dx.doi.org/10.1016/j.pecon.2017.06.001

government agencies overlooked and underestimated numerous flaws in the implementation of construction plans and monitoring programs (Morgenstern et al., 2016; Polícia Civil, 2016). The ineffectiveness of the EIA system is corroborated by recent scholarly articles that argue that poor follow-up and streamlining of the environmental licensing and EIA system is one of the key elements behind the dam failure (Fernandes et al., 2016; Neves et al., 2016).

EIAs, not only in Brazil, but also globally, have long had its effectiveness questioned. Among the most frequently debated problems are: low quality of the impact assessment statements, weak public participation, project delays, increased costs for proponents, amongst others (Morgan, 2012). Few studies, however, have highlighted the problem of "government and private negligence in follow up controls" as a key one. The roots of this not so usual problem are unclear, but they could be related to Minas Gerais state's pro-mining policies. Rocha and Fonseca (2017) recently showed that some mining projects in Minas Gerais were being subject to radically streamlined timeframes that could reduce government control, and thus jeopardize conservation efforts.

Toward effective biodiversity monitoring programs

Improving Brazil's EIA system will not fix the past; but it could, for example, enhance the monitoring programs that are needed to restore the Rio Doce basin and affected marine habitats. The monitoring requirements of EIAs are critical to the environmental performance of industrial projects and to the broader environmental governance of municipalities, watersheds and conservation areas (Morrison-Saunders and Arts, 2004; Marshall et al., 2005).

The quality of EIA monitoring programs has long been criticized in Brazil for being partly implemented and for not clearly translating into better environmental decision-making (Prado Filho and Souza, 2004; Sánchez and Gallardo, 2005). Such problems are arguably more critical in the case of biodiversity monitoring programs, which, unlike physical and chemical monitoring programs, have not been clearly laid out and analyzed by consultants and government analysts.

Biodiversity monitoring programs can take various forms, addressing different spatial and time scales. According to Lindenmayer and Likens (2010), in any case, ecological and biodiversity monitoring programs need to be driven by (1) good questions, (2) a robust conceptual model of how an ecosystem or population works, (3) strong partnerships between scientists, policy-makers and managers, and (4) frequent use of data collected. However, such requirements are not often observed.

Legg and Nagy (2006) add that biodiversity and ecological monitoring programs must have well-formulated hypotheses, consistent methodology and statistical power; otherwise, it may fail to reject null hypotheses (e.g. accepting the null hypothesis that impact does not affect diversity of species whereas, in fact, it affects the latter). In order to illustrate this framework, take the example of one of the impacts associated with mining entrepreneurships – noise disturbance. Certain fauna groups, such as birds, might be sensitive to noise, thus, the hypothesis is that the populations of birds may have behavioral alterations during the reproductive period, which, in its turn, may cause alterations in population parameters when compared to a baseline condition prior to the impact. In order to assess this hypothesis, the research should set a collection protocol using a robust sampling design, with sufficient sampling effort, spatial replica, methodological consistency and time to detect eventual demographic alterations. Initially, such a monitoring program can be perceived as costly and time-consuming; however, without scientific rigor, collected data may have no decision-making value, representing a complete waste of time and money.

Perceptions and recommendations about biodiversity monitoring in mining-related EIAs

The state of EIA-related biodiversity monitoring programs in Brazilian mining regions has been marginally explored in the academic literature. However, an ongoing research project conducted in the Graduate Program in Ecology of Tropical Biomes at the Federal University of Ouro Preto is shedding light on the various problems surrounding this practice. The main objective of the project is to analyze, through content analysis and confidential semi-structured interviews, the technical consistency and the decision-making relevance of fauna data generated in the impact assessment of large mining projects in Minas Gerais, including the region where the Fundão Dam collapsed. While the research is still in progress, a number interviews conducted with seasoned environmental consultants in Minas Gerais is suggesting a worrisome situation.

Four senior consultants stated that most mining-related biodiversity monitoring programs in which they have worked on is poorly planned, mirroring several technical flaws that ultimately impairs the capacity of analysts to make sound decisions about the impacts of mining projects. One of the key problems, according to them, is that the programs are unable to clearly correlate biodiversity information and mining impacts.

Both the literature and the interviews indicate that biodiversity monitoring programs should be guided by, at least, three fundamental questions: (1) Why monitoring? (2) What to monitor? and (3) How to monitor? (Yoccoz et al., 2001). Biodiversity monitoring programs in mining projects need to detect significant alterations in biodiversity over time as a result of mining activities. It should be impact-oriented, with a clear definition of what needs to be explained. Another critical issue is the choice and calibration of indicators. For instance, it is probably a waste of time and money the usual practice of monitoring large and medium-sized mammals' populations over three-year periods. Detecting alterations in large mammal' population requires periods of time quite longer than that. The choice of indicators ought to be based on knowledge on ecology and the biology of the group, in anticipation of a response given to environmental alterations (Noss, 1990; McDonald-Madden et al., 2010).

Current practice in Minas Gerais is teemed with inconsistency: a situation that is, to a large extent, a result of the lack of detailed Terms of Reference and monitoring regulations. This is arguably a global problem, as international literature has long signaled similar problems in other countries (Dipper, 1998). Nixon and Ahammed (2005), for example, in a detailed study on monitoring of environmental impacts in Australia, observed that many monitoring programs were based on rather discretionary choices.

According to one of the Brazilian consultants, in the absence of regulations, consultants have too much room to adapt their monitoring "choices" to the financial and political context. This can be a significant problem, because, in such a highly competitive sector, economically-sound choices tend to be prioritized.

Altogether, these facts contribute to a monitoring culture of compliance, where companies are generating fauna data to obtain and maintain their licenses, rather than to learn how to better interact with the environment. Sadly, all interviewees agreed that the fauna data of mining sites tends to merely fill the environmental agency's archives, as opposed to inform better decisions.

Recent years have witnessed many proposals for simplifying and streamlining Brazil's EIA regulations (Fonseca et al., 2017). Hopefully law-makers will realize that a faster and simpler EIA system, while apparently good for business, can be dangerous when unaccompanied of environmental quality on the ground. The tragedy of Mariana is a sour reminder of this lesson.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgements

A. Dias is supported by CAPES scholarship. A. Paglia and the Ecology & Conservation Lab's research has been funded by CNPq, CAPES and FAPEMIG. We also thank the anonymous reviewers.

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