

Biodiversity Research Consortium (BRC): A technical and scientific partnership in search of "State of the Art" Mined Area Recovery

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Abstract



Hydro Paragominas is a bauxite mining company that operates in the municipality of Paragominas, in Pará State, Brazil. To carry out environmental restoration activities as close as possible to what was before or with superior environmental quality, Hydro has an initiative to create the Brazil-Norway Biodiversity Research Consortium (BRC), aiming to achieve existing, and create a new "State of Art in Environmental Restoration "in areas of bauxite mining. Of this initiative, 26 projects were approved and are in the implementation phase (be it budgetary or technical). Of these, three are presented with their main results. These projects are: Terrestrial Mammal Monitoring Project (25 species were recorded, 11 of conservation interest); Evaluation of chemical components of stored wood (favorable results in increasing organic matter in soil); Biodiversity of Birds, where 240 species were registered, 146 in the forest areas, 53 species in the Natural Regeneration technique, 49 species in the Traditional Planting technique and 37 in the Nucleation technique. For the academy, these four studies assisted in the development of 5 master's degrees; one graduation, with 14 students involved. In total the BRC's projects have at least 100 researchers and students working on surveys, 10 master's degrees concluded (and more in progress), 9 graduation's degree concluded, and several papers and articles produced. During the studies 3 new species of fungi, a new species of lichen and a new species of bug was discovered.

Keywords: Biodiversity, BRC, Hydro Paragominas, Amazon, Research.

1. Introduction

Hydro Paragominas is a project located in municipality of Paragominas, in the state of Pará, Brazil, which mines and beneficiates bauxite ore, transforming it into pulp (50% water and 50% ore), that is sent by pipeline to the municipality of Barcarena (244 km), to transform into alumina and later aluminium.

Mining activities have as the first step the removal of vegetation before the excavation of topsoil and overburden to reach the bauxite deposit. After this last stage, the organic rich topsoil, which is removed and stored, is returned to the mined area after contour reshaping with overburden to initiate forest recovery. Three different techniques are used for reforestation: Traditional Planting; Natural Regeneration; and a third and innovative technique, Nucleation.

On its own initiative, Norsk Hydro ASA (Hydro) invited four academic institutions to research and study three different scientific themes. This work had the purpose of establishing a model of environmental restoration proposed by scientific criteria integrating the academy and the technical operation, along with fostering the knowledge of Amazonian biodiversity and the exchange of technical-scientific learning, to achieve the State of the Art in Environmental Restoration after bauxite mining.

2. The Biodiversity Research Consortium Brazil-Norway (BRC)

In January 2012, Hydro issued the technical report "Reforestation and Wildlife Program, Hydro, Paragominas, Pará, Brazil", prepared by researchers Rafael Salomão & Silvio Brienza. This report contained a technical assessment of the Fauna and Flora Programs, as well as suggestions for improvement of the biodiversity program carried out at Mineração Paragominas S.A (MPSA). According to the researchers' analysis, the following can be observed in the report:

"Due to the unique conditions of the project in a heavily anthropogenic area close to the city of Paragominas, associated with the high production of the MPSA, it is urgent to establish a broad research program in forest restoration that supports the consolidation of the new vision that Hydro wishes to implant in the company. The establishment of a research-based forest restoration model should be pursued to enable HYDRO to generate a genuine forest restoration model that could be applied to other degraded areas of the Amazon under similar conditions." [1]

According to the griffons on text, the report recommends that Hydro Paragominas establish a Forest Restoration program for new restoration activities that is based on scientific and academic research.

In response to the recommendations of this report, Hydro and the Natural History Museum (NHM) of the University of Oslo (UIO) signed a Memorandum of Understanding in May 2012, related to an intention to do research on environmental themes in Paragominas, Brazil. As a goal of this cooperation, Hydro aims to develop relevant knowledge, applied to biological diversity and climate change, to support and develop activities, among others, in the monitoring and rehabilitation program of Hydro's bauxite mine in Brazil.



Figure 1. Event held in October 2017 in Belém (State of Pará, Brazil) to extend the BRC Consortium until 2023. Source: Hydro.

In November 2013, the Brazil-Norway Biodiversity Research Consortium (BRC) was formally created. In addition to Hydro and UiO, the BRC consists of the Federal Universities of Pará (UFPA) and Rural da Amazônia (UFRA) and the Museu Paraense Emílio Goeldi (MPEG). In

7. Results and Discussions

With the results of the four studies discussed here, it was observed that valuable information about the ecological dynamics of the region was obtained, such as:

The habits of terrestrial mammals under the influence of mining activities, mainly species of conservation interest;

The study of decaying wood suggests that the presence of decaying wood in the areas of Nucleation and storage patios, present a quantity of nutrients favorable to soil recovery, with increase of organic matter, favoring the development of the local recovery;

The diversity of local birds, as well as the preference for forest recovery techniques, as well as species of conservation interest;

The ecological dynamics of water bodies in surrounding mining areas, as well as an understanding of how these groups can serve as indicators for the processes of mining and environmental recovery.

During the samplings of several groups surveyed, six new species for science have already been registered, with potential to expand these new discoveries with new projects that will begin in the coming years.

With the help of these partial results, it is possible that Hydro Paragominas adopts new and improved environmental control measures before, during and after its activities, which will serve to inform strategic decisions for the conservation of local biodiversity.

In addition to the ecological results, it is worth commenting on the value of the social and academic gains, which are evidenced through the promotion of studies for the local Amazon, as well as the academic improvement of the students involved.

8. Conclusions

While this article reports on the partial results of only four research projects being delivered in the area of Hydro Paragominas, other studies continue to be carried out. In the future it is expected that more results will be presented that will add value and technical knowledge to the pre-mining activities (biodiversity inventories and management specific groups as examples); during mining (top soil management); and post-mining (in the environmental recovery activity), with the proposal of indicators, techniques and actions that favor and increase environmental restoration, underpinned by scientific and academic knowledge, informing the technical operations of mining, in search of the State of Art in Environmental Restoration in bauxite mining areas.

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