

Annual Report 2018

The Biodiversity Research Consortium Brazil-Norway (BRC)



BRC with more exchange and results. Top: Hydro staff and BRC researchers and students in a National Seminar about Restoration. Bottom: The first year of the Tropical Ecology course Between Brazil and Norway. Photos: Hydro /UFPA.

CONTENTS

1. Introduction and background	3
2. Main results 2018.....	3
3. The BRC board	4
4. The BRC scientific committee.....	4
5. The BRC secretariat	5
6. New research projects	6
7. Research project activities	7
8. Fundraising activities.....	8
9. Strengthening partnership UiO – UFRA and UiO – UFRA.....	8
10. Mining and Biodiversity Week	9
11. Field Course in Tropical Rainforest Ecology and Biodiversity	9
12. Brazilian Society of Restoration Ecology – Symposium.....	11
13. Participation in the International Aluminum Exhibition	12
14. Student Involvement and Exchange.....	13
15. Lessons Learned	14
Annex 1: BRC – Overview research projects 31.12.2018	16

1. Introduction and background

The Biodiversity Research Consortium Brazil-Norway (BRC) carries out research on biodiversity and climate change issues in the Brazilian Amazon. Established in 2013, the consortium comprises the Federal University of Pará (UFPA), the Emilio Goeldi Museum of Pará (MPEG), the Federal Rural University of the Amazon (UFRA), the University of Oslo (UiO) and the Norwegian mining and aluminium company Norsk Hydro (Hydro). The BRC Consortium Agreement initially lasted for five years (2013-18), but it has been extended for a new five-year period (1 November 2018 – 31 October 2023).

BRC is the result of a Hydro initiative. In 2012, not long after taking over Vale's aluminium operations in Pará, Hydro approached the Natural History Museum (NHM) at the University of Oslo. NHM was given the responsibility to facilitate the creation of a research cooperation based on the recommendations in the Hydro technical report "Reforestation and Wildlife Program - HYDRO Paragominas, Pará, Brazil" by Salomão et al. (2012).

In the BRC Consortium Agreement, the main aim of the cooperation is "to develop research activities both applied and basic, and build a strong base of outputs in biodiversity and climate knowledge" among the partners. The consortium shall also contribute to "increased university – industry partnership". In addition to joint research and publications, "graduate education (master and PhD) will be important elements of the consortium activity."

This report is prepared by the BRC secretariat. It presents the consortium's main results and activities in 2018. In the final section, important lessons learned are presented. We refer to minutes from BRC Board and Scientific Committee meetings and specific event reports for further details.

2. Main results 2018

In 2018, BRC made substantial progress on all defined aims – research, partnerships and student involvement – as well as on the consortium's long-term sustainability. The main results in 2018 were:

- Extension of the bilateral MoU between UiO and UFPA for another five years. A similar extension of the MoU between UiO and UFRA is still under negotiation.
- Adoption of a revised Research Program for BRC.
- Promotion of BRC in one of the most important restoration events in Brazil.
- Implementation of the Field Course in Tropical Rainforest Ecology. It facilitated the exchange of students and professors between Norway and Brazil.
- New call for research projects. The number of proposals was high and it shows that BRC is getting well known among partner institutions.
- Some projects are reaching their end and the final results are promising. A BRC paper of the Biodiversity research was awarded as the most popular in the Brazilian Society of Restoration Ecology symposium.
- BRC projects are interacting more with the community. The Mining and Biodiversity Week in Paragominas was a step forward for BRC contribution to environmental education.

3. The BRC board

The BRC board consists of one representative from each member institution. In 2018, the board members have been: professor Marcos Piedade (UFRA), professor MarluCIA Martins (MPEG), professor Leonardo Sena (UFPA), Domingos Campos (Head of HSE - Hydro B&A) and Fridtjof Mehlum (Senior Researcher - UiO). Leonardo Sena (UFPA) exercised the function as chair of the board.

The board had only one meeting on 07th March 2018. The Goeldi Museum in Belém was the host (Figure 1). The main discussions focused on how to follow up the mid-term review and Barcarena Incident.



Figure 1: BRC Board meeting at Goeldi Museum Belém in March 2018.
Photo: BRC.

4. The BRC scientific committee

The BRC scientific committee takes all the overall scientific and operational decisions. It consists of two representatives from each member institution and normally meets two times every year.

In 2018, the members of the committee have been: professors Gracialda Ferreira and Danielle Pinto (UFRA), researchers Lourdes Ruivo and Rogerio Silva (MPEG), professors Ana Cristina Oliveira and Leandro Juen (UFPA), Patrick Brading (Environment Manager – Norsk Hydro), head of HSE Domingos Campos (Hydro B&A), and senior researcher Fridtjof Mehlum and professor Øystein Wiig (UiO). Fridtjof Mehlum (UiO) exercised the function as chair of the committee. Prior to the last meeting, professor Danielle Pinto (UFRA) substituted Jonas Castro, and professor Ana Cristina Oliveira (UiO) substituted Leonardo Sena. Patrick Brading (Hydro) replaced Bernt Malme (Vice President - Environment – Norsk Hydro) in the Scientific Committee.

In 2018, the committee had two ordinary meetings and one extraordinary telephone meeting. Regarding the ordinary meetings, the first one was in March in the Goeldi Museum Belém (Figure 2) and the second was in September at UFRA campus Belém. The main discussions

focused on adoption of a revised BRC Research Plan, status of ongoing projects, a call for proposals for new research projects, seminar about restoration indicators and the constitution of the project management group. The telephone meeting was about Final ranking of the project proposals.



Figure 2: Scientific committee meeting at the Goeldi Museum Belém in March 2018. Photo: BRC.

5. The BRC secretariat

The BRC secretariat is responsible for coordinating the consortium's activities. It is hosted by the Natural History Museum, UiO, and has been staffed by one full time person, human geographer Torkjell Leira. BRC strengthened the secretariat with a person working two days a week in Belém, namely environmental engineer André Carvalho. Discussions have been going on among the Brazilian partner institutions about how to organize the local secretariat functions in Belém on a more long-term basis, but not final conclusion have been made.

By the end of September, the BRC Secretary, Torkjell Leira, left BRC and has started in a new position at UiO. He has been working for the Consortium since the beginning and has made an excellent contribution to the development of BRC, running the Secretariat, networking and arranging events.

BRC advertised the open position worldwide and after a selection process, Rafael Leandro de Assis was announced as the new coordinator. He has a master degree in Botany (from National Institute for Amazonian Research - INPA, Brazil), and a PhD in Ecology and Natural Resource Management (from Norwegian University of Life Sciences - NMBU, Ås) supervised by Torbjørn Haugaasen. Currently, he is a Postdoc at INPA (Manaus) Projeto Dinâmica Biológica de Fragmentos Florestais (PDBFF).

6. New research projects

In 2018, BRC opened a new call for research projects on the basis of the revised BRC Research Program (2018-2023). This was a very time-consuming process, both for the BRC Scientific Committee, the BRC secretariat and the technical and the scientific evaluation committees. The prioritized research themes were:

- New techniques and technologies to restore areas that compose tailing dams, (compatible with the physical and chemical characteristics of the substrate, integrating soil restoration and biodiversity (fauna, fungi, microbiota, etc).
- Dispersal of wildlife due to mining activities.
- Re-colonisation of wildlife in replanted areas subjected to mining.
- Comprehensive inventory of the herbaceous stratum, epiphytes and / or fungi in forested areas surrounding the Paragominas mine.
- New biodiversity monitoring techniques, for example DNA metabarcoding.
- Techniques for improving estimates of forest aboveground biomass and carbon stock to be applied in restoration areas.
- Effects of mining on hydrological resources (chemical, physical and biological).

The evaluation of proposals followed two lines:

- A technical committee evaluated the project proposal in relevance to the Research Program, feasibility, logistics, budget plan etc. A pre-selection of the proposals was made to eliminate proposals that are considered not relevant for funding. Only proposals addressing the themes listed in the call were considered. Incomplete proposals and proposals not following the guidelines in the application form were not accepted.
- An external committee evaluated the scientific quality, and potential for gaining important new knowledge on restoration and biodiversity of the proposals, and rank the proposal based on scientific merit.

As a principle, SC members are not allowed to be project coordinators of new proposals.

The Consortium received 22 proposals. After the evaluation process and the final rank, 11 research projects were recommended to Hydro for funding by the Scientific Committee (Table 1).

Table 1: Approved research proposals in 2018.

Proposal's description		
Coordinator	Proposal	Institution
Jonathan Stuart Ready	Measuring biodiversity dynamics using environmental DNA and metabarcoding: establishing baselines and monitoring recovery in affected ecosystems	UFPA

Vladimir Gusarov	Metabarcoding and metagenomics for high throughput inventory and monitoring of terrestrial arthropod biodiversity	UIO
Leandro Sena	Metagenomic and metabarcoding as a tool for developing One Health In Hydro Area, Paragominas, Pará, Brazil	UFPA
Lilian Lund Amado	Use of native species from different trophic levels and occurring in bauxite mining area to evaluate the toxicity of residues derived from this activity	UFPA
Luciano Montag	Aquatic biota monitoring and assessment upstream and downstream of bauxite pipeline Norsk Hydro Paragominas - Barcarena (Pará, Brazil) – an instream and riverscape approach	UFPA
Marcos Persio Dantas Santos	Bird telemetry monitoring to evaluate loss of habitat in mining area in the northeastern Amazon	UFPA
Maria Aparecida Lopes	Effect of large herbivorous mammals on forest regeneration in post-mined areas, in Paragominas, Pará, Brazil	UFPA
Rossineide Martins da Rocha	The use of physical, chemical and biological tools to evaluate the water resources under the influence of the Norsk Hydro Mining Company (Paragominas-PA)	UFPA
Leonardo dos Santos Sena	Coexistence plan for human and carnivores	UFPA
Rapahel Ligeiro	Assessing the integrity of aquatic ecosystems by implementing a next generation DNA sequencing-based method for biomonitoring	UFPA
Tháísa Sala Michelan	Effects of soil use on diversity and ecophysiology on the riparian vegetation, aquatic macrophytes and plankton in streams and lagoons in mining areas of Paragominas sa, Pará, brazil	UFPA

7. Research project activities

Most of the projects that have been approved in previous years are now fully operational, and great progress has been made. Progress reports have been presented bi-annually to the BRC

Scientific Committee. However, there are two approved projects (BRC 2/14 emissions and BRC 4/15 entomology) that still not have started field work because of administrative hurdles. It is expected that these problems will be solved in the near future. The administrative process for initiating projects is slow, and for another two projects (BRC 14/2017 and BRC 15/2015) approved by BRC in 2017 signed contracts with Hydro are still pending (See Annex 1). Some projects are approaching the end of the project period and will prepare final project reports.

8. Fundraising activities

BRC is actively seeking other funding sources for new projects. In 2018 BRC has been successful in obtaining a new bi-lateral project funded by CAPES and The Norwegian Centre for International Cooperation in Education (SIU). The project entitled “Transnational training in environmental DNA for biodiversity assessments and restoration ecology” is a collaboration between UFPA and UiO.

9. Strengthening partnership UiO – UFRA and UiO – UFRA

The BRC secretariat had meeting with the international department of UFPA for the renewal of the cooperation agreement with UiO. On behalf of UFPA, Claudio Szlafsztain from the international department was positive to the extension and highlighted importance of BRC for the institution. He also said that BRC is one the longest international cooperation in the History of UFPA. The new MoU was signed by both parties for the period of 2018-2023.

UFRA also organized a meeting with the secretariat (Figure 3). The main discussion was the renewal of the agreement with UiO and how to strengthen the partnership between both institutions. I was also an opportunity to promote BRC’s activities for the professors that attended the meeting.



Figure 3: Meeting between UiO and UFRA about the agreement renewal. Photo: BRC.

10. Mining and Biodiversity Week

Hydro and UFRA arranged a “Mining and Biodiversity Week”. The event occurred from 24th to 29th June 2018 in the Environmental Park in Paragominas (Figure 4). The visitors could learn more about the bauxite mining activity and BRC research in the area. A theatrical group presented Amazonian Legends for the children.



Figure 4: Professor Gracialda Ferreira, The theatrical group and the students in the Mining and Biodiversity Week. Photo: Gracialda Ferreira (UFRA).

11. Field Course in Tropical Rainforest Ecology and Biodiversity

The Field course is conducted by the BRC partner institutions and it is integrated in the graduate programs for students in the participating institutions. Dedicated funding for the course is obtained from the Norwegian Centre for International Cooperation in Education. The field course in 2018 had two components. One in Brazil and one in Norway. In August 2018, The Norwegian students and professors from UiO and NMBU (Norwegian University of Life Sciences) came to Belém, Brazil and met with students and professors from UFRA, UFPA and MPEG. The group visited the Hydro mining area in Paragominas and spent nearly two weeks at the Ferreira Penna Research Station in the Caxiuanã National Forest (Figure 5). In the forest, the students from Brazil and Norway worked in pairs and carried out short research projects.



Figure 5: Visit at Hydro Paragominas and The Boat trip to Caxiuana National Forest. Photo: BRC/UFPA

The second part of the course was on November 2018. The Brazilians students and professors went to Norway. The group visited the Hydro plant in Holmestrand (Figure 6). They also analyzed the collected data and presented the results in a seminar in the Natural History Museum (NHM) in Oslo.



Figure 6: Visit to Hydro plant in Holmestrand, Norway. Photo: BRC.

12. Brazilian Society of Restoration Ecology – Symposium

Hydro was the main sponsor of the Symposium and invited BRC students and researchers to present the main results in a stand and submit research papers to event (Figure 7). The symposium was held from 21st to 23rd November in Belo Horizonte, Minas Gerais.



Figure 7: Hydro and BRC presenting the project results at the Restoration Ecology Symposium. Photo: GAMAS/Hydro Paragominas

This was an important event to promote BRC on a National level. The most relevant institutions and researchers working with restoration ecology attended the symposium. Forestry bachelor student Jessy Senado, from the Biodiversity project (BRC 03/14) presented the paper entitled “*Soil chemical attributes in areas under restoration after bauxite mining, Paragominas-PA*”. It was awarded as the most popular in the poster session (Figure 8).

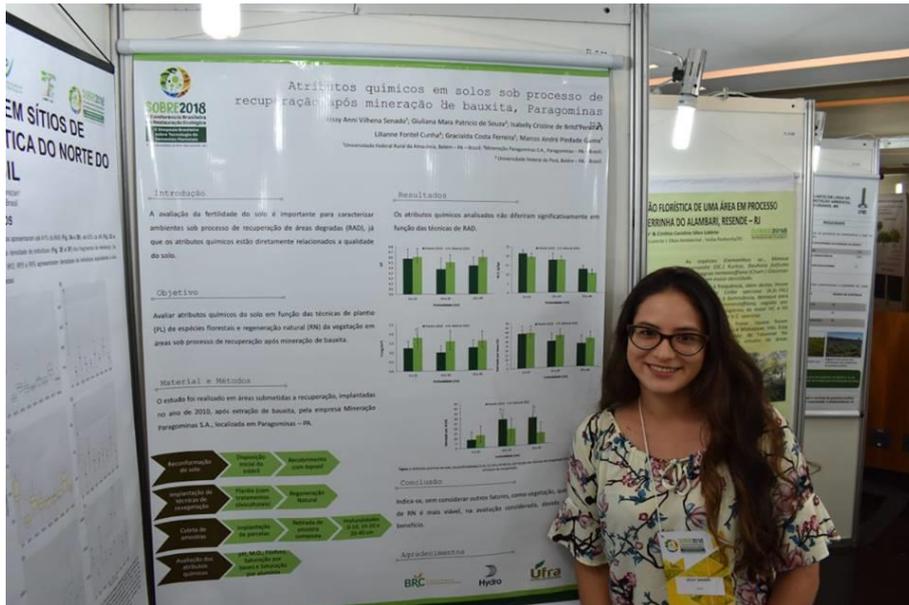


Figure 8: Jessy Senado presenting the poster paper in the symposium. Photo: BRC

13. Participation in the International Aluminum Exhibition

Hydro Presented the concept of the Consortium in the International Aluminum Exhibition on September 2018. The presentation highlighted the partnership with Academic institutions for developing the state of art in ecological restoration of mined areas. Victor Barbosa was the speaker and he introduced five BRC projects. It was awarded in the category of Sustainable Development (Figure 9).



Figure 9: Victor Barbosa and Gizelia Matos in the International Aluminum Exhibition. Photo: GAMAS/Hydro Paragominas.

14. Student Involvement and Exchange

One of BRC's main aims is to integrate students in research projects. With research activities expanding, so is the number of students involved. By the end of 2018, a total number of 51 students were taking part in the BRC research projects: 28 on bachelor level, 15 on master level 6 on PhD level and 2 Postdoc (Figure 10). Some of the project are approaching the end and the Consortium may get more thesis and papers. In 2018, the interaction project (BRC 12/16) was the first one to include Postdoc students in its research.

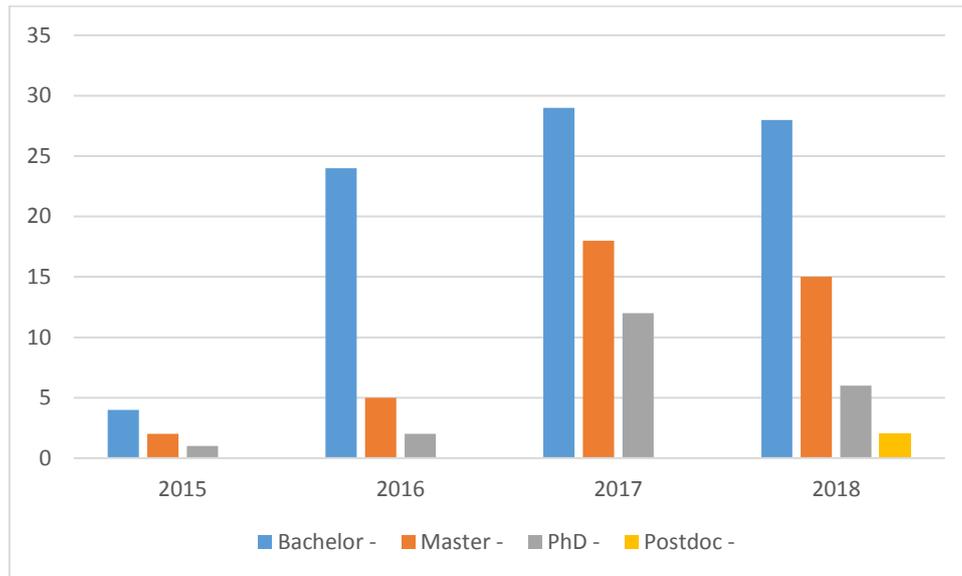


Figure 10: Number of students involved in BRC research projects from 2015 to 2018.

15. Lessons Learned

2018 was another year of progress for BRC. The consortium advanced on the defined main aims of the cooperation, namely to develop research activities, to improve university – industry partnership and to integrate graduate students in research. Still, there are challenges.

- *As in 2017, the time- and energy-consuming contract negotiations has been a challenging issue. Fortunately, we have now solved the main hurdles, thanks to competent staff, good faith and a lot of patience. All four academic partners have established research project contracts with Hydro, so the next projects in line will hopefully have a much easier way now that all partners are more experienced related to these types of contracts.*
- *Updating of the BRC Research Program and the identification of priority research themes for the September 2018 call for proposals was a major activity. The process of evaluation of proposals by separate technical and scientific evaluation committees was successful but time consuming for the participants and the secretariat. The transparency of the process and feed-back of the evaluations to the project proposers were important improvements.*
- *External funding for research projects continues to be a concern for BRC. The secretariat has reached the conclusion that smaller initiatives, rather than large Amazon Fund proposals and similar initiatives, might be a more effective way to use fundraising resources.*
- *Language is still a challenge. Using English as common ground slows down meetings and creates some misunderstandings. However, the secretariat considers that BRC has evolved, and that the language barrier is lower than some years ago.*
- *A well-staffed secretariat is important for serving BRC. Having André Carvalho as an interim part time secretariat officer in Belém has been essential for assisting dialogues between research projects and Hydro, as well as for arranging meetings and other events*

in Belém and Paragominas. A permanent solution for establishing a local BRC secretariat function in Belém has to be found as soon as possible.

Oslo and Belém, 30th January 2019

Fridtjof Mehlum and André Carvalho

Annex 1: BRC – Overview research projects 31.12.2018

Project title	Institution / Coordinator	Contract signed	Did it start already?
BRC 01/14: Arbuscular mycorrhizal fungi in natural areas and areas in restoration after bauxite mining in Pará	UFPA Altamira/Magali Goncalves Garcia UNIFESSPA/Ulisses Albino	YES	yes
BRC 02/14: Measuring the emissions of trace gases in chrono-sequence of reforestation in areas influenced by bauxite mining in Paragominas, Pará	UFPA Braganca/Hudson Cleber Pereira da Silva	YES	no
BRC 03/14: Biodiversity, proliferation of plant species and restoration of degraded areas from bauxite mining in the southeast region of Pará	UFRA/Marcos André Piedade Gama	YES	yes
BRC 04/15: Entomology Survey and Bioindicators for Biodiversity Monitoring at Mineração Paragominas SA, Pará, Brazil	MPEG/Rogério Rosas	YES	no
BRC 05/15: Camera trap survey of ground-living mammals in the Hydro bauxite mine area in Paragominas, Brazil.	UiO/Øystein Wiig, UFPA/Ana Cristina de Oliveira	YES	yes
BRC 06/15: Evaluation of chemical compounds of different forest species stored, susceptible to contamination in the soil.	UFRA/Gracialda Costa Ferreira	YES	yes
BRC 07/15: Impact study of a biodiversity recovery program in a bauxite mining area on populations of insect vectors in the Amazon forest, Pará, Brazil	UFPA/Ivoneide Maria da Silva	YES	yes

BRC 08/15: Bird diversity in three areas in different states of conservation in the Eastern Amazon.	UFPA/Marcos Persio Dantas Santos	YES	yes
BRC 09/15: Wood-decay fungi in Paragominas and Trombetas: baseline information, monitoring priorities, and how to achieve the “no net loss” target?	UiO/Karl-Henrik Larsson	YES	yes
BRC 10/15:Aquatic biota monitoring of streams in mining areas of Paragominas SA, Pará, Brasil	UFPA - MPEG/Akama, Juen and Montag	YES	yes
BRC 11/15: Diversity of the herbivorous insects in four areas of the Hydro mining company	UFPA/José Antonio M. Fernandes	YES	yes
BRC 12/16: How ecological interactions are influenced by mining activities and efforts for environmental restoration after exploration in the municipality of Paragominas	MPEG/Marlucaia Martins	YES	yes
BRC 13/16 Tracking jaguars in the Hydro bauxite mine area in Paragominas, Brazil	UiO/UFPA Øystein Wiig /Leonardo Sena	YES	yes
BRC 14/17 Monitoring Amphibians and Squamata Reptiles in Reforestation Areas in the Hydro Bauxite Mine Area in Paragominas, Brazil.	UFPA/Maria Cristina dos Santos Costa	NO	no
BRC 15/17 Rehabilitation techniques in bauxite mining areas - A topsoil study	UFRA/Gracialda Ferreira	NO	no

