

# Innovation for Sustainable Development – New Partnerships (NoPa)

Success factors, challenges and the way forward

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*After eight years of existence,  
20 research projects in the focus  
areas Protection and Sustainable  
Management of Tropical Forests,  
and Renewable Energies &  
Energy Efficiency were conducted  
under the NoPa program*



# I. Foreword

## Dear reader,

Sustainable solutions and innovation are more likely to be achieved if complementary players from the public sector, the academia, the industry and civil society act together and interact. This principle has underpinned all the projects developed within the NoPa program. Since its inception, in the context of the 2010-2011 Brazilian-German Year of Science, Technology and Innovation, the program has creatively combined science and practice and has engaged multiple stakeholders by shifting the focus from supply to demand-driven results. This report brings to the fore essential testimonies of key actors involved in the program to disseminate the best practices in the interrelationship between technical, academic and scientific cooperation.

During the program, Brazil and Germany have learned valuable lessons that could be replicated in other parts of the world. The NoPa methodology may be one of the greatest legacies of the program. Throughout the implementation of the projects, both countries

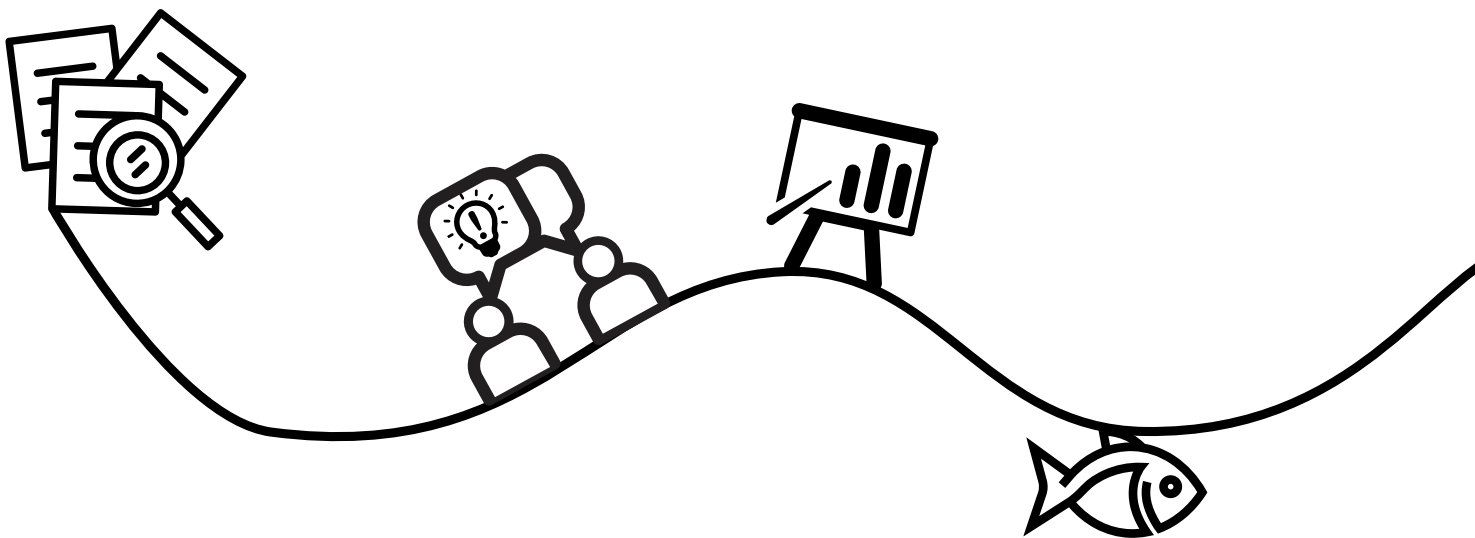
also reaffirmed their commitment to achieving the Sustainable Development Goals.

The conclusion of the NoPa program does not mean the end of the thriving technical, scientific and technological partnership between Brazil and Germany in the two main areas of the program, *Protection and Sustainable Use of Tropical Forests and Renewable Energies & Energy Efficiency*.

NoPa is another successful chapter in the quest to find solutions to our societies' challenge to integrate the economic, social and environmental dimensions of sustainable development.

**Luis Fernando Machado**

*Head of the Division for Science and Technology  
Ministry of Foreign Affairs of Brazil*



## Dear reader,

The NoPa program, conceptualized in the 2010-2011 Brazilian-German Year of Science, Technology and Innovation and financed by the German Federal Ministry for Economic Cooperation and Development (BMZ), has been further developed during the years, and the experiences might be even more relevant today than several years ago.

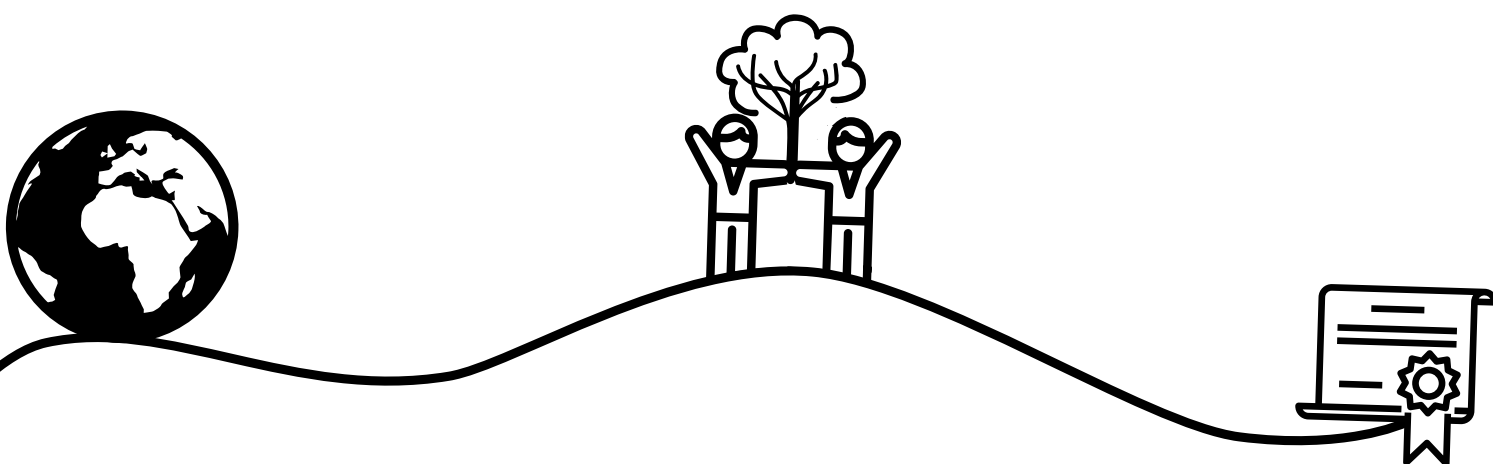
Sustainable Development Goal 17 prioritizes the need for international cooperation on and access to science, technology and innovation, and enhances knowledge sharing on mutually agreed terms. The meaning of this goal has recently been described by the German Development Institute (GDI): “To bring about the necessary global transformation envisioned in the SDGs [Sustainable Development Goals], we must take a radically different approach.” In this regard, the GDI emphasizes that “a division between international research and education

cooperation on the one hand and development cooperation on the other hinders synergies and, as such, is no longer viable in today’s world.” According to the GDI, “initiatives such as the NoPa programme show that there is another way” – what brings the GDI to recommend the upscaling of this “promising approach”.

We hope that the collective NoPa experiences with our Brazilian and German partners inspire the development of new cooperation modes and approaches for joint research and knowledge generation in other parts of the world. We are happy to see the first results in this regard: the inclusion of research and science components into new international cooperation projects to attend concrete demands, always aiming for sustainable development.

**Christoph Büdke**

*Head of Project – Innovation for Sustainable Development – NoPa/Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH*



## Dear reader,

We, the German Academic Exchange Service (DAAD), started our journey with NoPa, along with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and the Coordination for the Improvement of Higher Education Personnel (Capes), eight years ago. From 2010 to 2018, DAAD supported twenty projects regarding the academic aspects of their cooperation with the Brazilian partner.

Jointly with GIZ, Capes and Division for Science and Technology of the Ministry of Foreign Affairs of Brazil (DCTEC), we are proud to present this final publication. In our joint previous publications, we intended to take a closer look at the factors that made NoPa successful, and at our contribution to sustainable development. Now, all our insights are presented on the inner workings of NoPa works, its benefits, and its possible adaptations by other programs outside of the Brazilian-German Cooperation.

We are proud of this combination of development and scientific cooperation, which can be regarded as a remarkable example of coordinated development cooperation.

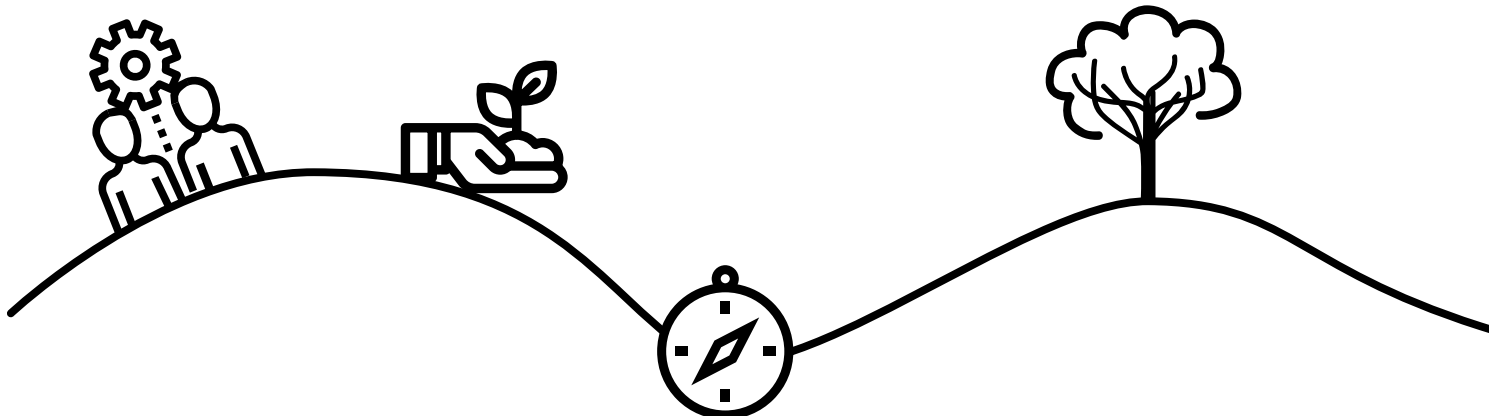
We would like to express our deep gratitude to the Brazilian Ministry of Education (MEC) and the German Federal Ministry for Economic Cooperation and Development (BMZ) for their funding and commitment.

We hope you enjoy this publication, which will provide you with an insight into the activities of the cross-sector cooperation under NoPa, as well as information and practical guidance based on the experience gained therein.

Yours sincerely,

**Lars Gerold**

*Head of Section – DAAD| Development  
Cooperation – Institution Building  
in Higher Education*





## Dear reader,

International cooperation is the first step towards the internationalisation of an educational system. It can contribute to the consolidation of existing fields of research or the establishment of new areas of strategic interest to all involved. It can also serve to exchange successful experiences and adapt them to new contexts or the joint development of innovative practices. Capes believes that fostering international cooperation is a strategic partnership with impact on the growth of the countries involved.

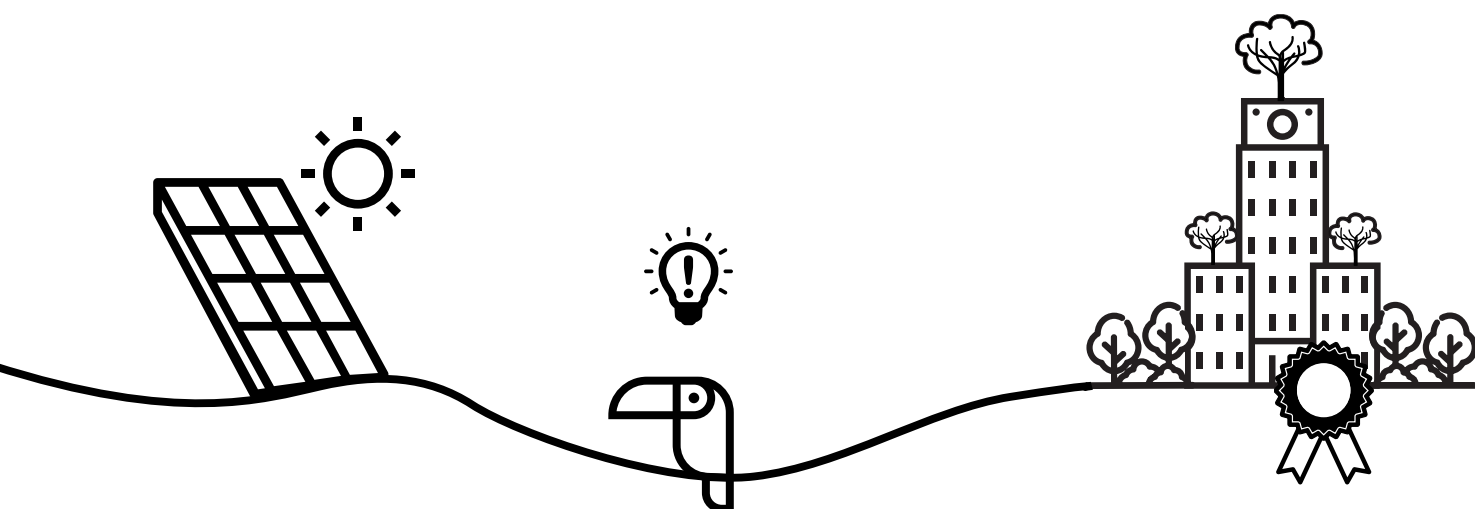
In this context, the NoPa program is the result of a Brazilian-German cooperation started in 2010 between Capes, DAAD and GIZ. The program's innovative goal is to foster state-of-the-art research to meet the demands of both the private and public sectors in Brazil and eventually contribute to disseminate innovation for sustainable development.

From 2011, when the first call was launched, to 2018, 20 projects have been supported by the agencies in the following research fields: *Protection and Sustainable Use of Tropical Forests* and *Renewable Energies & Energy Efficiency*. Many of these projects built solid partnerships to go over the borders of NoPa itself and promote innovation for sustainable development.

This material intends to take a closer look at these cases and continue promoting partnerships between public and private sectors in any field of work.

Enjoy!

**Helena Albuquerque**  
*General Coordination of Programs – Capes*



## II. Background



*Partners gathered together for the closing event of NoPa program*

Eight years of invaluable experience, involving more than 120 partners from Germany and Brazil who engaged in 20 bilateral research projects in the focus areas of *Protection and Sustainable Use of Tropical Forests*, and *Renewable Energies & Energy Efficiency*.

These are only a few achievements of NoPa (New Partnerships: Innovation for Sustainable Development), a program jointly implemented by the German Academic Exchange Service (DAAD) and the Brazilian Coordination for the Improvement of Higher Education Personnel (Capes), two agencies of renowned relevance in academic cooperation. They, in turn, work with the Division for Science and Technology of the Ministry of Foreign Affairs of Brazil and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) by the commission of the German Federal Ministry for Economic Cooperation and Development (BMZ).

This is the union of two world forces to promote innovation in the field of sustainability.

Brazil is extensive, diverse, and amazingly rich in natural resources. The country also has a resilient economy, which shines as the ninth highest gross domestic product (GDP) in the world, despite the severe recession it has recently faced. Above all, Brazil possesses world-class human resources throughout the sectors of its society. Indeed, Brazil is a key player that can help the world face its environmental challenges. Besides, it has a huge potential to apply science to the formulation of public policies and innovation.

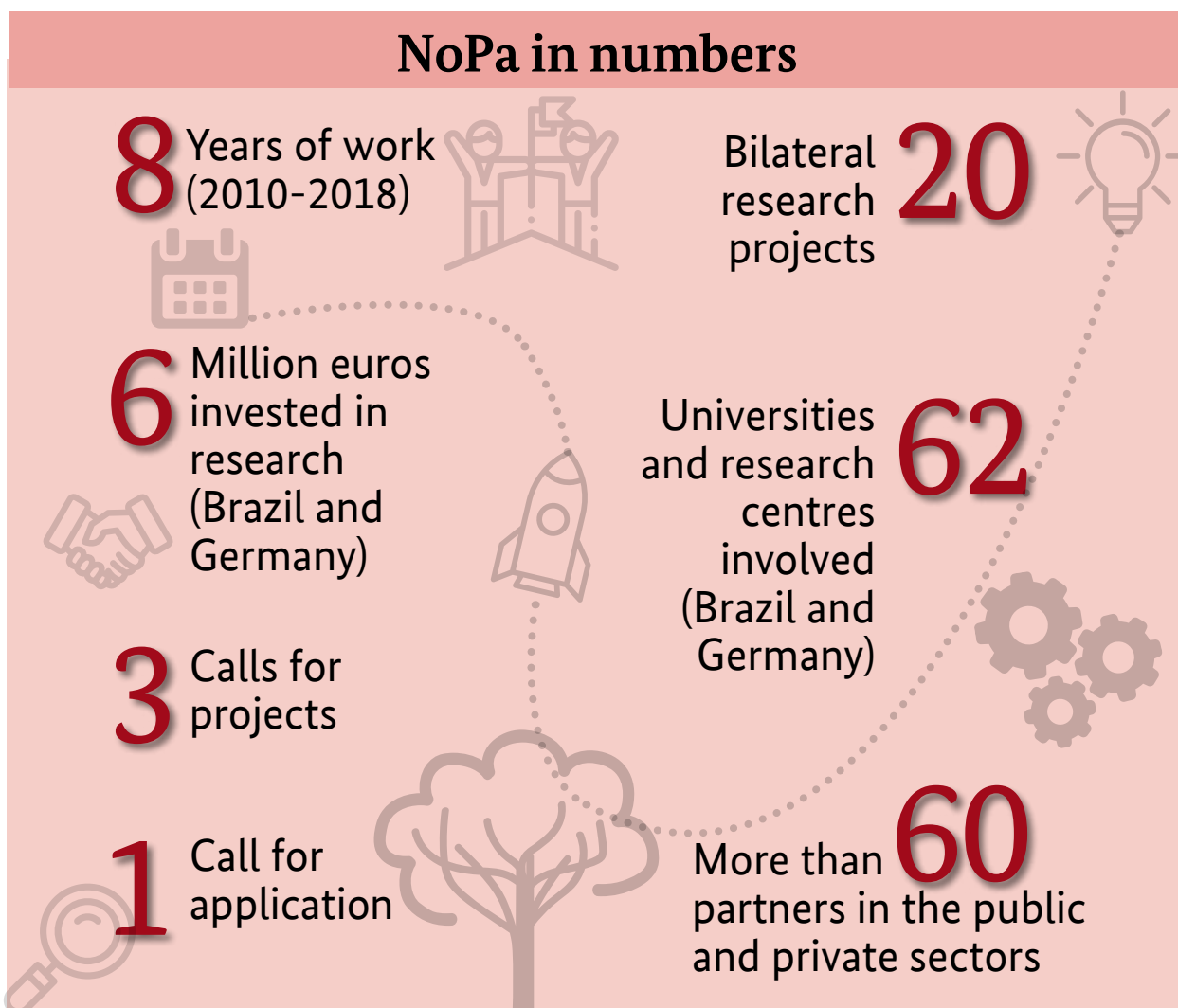
Germany has a strong economy and has been making remarkable progress in research and innovation, a field of great opportunity to strengthen the partnership with Brazil. Moreover, the German government has been

taking strong actions to tackle global warming at both the national and international levels as well as bringing forward the German Energy Transition (Energiewende).

NoPa is a natural consequence of the partnership between these two nations, which started 50 years ago, when only experts in the field of sustainability suspected about the challenges the world would face decades later. Therefore, the program was released as part of the agenda of the Brazilian-German Year of Science, during 2010-2011.

Through its methodology <sup>(1)</sup>, NoPa unites the capabilities of the players involved in the fields of scientific and technical cooperative approaches to foster research that meets the demands of the private and public sectors in Brazil, always focusing on the areas of research proposed by the program.

Although NoPa now reaches its end (June 2018), the research projects developed under the program’s scope leave a legacy for all of its partners, and we believe for future generations as well. In this publication, we share with you some of these success stories.



(1) Find more details about the methodology on page 23.

## III. Achievements



Managed by Sanepar, the Passaúna dam was the study subject of the SeWaMa project

### Success cases overview

Since the Brazilian-German Year of Science (2010-2011), when NoPa was released, more than 120 partners from universities, research centres, public institutions and the private sector engaged in 20 bi-lateral research projects in the focus areas of *Protection and Sustainable Management of Tropical Forests*, and *Renewable Energies & Energy Efficiency*. Each one of them proves that sustainable development is achievable and has a vast potential to generate gains for society and environment.

Here, you will find an overview of six of these success cases. They offer solutions for deforestation, dam management, energy efficiency, renewable energy, solid waste and non-timber-forest-product value chain (more starting on page 26). More than that, these researches are excellent examples of how far research projects based on good partnerships and focused on concrete demands can go.



### EcoRespira-Amazon

**ABSTRACT** – The current understanding of greenhouse gases (GHG) emissions from tropical soils is still limited. Therefore, the project studied the soil respiration and its chemistry in both preserved and post-forest sites around Manaus and the south of Amazonas state.

**RESULTS** – The main outcome of the study was a guideline to promote the reforestation of degraded areas with native species of trees. Also, a series of workshops and training courses were offered for about 100 key agents—smallholder farmers, inspection bodies, and university students—who can then teach other people to promote environmental adjustment in the lands they own or work on.

**IMPACT** – By recovering degraded land,



*EcoRespira project studied the soil respiration in preserved and post-forest sites*

farmers can legalise their properties in compliance with the Brazilian Forest Code, improve their livelihood through the forestry activities, make environmental services better, and hence mitigate climate change.

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### Innovative Approaches for Future Sediment and Water Management in Brazil (SeWaMa)

**ABSTRACT** –Due to a lack of data concerning reservoir volume in Brazil, it is essential to implement techniques that allow dam administrators to measure the flux of sediments in their basins. The project provides improved data for decision making on hazard prevention and the development of management strategies regarding hydroelectric plants, water supply, and mitigation of GHG emissions into the atmosphere.

**RESULTS** –As an outcome of this project, the water and sanitation company in Paraná state, Sanepar, developed strategies regarding reservoir management by using advanced detection methods for sediment volumes and water quality.



*Platform equipped with devices to measure several quality factors in the Passaúna dam, in the Paraná state*

**IMPACT** – Knowledge of sediment volumes and derived measures can significantly decrease the vulnerability of the hydroelectric and water supply sectors. Additionally, proper management may reduce the production of methane in the reservoirs, mitigating GHG emissions.

## Energy-Efficient Retrofitting of Buildings in Brazil

**ABSTRACT** – In Brazil, 47% of electricity usage in the building sector comes from air conditioning alone. The situation demands new methods and tools to create a sustainable architectural design for existing buildings.

**RESULTS** – By calculating the discharge coefficients – the ratio between the actual and the ideal air flows – of seven windows, four of them made in Brazil and three from Germany, researchers figured out how to tap into the vast energy-saving potential of natural ventilation. As a result, they are now producing guidelines for energy-efficient facade systems.

**IMPACT** – With the use of natural ventilation to cool buildings, the demand for energy for air conditioning decreases, thus decreasing electricity usage, and ultimately, GHG emissions.



*Natural ventilation can be an effective way to cool building down and diminish the demand for air conditioning systems*

## Solid Waste Management in Jundiaí (MBT)

**ABSTRACT** – With the implementation of the Solid Waste National Policy in Brazil, the research project pursued the fulfilment of governmental requirements and the development of technology, technical consulting and state-of-the-art machinery in this field.

**RESULTS** - The project consisted of three main components conducted at the municipality of Jundiaí: collecting and evaluating data on the implementation of the fermentation stage; building and extending academic and non-academic training and capacity; and extending research capacities at Pontifical Catholic University of Rio de Janeiro (PUC-Rio).

**IMPACT** – Solid waste management promotes population health in the same time that it tackles environmental contamination and reduces GHG emissions. To do so, the project set up the Brazilian Centre for Research, Education and Demonstration in Waste Management (CREED); implemented a methodology to sort waste by grain size and weight in Jundiaí; and established a task force led by the town mayor to oversee the implementation of research results and guarantee continued cooperation.



*Inadequate solid residues disposal still poses a major threat in many places of Brazil*

## Cogeneration Plant Using Sugarcane Bagasse

**ABSTRACT** - The Brazilian sugar and alcohol industry usually operates combining heat power plants (CHP) fuelled by sugarcane bagasse. As the sugarcane harvest in Brazil goes from April to December, both factories and power plants are idle for the remainder of the year. This project studied the possibility of extending the period of operation of bagasse-fuelled CHPs by integrating solar heat to the plants.

**RESULTS** – Applied research demonstrated that concentrated solar power and sugarcane bagasse can be an intelligent combination to extend the operation of an energy cogeneration plant all year long.

**IMPACT** - Brazil needs to diversify its electricity matrix to be less vulnerable to the uncertainties of hydrological regimes. An increment



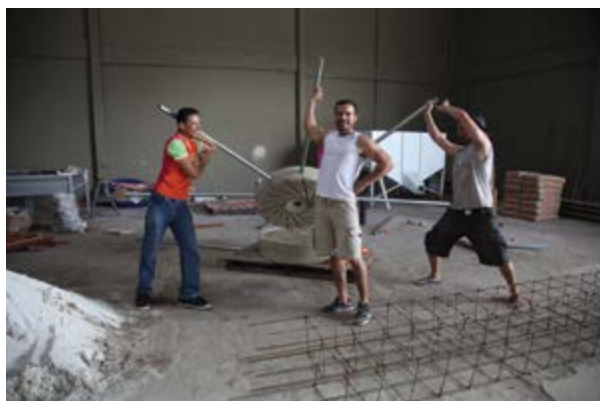
*Sugarcane bagasse used in cogeneration power plant*

in diverse sources of renewable energy production, like the cogeneration proposed by this study, means less dependence on hydropower and fossil fuels, which ultimately means less GHG into the atmosphere.

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## Puxirum: Value Chain of the Brazil Nut

**ABSTRACT** - An effective way to protect tropical forest is by supporting people who care for the environment and harvest its products sustainably. The research project aimed to facilitate the implementation of the National Plan for the Promotion of Socio-Biodiversity Product Chains in Brazil, strengthening the



*Workers of the Brazil nut value chain in a moment of relaxation*

value chain of non-timber-forest products, mainly the Brazil nut.

**RESULTS** - The greatest success of the project was the connection of all players of the Brazil nut value chain on local level. The study also led to capacity building and primary research activities, as well as multiple scientific and academic outputs, including Germany-based students doing fieldwork in the Calha Norte area, Brazil, and Brazil-based PhD students working on their thesis at German partner universities.

**IMPACT** - In the long run, the implementation of the project proposals has the potential to lower costs for deforestation control, adaptation to climate change and poverty relief programs.



## IV. Success factors

### What our partners say about NoPa

Since 2010, NoPa has fomented 20 research projects with concrete results to enhance innovation in the two thematic areas of the Brazilian-German cooperation: *Protection and Sustainable Use of Tropical Forests*, and *Renewable Energies & Energy Efficiency*.

NoPa focuses on the strengths of both technical and academic cooperation to promote, exchange, develop and disseminate innovation for sustainable development based on real demands. This approach has shown to be highly effective in the establishment of strong partnerships, thus increasing the probability of project success.

Along the way of NoPa, three main success factors were identified:

1. alignment with concrete demands;
2. solid partnerships between academic and non-academic actors;
3. sustainable partnerships and achievement of results.

But who better than our partners to say what makes NoPa a successful experience?



“

***NOPA ALLOWS THE INTERACTION BETWEEN DIFFERENT PLAYERS WHO USUALLY DON'T DIALOGUE WITH EACH OTHER. ITS METHODOLOGY PROMOTES ANOTHER PERSPECTIVE OF APPLIED RESEARCH, DIALOGUING WITH SOCIETY AND ITS ACTORS.***

”

**DÖRTE SEGEBART**  
*Researcher at FU Berlin*





**JARLENE VIANA**  
*Researcher at IPAM*

“

*NOPA'S METHODOLOGY SUGGESTS THE DECISION-MAKERS SHOULD GET TOGETHER TO CREATE A MATRIX ALLOCATING RESPONSIBILITIES TO EVERYONE INVOLVED IN THE PROCESS, WHILE STILL CONSIDERING THE LEGAL ASPECTS AT ALL TIMES. THIS PROCESS CAN FACILITATE THE IMPLEMENTATION OF ACTIONS PROPOSED BY THE PROJECT RESEARCH.*

”

*“The cooperation between the Brazilian Ministry of Science, Technology, Innovation and Communication (MCTIC) and Germany works particularly well for several reasons. Firstly, we have the support of GIZ, an agency designed to promote this kind of collaboration. It makes a huge difference in facilitating the workflow.*

*Secondly, it is a win-win cooperation for both countries. In some fields, Brazil can support Germany, and in others, Germany can support Brazil. The research projects are developed in a bidirectional, well-balanced way.*

*To facilitate this process, there is the NoPa methodology, which is a fascinating tool we always adopt in our projects to connect partners more efficiently.*

*Another exciting aspect of this program is that the partners must present concrete results. It is common in Brazil to focus on the process while forgetting the practical aspects of the project. Of course, to reach a specific objective*



**EDUARDO SORIANO**  
*General coordinator for Sectoral Technologies at MCTIC*

*one needs to go through a process, but the impact of a new knowledge or technology on the society is the most important thing of this process.”*



**MARISA MAMEDE**  
*Science and Technology Analyst  
at CNPq*

*“The philosophy and essence of NoPa are the best aspect of this methodology for the National Council for Scientific and Technological Development (CNPq). Unfortunately, it is impossible for us to absorb all the elements of the program. We have thousands of processes to analyse. The cost of promoting face-to-face meetings with all the potential partners makes the complete adoption of NoPa unfeasible for our reality.*

*Nevertheless, when the methodology was presented to us last year (2017), it opened our minds. We realised how important it is to bring together producers and users of knowledge.”*

“

*NOPA IS INNOVATIVE BECAUSE IT FOSTERS THE DISCUSSION WITH THE SOCIETY. THE PROGRAM DOESN'T RESTRAIN THE PROJECT ONLY TO THE EXECUTIVE TEAM, BUT RATHER EXTENDS THE CONVERSATION TO STAKEHOLDERS.*

”



**CHRISTIANE DIAS PEREIRA**  
*Researcher at TU Braunschweig*



**GUSTAVO POSSETTI**  
*Manager of the Research and  
Development Office at SANEPAR*

*“The proximity promoted by NoPa between companies and universities is of immense help. This way, the academics can better understand what the industry needs. NoPa also gave us its amazing methodology, which we are adapting to promote the Paraná Research Program in Environmental Sanitation, in partnership with the Araucaria Foundation, the state research promotion agency. The goal is to attract universities and research centres, so they can develop solutions to attend the needs of the Paraná Sanitation Company (Sanepar) and other sanitation companies as well.”*



“

*THE NOPA PROGRAM IS FANTASTIC. IT ESTABLISHES AN EXCITING INTERNATIONAL PARTNERSHIP, MAKING IT POSSIBLE TO EXCHANGE KNOWLEDGE AND EXPERIENCE BETWEEN TWO ENTIRELY DIFFERENT REALITIES. THE GERMANS HAVE AN INTERFACE WITH THE PRIVATE SECTOR THAT WORKS INCREDIBLY WELL.*

”

**MARCELO PIZZUTI PES**  
*Researcher at UNIFESP*

*“An essential feature of the NoPa methodology implemented was the encouragement to creating new partnerships between German and Brazilian institutions, but also between the institutions and companies operating in the industrial sector. The industries actively assisted us in targeting the work and researchers in a way that these players could directly utilise those results.*

*Another exciting activity was the research-into-use workshop. We had the opportunity to present our results to potential users and discuss partnerships to implement this technology.”*

**EDUARDO BURIN**  
*Researcher at UFSC*





*“The NoPa methodology is a tremendous success. The differences between this program and others are the follow-up made by GIZ, the process of research planning, and the obligation to present concrete results. The matchmaking stage is also essential. There is a system in place to pair potential partners together, even before submitting a project. I can say the same about the fact-finding phase, when the partners define the topics to address during the work. The whole process is precious.”*

**TOBIAS BLENINGER**  
*Researcher at UFPR*

*“The Brazilian Electricity Regulatory Agency (ANEEL) wants to establish an innovation network to promote electric mobility in Brazil. To do so efficiently, we are adapting the NoPa methodology to conduct our process, and so far, it is working incredibly well.*

*In April 2018, we presented this idea to the industry, investors, researchers, and educational institutes. This was our first opportunity to show what we want to do, and to understand what potential partners think and expect of it.*

*The NoPa concept of uniting people from different areas to reach a common goal is extraordinary. Therefore, we hope to give an important contribution to the development of the electric mobility sector in Brazil in a secure and organised way.”*



**FERNANDO CAMPAGNOLI**  
*Specialist in Regulation in the Superintendence of Research and Development and Energy Efficiency at ANEEL*





## V. Challenges and lessons learned

### Partners reflect on how to maximise results



*Nilceu Jacob Deitos, from the Araucária Foundation, during the NoPa final evaluation workshop: “Partnerships that look solid to me are those in which partners understand what they have to offer.”*

To date, all is going very well, but we could not agree more with the American writer Booker T. Washington (1856–1915) when he said, “Success is to be measured not so much by the position that one has reached in life as by the obstacles which he has overcome.”

Of course, the results are of high importance for NoPa, but in fact some research projects succeeded thanks to the partners’ endurance and ability to turn a few setbacks

around. Overcoming difficulties has been equally as significant as the lessons learned because of them.

Although the NoPa program understands that some projects need more time to be concluded than others, one complaint shared by scientists was not having enough time to finish the studies. Researcher Luciana Oliveira Fernandes at Unicamp regrets that this aspect interfered in the *Energy-Efficient Retrofitting of Buildings in Brazil* project.

Marcelo Pizzuti Pes at the Federal University of São Paulo (Unifesp) had to face a similar situation. He recalled that the data collected was not enough to reach a definitive conclusion. “It is a good starting point from which this research can continue, but we still need more time in the field. To establish innovative scientific knowledge, you need a large sample”, he says.

Bureaucracy and Brazilian legislation were also mentioned as setbacks in some cases. Pizzutti, for example, could not import technical equipment from Germany to conduct studies in Brazil.

For Francisco Vasconcellos at the Union of the Civil Construction Industry in São Paulo state (SindusCon-SP), who partners with the project *Energy-Efficient Retrofitting of Buildings in Brazil*, legal restrictions currently make the application of the research unfeasible to existing buildings.

The solution, in this case, was to develop ampler guidelines for the construction sector, considering energetic efficiency not only in existing building but mainly in new ones.

### **Lessons learned**

What could be considered when designing project approaches at the interface of scientific cooperation and technical cooperation?

The following lessons are based on discussions among the NoPa project partners as well as a final evaluation workshop held in June 2018, which gathered researchers, funding agencies and end users of research results to reflect on the NoPa experience:

#### **1. Tap into the potential of non-academic research partners to contribute**

NoPa publishes calls for research projects oriented to concrete demands as defined by specialists. These research calls stimulate multi-actor projects where scientists create solutions together with representatives from political decision-making or the private sector. According to Fernando Campagnoli, from the Brazilian Electricity Regulatory Agency (ANEEL), players in the entire value chain should be engaged in research and development since in its earliest stages.

Sometimes bureaucratic mechanisms prevent partners from the private sector from having access to project funds, which could reduce their risk to participate in research and, by that, motivates them to get involved.

#### **2. Different cultures and “languages” require effective interaction platforms**

Excellent individual players do not necessarily make an excellent team. Sometimes their cultures (e.g. academic vs private sector) and expectations may differ so wildly that effective partnerships may simply be not viable. However, those are extreme cases. Most commonly, different expectations and cultures are more a resource to be exploited than an obstacle to joint work.

“Partnerships that look solid to me are those in which partners understand what they have to offer – be their contributions financial or not”, says professor Nilceu Jacob Deitos, from the Araucária Foundation. “It is important to identify the partner’s potential to contribute to meeting concrete demands.”

Another aspect is the need for translating “languages”: translating “academic words” into “common language” understandable for project partners as well as decision-makers from



*NoPa project partners during the final evaluation workshop held in June 2018*

the public sector is helpful for the effective dissemination and use of research results.

### **3. A flexible approach allows dealing effectively with partner constraints**

Dialogue and flexibility are crucial to solve problems, be it financial constraints, be it bureaucratic obstacles or changes in the project partner personnel. Professor Tobias Bleninger, researcher at the Federal University of Paraná (UFPR), points out the importance of a mediator among the partners not only to facilitate the initial phases of new partnerships – such as NoPa’s matchmaking events – but

also to guarantee a smooth, clear flow of information among partners during the research and even beyond.

During NoPa, GIZ played this role, but other regulatory bodies, such as ANEEL or the Brazilian National Water Agency (ANA), were considered potential effective mediators as well: “They have the competency and know the real demands of their sectors. Besides, they can support project monitoring”, Bleninger said. It is necessary to have tools to monitor research in all its phases and to keep track of accomplishments and results.



#### 4. Clearly defined roles allow partners to contribute with their core expertise

High-quality scientific research institutions, private companies or public actors who come together to form a project team often have to deal with different internal organisational processes. Clearly defined roles and responsibilities provide the basis for efficient and well-functioning project teams with little conflicts. These roles and responsibilities should be set at the start of the project. The higher the trust among the project team, the more likely the successful implementation of the project will be.

#### 5. Be clear about the ownership of research results

It is very important to clarify any issues related

to the ownership of research results from the beginning of the process. In NoPa, all results achieved were public, because the research itself was funded with public money.

That notwithstanding, in other situations, research may result in products that generate royalties to an involved party.

While both situations are perfectly legitimate and contribute to innovation, the rules must be made crystal clear to all parties involved.

Finally, research projects must be understood as drivers of concrete changes in the society: “This means that, in the end, someone uses the product and changes people’s lives”, added Campagnoli.

## NoPa’s Methodology <sup>(1)</sup>

- *The process starts as NoPa’s partners develop the initial concepts of the program. A meeting is then organised with representatives of academia, policymakers, the private sector and research funders who compose the **Thematic Advisory Group (GAT)**.*
  - *Then, DAAD and CAPES, the funding partners, consolidate and publish a joint **call for research**.*
  - *After that, come the **matchmaking** events, where scientists and other players establish partnerships and start to draft project proposals.*
  - *Later, GAT pre-evaluates projects that will be chosen by a scientific committee appointed by CAPES and DAAD. **Selected projects** will be funded under the NoPa program.*
  - *The **kick-off meeting** comes next, with selected research projects identifying potential synergies with each other. This session also includes*
- workshops on project management and financing.*
  - *During the **implementation** phase, NoPa projects are assisted by GIZ, who provide an interface between research projects and potential users. DAAD and CAPES provide support regarding academic matters.*
  - *Towards the end of project implementation, research teams hold **research-into-use workshops** with potential users of project results.*
  - *Finally, project teams **document** their findings and recommendations.*
  - *The application of research results is accompanied by capacity development measures to stimulate sustainability.*

(1) The publication NoPa Toolbox, Chapter II, presents a complete description of all NoPa instruments and their roles in promoting sustainable innovation.

## VI. Success cases

### EcoRespira-Amazon

Due to agricultural practices and illegal deforestation, Brazil's national GHG emissions have risen almost 9% in 2016 alone. According to the Greenhouse Gas Emissions Forecasting System (SEEG), this was the highest level of emissions since 2008. Land-use change accounts for half of this total, with a growth of 23%. "The lack of deforestation control, especially in the Amazon, has led us to emit, in 2016, 218 million tons of CO<sub>2</sub> more than in 2015," said researcher Ane Alencar at the Institute of Environmental Research of the Amazon (Ipam).

Clearly, the numbers are astounding, but the current understanding of GHG emissions from tropical soils is still limited. To analyse this, the EcoRespira-Amazon project studied the soil respiration and its chemistry in both preserved and post-forest sites around Manaus and the south of Amazonas state. By comparing these two systems, the researchers could understand how they behaved regarding changes in land use.

The final goal was to identify the best model to recover degraded areas and, therefore, provide a meaningful framework to establish sustainable land-use management. "We found out that post-forest areas with a similar structure to the native jungle are more appropriate in respect of GHG emission from soils," explains researcher Roberval Lima at Brazilian Agricultural Research Corporation (Embrapa), who oversaw the project in Brazil.

To reach this conclusion, the project had the support of Professor Jörg Matschullat and his team at the Technical University Bergakademie Freiberg, Germany. "The German high technological level contributed through the application of techniques and methods to obtain a robust and reliable data network on the protection and sustainability of forests in the Amazon," Lima emphasised.

First, Matschullat's team measured the GHG emissions from the soil by using a closed gas chamber (SEMACH-FG). After adapting the

### Facts and figures

- 2 workshops for more than 30 multipliers in 2 areas of the state of Amazonas
- 1 partnership with a municipality to continue the research results application (reforestation)
- 7 partners engaged in environmental policies in the state of Amazonas

#### Partners

- Brazilian Agricultural Research Corporation (Embrapa)
- Institute of Environmental Protection of Amazonas (IPAM)
- Federal University of Amazonas (UFAM)

- Technical University Bergakademie Freiberg (TUBAF)

#### Collaborators

- Amazonas State Institute of Agricultural Development and Sustainable Forestry (IDAM)
- National Institute of Meteorology (INMET)
- National Institute for Amazonian Research (INPA)
- State Secretariat for Environmental Development of Amazonas (SEDAM)
- State Secretariat for the Environment of Amazonas (SEMA)





*The EcoRespira project conducted many studies in the Amazon forest to understand the GHG emissions from tropical soils*



equipment to function in high temperature and humidity environments like the Amazon, it was possible to transport the device to distant sites, and so collect reliable and robust data.

### **Implementation and dissemination**

With inputs in hands, the second part of the project applied the study's results in the field. A post-forest model is now being implemented on a farm, which teamed up with EcoRespira project, in the municipality of Boca do Acre, south of Amazonas. This area is well-known for its high environmental degradation.

After conducting a detailed study of the land, EcoRespira research team planned the recovery of the Area of Permanent Protection (APP) and Legal Reserve as a pilot program. The idea was to use part of the land that must be recovered to grow a short-term forest. "This way, in a few years' time, the farmers will be able to harvest products such as firewood, wood stakes, nuts etc. without



*Researcher Roberval Lima operates a device designed to measuring soil respiration*

the need to destroy anything from the APPs", explains Lima.

The third stage of EcoRespira concerned the multiplication of the findings. This phase included a series of training workshops for about 100 key agents—smallholder farmers, inspection bodies, and students—who can then teach the approach to other people. "We showed them the results, gave out manuals and taught the participants how to promote environmental adjustment in the lands they own or work on," says Lima.

## **EcoRespira in action**

*Mr. Edegar Manuel da Silva owns a 100-hectare property in Boca do Acre, south of Amazonas. Together with his wife and son, he raises a herd of sixty cattle.*

*But Silva has a problem. His land is considered illegal according to the Brazilian environmental law. This is because most of the area is deforested, instead of having 80% of it preserved as the Brazilian Forest Code demands.*

*This situation began in 2004, when Silva was fined in 200,000 reais. This way, he was unable to obtain an allowance from banks until he was back in legal compliance.*

*With support from EcoRespira, he aims to solve the problem. "As a starting point, we are recovering our APP in a total of 8 hectares," affirms Silva. "When we finish the project, in ten years' time, we expect to maintain 80% of our land preserved, growing cattle in the 20% allowed by law. Meanwhile, we intend to do the reforestation with nuts, wood trees and native fruits to increase our financial income. I believe this project can help us to legalise our land and to explore the products of an agroforest without the need to cut down the forest," concludes Silva.*





*The Amazon Forest, where Ecorespira team conducted a series of studies to understand the soil respiration in preserved and denuded rainforest areas*

## Impact

*Land use in the Amazon has a huge impact on climate change. By cutting down the forest to make pasture, the soil is destructed and GHG emissions increase. By measuring soil respiration, the EcoRespira-Amazon project develops a more adequate and eco-friendly land management methodology.*

*The project shows that preserved forest can be more valuable for farmers than pasture. By preserving the forest, farmers will act in accordance with the law, have an income from agroforest products, and still be able to use part of the property to grow cattle. Moreover, the farmer and his preserved land will*

*promote an invaluable environmental service to the planet.*

*Indeed, this is not the kind of work that reaps the rewards overnight. A ten-year period is needed to see the forests recomposed, as defined by the Brazilian Forest Code. Ultimately, says Lima, the success of EcoRespira relies on the cooperation of landowners. “In the long run, with the growing of forests – if more properties adhere to the plan –, we will have better nutrient recycling, more pollinators attracted to the fields, Legal Reserves recovered, and, last but not least, we will see islands of forests, which are essential to maintaining the biodiversity of the Amazon.”*

## Innovative Approaches for Future Sediment and Water Management in Brazil (SeWaMa)

According to the World Bank, Brazil possesses 20% of the world's water supply. There is no larger freshwater reserve anywhere else on the planet. The idea of an endless resource, however, has caused indiscriminate usage by industries, agribusinesses, the domestic sector, and electric power generation, among others.

Due to the chronic overuse and administration gaps of the water supply, it only took one drought season to plunge some parts of the country into a severe crisis—mainly in the Southeast, which is the most populated and water-stressed area of Brazil.

To avoid worst-case scenarios, the World Bank emphasises the need for better management to meet the growing demand for drinking water and water usage in the agricultural and energy sectors.

Due to a lack of data concerning reservoir volume, it is crucial to implement techniques that allow dam administrators to measure the flux of sediments in their basins. This would

lead to a better understanding of the volume available and, consequently, the possible socioenvironmental impacts on this kind of infrastructure.

The project *Innovative Approaches for Future Sediment and Water Management in Brazil (SeWaMa)* took the first step towards this goal. This study is of the utmost importance for Brazil. While countries like the United States and Germany have no plans to build up any water reservoir, Brazil has 500 projects, many of them already in operation. “We realised we lack information to develop new techniques to plan and manage these reservoirs”, says researcher Tobias Bleninger at UFPR, who coordinated the project in partnership with Sanepar.

He goes on to state that the project provides improved data for decision making on hazard prevention and the development of management strategies regarding hydroelectric power production, water supply, and even mitigation of GHG emissions into the atmosphere.

### Facts and figures

- 2 trainings in reservoir management technologies
- More than 20 technicians trained in public sanitation companies
- 1 funding obtained to continue the research and training

#### Partners

- Federal University of Paraná (UFPR)
- University Positivo (UP)

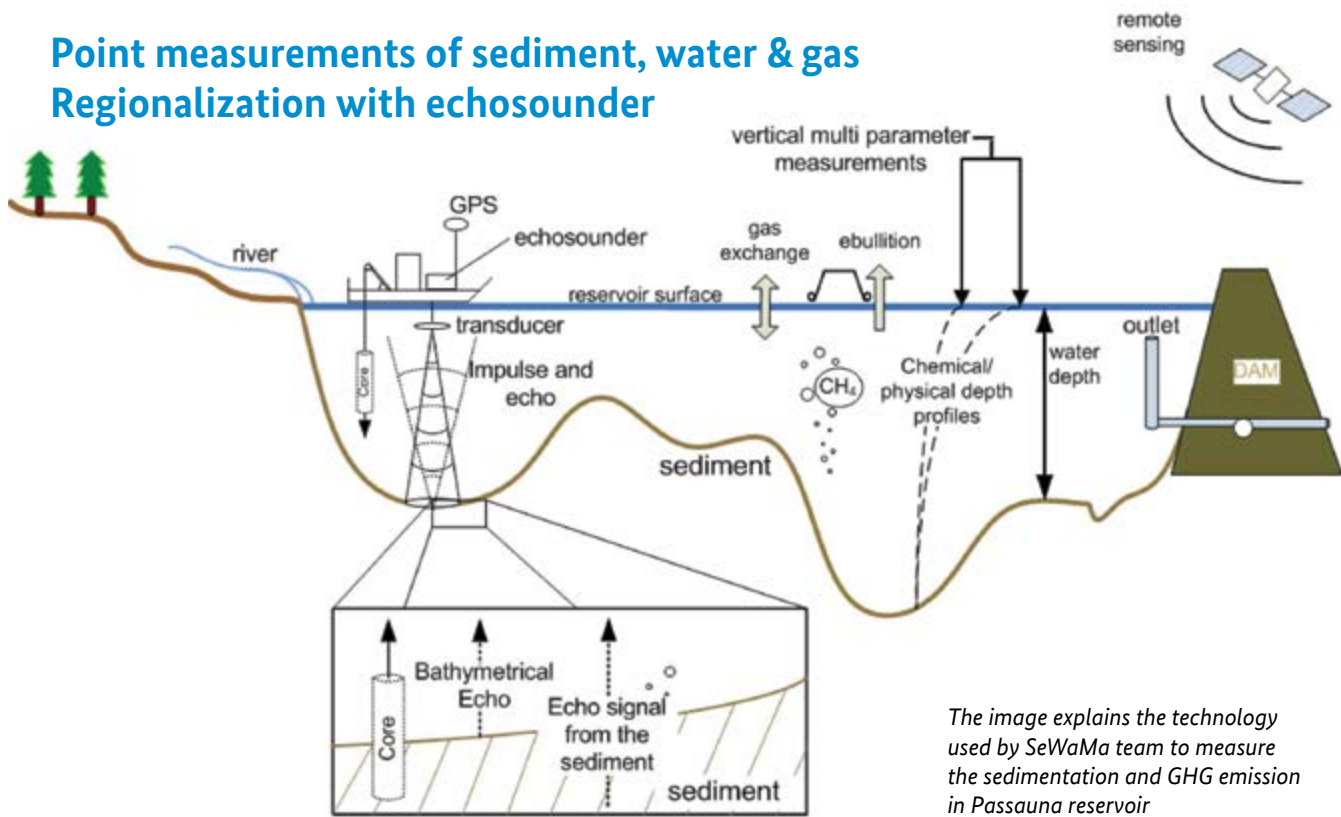
- Institute of Technology for Development (LACTEC)
- Energy Company of the State of Paraná (COPEL)
- Company for Sanitation of the State of Paraná (SANEPAR)
- Karlsruhe Institute of Technology (KIT)
- INNOMAR Technologie GmbH
- SENECT Aquatic Technology GmbH





*Platform installed in front  
of the SANEPAR water  
collection facilities to  
measure the water  
quality parameters*

## Point measurements of sediment, water & gas Regionalization with echosounder



*The image explains the technology used by SeWaMa team to measure the sedimentation and GHG emission in Passauna reservoir*

### Better Reservoir Administration

To conduct a series of analyses in the Passauna reservoir, which is managed by Sanepar, SeWaMa's team followed the guidelines of a model developed at the Karlsruhe Institute of Technology in Germany. The method is based on the Water Framework Directive, a European Union project created to improve water quality in the continent.

These studies revealed where the sediments in the dam came from, thus allowing to define the best locations to invest in the improvement of sanitation, such as agriculture and reforestation of open areas.

As an outcome of this project, the researchers presented six final products, interconnected with one another, which are helping Sanepar to better oversee its reservoirs. The knowledge developed can potentially be applied in all the existing dams in Brazil, as well as in future facilities. The first product included mapping the GHG

emissions from the sediments in the watershed. Researchers were able to verify a change in the land use due to the presence of fertilisers in the water. "These contaminants make the cleaning procedure more expensive", explains Bleninger.

The second product was the innovative measurement of the reservoir entrance. In most of the Brazilian dams, administrators do not know how much water they collect and store, or even its quality.

A third product was developed inside the Sanepar reservoir and concerns the mapping of accumulated sediment. "With acoustic sensors obtained from our partners in Germany, we could measure the reservoir sedimentation over the years and, consequently, estimate its lifespan", says the researcher. "This was the product Sanepar liked the most because the company didn't know that there was already so much sediment in the reservoir", he continues.



The fourth product dealt with the interference of sediments in the water quality. “When we found non-satisfactory water quality, we tried to understand the factors which led to those results”, Bleninger explains.

With the fifth product, the team measured gas bubbles with a flowmeter. Many reservoirs, especially tropical ones, have GHG emissions such as carbon dioxide and methane. This occurs because sediment accumulates in a submerged area of the reservoir, where there is no oxygen. Therefore, these bubbles can arise and contribute to climate change. Although there is currently no legal demand for companies like Sanepar to measure their emissions, this result could be included in their records in case they need to take action in the future.

The final product was the reservoir modelling. According to Bleninger, every new project should consider this point. “Usually, modelling costs a fraction of the final price of a project. With proper planning, research could lead to reservoir optimisation, which, in turn, could save money in the construction of a dam and avoid negative consequences, such as GHG emissions”, explains Bleninger. Now that the project is being concluded,

Bleninger sees the initiative as a tremendous success, not only because his team discovered a significant amount of valuable information with scarce resources, but also because Sanepar is already implementing this knowledge. The company invested close to one million reais on new equipment and technologies to have better control over all the aspects of dam management and water supply.

Gustavo Possetti, manager of the Research and Development Office at Sanepar, goes on to say that even after the end of NoPa, the work started in the scope of this partnership will continue. “The program allowed us to access academic knowledge, providing training to our staff and improving our operation and infrastructure. Altogether, it will help us to reach our sustainable goals”, he says. “NoPa gave us its amazing methodology, which we are adapting to promote the Paraná Research Program in Environmental Sanitation, in partnership with Araucaria Foundation. The goal is to attract universities and research centres, so they can develop solutions to attend the needs of Sanepar and other sanitation companies as well”, he concludes.

## Impact

*With a more rational management model implemented through the research, Sanepar can now analyse different variables that affect its activities, like dam siltation and environmental impact. This ensures better dam management and an enduring supply of water with better quality.*

*Furthermore, better dam management helps to mitigate GHG emissions in two ways. If vegetation surrounding and submerged in the reservoir*

*degrades, GHG is released into the atmosphere. By avoiding this degradation, the company automatically mitigates these emissions. The second way concerns the huge amount of energy demanded in this kind of reservoir. Siltation, water transportation and cleaning—just to mention a few—make the product more expensive for the user. A better-managed reservoir is more energy-efficient.*

## Energy-Efficient Retrofitting of Buildings in Brazil

Heating and cooling systems account for about 40% of building energy consumption around the world. In Brazil, 47% of electricity usage in the building sector comes from air conditioning alone. As the Earth's temperature continues to rise, demand for cooling devices is expected to increase rapidly over the coming years, mainly in developing countries. This leads to a vicious circle where the more severe the global warming becomes, more energy is needed to supply refrigeration systems, which very likely will increase the GHG emissions by the electric sector, thus worsening climate change.

This scenario demands new methods and tools geared towards a sustainable architectural design for constructions, as proposed by the project *Energy-Efficient Retrofitting of Buildings in Brazil*. The idea is to take advantage of natural ventilation to set up energy-efficient facades.

According to project researcher Luciana Oliveira Fernandes at Unicamp, although the effectiveness of natural ventilation depends

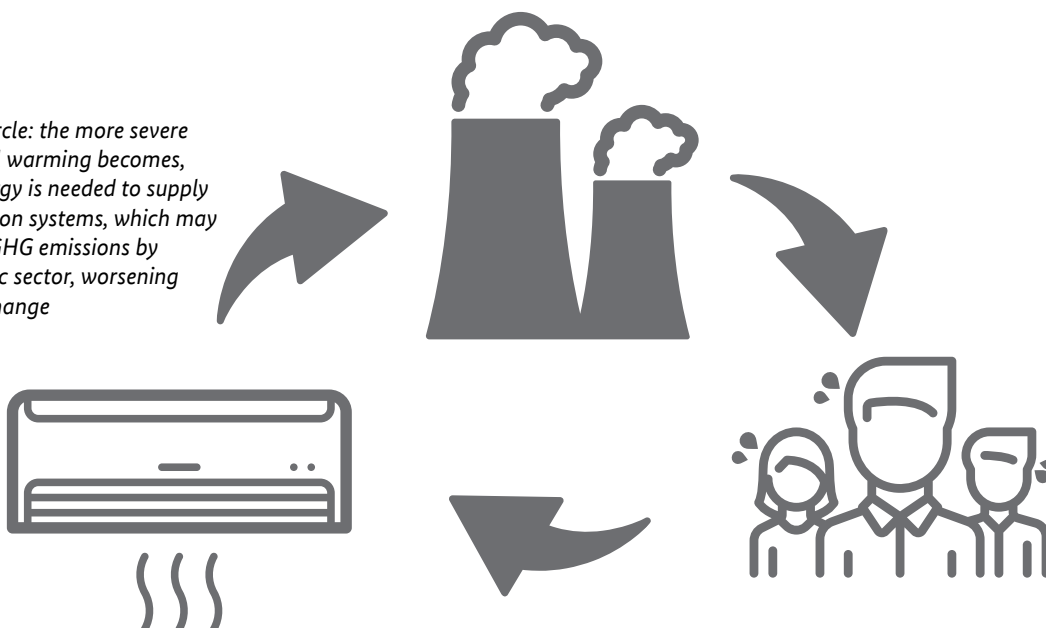
on the area where the building is located, as well as its thermal properties, such as the construction materials, a good facade protects against overheating during the day and allows for passive cooling through the night.

Based on this concept, Fernandes and her team ran tests in seven market-relevant window systems: four made in Brazil (provided by MGM Produtos Siderúrgicos Ltda.) and three from Germany (supplied by Christophe Lenderoth GmbH). They were all tested in the Unicamp wind tunnel to calculate the ratio between the actual and ideal air flows.

The scientists then carried out a series of computer simulations considering various regions of Brazil. The idea was to estimate the energetic efficiency promoted by the seven types of windows across different scenarios.

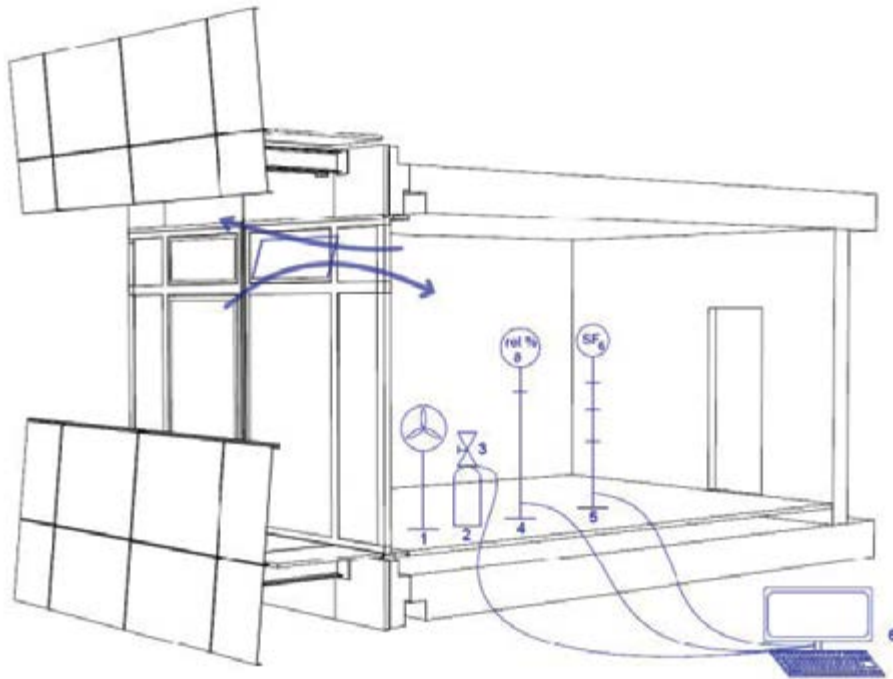
“The study confirms that natural ventilation has a direct impact on the building temperature, but also that we can't generalise the results by ranking the best and the worst windows.

*Vicious circle: the more severe the global warming becomes, more energy is needed to supply refrigeration systems, which may increase GHG emissions by the electric sector, worsening climate change*





*Research project demonstrates that it is possible to tap in the huge energy saving potential of natural ventilation*



The illustration shows how natural ventilation works in buildings

What we can say is that, as they have distinctive characteristics, they will attend better to different needs,” she continues. Fernandes explains that design and geometry, as well as the characteristics of the window—if it is sliding/tilting or if it opens inside/outside—, will interfere with the amount of air that circulates inside the room.

“Let’s imagine a kitchen, with a lot of heating factors, that has only one tilting window. To make things worse, the wall where this window is placed doesn’t experience much wind. With this setup, it is very likely that the heat will not be easily extracted, creating an uncomfortable environment for users and increasing the electricity bill, as cooling systems will be needed to improve the air quality and temperature,” she says.

On the other hand, if a kitchen has two windows on opposite sides, it will provide cross-ventilation in the room. This means that the air which comes in through one wall opening can make its way out through another. “This system is far more efficient. By following this path, the natural ventilation can remove accumulated heat more easily,” adds Fernandes.

Although this plan sounds perfect, she emphasises it may not be the best solution for every single room in a building: “In a bedroom, for example, people may not want all this ventilation. That’s why we cannot classify windows. Each one of them will perform better according to their usage.”

## Facts and figures

- More than 80 people reached in the construction industry (Builders, Power Distributors, Consultants, Trade Unions)
- 1 working group established to elaborate guidelines for window frames focusing on energy efficiency
- 1 guideline for energy efficiency buildings published with the construction sector

### Partners

- HafenCity University Hamburg
- University of Campinas (Unicamp)
- Christophe Lenderoth GmbH
- MGM Produtos Siderúrgicos Ltda.
- Civil Construction Industry Union of Sao Paulo (SindusCon-SP)



### **Beyond retrofitting**

The original plan of the research was to establish design guidelines for civil engineers and architects to tap into the vast energy-saving potential of natural ventilation in retrofitting existing buildings.

With the cooperation of SindusCon-SP, the project expanded the results. The union set up a working group with civil construction companies to verify and adapt the research results according to the needs of the private sector. During a five-month consultation process, an interactive guideline was developed in partnership with the Ministry of Mines and Energy (MME), which brings recommendations for companies regarding energy efficiency in buildings. An additional video will help to sensitise its member companies and show opportunities on this theme.

The vice-president of the union, Francisco Vasconcellos, says SindusCon-SP gives the highest importance to the studies carried out at Unicamp. “Indeed, we talk about the

connection between energy-efficient window frames and retrofitting, but we are also bringing assorted styles of constructions to the project, from those with high standards to popular ones,” he affirms.

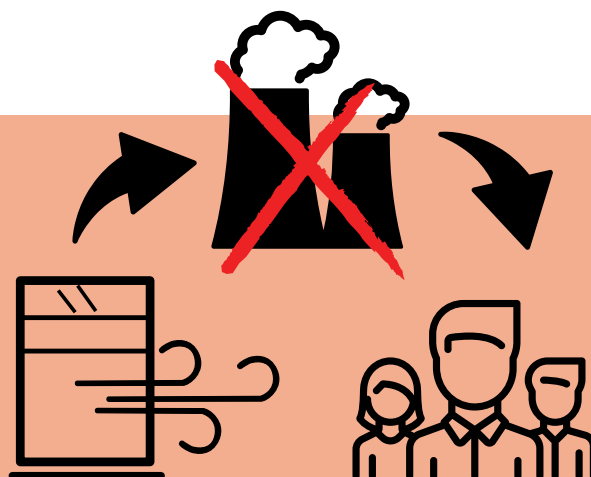
The reason for that, Vasconcellos explains, are bottlenecks that hamper retrofitting projects in Brazil. “Just to mention two points, we have a legislation issue, which is impossible to comply with, and lack of confidence in this kind of plan,” he says. “There are wonderful buildings that could be adapted to the present reality and serve society well.”

Still regarding the implementation of the study, SindusCon-SP is preparing courses with the National Service of Industrial Training (Senai) and producing an interactive guide with MME.

### **Impact**

*When we talk about energy-efficient buildings—whether in retrofitting projects or new houses—, we are bringing up a new way of thinking of the construction sector.*

*The more common the use of natural ventilation in buildings becomes, the less energy will be needed to supply air conditioning systems, which will likely decrease the demands on the energetic grid and consequently lower the GHG emissions in the electric sector. This contributes to more efficient building, which, besides consumption and cost reduction, can bring more comfort to users. Ultimately, it means climate change mitigation, or at least an important contribution to that.*



*On this project, SindusCon-SP developed a series of activities to promote more efficient buildings, with the ventilation systems being only a starting point. As a result of this partnership, the awareness of the building industry can be stimulated and climate-friendly projects can be implemented in the long run.*

## Solid Waste Management in Jundiaí (MBT)

In 2010, when the Brazilian government implemented the Solid Waste National Policy (SWNP, Law 12.305/2010), there was a hope that the country's sanitation issues would be finally solved. The order was clear: "Final environmental disposal of the tailings [...] shall be implemented within four years after the date of publication of this Law." It should facilitate and enforce selective collection, waste treatment and recycling strategies before final disposal all over Brazil.

Few years have passed after the deadline, but, as shown by the Panorama of Solid Waste 2016, the country still has a long way to go to comply with the SWNP. There are 3,000 dumps or controlled landfills spread throughout the national territory in 3,331 municipalities, which receive about 30 million tons of urban waste (41.6%) every year.

Limited expertise was available to develop the necessary technology, and faltering decision-making has caused these negative effects. For example, less than 30% of the municipalities submitted a solid waste management plan until the end of 2013, which was demanded in the SWNP.

In addition, there is a distinctive lack of knowledge about the quantity and quality of resources from the residue sectors in the field of waste treatment and secondary products. This also influences the qualified human capital, which is necessary to build substantial waste management on all levels.

In this context, the research *Solid waste management in Jundiaí* pursued the fulfilment of the governmental requirements and the development of sustainable knowledge in this

area. Therefore, the municipality of Jundiaí, located 57 km from Sao Paulo, with about 410,000 inhabitants, aimed to install an eco-efficient urban solid waste management system and, more specifically, the construction of a fermentation plant to enable mechanical biological treatment for municipal solid waste.

### **Understanding and educating**

With the cooperation of German institutions that dominate remarkable knowledge in the field of waste management, such as TUBS, DBFZ, DAAD, GIZ, BMBF and KFW, the project consisted of three main components: collecting and evaluating data on the implementation of the fermentation stage; establishing and extending academic and non-academic training and capacity-building; and extending research capacities at the Pontifical Catholic

### **Facts and figures**

- *1 Solid Waste Management Research and Demonstration Centre founded in the municipality of Jundiaí, an area with about 410,000 inhabitants*
- *More than 50 non-academic partners, including 3 municipalities, 1 development bank and about 5 industries*

#### **Partners**

- *TU Braunschweig*
- *Deutsches Biomasseforschungszentrum (DBFZ)*
- *Centre for Research, Education and Demonstration in Waste Management (CReED)*
- *Eggersmann Anlagenbau*
- *Pontifical Catholic University of Rio de Janeiro (PUC-Rio)*
- *The municipality of Jundiaí*
- *Anchieta University in Jundiaí*



*Brazil still has about 3,000 dumps or controlled landfills spread throughout the national territory*







Above, one of the training section about solid waste management organised by the research team at the municipality of Jundiá

University of Rio de Janeiro (PUC-Rio). Gravimetric interventions pioneered the implementation of waste assessment according to grain size, allowing for a more accurate basis of fractions and future technological choice.

Another part of the project was the creation of the Brazilian Centre for Research Education and Demonstration in Waste Management (CReED). The institution provides training, information and consulting for decision-makers in the public administration, the waste management industry, the energy industry and regulating agencies not only for Jundiá but for other municipalities as well.

This experience enabled the players involved in the project to understand the problem of solid waste generation in the city, the instruments of the SWNP, and the appropriate ways of generating, treating and disposing residues. Also, it presented treatment and minimization

of environmental impacts technologies, thus broadening the discussion with the society on the sustainable management of solid waste.

The completion of the project also provided comprehensive knowledge of this new market and the construction of an interrelationship with the waste sector in a Brazilian-German framework. This way, a permanent exchange of experiences through vocational and technological education was made possible.

For Christiane Dias Pereira, researcher at TU Braunschweig who was in charge of the academic part of the project, the most significant achievement of this work was to guarantee the technical capacity of the partners.

Pedro Bigardi, mayor of Jundiá by the time the research was developed, said “this project is a reference to all Brazil relating to waste treatment.”

## Impact

*Indiscriminate disposal of solid waste is a problem that affects many towns in Brazil. Dumpsites are a threat not only for public health, but also for the environment. Appropriate solid waste management promotes population health at the same time that it stops soil, water and air contamination, and reduces GHG emissions.*

*To promote that, the project set up CReED; implemented a methodology to sort waste by grain size and weight in Jundiá; and established a task force led by the mayor of the town to oversee the implementation of research results and guarantee continued cooperation.*



*Dumpsites are a threat not only for public health, but also for the environment. Appropriate solid waste management promotes population health at the same time that it stops soil, water and air contamination*





## Cogeneration Power Plant Using Sugarcane Bagasse

As the Brazilian economy begins to show signs of recovery, energy consumption increases again and will most probably keep this path in the next years. This scenario may become an environmental issue in case Brazil relies on fossil fuel to supply the energy demand. On the other hand, it may also be a massive opportunity for the country to invest, develop, and embrace new sources of renewable energy, further strengthening its mostly green energetic matrix.

Sure, it is not an easy task to accomplish. The availability of alternative sources is inconsistent. If the rain doesn't fall, the wind doesn't blow, or the sun doesn't shine, there is no electricity.

The same logic works for biomass, like sugarcane bagasse, the fibrous residue of sugarcane juice extraction. Though this is the most common biomass used in Brazil, it is available only from April to December, when the sugar and alcohol industry use it to generate electricity in cogeneration plants. Out of this period, cogeneration power plants stop working and no electricity goes to the grid.

There is still another factor to add to this equation: it is not possible to directly store electricity on a large scale. Overall, power plants produce energy according to demand. Therefore, to reach a 100% renewable energy era, power production and power demand must correspond to each other to avoid blackouts.

Cogeneration using renewable resources can be an excellent way to address this issue, as shown by the research *Cogeneration Power Plant Using Sugarcane Bagasse*.

### **Sun and biomass**

Which sources should be combined to continue to produce renewable energy at a reasonable cost?

According to Eduardo Burin, researcher at the Federal University of Santa Catarina (UFSC) who conducted this project, concentrated solar power (CSP) and sugar cane bagasse are a good combination, for these energy sources supplement one another regarding local availability.

Brazil has a good insolation potential that can be harnessed by a thermoelectric plant, because CSP also uses the steam cycle to transform heat energy into electricity.

As an additional fuel, sugarcane bagasse is available during a reasonable period of the year, being the most used biomass in power plants, not to mention its carbon neutrality.

### **Facts and figures**

- *More than 40 non-academic partners, representing about 10 private energy companies*
- *1 pilot cogeneration plant designed by 2 companies: TGM Turbinas and Valmont*

#### **Partners**

- *University of Duisburg-Essen*
- *Federal University of Santa Catarina (UFSC)*
- *Federal Institute of Santa Catarina (IFSC)*
- *Federal University of São Paulo (Unifesp)*
- *Laboratory of Combustion and Thermal Systems Engineering (LabCET)*





*Boiler for the burning of sugarcane bagasse*

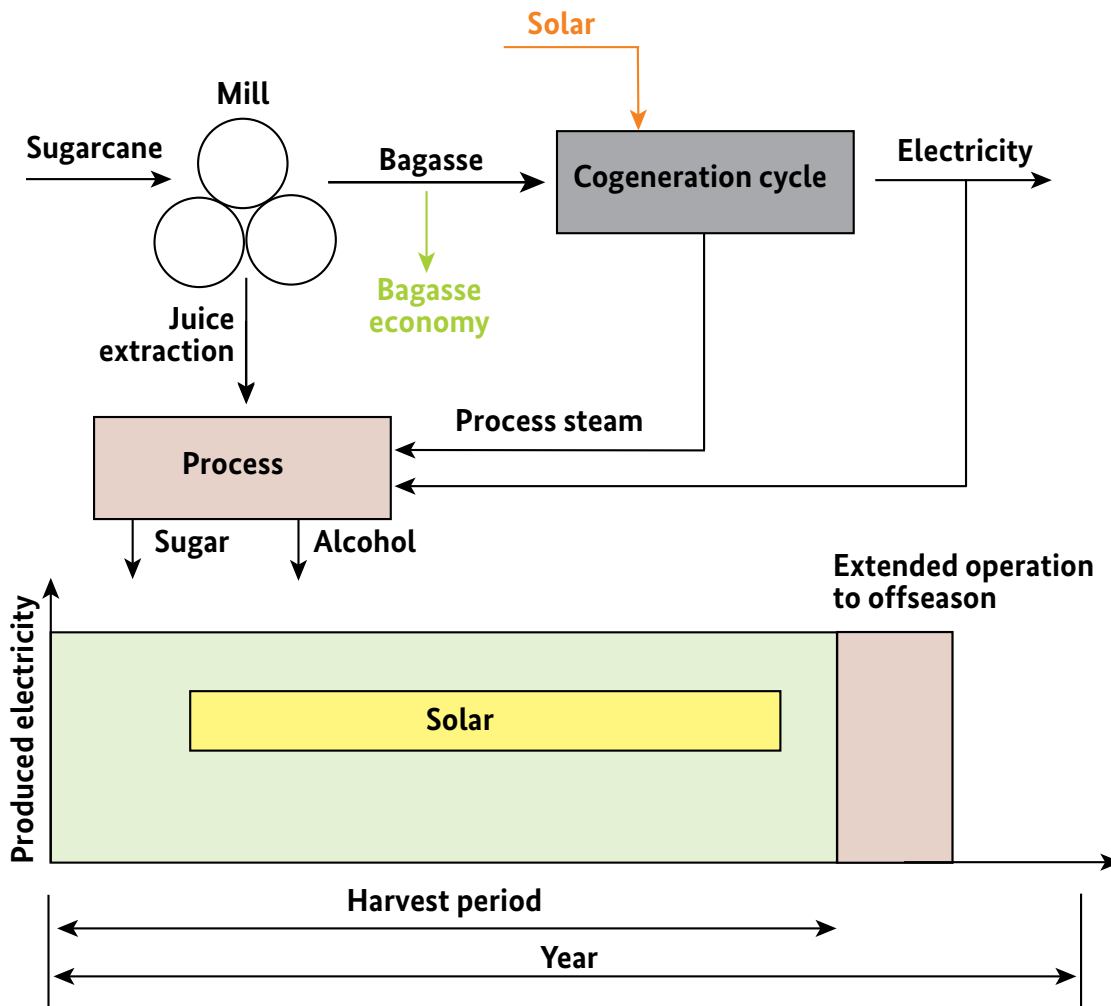
This characteristic makes the product more interesting regarding the reduction of GHG emissions.

Therefore, researchers evaluated the technical and economic feasibility of partially replacing bagasse with solar energy during a typical operating season. In this regard, the bagasse saved during harvest period could be used to extend the operation of power plants to the off-season, increasing the electricity production.

The first step of the research was to identify a typical state-of-the-art Brazilian bagasse cogeneration power plant to be the reference case for the study. The selected plant is located in Campo Grande, Mato Grosso do Sul state.

It processes 3 million tons of sugarcane per harvest with two 170 t/h steam generators that provide live steam at 67 bar and 525 oC. Most of the steam is expanded in a backpressure turbine, whereby the residual heat of the exhaust steam supplies the heat demand of the processing plant. In parallel, the remaining live steam mass flow (roughly one third) is expanded in a condensing steam turbine. The electricity produced by the turbines supplies the on-site power demand, and the surplus provides the grid.

Researchers performed a series of simulations for the entire harvest period while keeping the net electricity exported to the grid equal to the reference condition (46.6 MWe1) and respecting ambient weather fluctuations.



Scheme shows how a cogeneration power plant works with sugar cane and solar energy





*Cogeneration power plant Borges Termossolar, which uses biomass and solar energy as fuels to produce electricity*

## **Results**

The results of the project show the advantage inherent to the year-round operation of a solar aided power plant. “We realise it is possible to spare sugarcane bagasse during the harvest period, and that this sugarcane bagasse can be utilised to extend the operation of the existing plants to the off-season period”, affirms Burin. “This increment in the production from clean sources makes it possible to increase the participation of renewable energies in the Brazilian energy matrix”, he continues.

A research-into-use workshop was held in October 2014 and gathered relevant equipment manufacturers, facility owners and energy suppliers. The participants discussed the preliminary results of the project, the necessary steps for their commercial application and future activities involving the academy and the production sector.

Finally, the companies TGM Turbinas and Valmont, with the Charitable Association of the Coal Industry of Santa Catarina (SATC), prepared a pilot cogeneration plant.

## **Impact**

*Brazil needs to diversify its electricity matrix to be less vulnerable to the uncertainties of hydrological regimes, which in turns may lead to the use of fossil fuel. If on the one hand, CSP hybridisation with biomass indicates the possibility of baseload*

*power supply, on the other hand, the solar thermal load can also lead to the rational use of bagasse, by improving the injection of electricity to the grid. Ultimately, a higher renewable energy production means less GHG into the atmosphere.*



## Puxirum: Value Chain of the Brazil Nut

Extensive cattle ranching and monocultures have been significant causes of logging in the Amazon, mainly in the interface of the rainforest with the Cerrado biome. This scenario calls for strengthening more environmentally as well as socially sound economic sectors.

An effective way to protect tropical forests is through supporting people who care for the environment gathering its products in a sustainable way. The harvest of non-timber-forest products (NTFP), for example, is an economic activity which helps the livelihood of forest users, thus stimulating the value and protection of biodiversity as well as the survival and respect for the local people.

Based on demands from social movements, the last governments of Brazil started to look for alternatives to address this issue and promote inclusive, sustainable development. Although far from a shift in investment priorities for land use, politicians recognised and supported the potential that lies in NTFP, not only for conserving the Amazon forest but also for the sustainable management of the so-called socio-biodiversity—a management practice spread worldwide by traditional communities for centuries.

Therefore, in 2009, Brazil implemented the National Plan for the Promotion of Socio-Biodiversity Product Chains (PNPSB) in a joint programme by the Brazilian Ministry of Agrarian Development (MDA), the Ministry of the Environment (MMA), the Ministry of Social Development and Fight Against Hunger (MDS) and the National Supply Company (Conab). Nevertheless, the obstacles for its enforcement

were many, going from legal conditions to lack of infrastructure, funding, markets, information and education at the local level. Besides, due to hygienic and legal constraints, small landholders faced issues concerning production, transportation, processing and commercialisation of their products.

The research *Puxirum: Value Chain of the Brazil Nut* was conceived specially to facilitate the implementation of PNPSB. The project focused on linking successful initiatives from players involved in improving the exploration, processing and marketing of NTFP, especially the Brazil nut in Calha do Norte area, Pará state.

### **Building up networks**

What is the importance of connecting these players to foster socio-biodiversity value chains?

Before answering this question, researchers had to look at the value chain in Calha do Norte. Overall, as mentioned in the Puxirum project paper, it was disorganised and had inefficient logistics for marketing products of extractivist communities, given difficult accessibility conditions concerning urban centres and markets.

Reconciling local development and forest conservation depends mainly upon identifying shared challenges and goals, as well as synergy potential between forest user groups, firms and services to achieve mutually beneficial outcomes.

The research recommended three steps:  
1. Simultaneous concerted action in all sectors

*The value chain  
of Brazil nut  
in the Calha  
do Norte area  
was the study  
subject of the  
Puxirum project*



along the value chain. Strategic and detailed planning as well as strong governance and steering concept are essential for this.

2. A strong political commitment to support the NTFP sector in the Amazon, expressed through corresponding and relevant financial investments by the state.

3. The strengthening of existing networks and initiatives which are working on NTFP in Brazil (science, non-governmental organisations, associations, initiatives of the private and public sectors).

To put these recommendations into practice, a Centre for Technological Extension (Next) was established during the project and received funding to operate for five years. Furthermore, the Amazon municipalities of Oriximiná and Óbidos formed a governance committee on the Brazil nut value chain to discuss joint actions. Moreover, a manual to produce briquettes from nut residues, developed within the framework of Puxirum, is still being used in the municipality of Oriximiná.

“One of the greatest achievements of the project was to bring together all these players from the value chain in a local level”, celebrates Dörte Segebart, researcher at FU Berlin who conducted the Puxirum project. “NoPa allows the connection between these different players, who usually don’t dialogue with each other. We are referring to extractive associations, factory owners, employees and researchers”, she continues. “So, what NoPa promotes is another perspective of applied research, dialoguing with the society and with different actors in the society”, concludes the researcher.

Beyond that, the achievements of the Puxirum project can be disentangled into not only capacity building and primary research activities, but also multiple scientific and academic outputs in 2012-2013. The former comprises seven events, including a good practice in post-harvest management course for Brazil nut (supported by the project and one of its partners, Mundial Exportadora Ltda.), household and group interviews as well as SWOT analyses (strengths, weaknesses, opportunities, threats) of the Brazil nut value chain at the community level. Overall, the latter built upon various studies about the Brazil nut conducted by project team members, including Germany-based students to do fieldwork in the Calha Norte area, and Brazil-based PhD students at German partner universities.

Further, five dialogue events were organised by the project team and attended by representatives of extractive activities, scientists, the private sector and policy-makers: three regional seminars in the city of Belém, Pará state; a national one in the city of Brasília; and an international conference in Berlin.

## Impact

*The Puxirum project aimed at providing constructive inputs for strengthening Brazil nut value chains, particularly in the Calha Norte area, while contributing to enhancing NTFP management in line with the PNPSB.*

*In the long run, the implementation of the research proposal has the potential to reduce costs for deforestation control, adaptation to climate change and poverty relief programs—besides its sustainable development benefits for the maintenance of environmental services of this valuable and sensitive ecosystem.*





*An effective way to protect tropical forests is through supporting people who care for the environment*

## Facts and figures

- 7 non-academic partners
- 4 academic partners
- 4 training workshops for more than 50 multipliers - extractivists, government of the state of Pará, associations and companies
- 1 centre of technological extension founded in the middle Amazon area

### **Partners**

- Federal University of Pará (UFPA)
- Federal University of the West do Pará (UFOPA)
- Federal Rural University of the Amazon (UFRA)
- Freie Universität Berlin
- Institute for Advanced Sustainability Studies e.V. (IASS)
- University of Southern Denmark (Syddansk Universitet)
- World Agroforestry Centre (ICRAF)
- Forest Development Institute of Pará (IDEFLOR)
- COMEX State Extractive Commission
- Association of Processing Industries Commerce and Extractive Communities of Brazilian Chestnut (AICOMEX)
- Exportadora Florenzano Ltda.
- Reference Center for Innovative Technologies Foundation (Certi)
- Mundial Exportadora Ltda.
- Amazon Oil Industry
- Association of residents of remaining quilombola communities (Amocreq)
- Forestry and Agricultural Management and Certification Institute (Imaflora)
- National Council of Extractive Populations (CNS)
- Secretariat of State Science, Technology and Innovation (SECTI) of Pará

## VII. NoPa: beyond the research projects



*NoPa partners discuss the success factor and the program's contribution to the Brazilian innovation system*

### New consolidated partnerships with relevant actors in the Brazilian innovation system

In this publication, we have discussed the results of NoPa projects, their impact on the society, and the lessons learned during the eight years working to make NoPa happen. Nevertheless, while we look back and celebrate our achievements, it is very important not to forget to look ahead and consider the legacy of the program.

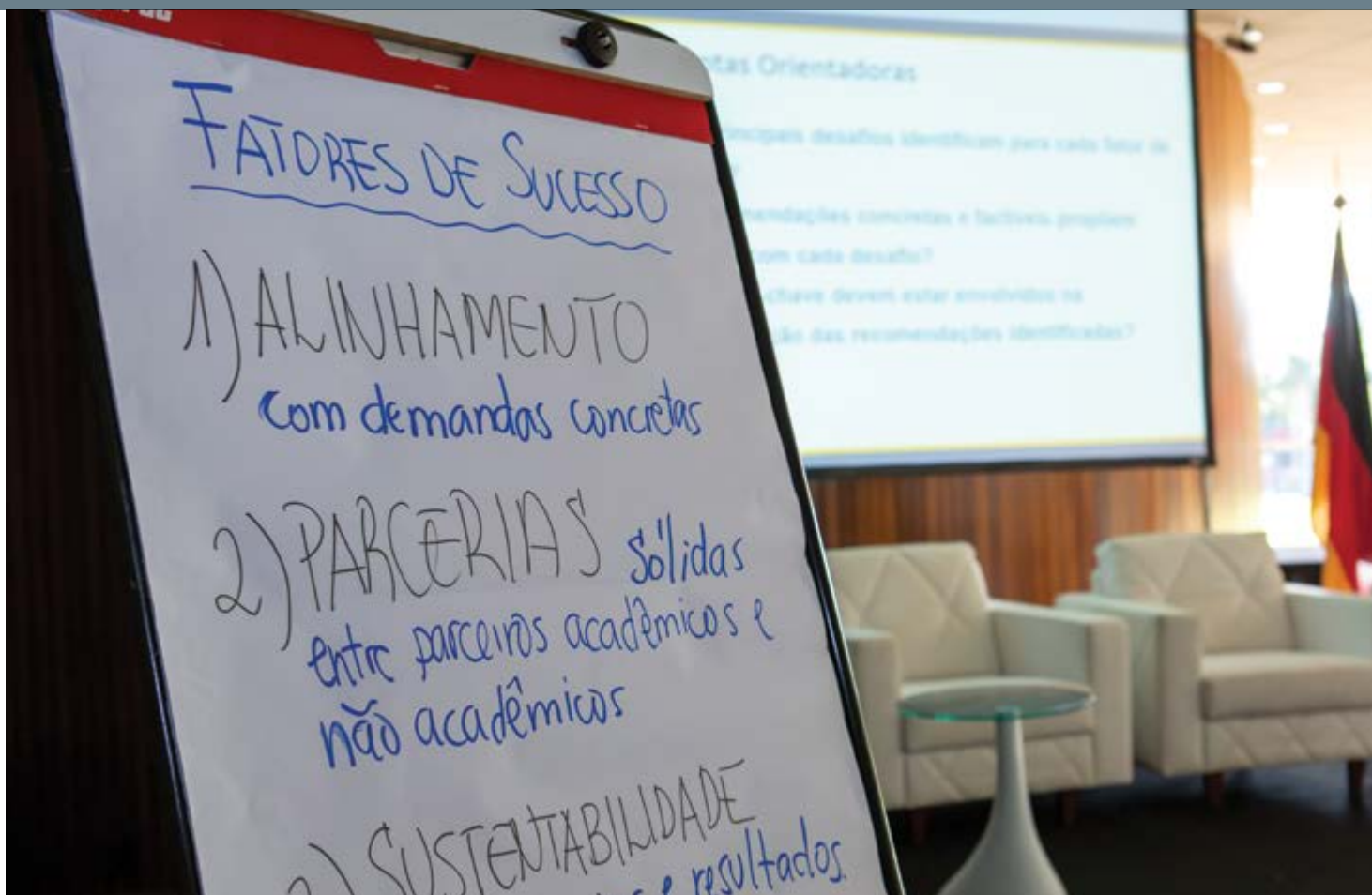
As a matter of fact, the partnerships we built went beyond those of our research projects. We have worked very closely with important players in the Brazilian innovation scene, and have secured with them that the positive experience we have had together will not only continue, but also improve greatly. Here are three concrete examples.

#### **CNPq**

In 1999, the National Council of Technological and Scientific Development (CNPq) implemented the Program of Long-Term Ecological Research (PELD), which articulates a network of reference sites for research on ecosystem ecology. Through this project, CNPq promotes qualified knowledge on Brazilian ecosystems and biodiversity and knowledge transfer to the society at large.

Successful as it has been in almost twenty years, PELD still faced challenges regarding the application of research results, said Marisa Mamede, Science and Technology analyst at CNPq. To face that challenge, GIZ and CNPq





Flipchart lists the NoPa success factors

started working together in 2016 to adapt some of NoPa’s positive experiences to the application of PELD results. “We needed to develop products and processes applicable to public policy”, explains Mamede. In May 2017, the institution organised a meeting with partners from all over the world to establish a “knowledge synthesis centre” in Brazil that would do exactly that. “We designed [the centre] inspired by the philosophy of NoPa, which brings researcher and end users together.”

### **ANEEL**

“The Brazilian electric sector is very conservative. It is deeply rooted in a monopoly, and that results in players that resist innovating. How can you promote innovation in a world ruled by stiff contracts?” Fernando Campagnoli, an expert in regulation at ANEEL’s Superintendence of Research and

Development and Energy Efficiency (SPE), started his reflection with this bluntly honest remark. Despite the conservativeness of many players, ANEEL does not shy away from its role as a driver of innovation in the Brazilian power sector: “As regulators, we started to review our role and what we want to promote concerning innovation”, added Campagnoli.

SPE, which is the main innovation driver at ANEEL, decided to provoke the industry with new ideas and opportunities. Representatives of the industry and academia were invited to participate in a special session at the 2017 Congress of Technological Innovation in the Electric Energy (Citene), in which they discussed research and development funded by power utility companies that are legally required to save part of their earning to that end. The discussion session was based on





*Researchers and representatives of private and public institutions who have partnered with NoPa in the closing event of the program*

NoPa's matchmaking experience and the result of months of joint work between GIZ and ANEEL. "It was a great success", celebrates Campagnoli.

The initiative was so successful that ANEEL decided to carry it forward and, once again, teamed up with NoPa to set up a call for research and development projects in electric mobility as well as a research and development network to promote innovation in the sector. The call will be published in the second semester of 2018 and, in April 2018, a kick-off workshop gathered more than 120 representatives from automakers, equipment producers, start-ups, research centres and utilities interested in joining the network.

### **Sanepar**

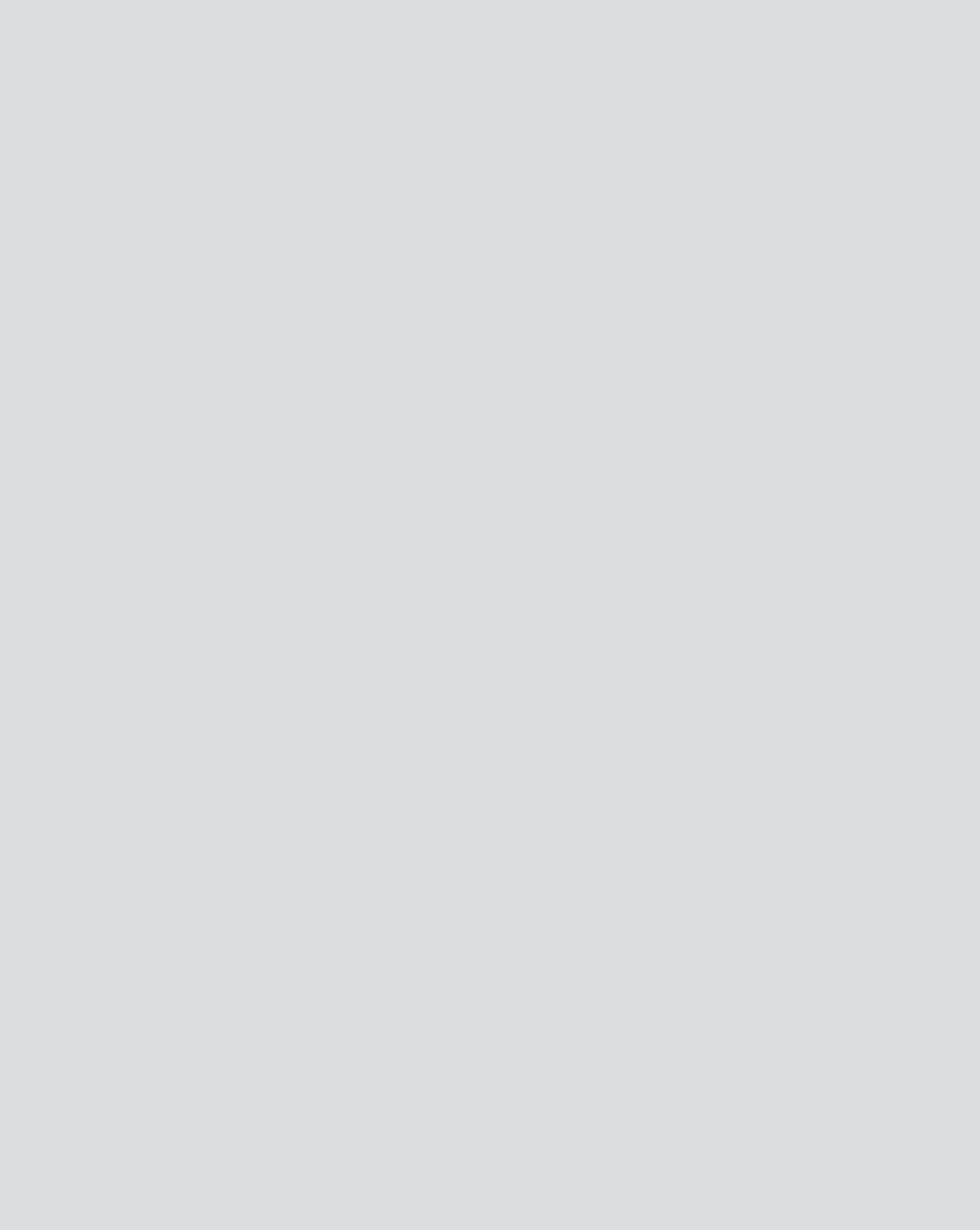
The goal of Sanepar is to become a national reference in environmental research by 2020. To that end, "the NoPa proposals fitted like a glove", says Ronald Gervasoni, Sanepar's advisor for Research and Development.

Sanepar was already a partner in NoPa's SeWaMa project. That was only the beginning of a solid partnership to promote demand-driven research to contribute to climate-

friendly sanitation services not only in the state of Paraná, but in other parts of Brazil as well. "It started small with NoPa, and now it is expanding", says Gervasoni.

In a joint effort with the Araucaria Foundation, the research funder of the state of Paraná, Sanepar had already published two calls for research projects. The calls, funded on a fifty-fifty basis by Sanepar and the state, had gathered more than fifteen universities. A third call worth 3 million reais will be published in July 2018 using an adapted version of the NoPa methodology to guarantee research with high potential to respond to actual public demands from Curitiba and other cities of Paraná.

Additionally, NoPa's expertise in promoting cooperation among partners in the academia and the industry is being applied in the National Institute of Science and Technology (INCT) program, a partnership funded by the federal government. Sanepar is a key player in this partnership, which intends to promote applied research and knowledge transfer in the field of water supply and sewage treatment. "The great advantage of NoPa is its dynamic, flexible methodology", concludes Gervasoni.



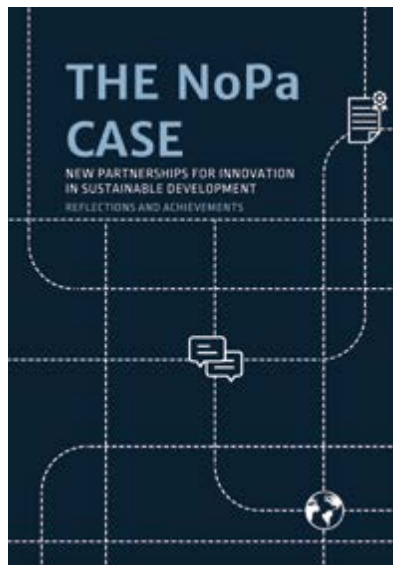
## VIII. NoPa publications



### The NoPa Toolbox

Why, how and who

*The publication presents in detail the NoPa Methodology and the design of the Program.*



### The NoPa Case

Reflections and Achievements

*The publication brings some success stories and a reflection about the NoPa experience.*



### NoPa Innovation for Sustainable Development

Success factors, challenges and the way forward

*The publication presents the success stories of the second stage of NoPa.*



### 10 Secrets for good research practice

Oriented to impact & Concrete application

*The publication gives practical advice and presents tools that have contributed to the success of NoPa's research projects.*

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